

# **Take-Make-Destroy**

Exploring Unsustainable Production-Consumption Systems and  
Policies to Address Product Destruction

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## *'No phosphorus, No thought' – Frederik Soddy*

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Yet, as Daly (1992) eloquently reminds his readers, even the human mind is not independent of the Earth's biophysical boundaries, to quote Frederik Soddy, 'no phosphorus, no thought'. I hope, therefore, that my research findings inspire the much-needed action to limit our mindless and wasteful use of the Earth's finite resources and bring our consumption within planetary boundaries, such that similar intellectual endeavours may continue for generations to come.

## **Abstract**

The practice of product destruction, whereby retailers or manufacturers dispose of viable consumer products such as unsold goods or consumer returns, is an extreme expression of the linearity of our current production-consumption system. This qualitative exploratory study aims to uncover why companies engage in this highly unsustainable and resource-inefficient behaviour, and to explore the potential policy interventions required to effectively address the issue. Sixteen practitioners with relevant knowledge of product destruction in the textiles, electronics and food sectors were interviewed in order to gain a deeper understanding of the forces driving companies to engage in this practice and provide a bottom-up perspective to inform a policy framework. This study found two distinct sets of factors that contribute heavily to product destruction. Upstream factors influence overall levels of customer returns and unsold stock, and include aspects of the retailer business model, consumer expectations and product design. Downstream factors, on the other hand, influence the companies to dispose of these products rather than pursuing product life-extension strategies such as repair and reuse. Key downstream factors include economic incentives, profit-margin considerations, liability and brand integrity concerns, the availability of reuse networks and management issues. This study found that, if product destruction is to be meaningfully addressed, a policy mix is required, simultaneously targeting both upstream and downstream factors in order to modify the behaviour of a wide range of different actors, from manufacturers and retailers to consumers and reuse organisations. Intervening upstream to address the root causes of product destruction, in particular, will require far-reaching changes to mainstream business models along with the type and volumes of goods produced, combined with shifts in consumer norms. In this way, tackling product destruction presents a vital opportunity to accelerate the transition to a more sustainable and just economy.

**Keywords:** retail, sustainable consumption and production, circular economy, e-commerce, policy

## **Executive Summary**

### ***Background and Aims***

This thesis aims to explore how the issue of product destruction can be effectively addressed. Product destruction (PD) refers to a situation whereby retailers and manufacturers purposefully dispose of viable consumer products, most commonly unsold goods or customer returns. This practice has been reported across much of the retail industry but is thought to be particularly common in e-commerce settings and for electronics, textiles, and food products.

Product destruction represents a significant sustainability challenge. From an environmental standpoint, it is a highly resource-inefficient practice: significant environmental harm occurs throughout the production process, but no private nor societal utility is gained from it as the goods are ultimately never consumed. Moreover, the environment is further damaged through disposal via landfilling or incineration. And there are also challenges in terms of social sustainability. While companies are destroying large volumes of viable consumer products, many people are routinely unable to access such products and are struggling to maintain a decent quality of life.

From a global perspective, we know that our resource consumption has surpassed sustainable thresholds, and that the Earth is in ecological overshoot (Global Footprint Network, 2018). Countries – particularly those in the Global North – need to drastically improve resource efficiency, and many have expressed such ambitions, creating targets to this end. The practice of product destruction, however, directly contradicts these efforts, and governments therefore have strong reasons to address it. Despite the obvious need for intervention, there is a prominent lack of research regarding the nature of product destruction, and the reasons why companies engage in this harmful practice. Moreover, there is limited knowledge regarding the range of policy interventions that could be leveraged to effectively address this problem. This study thus endeavours to answer the following research questions:

**RQ1:** What are the main factors driving product destruction?

**RQ2:** Which policy interventions are needed to eliminate the practice of product destruction?

### ***Methodology***

This study utilises exploratory methods, which are particularly suitable for tackling an under-researched phenomenon for which there is a lack of empirical data. It is a qualitative study, and the key methodological steps involved reviewing literature from a range of disciplines to determine the factors involved in product destruction along with potential policy interventions. Subsequently, sixteen practitioners were interviewed from the textile, electronics, and food sectors. Interviews aimed to evaluate the factors identified in the literature and assess practitioners' views with regards to the effectiveness of different policy instruments. The data was then analysed using content analysis software and abductive coding methods.

From an initial literature review, two sets of factors were identified as having influence over product destruction decisions. Upstream factors refer to those factors which affect levels of unsellable stock and customer returns, including aspects of the retailers' business model, product design characteristics and consumer behaviour. Downstream factors, in contrast, influence companies' decisions to dispose of these products instead of using more sustainable disposition routes; they include profit margin considerations, economic incentives, brand integrity, and legal/liability issues. The identification of these two sets of factors allowed for the

development of the study's conceptual framework which provides a holistic overview of the drivers of product destruction, while identifying where interventions should be targeted.

Next, the policy literature was reviewed to determine which policy instruments could be leveraged to address the issue of product destruction, focussing on policies that promote product life extension. Product longevity is a critical component of a circular economy and represents the antithesis to product destruction practices; policies to extend product longevity were thus found to be of significant utility in addressing PD. This literature review also revealed that a large range of policy instruments – administrative, market-based, and informative – can be utilised to foster product longevity. The review also highlighted the necessity of targeting the behaviour of many different actors within the production-consumption system, from retailers and manufacturers to consumers. Specific legislative measures related to product destruction that have recently been introduced in France, Germany and Belgium were also analysed and deemed to be of limited effectiveness if enacted individually, as none appear to address the upstream root causes of product destruction.

### **Main Findings**

The findings of this empirical study corroborate many of the factors identified in the literature as contributing to product destruction. In terms of upstream factors, three main driving forces were identified: business models, product characteristics and consumer behaviour. For example, the levels of surplus stock and customer returns is highly dependent on the business practices of retailers in terms of their purchasing behaviour (bulk ordering), liberal returns policies and made-to-stock retail models. On the other hand, a symbiotic relationship between consumer behaviour and retailer practices was observed. In many ways, retailers claim to have built their model around consumer expectations and are thus wary of changing practices, fearing a customer backlash which could harm their commercial viability. Importantly, the role of the consumer in altering expectations and demands was found to be more significant than initially suggested in the literature. Finally, product characteristics such as quality and cost had significant influence on whether the product was returned or whether it became unsellable after being damaged in transportation, handling, and storage. Thus, the importance of a high-quality and limited product portfolio was emphasised. These upstream factors can in many ways be seen as the driving forces of product destruction, as they contribute to the existence of large volumes of unsellable and surplus stock; they must be targeted if product destruction is to be effectively addressed.

This study also identified the downstream factors which influence companies' decisions to dispose of unsold goods and customer returns instead of making use of more sustainable disposition routes such as reuse, repair, or remanufacturing. The main factors uncovered in the literature were corroborated by the interviewees. There are several examples of economic incentives which disincentivise companies from reusing products and instead encourage disposal strategies lower in the waste hierarchy. For example, in many EU countries companies are required to pay VAT on items donated to charity or are offered financial compensation for sending products for energy recovery or animal feed in the case of food products. Profit margin considerations also had significant influence, relating to the costs which retailers face when it comes to reintegrating returned stock or finding avenues for product reuse. In many cases, these costs were found to be greater than the original cost of the product. In purely business terms, it therefore often makes sense to dispose of these products rather than bearing the handling and storage costs.

Concerns of brand image and integrity were also significant downstream factors. Retailers and brands often want to retain the exclusivity of their products and prevent them from ending up in grey markets, which can cannibalise their own sales; landfilling and incineration are thus seen

as a reliable method for ensuring brand protection. Informants nonetheless emphasised the negative associations with brands that are exposed to be engaging in product destruction scandals, leading brand integrity issues to become less influential in driving destruction decisions. Finally, in certain situations retailers may be required to dispose of products due to the significant liability risks associated with allowing these products to be reused in other markets. For example, returned electronics products can pose significant data protection issues, meaning retailers must ensure all personal information has been wiped. This process is rarely economically viable for products below a certain value threshold. Meanwhile, for food products, some retailers fear that they may face legal repercussions if below-specification products make it on to secondary markets, with disposal seen as a less risky option.

Two further downstream factors were uncovered by this study, which were not present in the existing body of literature. Firstly, the existence of a redistribution network for products that would be otherwise destroyed was found to be crucial. This means that if products are not going to be disposed of, there has to be a demand for them to be used again, a so-called 'reuse case'. In the case of food products, it was explained that there is often a demand for them as they serve an important societal function. Thus, the importance of capacity building amongst actors that can redistribute surplus food products to those in need was highlighted. In the absence of a developed redistribution sector and infrastructure, there are limited opportunities for product life extension. In contrast to food products, textile and electronic products presented more challenges in terms of redistribution and reuse, as the societal need or demand for them is often lacking, particularly given the large volumes of products some retailers are faced with. Thus, it can be difficult to find any viable alternative to disposal, even if retailers are willing to take on the associated costs. A final factor which was not present in the literature related to management issues and the fact that disposal is often preferred as it is a highly convenient and time-efficient waste management technique which requires little co-ordination. Time-pressured staff may thus favour this disposal route, particularly if the necessary infrastructures and processes have not been properly established or resourced.

Having established the driving forces behind product destruction this study next explored which policy interventions are needed to effectively address the problem. This study found that to tackle the root causes of product destruction, upstream factors such as retailer business model, product characteristics and consumer behaviour must be addressed. Several policies were discussed in this regard, including levies on volumes of products that are returned or remain unsold, minimum product standards and eco-design requirements, along with consumer awareness campaigns to encourage more sustainable consumption norms. Tackling the root causes of product destruction in many ways presents challenges to the underlying model of the linear economy. This is no easy task, and it therefore requires significant policy innovation and experimentation.

This study has also established that policies are also needed downstream to ensure better reuse and redistribution of surplus and returned products. This study recommends several policies that can be used to change economic incentives, by reducing VAT on donated products, introducing a taxation structure in line with the waste hierarchy to promote reuse over energy recovery and placing financial penalties on companies that continue to dispose of products. Other important policies involve supporting capacity-building and the development of the reuse sector, in order to provide viable alternatives to disposal for surplus and returned products. Nonetheless, this study has found that these downstream measures only offer a partial solution to the problem, as they do nothing to address the root causes of product destruction.

This study focused on three distinct product groups – textiles, electronics, and food products. Important differences were identified in the factors driving destruction decisions within each

group, highlighting the need for a differentiated policy approach. For example, given the difficulties and potential risks associated with intervening upstream within the food sector, along with the social value that can be harnessed from redistribution of these products, downstream interventions are perhaps more favourable in the food sector. In contrast, given the difficulties of finding a reuse case for many of the low-value, low-margin products in the textiles and electronics sectors, it may prove to be more important to intervene upstream and restrict the overall volumes of returns and unsellable products to begin with. This study has also underlined the importance of a policy mix when addressing product destruction. As demonstrated through RQ1, the reasons for product destruction are varied and complex and involve many different actors; in order to effectively address this problem, multiple interventions are needed simultaneously to target the behaviour of these distinct actors. Moreover, market-based instruments were shown to be particularly important within the policy mix, as profit margin consideration and economic incentives were two of the driving forces behind disposal decisions.

### **Concluding remarks**

Product destruction is an unacceptable feature of our current production-consumption system. The ‘take-make-destroy’ logic associated with the practice is both environmentally disastrous and morally reprehensible, particularly as the planet is already in ecological overshoot while millions still lack the basic resources needed to sustain a good quality of life. This study has nonetheless highlighted that the reasons for the existence of this practice are variegated and complex, and it has brought attention to the wide range of policy interventions that could be leveraged in order to effectively address this problem. This study has shown that there is no simple fix, as properly addressing PD requires significant changes to the way our current production-consumption system functions, particularly in terms of retailer business models, product design and consumer expectations. The findings from this thesis are thus meaningful for policy makers that wish to address this problem in a variety of contexts. In many ways, product destruction is an expression of the extreme linearity embedded in our economic system, and thus effectively addressing it will require some systemic changes and significant policy innovation. Yet tackling this problem provides an opportunity to accelerate the transition to a more circular and just economy and thus should be embraced with enthusiasm.



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## Abbreviations

PCS – Production-Consumption-System

PD – Product Destruction

CE – Circular Economy

SCP- Sustainable Consumption and Production

# 1 Introduction

## 1.1 Problem Definition

Global natural resource use has more than tripled since the 1970s and continues to grow (IRP, 2019). The extraction of natural resources and their conversion into products and services that are consumed on markets is the basis of our current economic system. Although this process has contributed to significant growth in GDP, it is also responsible for much of the ecological breakdown we are witnessing today, contributing to 50% of GHG emissions (not including emissions related to land-use change), along with 90% of biodiversity loss and water stress (IRP, 2019). Since the 1970s, global annual demand for resources has continuously exceeded Earth's biocapacity, placing humanity in ecological overshoot (Global Footprint Network, 2018). The distribution of natural resource use and related benefits is nonetheless highly unequal: the material footprint of high-income countries is up to 13 times greater than that of low-income countries, where individuals still struggle to meet basic needs (IRP, 2019). Global material use is expected to grow rapidly in the coming decades, increasing by 110% from 2015 levels to reach 190 billion tonnes by 2060 (IRP, 2019). While this could lead to important human development gains in low-income countries, it will certainly place Earth's systems under ever increasing pressure. For these reasons there has long been an acknowledgement in the international community, particularly among high-income countries, that establishing more resource-efficient economies and advancing a more sustainable global production-consumption system is critical, both for keeping within planetary boundaries (Rockström et al., 2009) and also in terms of sustainable development (European Commission, 2011; UNEP et al., 2016).

Despite the longstanding recognition of the need for change (Boulding, 1966; Daly, 1992; Meadows et al., 1972; Murray Bookchin, 1989) and the recent prioritization of resource-efficiency and circular economy on the European policy agenda (European Commission, 2011, 2020), the linear industrial economy and associated 'take-make-waste' logic remain entrenched. One particularly alarming and highly resource inefficient feature of our current production-consumption system (PCS) is the practice of product destruction (PD). Product destruction refers to a situation whereby consumer products are willingly disposed of before use. Companies, both retailers and producers, are thought to engage in this practice for a variety of reasons, often as a strategy for dealing with excess inventory, customer returns, defects/damaged goods or product recalls (Elia, 2019; Naiper & Sanguineti, 2018; Pourhejazy, 2020). Many different companies, including Nike, H&M, Burberry, Walmart and Amazon have faced criticism for engaging in product destruction (BBC News, 2018; Hendriksz, 2017; Naiper & Sanguineti, 2018; Pallot, 2021). Despite a lack of clear data on the issue – a result of high sensitivity and brand reputational risk - product destruction is thought to be a widespread and long-established practice across much of the retail industry and is particularly apparent for textiles (Elia, 2019; Naiper & Sanguineti, 2018), electronics (Rödig et al., 2021) and food products (DEFRA, 2008; The Independent, 2021). It is understood that changes in consumer preferences along with the growth of the e-commerce sector and the advent of new business strategies such as 'fast-fashion' have contributed to an increase in product destruction over the years (Naiper & Sanguineti, 2018; Pourhejazy, 2020; Rödig et al., 2021). In France, it is estimated that around €630 million of unsold goods are destroyed every year (Rödig et al., 2021), whilst in Germany estimates are as high as €7 billion per year (Deutsche Welle, 2020). Some initial modelling suggests that the sum of products being destroyed in the European Union from only

two product categories (textiles and electronics) is expected to reach €21.74 billion by 2022 – larger than the entire GDP of Cyprus for the year 2020<sup>1</sup> (Rödig et al., 2021).

The ‘take-make-destroy’ logic associated with product destruction is highly problematic from a sustainability standpoint. Firstly, the extraction of natural resources and their manufacturing into consumer products results in significant environmental degradation and the emission of pollutants and hazardous substances (IRP, 2019). The environmental harm associated with production, however, provides no private nor social utility, given that the products are destroyed before ever being used. Secondly, landfilling and incineration have been widely reported as the most common waste management solutions for these products (BBC News, 2018; Hendriksz, 2017), which presents further sustainability challenges in terms of the associated pollutants, hazardous substances, and health concerns. Moreover, waste management systems are under pressure given the continuously increasing volumes of waste. In England alone, the volume of waste being sent to incineration has increased from 5 million tonnes in 2014 to over 10 million tonnes in 2017-2018 and continues to rise (DEFRA, 2022). The addition of products which have never been used, to this already overloaded waste management system, is thus a significant burden. Product destruction also has noteworthy consequences in terms of climate change; in total, it is estimated that the destruction of unsold goods generates five to 20 times more GHG emissions than their reuse (Ellen MacArthur Foundation, 2021). Thus, countries with climate ambitions and net-zero targets have strong reasons to put an end to this unsustainable practice.

Product Destruction also presents major social challenges. While corporations are destroying vast numbers of viable consumer products, many people are struggling to consume the necessities needed to sustain a decent quality of life. To take one example, in France every year €180 million worth of unsold hygiene and beauty products are destroyed and yet around three million French people routinely cannot afford basic hygiene products (Ellen MacArthur Foundation, 2021). In the UK, meanwhile, supermarkets were found to be throwing away the equivalent of 190 million meals a year that could have been redistributed to the hungry (The Independent, 2021), at a time when millions of people are facing food insecurity as a result of the Covid-19 pandemic and the mounting cost of living crisis (Food Foundation, 2022). The purposeful destruction of consumer products thus represents a ‘lose-lose situation’ for both people and planet, and yet it remains embedded in the business models of many corporations as an economically viable practice. Commenting on a destruction scandal at an e-commerce warehouse in the UK, in which 124,000 products were earmarked for destruction in one week alone (Pallot, 2021), the celebrated environmentalist Greta Thunberg remarked that ‘a system where this is possible – and even profitable – that’s a clear sign that something is fundamentally wrong’ (Greta Thunberg, 2021).

It is clear, therefore, that PD serves as a major barrier to establishing a resource-efficient and just economy and thus is an issue that commands policy attention. In a European context, the practice of PD lies in direct contradiction to the European Union’s Roadmap to a Resource Efficient Europe (European Commission, 2011) along with the more recently announced Circular Economy Action Plan for a Cleaner and More Competitive Europe (European Commission, 2020). For this reason, along with mounting pressure from environmental and civil society organizations (Guardian, 2021; Rödig et al., 2021), the topic has received increased attention within EU policy circles. France, Belgium, and Germany have shown leadership on this issue, introducing a variety of policy instruments to address the issue directly. French lawmakers made the headlines in 2020 when they announced a ban on the destruction of unsold

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<sup>1</sup> Note: Estimates are based on German e-commerce sector. This a conservative estimate as it only reflects the destroy rate for returned goods that are sold online, and does not include unsold goods that are destroyed or those that are sold in local retail stores.

goods as part of the French Anti-Waste Law (LAW N° 2020-105 of February 10, 2020 Relating to the Fight against Waste and the Circular Economy, 2020). In Belgium, VAT relief for donations has been introduced as an economic mechanism to encourage product reuse over destruction (Law amending the Value Added Tax Code with a view to exempting from VAT donations of non-food items to the most deprived, 2019) , whilst in Germany a novel ‘duty of care’ legal principle has been put in place for producers and retailers along with mandatory reporting requirements for the types and volumes of products being destroyed (Circular Economy Act, 2020). In an effort to provide harmonization at the EU level and to prevent the movement of goods to other locations within the single market where regulations around product destruction remain looser, in April 2022 the European Commission announced a proposal to introduce mandatory reporting requirements on the volumes and reasons for the destruction of unsold goods (Huestebeck & Bellot, 2022).

Despite the growing interest, PD remains a highly under-researched topic, with very few academic publications addressing the phenomenon directly. In the field of policy studies, there is a significant lack of research to determine which measures will be most effective in addressing the issue. Some literature already points to the potential short-comings of the French, Belgian and German legislation (Rödig et al., 2021), suggesting that a wider range of policy interventions may need to be leveraged. There also remains a significant gap in our understanding of the policy problem, and the root causes of product destruction practices. A comprehensive understanding of the nature of the policy problem is, nonetheless, fundamental to design effective policy responses (Hoornbeek & Peters, 2017).

Further research is needed to better understand the nature of product destruction and the driving forces behind the practice. Building from this, additional research is then required to map the full range of policy responses and understand practitioners’ views with regards to the potential of such policies. This research will hopefully be of use to policymakers, particularly in the European context, but also in other retail markets where product destruction has also been reported. Given the importance of addressing this issue and accelerating the transition to a more resource-efficient and just economy, research is urgently required to ensure that future legislation will be fit for purpose.

To summarise, product destruction is highly unsustainable from both an environmental and social perspective. The fact that this practice remains embedded in the business models of many companies signals the need for targeted public policy intervention. Nonetheless, it remains an under-explored topic, with a lack of in-depth understanding of the root causes of the problem and the policy instruments needed to eliminate this highly resource-inefficient practice.

## 1.2 Aim and Research Questions

The objective of this thesis is, to first, understand the driving forces behind product destruction and the key factors which influence companies’ decisions to engage in this practice, and second, to explore which policy interventions are required to effectively address this problem. An initial literature review will help to identify the key reasons for product destruction along with possible solutions. Interviews with practitioners will be used to corroborate findings from the literature and provide insights into the potential of specific policy interventions. Such analysis aims to produce a meaningful policy framework which outlines the full range of policy responses to this issue, helping to provide much needed insights and support related policy processes in contexts where product destruction has been observed.

To achieve this aim, it will be necessary to answer the following research questions:

**RQ1:** What are the main factors driving product destruction?

**RQ2:** Which policy interventions are needed to eliminate the practice of product destruction?

### 1.3 Scope and Delimitations

This thesis will focus on the issue of product destruction with specific reference to textiles, electronics and food sector, as product destruction is thought to be particularly prevalent among these product categories (Elia, 2019; Naiper & Sanguineti, 2018; Rödig et al., 2021). To answer the proposed research questions, this thesis will predominantly rely on 16 interviews with key actors in the value chain, including companies destroying stock, reuse organisations receiving surplus stock, along with experts in supply chain and logistics and waste management consultants. The decision was made to not conduct a survey, as due to the sensitivity and associated brand reputational risk, the sample size would likely have been limited, hindering the reliability of results. Instead, a select group of practitioners have been chosen as they were deemed to have the greatest understanding with regards to the policy problem, given their direct exposure to and engagement with the topic. This thesis aims to equally represent practitioners from the textiles, electronics, and food sectors to determine any variations in the drivers of product destruction across different industries, and whether any unique policy interventions are needed for specific product groups. The decision was made to engage with practitioners working in a range of different geographical contexts, to gain a holistic understanding of the topic and maximise the generation of new knowledge on product destruction practices. Moreover, given that many large retailers operate in a transnational context, many of the factors driving destruction decisions were thought to be common across different markets, particularly within a European context. Interviewing practitioners from different international contexts is nonetheless also of utility in establishing why different factors prevail in some unique contextual circumstances for example, due to differences in VAT laws between UK and the rest of Europe. That said, most informants were drawn from northern Europe and as a result the findings from this study are most relevant for similar contexts i.e., Global North countries with affluent consumer sectors.

### 1.4 Ethical Considerations

This research design has been reviewed against the criteria for research requiring an ethics board review at Lund University and has been found to not require a statement from the ethics committee. This is an independent, unfunded qualitative study, conducted without any external influence on my conclusions other than the support and guidance offered by the thesis supervisor. Participation in this study was entirely voluntary and interviews were conducted with prior informed consent. Given the sensitivity of this topic for many companies' reputation, the decision was made not to include informants' names nor the names of their organisations or any other personal information, instead generalised descriptions of their role and the group they represent have been recorded to ensure total anonymity for participants. In addition, the decision was made to not include any direct quotations, as these can often be linked back to individuals and undermine anonymity. Data collected will be stored on university servers for 10 years and registered in Personal Data Lund University (PULU) in accordance with research guidelines. This requirement has been explained to participants and consent has been collected.

### 1.5 Audience

The target audience for this thesis is those involved in the policy process, not limited to decision makers themselves, but also those involved in advising and supporting policy making in both private and public research institutes along with think tank settings. Advocacy and environmental organisations which also wish to influence the policy agenda are also a key audience. This study aims to provide useful insights to policymakers in the UK and Europe, due

to the significant interest in this policy problem in those contexts but may also be interesting to actors in other contexts where similar practices of PD have been observed. As an academic endeavour, this thesis also aims to inform ongoing academic work on the importance of the issue of product destruction and its wider relevance for sustainability transitions.

## **1.6 Disposition**

Chapter 1 provided the necessary background information regarding the extent of the environmental and social challenges associated with our current patterns of natural resource consumption. With this context in mind, the problem of product destruction is introduced, and the main sustainability issues associated with this practice were highlighted. Having established the nature of the problem, the research questions, which will be answered throughout the remainder of this study, were then established.

Chapter 2 outlines the methodological approach employed in this study to answer the proposed research questions. It provides justification for the use of exploratory methods for this research topic, along with offering an overview of the key methodological steps involved in the data collection and analysis.

Chapter 3 introduces several important concepts which help to frame the topic of product destruction within the overall sustainability agenda. Next, the current state of knowledge with regards to the reasons why companies engage in product destruction, along with an overview of existing policy frameworks is outlined. Finally, building from the literature review, a conceptual framework is developed to illustrate the different levels (upstream and downstream) at which factors operate and how different policies are needed to target these distinct drivers.

Chapter 4 reports the main findings from the 16 interviews conducted as part of this empirical study. The analysis is structured according to the themes identified in the conceptual framework.

Chapter 5 offers a discussion in relation to these findings, highlighting the extent to which the empirical findings provide answers to the initial research questions and how these research findings contribute to the current state of knowledge on the topic. This chapter also delineates some of the main limitations with the study and suggests areas for improvements.

The final chapter (Chapter 6) presents the main conclusions of this thesis along with their broader significance to the current policy debate surrounding product destruction. Some practical recommendations are set forth, in addition to some avenues for potential future research.

## **2 Research design, materials, and methods**

### **2.1 Research Design**

This thesis employs an exploratory research methodology, “a broad ranging, purposive, systematic, pre-arranged undertaking designed to maximise the discovery of generalisations leading to description and understanding of an area of social life” (Stebbins, 2001). The historical development of exploratory methods are not well documented in the literature. Nonetheless, in the 1930s several researchers at the Department of Sociology at Columbia University pioneered the use of exploratory methods, and the methodological approach was later adopted in other social science fields such as psychology and political science (Swedberg, 2020).

Exploratory approaches are particularly suitable when a topic is relatively under-studied and when there little or no scientific knowledge about the phenomenon (Stebbins, 2001). Accordingly, this research approach aims to develop initial evidence about the nature of a problem and explore potential solutions, they are often qualitative in nature and thus more concerned with theory generation than testing (Bryman, 2012). Exploratory studies are also particularly useful in situations where there is a lack of accessible empirical data (Swedberg, 2020). Product destruction is relatively underexplored within the academic literature, and there is little knowledge regarding the main drivers of product destruction nor the range of policy interventions which could help to eliminate this practice. Therefore, a qualitative exploratory study was deemed the most appropriate approach, as it permits the researcher to maximise the amount of new insight on a subject. Moreover, the lack of transparency and empirical data regarding companies’ practices also makes the exploratory method highly suitable.

A 'bottom-up' approach was taken to answer the proposed research questions (Milios, 2021a). This means that key actors in the value chain and practitioners which have had direct exposure to, and engagement with product destruction practices, were consulted to understand the main factors involved in destruction decisions and to derive the desired policy interventions. These on-the-ground actors were deemed to have more relevant knowledge to answer the proposed researched questions compared to policy officers or policy makers. This is because product destruction is a relatively new topic within the policy sphere and thus current understandings of the policy problem are underdeveloped.

This research is framed by critical realism, an epistemological perspective that incorporates a diversity of ontological views by acknowledging that whilst there is an objective reality independent of human consciousness, our ability to observe and analyse this reality is high constrained by the socially constructed world we inhabit and the subjective view of researchers (Archer, 1998). Critical realism is primarily concerned with identifying causal mechanisms, and thus entails a reflexive and interdisciplinary approach to scientific inquiry. This perspective is of particular relevance when researching in the field of sustainability due to the scale and complexity of environmental challenges (Bhaskar, 2010).

### **2.2 Methods used to collect data**

#### **2.2.1 Literature Review**

Given that product destruction is a relatively new topic, an integrative literature review, which allows for the synthesis of literature from diverse sources (Whittemore & Knafl, 2005), was deemed to be the most appropriate method. Such an approach helps to build a comprehensive



understanding of a particular phenomenon by leveraging a range of perspectives from distinct research disciplines.

Firstly, to gain a clear understanding of the drivers of product destruction it was necessary to consult journals associated with business management, retailing, supply chain and logistics. The primary databases utilised were Google Scholar, Scopus, and LUBsearch. To find appropriate studies, key search terms such as “product destruction”, “product disposal” “destruction of unsold goods”, “destruction + excess inventory”, “overstock”, “reverse logistics + challenges” “customer returns” were employed. It was necessary to cover a range of different terms, as ‘product destruction’ as a distinct phenomenon is a relatively new topic in academia and thus it required a more nuanced search to piece different aspects of the literature together. Only five academic articles which directly addressed the topic of disposal were retrieved, however, a further seven articles which addressed upstream issues relating to inventory management practices and reverse logistics were also reviewed. Moreover, given this is research topic is relatively under-developed, there has been more discussion in grey literature and popular media than in traditional academic outputs and therefore an additional five reports and several news articles were reviewed. A google alert was set up with the term “destruction of unsold goods’ and ‘e-commerce returns’ to capture the latest content and developments regarding these topics.

Next, to capture the range of potential policy instruments that could be leveraged in response to this problem, grey literature including policy documents, legal texts, reports, and policy briefs on the issue were consulted. In terms of academic literature, existing studies which discussed policy interventions in relation to circular economy transitions, resource efficiency and product life-extension were also reviewed, predominantly using google and google scholar as a search engine, focussing on keywords such as ‘circular economy policy interventions’, “policy + resource efficiency” “policies + product life-extension”. After filtering and reading the abstracts, a total of 14 academic articles along with three key reports were deemed most suitable for review.

## **2.2.2 Practitioner Interviews**

Following the literature review, interviews with practitioners were conducted to verify the factors observed in the literature, and to allow for practitioners to identify appropriate policy responses. It was necessary to interview practitioners from different sectors to understand if there was any variation in the main drivers between electronics, clothing, and food products. A total of 16 practitioners were interviewed including representatives from retailers/companies destroying stock, experts in inventory management, supply chain management and logistics, along with reuse organisations which receive products that would otherwise be disposed of.

To select the relevant informants a non-random judgement approach (purposive sampling) was employed, selecting the most productive sample to answer the question (Marshall, 1996). To recruit relevant practitioners, the professional and academic network of the researcher was leveraged, along with tools such as LinkedIn to identify informants with the relevant knowledge. An effort was made to recruit an even number of informants from each sector, to ensure that they received equal representation. Respondents were nonetheless able to suggest or recruit additional sample for the research, otherwise known as the snowball method (Kirchherr & Charles, 2018). Table 1 represents the final list of those interviewed along with the sector they represent, their position title and a description of their organisation. Given the sensitivity of this topic and brand reputational risk, it was decided to keep all informants anonymous. To confirm whether potential interviewees had the relevant and required expertise, participants were sent an outline of the research aim along with an interview guide detailing the interview questions prior to the interview (appendix A).

Whilst a focus group could have potentially offered an efficient method for data collection, conserving resources, and allowing for interaction and discussion among practitioners, in-depth individual interviews were ultimately determined to be the most effective data collection method for a variety of reasons. Firstly, individual interviews allowed for the high level of anonymity required to ensure practitioners felt comfortable to talk about the problem openly. Secondly, in-depth individual interviews allowed for a tailoring of the questions to the specific knowledge of actors to understand their sector perspective more thoroughly. Due to the geographical locations of informants, interviews were conducted via Zoom. Each interview lasted between 40-60 minutes. The interviews were semi-structured, as previously mentioned, an interview guide was prepared beforehand, however during the interview there was flexibility to diverge from the script and tailor questions to the expertise of each informant. Relevant consent was collected from informants (via a consent form found in appendix B), to allow for interviews to be recorded, transcribed and for the content of the interviews to be analysed and published in research outlets. Prior to reaching out to participants, the interview protocol was piloted and tested with the research supervisor. The interview data will be stored on Lund University servers for 10 years and registered in Personal Data Lund University (PULU) in accordance with Lund University research guidelines.

Table 1 Summary of informants

<b><u>Interview Identifier</u></b>	<b><u>Sector</u></b>	<b><u>Position description</u></b>	<b><u>Organisation description</u></b>
A	Food	External Consultant	Surplus redistribution business
B	Food	Expert on food waste and loss	University
C	Food	Head of Sustainability	Global Food Retailer
D	Food	Consultant	Sustainability Management Consultancy
E	Food	Expert food waste and loss	Global research non-profit
F	Textiles and Electronics	Sustainability Manager	Global retail company
G	Textiles	Former operations employee	Textile retailer
H	General Retail	Supply chain and logistics expert	University
I	Textiles	Research Fellow	Research Institute
J	Textiles	Retail Expert/Former CEO	University/Retailer
K	General Retail	Supply chain and reverse logistics expert	University
L	General retail	Expert in reverse logistics	University
M	Textiles	Former corporate partnerships manager	Charity receiving surplus stock from retailers
N	General retail	Expert on product life extension	University
O	Electronics	Head of Sustainability	Company offering solutions for handling e-commerce returns and extending product life
P	Textiles	Sustainability Manager	Company with sustainable business model that avoids many challenges associated with excess stock/returns

## 2.3 Methods used for analysis

Interview data was transcribed using Otter ai transcription software and then imported to NVivo content analysis software to be analysed. Qualitative software programmes are beneficial as they help to improve the efficiency with which the researcher is able to organise, sort and search for information within the database (Creswell & Creswell, 2018).

After gaining an overview of all the empirical data, an abductive approach to coding was pursued. For RQ1 codes were taken from the conceptual framework, which was derived from the initial literature review. Codes were based on the factors identified in the conceptual framework (Chapter 3.5, Figure 3), higher level codes included upstream factors and downstream factors. Within these codes, the data was categorised according to the specific factors detailed in Table 2. Additional themes and codes which were not observed in the literature, nonetheless, emerged from the interview data and. For RQ2 an initial coding framework was developed in line with the conceptual framework (Chapter 3.5, Figure 3), allowing for the categorisation of upstream or downstream solutions. Furthermore, a second set of codes were developed based on Mont and Dalhammer (2005)'s policy typology, allowing for the classification of different policy instruments (informative, market-based, administrative, voluntary). This typology offers a simple classification of policies on the basis of the mechanism by which behaviour change is achieved, i.e., through information, price, regulation or voluntarily. Moreover, it is a familiar framework used widely in environmental policy circles (Bemelmans-Videc et al., 1998; Gunningham et al., 1998) and will thus be meaningful for the intended audience. Nonetheless, other typologies, for example, those which categorise policy instruments according to the target groups are also of utility and will be utilised during the discussion.

*Table 2 Coding Framework*

<b>Code</b>	<b>Description</b>
<u>RQ1</u>	
<i>Upstream Factors</i>	Factors that influence overall volumes of unsellable stock and customer return volumes
Business Model	Attributes of retailer/manufacturer business model and commercial offering
Product Characteristics	Characteristics of products in retailer's portfolio
Consumer Behaviour	Consumer expectations and purchasing behaviour
<i>Downstream Factors</i>	Factors that influence companies' decision to dispose of goods instead of making use of other disposition channels such as liquidation or donation
Profit margin considerations	Factors that influence companies' bottom-line, considerations of costs vs revenues.
Economic incentives	External costing structures/ tax incentives which influence companies' decisions
Brand Integrity	Company fears about reputational damage/ brand image.
Legal/Liability	Company concerns regarding potential liability claims or legal suits
<u>RQ2</u>	
Upstream Solutions	Policy interventions which aim to limit overall volumes of unsellable and returned stock

Downstream Solutions	Policy interventions which aim to encourage companies to make use of alternative disposition routes, in line with waste hierarchy framework
Regulatory	Policy interventions which mandate behaviour change
Market Based Instruments	Policy interventions which incentivise behaviour changes by influencing price/costs
Informative	Policy interventions which change behaviour by provisioning information
Voluntary	Voluntary initiatives led by companies to address an identified problem, so called 'self-regulation'

## 3 Literature Review

### 3.1 Key Concepts

#### 3.1.1 Production-Consumption Systems

Lebel & Lorek (2008, p. 243) define a production-consumption system (PCS) as ‘a system that links environmental goods and services, individuals, households, organisations, and states through linkages in which energy and materials are transformed, utility is derived, and relationships (transactions of money, information, influence, and social control) take place’. This generalised system has formed the basis of the economy throughout much of human civilisation. Our current production-consumption, however, is deeply linear (Hartley et al., 2020). Resources are extracted from the natural environment, they are then transformed into consumer products and services through the production process, and after being used by the end consumer they then accumulate in waste sinks. (Millar et al., 2019). Beginning with the advent of the industrial revolution and accelerating from the 1950s onwards, this take-make-waste approach to resource use has become entrenched in our economic system (Andrews, 2015). In such a system, value is created through growth in the volume of products produced and placed on the market (Pirgmaier, 2020), resulting in a massive expansion in economic output over the past five decades and a quadrupling of GDP (IRP, 2019).

Nonetheless, there is now widespread recognition that this linear system is having a catastrophic impact on the natural environment (Akenji et al., 2021; Brown & Cameron, 2000; IRP, 2019; Steffen et al., 2015). Since the 1970s the extraction of natural resources has tripled, rising from 27 billion tonnes to 92 billion tonnes (Oberle et al., 2019). This rapid expansion has placed significant pressure on Earth’s life supporting systems (Steffen et al., 2015). In many ways, our current ecological woes can be attributed strongly to this extractive and expansionist linear PCS (Barrie & Schröder, 2021): contributing to climate change, increased acidification and eutrophication of soil and water bodies, increased biodiversity loss, soil erosion, and ever increasing waste and pollution (UNEP et al., 2016).

While climate change is far from the only environmental challenge the planet is facing, it is nonetheless an issue which receives significant attention within global environmental discourse. As the IPCC have warned on numerous occasions, to avert catastrophic levels of global warming, beyond 1.5 degrees of pre-industrial temperatures, unprecedented societal transformation is urgently required (IPCC, 2018). Climate change and natural resource consumption are inextricably linked. The activities involved in extracting, processing, manufacturing, and transporting physical goods are highly carbon intensive and these carbon-emitting activities tend to take place in lower-income countries and are then imported to higher-income countries where they are consumed (IRP, 2019). Production-based inventories, that measure the carbon emitting activities within a national economy, have so far dominated carbon accounting efforts. Consumption-based inventories, on the other hand, measure the embedded carbon in the products and services consumed within an economy, regardless of where the emissions originate, and thus offers a better representation of countries’ real climate impacts (Davis & Caldeira, 2010). Sweden is the first country in the world to adopt consumption-based emissions reduction targets, as it is estimated that 60% of Sweden’s total carbon emissions are embedded in imported products (Morgan, 2022). It is thus clear that to successfully implement the Paris Agreement and limit warming to 1.5 degrees, rich industrialised nations must acknowledge the centrality of resource consumption within the climate change debate and take responsibility for the embedded emissions associated with consumption patterns. (Davis & Caldeira, 2010).

Developments regarding consumption-based emissions have also draw attention to the fact that the benefits and burdens associated with our linear PCS are not distributed equally. Historically, due to forces of colonialism, resources have been extracted from low-income countries causing significant environmental harm and yet the value from production and the utility and benefits associated with consumption have been largely enjoyed in high-income countries (IRP, 2019). These patterns continue to this day (IPCC, 2022), and are reflected in the huge global inequalities in consumption, where material footprints in high-income countries are up to 13 times higher than that of low-income countries (IRP, 2019). As Lebel and Lorek (2008) highlight, both ‘gross overconsumption and acute underconsumption’ exist side-by-side within our current PCS, and both pose significant challenges to sustainable development. Given these global dynamics, Akenji (2014, p. 18) urges stakeholders in industrialised countries to recognise the “plight of those suffering from under-consumption, and be willing to moderate their levels of consumption, to free up consumption space so the needs of under-consumers can be met within ecological boundaries.”

Modelling from the International Resource Panel which assumes the continuation of historical trends, projects global material use to grow by 110 per cent from 2015 levels to reach 190 billion tonnes by 2060, having detrimental impact on Earth’s life supporting systems (IRP, 2019). As expressed by the planetary boundaries framework (Rockström et al., 2009), the Earth is already in ecological overshoot; particularly in terms of climate change, biodiversity loss, land conversion and biogeochemical flows, all of which link strongly with current patterns of production and consumption. There is therefore an urgent need to reimagine our current PCS and move away from the take-make-waste approach to resource use, to ensure a good life for all within planetary boundaries (O’Neill et al., 2018).

### Key Actors in the System

Figure 1 offers an overview of the generalised linear PCS, highlighting key actors within the system along with the flow of resources and waste outputs. For many scholars, consumers are seen to be the main cause of resource overconsumption as they drive demand for products. Some have argued that overconsumption has psychological roots, in which individuals consume

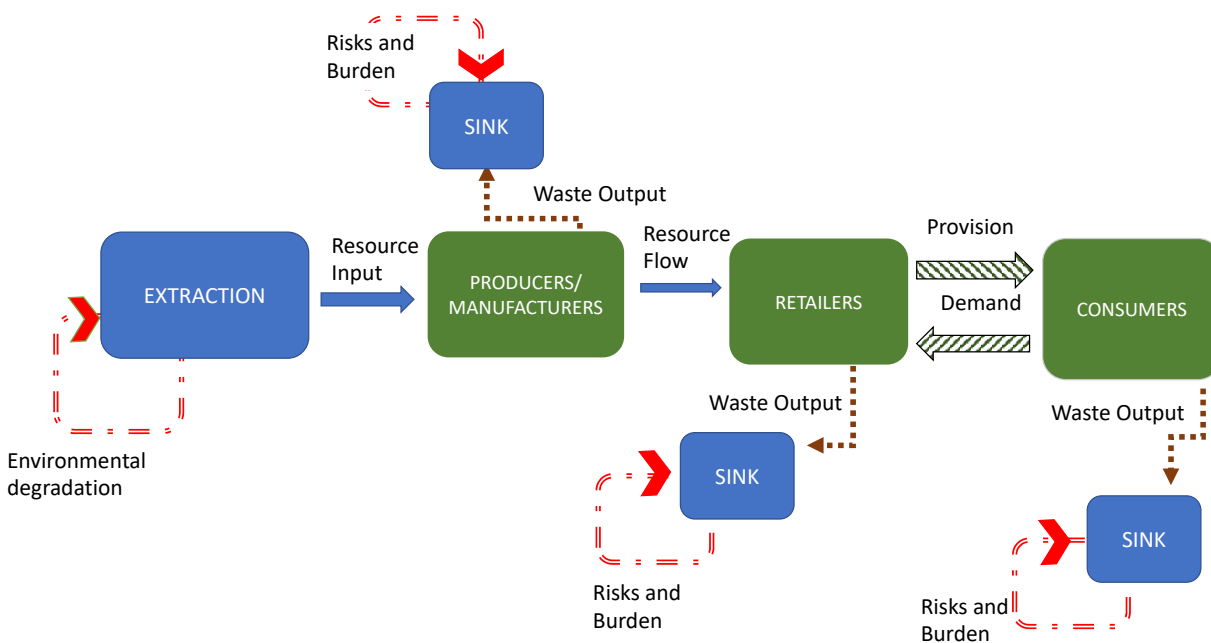


Figure 1 Overview of a generalized linear PCS adapted from Lebel & Lorek (2008)

as a means for achieving happiness and self-fulfilment (Håkansson, 2014; Lebel & Lorek, 2008). For others, consumption is seen as a cultural phenomenon, influenced by societal expectations, social norms and values (Brown & Cameron, 2000), after all “not only are people’s needs defined socially, but their individual needs include a need for social connection which is sometimes expressed materially” (Schudson, 1993, p. 148). From both perspectives, consumer behaviour and cultural norms are thought to be the root cause of unsustainable resource use. Enabling sustainable lifestyles and encouraging behaviour change are thus thought to be the key leverage points for transforming the production-consumption system.

Nonetheless, many have critiqued such analysis as being oversimplistic and disregarding other important actors within the system, in what Akenji (2014) terms ‘consumer scapegoatism’. Consumer centred analysis assumes that individuals are ‘sovereign, self-aware, and largely stable decision-making subjects’ and ignores that fact that consumer decisions are highly constrained by considerations of money, time and effort. (Coffin & Egan–Wyer, 2022, p. 108). From the structural perspective, overconsumption is seen as a systemic phenomenon, whereby the nature of competition in capitalist society creates a growth imperative which necessitates ever increasing levels of production (Cushman, 1990). In what has now become a famous text, London (1932) identified the predicament that the production of high-quality durable goods was leading to reduced levels of consumption and resulting in economic malaise. He thus advocated for the increased production of shorter life goods in the US, to stem rising unemployment (London, 1932). This text has since become well-known and is widely regarded as the first conceptualisation of planned obsolescence (McVeigh et al., 2019). Questions of sufficiency thus fall out of capitalist logic, as limiting production means limiting profits (Pirgmaier, 2020). Consumers thus have to be manipulated through aggressive marketing and advertising campaigns, encouraging them to make unnecessary purchases in order to absorb the goods that have been placed on the market (Murray Bookchin, 1989), ultimately finding themselves “locked-in by business interests” (Mont, Heiskanen, et al., 2013). As summarised by prominent 1950s retail analyst and economist Victor Lebow, “our enormously productive economy demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction and our ego satisfaction in consumption...We need things consumed, burned up, worn out, replaced, and discarded at an ever-increasing rate.” (Lebow, 1955, p. 3). Seen from this perspective, overconsumption appears instead to be rooted in overproduction (Pirgmaier, 2020) and thus overcoming it involves targeting a wider range of actors than consumers.

In recent decades, the role of retailers has become increasingly important within the consumption debate as they can act as an interface between producers and consumers with the ability to influence the behaviour of both actors (Bălan, 2020; Mont, Chkanikova, et al., 2013). The concept of choice-editing is increasingly being seen as an important enabler of sustainable consumption transformations. Choice-editing involves using criteria and standards to filter out or de-select certain products or services to prevent them entering the market and in doing so editing the choices available to consumers. Retailers already engage in these practices, however, so far choice-editing has been based around criteria such as profitability, availability, and attractiveness. (Akenji et al., 2021). However, increasingly proponents are calling for sustainability related criteria to edit out environmentally harmful options from the market and in doing so shape demand (Akenji et al., 2021; Gunn & Mont, 2014). The rise of e-commerce and at home delivery business models has also brought increased attention to the role that retailers play within the system. Internet purchasing and advanced logistics operations working on next-day delivery models have drastically enhanced accessibility to goods, arguably contributing to increased levels of promiscuous consumption (Sui & Rejeski, 2002). Moreover, in recent decades, advertising and marketing campaigns have become ever more insidious. The digital revolution has resulted in increased tracking of individual online

activity, their demographic data and preferences, allowing for companies to aggressively target and personalise advertisements towards different consumer profiles (Sartor et al., 2021; Wiewiórowski, 2022).

### **Sustainable Production-Consumption Systems**

There has long been an acknowledgement in academic circles that the linear production-consumption system is highly unsustainable as it is dependent on a permanent throughput of resources, a physical impossibility on a finite planet (Boulding, 1966; Daly, 1992; Meadows et al., 1972). In recent years the international community has also come to recognise the need for change, in June 2012 at the UN Rio+20 world heads of state adopted the 10-year framework of programmes on Sustainable Consumption and Production (SCP) patterns (10YFP) and this ambition was later formalised in Agenda 2030 under SDG12 (Sustainable Consumption and Production).

There is limited consensus regarding what a truly sustainable production-consumption system would look like. Following on from the initial system outlined in Figure 1, Lebel and Lorek (2008) deem a PCS sustainable insofar as the consumption of natural resources maintains human well-being without irreversibly damaging the natural environment. This is mirrored in the well-known definition of sustainable development offered by the Brundtland commission as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 39) Such framings recognise the importance of resource use for meeting societal needs, whilst also bringing attention to the need for limits to prevent detrimental environmental harm. In a similar light, the popularised Doughnut Economics theory, reimagines our current PCS, such that materials and energy are transformed into products and services that meet all our social needs (from food and housing to healthcare and a political voice), but do so in such a way that respects planetary boundaries (Raworth, 2017).

### **Material Throughput, Resource Efficiency and Circular Economy**

On a more granular level, reducing material throughput has been advanced as an important criterion of strong sustainability within SCP literature (IRP, 2019; Princen et al., 2002, p. 3; Van Ewijk & Stegemann, 2016). As Daly (1992) outlined in his seminal text, in a sustainable, steady-state economy, throughput (amount of materials and energy passing through a system) must be limited in a scale so as to be regenerative and assimilate capacities of the eco-system. To this end, the PCS should aim to reduce the consumption of non-renewable resources and minimise waste generation. A range of different strategies can be leveraged to achieve this aim, including but not limited to, limiting overall consumption, eco-design initiatives, cleaner production, product-life extension, product-service-systems, repair, recycling, refurbishment etc. Collectively many of these strategies can be grouped under the notion of resource-efficiency, which in essence involves doing more with less material input, in order to preserve the planet’s finite resources. The notion of resource efficiency has garnered significant interest within international policy circles, featuring strongly within Agenda 2030 as stand-alone goals and targets. Target 8.4, for example, explicitly encourages countries to enhance their resource efficiency in production and consumption over time (UNEP et al., 2016). Within the European Union, resource efficiency has also taken central stage, with the Roadmap to a Resource Efficient Europe as a pillar of the bloc’s economic strategy (European Commission, 2011)

In more recent years the concept of Circular Economy (CE) has risen to notoriety. Circular economy is perhaps best understood as an umbrella term which incorporates a variety of long-established concepts which similarly relate to reducing material throughput (Blomsma & Brennan, 2017). Whilst there is no singular definition, core principles include designing out



waste, keeping product and materials in use for as long as possible and regenerating natural systems (Barrie & Schröder, 2021). Although many of the concepts within CE are familiar, it has been argued that CE offers a unique framing with significant discursive power, particularly influential in systematizing an alternative to the take-make-waste approach to resource use (Blomsma & Brennan, 2017) and offers a vision of a more sustainable production-consumption system (Milios, 2021a). Many world leaders have also rallied around the concept of Circular Economy, in 2008 China formalised the concept in the Law on Circular Economy (Park et al., 2010), whilst the European Commission adopted the Circular Economy Action Plan in 2020 as a central building block of the European Green Deal. In addition to environmental considerations, resource-efficiency and circular economy are also seen as important strategies for enhancing global competitiveness and reducing vulnerabilities to high commodity prices and resource scarcity (Barrie & Schröder, 2021; Taranic et al., 2016; Yuan et al., 2008). Moreover, the recent war in Ukraine and subsequent deterioration of NATO-Russian relations has brought attention to the geopolitical and security risks associated with high resource dependencies (Benton et al., 2022). Thus resource-efficiency is increasingly becoming an important strategic endeavour for many nations.

### **The Waste Hierarchy**

As previously discussed, reducing material throughput has two key elements: reducing resource input and minimising waste output. The two strategies have a symbiotic relationship. Limiting resource input necessarily reduces waste output, however, minimising waste output by keeping materials and resources in use for as long as possible, although not guaranteed, can also help to lessen the need for virgin materials and new production and thus relieve pressure on natural resources (Van Ewijk & Stegemann, 2016). The relationships between these elements are captured through the waste hierarchy framework.

The waste hierarchy was largely established in a response to growing concerns about the environmental and health impacts associated with landfilling. In the United States, rising volumes of municipal solid waste were challenging landfill as the dominant waste management technique with concerns relating to cost, contamination and public opposition (Schall, 1992; Wolf, 1988). A similar waste crisis was mounting in Europe, with ever rising waste volumes and limited space for landfill, leading to the development of the Lansink Ladder (Van Ewijk & Stegemann, 2016). Since then, the hierarchy has become the prevailing framework within the waste management field. In the European Union it was initially formulated as a three stage hierarchy, however, this met with significant criticism and thus as of 2008 it was expanded to the strict 5 stage framework, detailed in Figure 2, and adopted in the Waste Framework Directive (Van Ewijk & Stegemann, 2016).

The waste hierarchy is best understood as the prioritisation of different waste management options aimed at reducing environmental impact. Prevention is the most preferable option within the framework. Prevention is not a waste management strategy per se, but rather aims at avoiding the existence of the waste stream to begin with by keeping the product in use for as long as possible. Once the product becomes waste however, the next best option is preparing for reuse, followed by recycling, then energy recovery and finally disposal/landfill. The Waste Hierarchy is an important part of a resource-efficient strategy and can be seen as a central mechanism for reducing material throughput, with the direct aim of reducing overall waste volumes but also, particularly through prevention and reuse, indirectly aims to limit the need for virgin materials and new production.

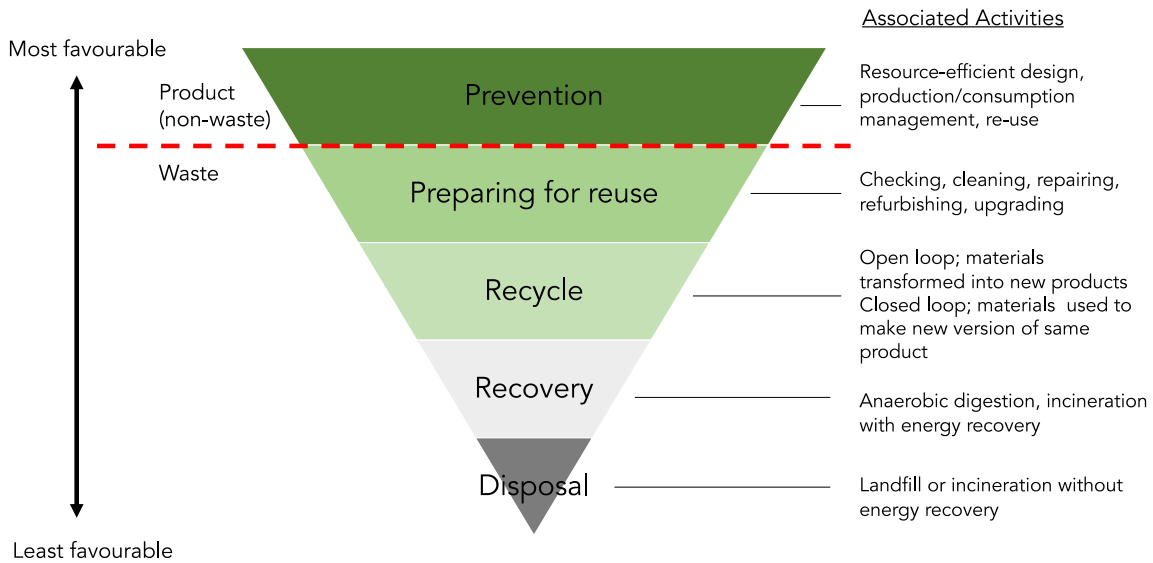


Figure 2 The Waste Hierarchy, adapted from *Waste Hierarchy Guidance* (DEFRA, 2011)

Certain aspects of the hierarchy require further elaboration. Prevention is widely acknowledged as the stage with the highest hopes of achieving reductions in material throughput, particularly if this stage targets demand, production or reuse (Van Ewijk & Stegemann, 2016). However, if it only interpreted narrowly in terms of the act of disposal, it may lead to an increase in the overall stock of products in the system. For example, when considering smartphone consumption, if prevention is interpreted correctly, high-quality, resource efficient phones would be produced, and consumers have access to repair them if they break, allowing for product life-time extension and preventing them from becoming waste. On a narrow interpretation, however, prevention would simply mean consumers hold on to their old smartphones, perhaps in a desk draw, instead of recycling them. This would lead to an environmentally worse outcome, as resources would remain locked up without providing any utility to the consumer. Thus, in a truly resource-efficient economy, the interpretation of prevention within the framework must target production, demand or use, as doing so prevents both waste generation and demand for material input (Van Ewijk & Stegemann, 2016). The preparing for reuse stage also requires further clarification within the framework. When it comes to preparing for reuse, many think of donation or second-hand markets as strategies, however, these activities would be considered under the prevention stage as the products are being used again for the purpose they were originally intended and thus cannot be considered waste. Within the framework, ‘preparing for reuse’ applies strictly to products that are deemed waste and thus involves activities such as checking, cleaning, or refurbishing whole items or spare parts so that they can then be reused again.

Despite the wide influence it has enjoyed, the hierarchy has nonetheless met with significant criticism, particularly in recent years where scholars have questioned the utility of the framework in the transition to a circular economy (Van Ewijk & Stegemann, 2016). From a practical standpoint, many have criticised policy makers for focussing most attention on the lower stages of the hierarchy, diverting waste from landfill and increasing recycling and recovery rates (Cooper, 2020, p. 202). For example, Extended Producer Responsibility (EPR) schemes have been promoted across much of Europe as a key policy for improving material

recovery, nonetheless, EPR schemes face criticism as they do not appear to provide sufficient incentives for moving towards the higher stages of the waste hierarchy. Producers must now reach set recycling targets meaning that products which might have been fit for reuse are instead recycled. (Dalhammar et al., 2021). Whilst recycling is an important element of a circular resource-efficient economy, it is not a guarantee of sustainability. Recycling initiatives alone do not do anything to address product replacement cycles nor prevent new production. Moreover, the recycling process itself can often be energy intensive and contribute further environmental impacts. The hierarchy also does not distinguish between closed and open loop recycling, the latter being far less preferential as the material deteriorates overtime (Van Ewijk & Stegemann, 2016). Even in the early 1990s, commentators observed the limits to recycling, where big business was seen to be embracing recycling scenarios ‘to perpetuate the ethos of disposability’ and ‘promote the environmentally exhausting activity and justify the production of shoddy goods’ (Fairlie, 1992, p. 282). Many thus lament the fact that that little policy attention has been given to prevention and reuse, the two stages with the highest potential for limiting material throughput (Cooper, 1994; Price & Joseph, 2000). It has thus been argued that in order for the hierarchy to facilitate a transition to a more circular resource-efficient economy, policy makers need to refocus efforts on the upper two stages of the framework (Cooper, 1994; Van Ewijk & Stegemann, 2016).

### **Product life-extension**

The upper two tiers of the hierarchy, ‘prevention’ and ‘preparing for reuse’ can be collectively understood as product life-extension strategies, often referred to in circular economy literature in terms of ‘slowing cycles’ (Bocken et al., 2019; Cooper, 2020). As previously discussed, closing loops through the recycling of materials, whilst an important element of a sustainable PCS and one that has received most attention, is increasingly being seen as insufficient. Product-life extension, on the other hand, limits material throughput, as keeping products in use directly reduces the demand for new production, limiting natural resource use and minimising waste generation (Cooper, 2020; Stahel, 2010). Even taking into account efficiency gains from technological improvements, for most product groups it is still beneficial to prolong the product life as long as possible rather than replacing it (Stamminger et al., 2018).

Product longevity is a multi-faceted concept which broadly describes the extension of the period in which a product is in use. Bakker and Schuit (2017) outline three main strategies for extending the useful life of products:

- 1) Extending product lifetime through design
- 2) Simply using products for longer through reuse and maintenance
- 3) Recovering broken products through repair, refurbishment, and remanufacturing.

Product longevity is thus influenced by a wide range of factors including; physical characteristics (e.g. eco-design, durability, modularity), economic aspects (e.g. cost of repair, cost of virgin materials, business offerings), consumer attitudes (e.g. propensity toward replacement, emotional attachment to products), and technological advancement (e.g. rate of obsolescence) (Cooper, 2020). In general, however, design aspects are of particular importance and have significant implications for both reuse and repair/refurbishment. Cheap low-quality products are often not designed with repair in mind, and thus there are limited opportunities for lifetime extension when the product breaks. Moreover, there is often no second-hand market for such products, as they are not seen as a worthwhile investment, particularly when new products can be purchased cheaply (Maitre-Ekern & Dalhammar, 2019). As such, scholars argue that “an important pre-condition for a circular economy is high product quality, for most products put on the market” (The Swedish Energy Agency, 2021, p. 18).

Product life extension has received increased policy interest in recent years and is recognised as a being of central importance to circular economy transition. In 2016, MEP's in the European Parliament passed a resolution "a longer lifetime for products" (2016/2272(INI), which mandated the commission to act in a wide range of domains relating to product lifetime extension, including; designing robust, durable high quality products, promoting repair and product usage models, ensuring better information for consumers on reparability and longevity and introducing measures on planned obsolescence, among others (Cooper, 2020). Such policies also have widespread support among citizen and consumer organisations due to the economic and social benefits they could bring to those purchasing products (The Swedish Energy Agency, 2021). Moreover, product life extension strategies provide increased employment opportunities, particularly for skilled labour (Milius, 2021a). In recent years the European Union has introduced a range of policies to increase product lifetimes including the Eco-design directive, standardization in terms of durability, reuse and reparability, and advances in repairer rights (Dir. 2019/771).

### **3.1.2 Product Destruction**

Building on these concepts, the highly unsustainable nature of product destruction is brought to light. Product destruction refers to a situation whereby companies (both producers and retailers), dispose of finished consumer products which have never been used. In such scenarios material throughput is exceptionally high, in some cases products come straight from the production line and almost immediately become waste. This presents a dual problem both in terms of managing the waste stream and increased pressure on virgin materials due to the need for new production. Many of these products have been reported to be either incinerated or sent to landfill (BBC News, 2018; Hendriksz, 2017; Pallot, 2021), the least sustainable options as expressed by the waste hierarchy. Moreover, according to the hierarchy the fact that in many cases the products are functional and fit for human consumption, means they should not be considered waste to begin with, but rather should be kept in use for as long as possible.

In product destruction scenarios products have virtually no lifespan at all, as the products are never used by a consumer. Thus, no societal or individual utility is gained and yet a significant environmental harm occurs through the production process and as a result of managing the waste stream (Rödig et al., 2021). The 'take-make-destroy' logic of product destruction is the antithesis of product longevity and can be seen as an extreme expression of the wasteful approach to resource use that is endemic in the linear system. Product destruction, therefore, has no place in a circular resource-efficient economy and thus lies in direct conflict with many of the European Union's strategic sustainability goals (Rödig et al., 2021).

Product destruction also presents many challenges in terms of the social aspects of sustainability. As previously discussed, resource use today is highly unsustainable placing significant pressure on Earth's systems, yet resource consumption is also highly unequal, with many people in developing countries routinely unable to consume enough to meet basic needs (IRP, 2019). For this reason, scholars increasingly argue that industrialised countries should be taking urgent action to limit excessive resource use to allow for the growth in resource consumption in developing countries, where expansion in material and energy use is needed in order to sustain a decent quality of life for citizens (Akenji et al., 2021; IRP, 2019). With this context in mind the fact that precious resources are being extracted and manufactured into products that immediately become waste, without ever being used, is not only environmentally objectionable, but also presents major challenges in terms of social justice.

The food sector provides an illustrative example. Agricultural activities are widely regarded as having significant impact on the environment, responsible for around 30% of GHG emissions

and poses a significant threat to biodiversity (Ritchie & Roser, 2020) and yet food production is also highly sensitive to changing environmental conditions and climate change. Agricultural activities are also incredibly resource intensive and rely heavily on non-renewable resources such as phosphorus. Given the importance of food in meeting basic needs, such resources should be used as efficiently as possible, whilst minimising food waste and pollution (IRP, 2019). In the UK alone, however, supermarkets have been reported to dispose of the equivalent of 190 million meals every year, food which is entirely fit for human consumption (Cohen, 2021). Meanwhile, food poverty is on the rise domestically, with reports that 2 million adults in the UK have gone a whole day without food because they cannot afford to eat (Butler, 2022) While at the global level, it is estimated that around 815 million people go hungry every year (WRAP, n.d.). When so many are struggling to access these products, the fact they are being willingly disposed of is not only highly unsustainable from an environmental perspective but also from a social perspective.

Textiles and electronics are also sectors in which product destruction is believed to be a common practice (Elia, 2019; Rödigg et al., 2021), and yet they are both highly resource-intensive and environmentally harmful industries. Within the European Context, textile production has the fourth highest impact on the environment after food, housing, and transport. Textile consumption in the EU requires 391kg raw materials, 400 square metres of land and a carbon footprint of 270kg per person on average (European Environment Agency, 2022). In the case of electronics there are significant environmental impacts associated with production, particularly due to the mining for critical raw materials and rare earth elements, which is contributing to resource and water scarcity along with pollution from chemicals but has also been tied to human rights violations (Global Witness, 2016). Modelling from the EEB estimates that if all the clothing and electronics products destroyed in 2020, in the European Union alone, were to be lined up side by side they would cover 1.5 times the Earth’s circumference, with estimates rising to 6 times by 2030 (Rödigg et al., 2021). The idea that significant environmental harm occurs to produce these products and yet they are never used by consumers and immediately enter the waste stream, is arguably both a moral and environmental outrage and merits public policy intervention.

### **3.1.3 Public Policy**

Public policy can be understood as the actions taken by a public body aimed to ‘fix’ or ‘address’ an identified problem (Vedung, 1997). Policies can be adopted at various levels depending on the nature of the problem, e.g., international, national regional or local. To achieve desired policy goals, specific interventions are required. Policy instruments are thus of central importance, defined as “the levers by which governments attempt to modify the behaviour of subject groups and attain policy objectives” (Carter, 2007, p. 322) There are variety of instruments that can be leveraged within the public policy domain. A common typology within the policy domain is detailed in Table 3 along with specific examples for product related policies.

*Table 3 Common policy typology with examples, adapted from Mont and Dalhammer (2005)*

Policy Instrument	Examples
Administrative or Regulatory	Bans, licenses, reporting requirements, producer responsibility targets, recycling and recovery quotas, material and quality requirements, emission levels, chemicals regulation, eco-design regulations, consumer guarantees
Economic or Market-Based	Deposit-refund systems, taxes and charges, liability rules, subsidies for green products and circular actors, modular fees in EPR schemes

Informative	Requirement on information on e.g., conflict minerals and chemicals, emission registers, durability, repairability indexes labelling, marketing regulations, public information campaigns
Voluntary	CSR schemes and standards, application of product standards and tools like LCA and foot-printing, product panels, agreements between government and industry, voluntary eco-labelling.

Administrative or regulatory instruments often referred to as “command and control”, mandate specific behaviour via legislation and punish non-compliance. In this sense policy outcomes are very dependable and predictable, if applied in context where adequate enforcement can be assured, but nonetheless are seen as rather inflexible (Gunningham et al., 1998). Economic or Market-Based Instruments (MBI) on the other hand, aim to influence market outcomes and the behaviour of market actors, working with price mechanisms to create incentives and send market signals. In recent decades, MBI have become popular due to their perceived flexibility as they do not mandate any specific behaviour change but rather allow for firms and consumers to respond to in such a way that is aligned with their interests (Jaffe et al., 2003). In this sense, they are more efficient but less dependable (Gunningham et al., 1998). Informative instruments, on the other hand, are based on rational choice model which assumes that if actors have the right information they will act in accordance with policy objectives, thus through the provision of information it is believed that behaviour change can be induced non-coercively. When utilised alone, however, informative instruments have low reliability (Gunningham et al., 1998). Voluntary initiatives and agreements are usually mechanisms by which industry self-regulates, however where the government is involved in the development of standards and initiatives they can be interpreted as New Environmental Policy Instruments (NEPIs) (Torgal et al., 2020).

It is very rare that complex environmental problems can be effectively addressed with a single policy instrument (Gunningham et al., 1998). Rather, in order to meet policy objectives in a cost-effective and feasible manner, and overcome the deficiencies of individual instruments, it is common for a variety of instruments to be leveraged simultaneously, in what is often referred to as a ‘policy mix’ (The Swedish Energy Agency, 2021). It is nonetheless desirable to aim for the minimum number of necessary instruments to achieve a desired aim within any given policy context (Gunningham et al., 1998). A policy mix is particularly critical in the domain of resource-efficiency and circular economy transitions. This because there are many different actors within the production-consumption system whose behaviour change is required, along with different stages of product life-cycle and thus a range of instruments need to be leveraged in order to achieve policy goals (Wilts & O’Brien, 2019).

### 3.2 A review of the Literature on Product Destruction

Product destruction is an understudied phenomenon, nonetheless in recent years a handful of scholars have looked to explore the reasons behind the occurrence of this practice. Previous studies have, nonetheless, predominantly focussed on the fashion sector (Elia, 2019; Naiper & Sanguineti, 2018) or have been limited to analysis of the practices of a specific case-company (Pourhejazy, 2020). These studies have thus been reviewed alongside other papers from the retail and supply chain management literature, to help build a holistic understanding of the main influences on companies’ practices. The following section offers an overview of this literature, summarising the common product streams which are subject to disposal (Table 5) along with an overview of the reasons why destruction is often preferred to other product-life extension strategies (Table 6).

Product destruction is a common strategy for handling excess stock (Pourhejazy, 2020). Excess stock, often referred to as “overstock” is inventory that is excess of need/demand. These products are thus usually in perfect condition and have, in many cases, come straight from the production line. There are multiple and varied reasons for the existence of overstock. Conventionally, overstocking has been viewed as a bad management practice and one that harms the bottom line by increasing costs (Fernandes et al., 2010). Thus, the presence of overstock is often thought to result from poor forecasting or purchasing errors, in which supply outstrips demand resulting in a surplus (Pourhejazy, 2020). On the other hand, overstocking has also been suggested as a competitive strategy as it provides multiple benefits to retailers (Natarajan, 2000). Retailers are often able to save money and reduce costs through bulk purchasing, and thus category managers may purchase beyond demand forecasts in order to take advantage of cost savings (Fernandes et al., 2010). Moreover, overstocking is thought to protect against stock-outs which would lead to customer dissatisfaction and potential loss of market share (Natarajan, 2000; Pourhejazy, 2020; Willoughby, 2010), particularly in hyper competitive markets like e-commerce overstocking is often preferred as it allows for shorter lead times and avoids negative answers to order requests (Willoughby, 2010). However, if overstock volumes are significant and units remain unsold, they begin to take up valuable storage space and increase holding costs thus making disposal increasingly likely. In many sectors, the presence of overstock has also been linked strongly with overproduction (Elia, 2019; Naiper & Sanguineti, 2018). In the textile sector, for example, access to cheap labour and resource inputs in low-income countries, has lowered the cost of production significantly, allowing companies to significantly increase their output and production volumes (European Environmental Bureau, 2021). Another phenomenon that has been long observed in the supply chain management literature and contributes to the presence of excess inventory is the ‘bullwhip effect’ (Geary et al., 2006). The bullwhip refers to a situation where a sudden increase in customer demand, causes retailers to increase their orders for a certain product group, which then has a ripple effect on suppliers throughout the entire supply chain resulting in production which significantly outstrips actual demand. Shorter lead times, the time between retailers placing an order and receiving the stock, have been recommended to mitigate the bullwhip effect and limit the presence of excess stock (Geary et al., 2006). Achieving this, nonetheless, could require significant changes to current supply chains including adopting nearshoring or back-shoring and avoiding bulk orders (Merino et al., 2021). Such changes, particularly near-shoring and back-shoring efforts, can also provide benefits for retailers and consumers in terms of improving supply chain resilience (Smialek & Swanson, 2022).

Another reason why a company might find themselves with surplus inventory relates to product obsolescence (Natarajan, 2000). There are several different categories of product obsolescence. Technological or functional obsolescence often occurs due to a change in product design or technological improvement which renders an older model less attractive and thus reduces the demand for that product (McVeigh et al., 2019). This type of obsolescence is particularly common in the electronics market, due to the rapid rate of technological change. Psychological obsolescence or cultural obsolescence also contributes significantly to product destruction, this is when a product remains functional but due to marketing campaigns which induce changes to consumer preferences there is no longer a demand for the product as it is deemed to be ‘out of style’ (McVeigh et al., 2019). Cultural obsolescence is also observed in the fashion sector, particularly in fast fashion, where trends change quickly, resulting in an excess of ‘last seasons’ clothing for which there is no longer any demand. Obsolescence costs result when a product becomes obsolete before it is sold, they include labour and materials consumed in producing the original product and the cost of disposal (identifying, transporting

and disposing obsolete inventory) (Natarajan, 2000). Where obsolescence costs are low, products thus become targets for disposal.

The other significant category of goods which are commonly reported to be disposed of are customer returns (Pourhejazy, 2020; Rödigg et al., 2021). According to modelling from the EEB, the sum of customer returns (electronics and clothing only) being destroyed in the European Union is estimated to reach € 21.74 billion by 2022 (Rödigg et al., 2021). In recent years, return volumes have been increasing significantly. Bernon et al. (2011, p. 484) discuss several reasons for the rise in this phenomenon, including “lowering product quality, as a consequence of sourcing goods from emerging economies, liberal returns policies, buyer's remorse, the rise of internet and home shopping and obsolescence linked to shortening product life cycles”. Another key contributing factor, is the rise of free returns policies, which by now have become the gold standard in retail and thus any company that doesn't offer this could lose market share (Barclays Bank, 2019; McKinsey, 2021). Moreover, research from Barclays Bank found a significant returns culture among consumers, with 49% of shoppers (age 25-34) in the UK admitting they often order items that they intend to return (Barclays Bank, 2019). A study from the US which surveyed over 2000 shoppers, ranked the top ten reasons for customer returns (Incisiv, 2021). As detailed in the Table 4, most of the reasons relate to manufacturer and retailer practices, while a minority relate to consumer behaviour, and are thus more difficult for retailers to control.

Table 4 Summary of reasons for customer returns. Source: *Incisiv (2021)*

Rank	Reason for Return	Responsible Actor
1	Product quality not as expected	Retailer/Manufacturer
2	Colour and product description mismatch	Retailer
3	Issues with product fit	Consumer/Retailer
4	Wrong item sent	Retailer
5	Product arrived damaged	Retailer
6	Product arrived later than expected	Retailer
7	Bought to try	Consumer
8	Product did not work	Retailer
9	Product no longer needed	Consumer
10	Found better price elsewhere	Retailer/Consumer

The rapid growth of e-commerce has led to an explosion in the volumes of customer returns, presenting many challenges- both financial and environmental- for retailers. Many have observed that retail has been optimised for forward logistics, whilst minimum attention has been paid to the reverse flow (Bernon et al., 2011). Substantial costs are associated with handling customer returns, including; processing costs incurred to process or handle the goods, logistics costs associated with transporting, sorting and handling the return volumes in warehouses, replacement costs and the issuance of a credit or refund for the product and asset depreciation costs associated with the goods that can be restocked, refurbished or sold as scrap (Bernon et al., 2011; Stock & Lambert, 1983). Thus, it is in the interests of many retailers to dispose of these products quickly to prevent further impact to the bottom line. The value of an item/ cost of goods sold (COGS) is of significance in determining whether a returned good will be prepared for resale or disposed of. Product destruction is more likely “for low-value products with short life cycles whose complexity of disassembly or repair processes is



expensive and could result in repairing/refurbishing them being beyond their economic value” (Bernon et al., 2018, p. 14)

Other products that are subject to disposal are products that become damaged either in transportation or in storage and thus no longer meet quality specifications, therefore retailers deem them unsellable (Rödiger et al., 2021). If these goods are low value, then as discussed previously, it may be more cost-effective to dispose of them than to make the necessary repairs or refurbishment (Pourhejazy, 2020). In the food sector, goods that have an expiry date are also common targets for disposal. As explained by the National Resource Defence Council “businesses needlessly trash billions of pounds of food every year as a result of... food expiration date labelling practices”(NRDC, 2013). Finally, recalled products may be subject to product destruction. This is arguably one of the only legitimate reasons for product destruction as producers and manufacturers usually recall products from the market when they pose health and safety risks to consumer or do not meet legal requirements (Elia, 2019; Pourhejazy, 2020). However, recycling or product recovery remains the most desirable option for such products (Rödiger et al., 2021).

*Table 5 Summary of types of products that are subject to product destruction*

Product category	Description:	Reasons:
Overstock	Products that have never been touched, come straight from the production line	Forecasting errors: demand does not meet supply Competitive strategy: increasing flexibility and allow to meet customer demand Bulk purchasing Overproduction due to low cost of factors of production
Obsolete Products	Products for which there is no longer any demand	Technological or functional obsolescence Cultural/Psychological obsolescence
Customer Returns	Products which consumer returns	Poor product quality/customer dissatisfaction Liberal returns policies Returns culture
Damaged	Products that are damaged in transportation or in storage	Product design Packaging failures Negligence when handling/transporting goods
Close to expiry (Food)	Food products have an expiry date, as this date nears, they become unsellable however they could still be used	Suggestions from manufacturers for when consumables are at peak quality. However, this is not regulated by health and safety law, as many are misled to believe.
Recalled/ Defective products	Producers take product off the market due to a defect or quality issues.	Health and safety requirements

As indicated by the waste hierarchy framework, there are many preferable options available to retailers/producers instead of disposing of the products discussed above. There are various ways to deal with unsellable products/customer returns (Pourhejazy, 2020). Companies can make use of price markdowns or liquidation channels to recover some economic value. Alternatively, they can donate inventory to charitable organizations or social enterprises that could reuse the products. For customer returns or damaged products, there is a potential to reintegrate these into the inventory through assessment and repair or refurbishment. The next

section reviews the literature to explore why companies favour disposal over product life extension strategies (reuse or preparing for reuse).

A study which uses an online shopping platform with over 1 million daily users as a case study, determined that the most influential factor in destruction decisions relates to profit margin considerations (Pourhejazy, 2020). High warehousing and inventory handling costs, particularly in e-commerce sector, create incentives for retailers to dispose of goods with a low-value / low COGS. (Pourhejazy, 2020). For low-value products that are not selling, then it might be more economically feasible to dispose of them in order to prevent further losses in terms of holding costs. In dynamic markets such as e-commerce, flexibility within operations is central and due to the physical constraints associated with warehousing, inventories may need to be removed quickly to make space for new products, thus destruction is seen as a quick and cost-effective option (Pourhejazy, 2020).

Preparing damaged or returned products for reuse is also labour intensive and involves costs in terms of assessing, handling, processing, repairing and upgrading along with storage, all of which bear significant costs (Bernon et al., 2018; Rubio & Jiménez-Parra, 2014). Disposal, thus, becomes the most cost-effective strategy and limits further losses. Stahel (2010) notes that the economic feasibility of many product life extension strategies such as reuse, repair or remanufacturing is particularly undermined by the presence of cheap mass-produced imports from countries where cost of production is very low. Moreover, low-quality products are often not designed with reuse or repair in mind presenting further technical challenges (Stahel, 2010).

In many countries tax structures are set-up in such a way that incentivizes product destruction as compared to the alternatives. Elia (2019) explains how under the “U.S. drawback and refunds law administered by CBP, businesses are allowed to claim a ninety-nine percent refund on duties paid for unsold goods that are either exported or destroyed under customs supervision” (Elia, 2019, p. 23). This creates strong economic incentives for retailers to destroy stock rather than make use of more sustainable alternatives. In the European context, similar disincentives are observed, as companies are required to pay VAT on the products which they donate to charities (Rödig et al., 2021). Under such circumstances it is more cost-effective for companies to dispose of the products, as the VAT to be paid on donated items exceeds the costs associated with disposal (E-commerce Europe, 2020).

Brand image, defined as the perception of a brand by consumers (Heding et al., 2009), is also an important issue within the product destruction debate. Many brands, particularly high-end luxury brands want to retain the exclusivity of their products and thus they prefer to destroy any unsellable or returned stock instead of discounting or donating the products, as this is thought to diminish brand image (Elia, 2019). Many companies also assert that destruction is necessary to protect intellectual property, particularly for luxury brands. Accordingly, some retailers have contractual agreements with certain brands and suppliers which mandate the destruction of unsold goods to uphold brand reputation (Elia, 2019). A final reason found in the literature, is that many companies fear legal repercussions or liability if products are repaired or reused as their quality cannot be assured, particularly for electronics where health and safety concerns are high (Dalhammar & Milios, 2016). Thus, to avoid any potential legal risk and associated costs, companies may prefer to destroy the products.

*Table 6 Summary of reasons why destruction favored over product life-extension strategies*

Reason	Explanation
Profit Margin Considerations/Business Model	For some low-value products, costs of storage and handling are lower than the cost of item so makes economic sense to destroy Particularly for customer returns, costs of inspection, fixing, repackaging presents many costs. As many products are not designed to be repaired.
Economic incentives/destruction costs	Due to tax/cost structures, destruction often most economic option as compared to reuse or repair
Brand Integrity/Supplier agreements	Destruction favoured to keep prices high and retain exclusivity Donating or discounting products is thought to diminish brand image/reputation
Legal restrictions/Liability	Companies fear being held liable for products which quality cannot be assured.

### 3.3 A review of policies to address product destruction

Scholars that have studied product destruction closely, have acknowledged that policy intervention may be required in order to help revise this unsustainable approach to resource use (Naiper & Sanguineti, 2018; Pourhejazy, 2020). Moreover, in recent years multiple scandals have brought to light the scale of destruction practices (BBC News, 2018; Hendriks, 2017; Pallot, 2021), thus policy interest in this topic has grown and several European countries have taken legislative efforts to address the issue directly. Table 7 offers an overview of existing policies which aim to address product destruction, along with offering a preliminary evaluation of their merits and limitations.

*Table 7 Summary of existing legislative initiatives to tackle product destruction*

	Policy Instruments	Merits	Limitations
France	Regulatory: Ban on destruction of unsold goods; required to reuse by donating or recycle unsold goods (for hygiene products companies required to donate). Non-compliance risks financial penalty of up to 15,000	Sends clear market signal that destruction will not be tolerated Will reduce volume of goods sent to landfill/incineration	Under the interpretation of the law reuse via donation and recycling are seen as equivalent, thus companies have no obligation to aim for reuse For many products there is no recycling solution and destruction is allowed in such a case Since there is no reporting requirement, there is a lack of transparency making enforcement difficult. Returned goods are not specifically addressed and so might still be subject to destruction
Germany	Regulatory: Duty of Care/Legal obligation “to ensure that fitness for use of product is maintained and they do not become Reporting obligations: quantity, whereabouts, and disposal	Increase transparency regarding the flow of goods and resources-providing a good foundation for further stringent legislation in future	Duty of Care is rather general and does not contain specific norm addressee, making effective enforcement difficult

Belgium	Economic: Reduction in VAT paid by companies on products that are donated	Likely to reduce number of goods destroyed by allowing companies to make use of donation alternatives	Charities might not be able to absorb types of and volumes of products donated- bear the waste burden May also lead to export of donations to developing countries and associated 'waste dumping' Companies concerned with brand integrity will not donate Does not prohibit the destruction of goods
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France made the headlines in 2020 with the announcement of a ban on the destruction of unsold goods, which came into effect in January 2022 as part of a wider Circular Economy and anti-waste package. Under Article 35 of Law No. 2020-105 companies are required by law to reuse or recycle unsold goods instead of dumping them in landfills or incinerators. This measure is backed up with a 15,000-euro penalty if companies are found to be non-compliant (Rödiger et al., 2021). Many advocates have praised this law, as a world-first in the belief that it sends a clear message to companies that product destruction will no longer be tolerated (Ellen MacArthur Foundation, 2021). Nonetheless, there are several concerns regarding the law's efficacy in improving environmental outcomes. Firstly, except for food and hygiene products, the law does not prioritise donation over recycling, instead they are seen as equivalent, in direct contention with the waste hierarchy framework (Rödiger et al., 2021). This means that for many companies, particularly those concerned with brand integrity, will continue to favour recycling over donation in order to avoid brand dilution (Elia, 2019). Moreover, if recycling facilities are not available then the law permits incineration or landfill (Rödiger et al., 2021). There is often no recycling solution for complex non-modular consumer products, thus creating a loophole in which product destruction can continue. Furthermore, the legislation does not contain any reporting requirement regarding the volumes and type of products being destroyed, as such there is limited transparency with regards to companies' actual practices, making enforcement of the law particularly difficult (Elia, 2019; Rödiger et al., 2021). Finally, the law only covers unsold goods (such as overstock, obsolete products, or damaged goods), however it does not explicitly address customer returns, which as previously discussed are a stream of goods for which product destruction is particularly common. Thus, despite being a pioneer on this issue, the French law is perhaps not sufficient in addressing product destruction. In March 2022, the European Commission made the decision to postpone the potential ban on destroying unsold and returned goods to future legal acts (European Environmental Bureau, 2022). However, the Scottish Government has announced their intention to introduce a similar ban under the Circular Economy Bill (BBC News, 2022).

Belgian and German policy makers have also introduced several measures. In Germany under the Circular Economy Law, a novel duty of care legal principle has been introduced which obligates companies to ensure that when distributing and handling products, both unsold and customer returns, that the product quality and function is maintained preventing them from becoming waste (Circular Economy Act, 2020). This novel legal principle is in line with the waste hierarchy placing emphasis on prevention as a key strategy for addressing product destruction. Also, unlike the French law it makes a direct reference to consumer returns. Nonetheless, the principle is rather general and vague, lacking a norm addressee which inhibits effective enforcement (Rödiger et al., 2021). In addition, mandatory reporting requirements have been introduced. Companies must now disclose the types of products, volumes, and whereabouts of disposal, bringing greater transparency to this previously opaque business practice. It has been argued that such information regarding the flow of products within the economy, is an important foundation for circular economy transitions (Hartley et al., 2020).

Instead of pursuing a ban, in March 2022 the European Commission decided to mirror the German approach, requiring businesses to report the volumes of unsold goods sent to disposal along with the reasons for the decision (Huestebeck & Bellot, 2022). Nonetheless, the regulation only refers to unsold goods and does not mention customer returns.

In Belgium, lawmakers have reduced the VAT paid by companies on products which they donate to charitable organisations (Law amending the Value Added Tax Code with a view to exempting from VAT donations of non-food items to the most deprived, 2019). The hope is that by altering economic incentives, donation becomes a more viable option for companies compared to disposal. E-commerce companies cited the tax structures, and in particular the VAT to be paid on donations, as one of the major reasons why disposal of products was favoured over donation (E-commerce Europe, 2020). Thus, it is hoped that this policy measure will incentivise businesses to pursue more sustainable options. On the other hand, this measure does nothing to prohibit product disposal, it merely makes donation a more attractive alternative (Rödig et al., 2021). This also assumes that charities have the capacity to absorb the volumes and types of products that were previously destroyed, which is in no way guaranteed. There is thus a risk that the waste burden might instead be transferred to charities and other reuse organisations (Rödig et al., 2021), or that products might be exported to developing countries (Elia, 2019). As previously highlighted, there are also other reasons beyond economic incentives why companies refuse to donate unsellable products, brand integrity being of particular significance. Thus, companies that are concerned with intellectual property and brand value issues will thus not be inclined to donate, despite the changes to tax structures.

A further limitation of the French and Belgian initiatives, is that they predominantly focus attention on the lower stages of waste hierarchy, aiming to encourage reuse and recycling but do little in terms of prevention. Arguably none of these initial legislative efforts do anything to address overproduction and the existence of such high volumes of unsold/returned goods to begin with (Rödig et al., 2021). Thus, there are likely a wider range of policy instruments that could be leveraged to effectively address product destruction, such interventions will be the focus of the following section.

### **3.4 A review of policies to extend product lifetime**

Within the circular economy literature, many policies have been proposed to promote product life-extension and are summarised in Table 8. Given that product destruction is in many ways the antithesis of product longevity, many of the policies which have been proposed to promote the latter, could be leveraged to address the former. As previously discussed, product life-extension is a multi-faceted concept which involves increasing the useful life of a product, and is influenced by many different factors ranging from the technical to economic and even behavioural (Cooper, 2020). Product life extension strategies also have significant overlap with the top two tiers of the waste hierarchy, ‘prevention’ and ‘preparing for reuse’.

Prevention strategies aim to prevent a product entering the waste stream and in doing so extends the products lifespan. There are many interesting policies which have been proposed to achieve this end. In terms of economic instruments, ecological tax reform (Brown & Cameron, 2000; Daly, 1992; IRP, 2019; Jackson, 2009) or a cap-and-trade system (Dietz & O’Neill, 2013) for resource use have been posited. The logic here is that by factoring in the environmental externalities associated with resource use, we can influence resource prices (Hartley et al., 2020), and alter production decisions. Companies would thus be incentivised to improve resource-efficiency, manufacturing and marketing products which are less resource-intensive, higher quality and more durable. Resource taxation and cap-and-trade systems could also lead to a substitution of virgin materials for secondary materials, as they become comparably less costly (Söderholm, 2011). This would likely have an impact on the volume of products produced as businesses can

no longer rely on cheap access to resources (Hartley et al., 2020). Such policies would thus have downstream implications for the overall levels of product entering the waste stream. Extended producer responsibility schemes have also been suggested as a means for preventing waste generation and extending product life span (Ekvall et al., 2016). Typically, EPR or take-back schemes have been developed to deal with products at the end of their lifetime after the consumer is finished with them, however, they could equally be leveraged to deal with waste generated at the retailer level, to ensure manufacturers take-back expired, unsold, or returned products. When designed effectively EPR schemes make producers responsible for the waste stream - either physically, financially, or both – and in doing producers are incentivised to make the necessary eco-design innovations and create stronger environmental benefits

In terms of regulatory measures, at the more radical end a moratorium on non-renewable material extraction has been proposed (Akenji, 2014), which would have similar impact to ecological tax reform, but much more difficult to implement given the scale and complexity of global supply chains. Product standards and legal minimum life guarantees have also been suggested (Cooper, 2020; Hartley et al., 2020; IRP, 2019; Lebel & Lorek, 2008). These requirements would ensure that only high-quality durable goods could be placed on the market, and thus reduces the risk that such products will enter the waste stream (Cooper, 2020). These regulations can also be interpreted as choice-editing measures, which remove unsustainable options from the market (Akenji, 2014). It has also been acknowledged that informative instruments can play a role, in contrast to the carrot-and-stick approach, these instruments aim to encourage behaviour change by providing access to information. A softer approach could take the form of education campaigns in addition to labelling schemes for product lifetime, durability and repairability (Cooper, 2020; Hartley et al., 2020). The concept of a digital product passport which would detail relevant environmental and performance information, has gained traction within the EU and would help consumers to make more informed choices, stimulating demand for more durable goods. (Barrie & Schröder, 2021; European Environmental Bureau, 2021).

Incentivising reuse and repair of products are also very important aspects of product life-time extension. Again, there are several policy instruments that can be leveraged to this end. Tax reduction on circular activities and products is a key mechanism for reducing costs and incentivising repair and reuse. In Sweden VAT has been reduced on repair activities (Cooper, 2020; Dalhammar et al., 2022; Hartley et al., 2020), whilst others have proposed reducing VAT on products purchased on second-hand markets (Dalhammar et al., 2022). There is also a need to capacity build and invest in circular actors such as the repair and reuse sector, particularly in markets where they are struggling, one suggestion put forward has been to earmark EPR revenues for such purposes (European Environmental Bureau, 2021). In terms of regulation, similar demands have been made in terms of minimum repairability requirements to ensure that all products that have been placed on the market can be easily repaired, this also would require manufacturers to provide repair guidance, spare parts and necessary tools (Cooper, 2020; Dalhammar et al., 2022). It has also been brought to light that current waste law is deficient as it often classifies products as waste rather than ‘secondary resources’, preventing their safe reuse or repair (Hartley et al., 2020; Van Ewijk & Stegemann, 2016), whilst stringent health and safety regulations around food also limit reuse rates (Rood et al., 2017), highlighting potential avenues for future reform. Finally, it has also been noted that more needs to be done in terms of information provision to assure consumers of the quality of repaired or reused products, in addition to communicating the environmental benefits of consuming these kinds of products (Dalhammar et al., 2022; Hartley et al., 2020). To further encourage companies to pursue product life extension strategies a novel waste hierarchy tax has also been proposed, a progressive tax which aligns with the prioritisation set forth by the waste hierarchy. Landfilling would be taxed the most, followed by energy recovery and then recycling, whilst preparing for

reuse and repair activities would be taxed zero or even subsidised (Milios, 2021b). This progressive tax rate, if sufficiently high to counteract the higher costs associated with reuse and repair activities, would thus disincentivise businesses from engaging in product disposal and encourage them to make use of more sustainable disposition routes, shifting product to the higher levels of the hierarchy. Whilst also providing revenues for government which could be ear-marked for developing reuse and repair infrastructure.

As previously discussed, a policy mix which simultaneously targets the behaviour of different actors within the system is required to ensure product longevity and wider circular economy transitions. Thus, it is likely that more action is required than the individual instruments put forward by France, Belgium, and Germany, in order to effectively address product destruction.

*Table 8 Summary of proposed policies for extending product lifetimes*

	Extending Product Lifetime		
Policy Instruments	Prevention (production, demand management, design)	Reuse (second hand markets, donation)	Preparing for reuse (cleaning, repair, refurbishment)
Economic	Ecological tax reform – tax resources and consumption rather than income (Jackson, 2009, Ekvall et al 2016) Cap-and-trade system for resource use (Dietz & O’Neil, 2013) Extended producer responsibility schemes (Linqvist; Ekvall et al 2016)) Product Levy (Dalhammer et al, 2020)	Investment in second-hand / circular trading platforms Reduced taxation (VAT) on reused/second-hand products (Hartley et al, 2020) Promote product services rather than purchase, through differentiated tax Waste Hierarchy Tax (Milios, 2021)	Tax reduction on repair activities (Hartley et al, 2020) Earmarking of EPR revenues to social economy and preparation for reuse actors (EEB, 2021)
Regulatory	Moratorium on non-renewable material extraction (Akenji, 2014) Technical standards for durable high-quality products (Orlebe, 2019; Hartley, et.al 2020) Legal and commercial guarantees to promote long minimum lifetimes (Dalhammer et al 2020) Choice editing: reductions in volumes	Change waste legislation/ H&S which classifies products as ‘waste’ rather than ‘secondary resource’, hampering the reuse of waste streams	Minimum repairability requirements Requirements to provide repair manuals, tools, and spare parts
Informative	Education campaigns: buy quality, buy once Labels that inform on product-life time/durability/repairability. Product passport information	Labelling for quality assurance of reused and remanufactured products (Hartley, et al) Awareness campaigns to encourage/make second hand desirable (Hartley et al, 2020)	Information on repairability (Dalhammer et al, 2022)

### **3.5 Conceptual Framework**

A conceptual framework, detailed in Figure 3, has been developed to guide the remaining analysis. In the literature several product streams were identified which are common candidates for destruction, these included overstock, obsolete products, defective or damaged products which can be broadly categorised as unsellable stock. The other distinct stream of products subject to disposal are often customer returns, some of which are fully functional products that simply did not reach consumer expectations while others may be damaged or defective and thus returned by the customer.

Two sets of factors which influence product destruction decisions have been identified and should be the targets for policy intervention. Upstream factors are those that influence the existence of overall volumes of unsellable stock and customer returns and can be interpreted as the root causes of product destruction. These factors have been grouped into three broad categories including business model attributes, product characteristics and consumer behaviour. In terms of business models, decisions taken by the companies including overstocking as a business strategy or free customer returns policies, along with product portfolios which include low value/poor quality goods all have an influence on the presence of unsellable stock and high return volumes. Consumer behaviour, on the other hand, also plays a significant role, as purchasing behaviour can lead to high return volumes when consumers purchase multiple items with the intention of returning them. Moreover, high demand fluctuation for goods and changing consumer trends can result in product obsolescence and the presence of unsellable stocks. Finally, product characteristics and design have great influence on both the level of customer returns and unsellable stock. Products that are cheaply made and low-quality are more susceptible to becoming damaged or broken and less likely to meet customer expectations and as such are more likely to become candidates for destruction. To prevent high volumes of unsellable stock and customer returns, policy is needed to target these three upstream factors. These three factors involve multiple actors including retailers, manufacturers, and consumers and thus a policy mix is needed to induce behaviour change. As outlined by the waste hierarchy prevention strategies are most desirable and have the highest potential for reducing material throughput and improving resource-efficiency, thus these measures should be prioritised.

Nonetheless, given that under current conditions significant volumes of unsellable stock and customer returns are observed. More needs to be done in the short term to prevent these items from being disposed of and instead encourage their reuse or repair. To this end, downstream factors are significant. As highlighted by the literature review, four main factors influence businesses decisions to destroy products rather than make use of donation or liquidation opportunities. These include profit margin considerations, economic incentives, brand integrity issues and liability concerns. To change business behaviour and incentivise reuse over disposal, public policy should aim to target these downstream factors.



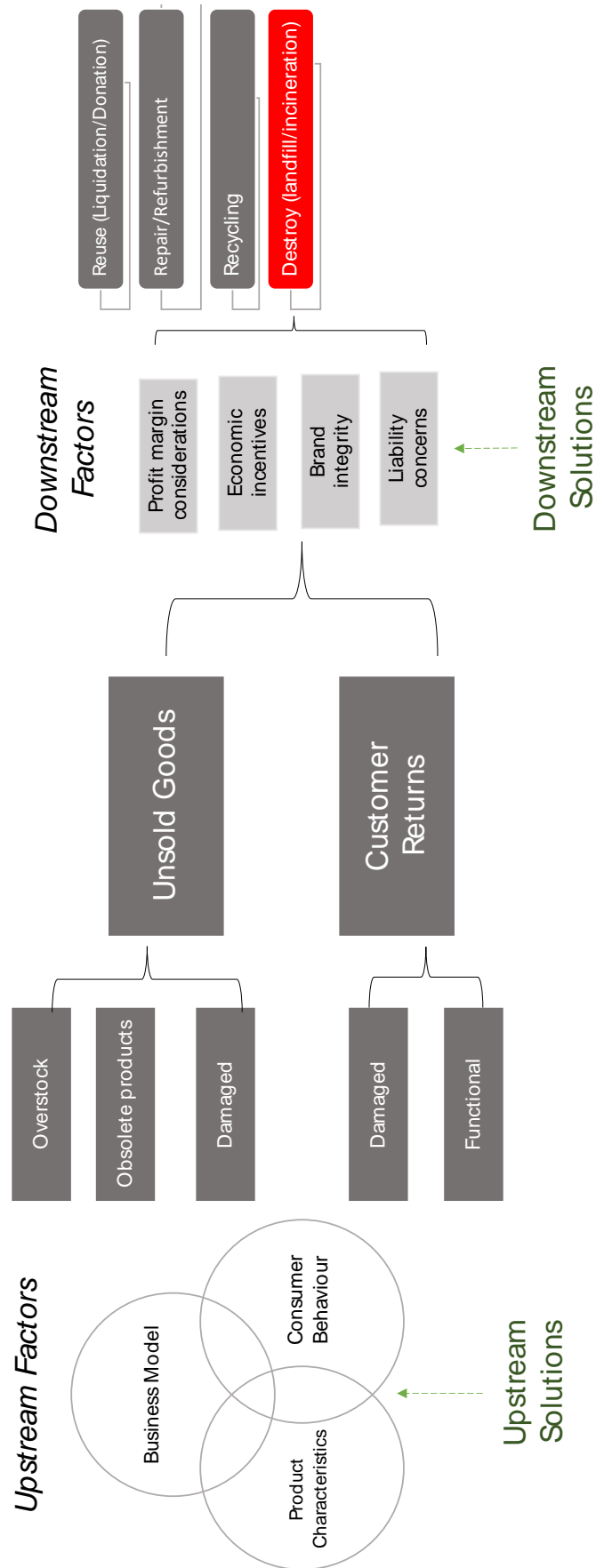


Figure 3 Addressing Product Destruction: A Conceptual Framework

## 4 Findings/Results

The following section reports the empirical results from 16 interviews conducted with key practitioners on the topic of product destruction in the food, electronics, and textile sectors. The complete list of informants, their job titles and organisation descriptions can be found in Chapter 2.2.2. The conceptual framework outlined in Chapter 3.5 is used to guide the analysis. First, upstream factors which influence the presence of unsellable stock and customer returns are considered, along with a discussion of potential targeted policy interventions. Next, downstream factors which influence companies' decisions to dispose of products instead of making use of more sustainable alternatives, such as reuse and repair, are considered. The following section then highlights potential policies which could target downstream factors and incentivise behaviour change to avoid product destruction. A summary of all research findings is detailed in Table 9.

### 4.1 Understanding Product Destruction in the Food sector

To gain insights into the driving forces behind product destruction within the food sector, five experts were interviewed. Within this sector, unsellable goods are the predominant category of products subject to product destruction. Due to the fast-moving and consumable nature of these products, customer returns are less common within this product group. Moreover, due to significant health and safety/liability risks associated with returned consumables, disposal is legitimate in such scenarios. Within the unsellable category, however, interviewees explained that occasionally due to forecasting errors companies might find themselves with large volumes of overstock which they need to move on. However, in accordance with the literature it was explained that most items which are subject to disposal are those which 'do not meet commercial specification' and thus the retailer makes the decision not to sell them. This could be for a variety of reasons; physical damage to the product, mislabelling, close to best-before date, packaging issues etc.

#### 4.1.1 Upstream Factors

##### ***Business Model***

When discussing the upstream factors which result in high volumes of unsellable stock several themes emerged. To begin with, many informants made the point that whilst in absolute volumes the amount of food disposed can often appear staggering, in comparison to overall sales it is often negligible and thus many companies fail to even recognise the existence of a problem. Interviewee B explained how managers that simply see the figures on a spreadsheet fail to recognise the problem, as they are often never exposed to the physical piles of food being sent to the waste management company. Several informants also explained how manufacturers have waste allowances built into their budgets, and thus so long as they are operating within this allowance these areas will not be prioritized by management and thus there is little incentive to move towards zero-waste scenarios. Interviewee E discussed that often companies do not calculate the cost of waste correctly, many simply look at the waste disposal costs but do not account for the costs associated with purchasing the product to begin with. Thus, it is common to underestimate the true cost of waste which results in a lack of engagement in the problem from management. Informants also explained that in recent decades, on-shelf availability has become the dominant commercial model for food retailers. Retailers assume that if a customer does not find the product they are looking for, they will go elsewhere, and thus on-demand availability is seen as key for customer retention. Empirical findings thus aligned with the literature, as informants explained how this creates a tendency for overstocking. Interviewee E made the point that thirty years ago, if you visited the supermarket in the afternoon, it was almost certain that bread would be sold out, now, however, this is not the case as the shelves are always fully stocked. Such practices, nonetheless, have a hidden cost and are responsible for

the high volumes of product waste. Another common theme, that contributes towards product waste relates to rigid product specifications. Informants reported how if a product falls outside these strictly defined specifications they are deemed unsellable. For example, many discussed the example of ‘wonky veg’ in which large volumes of fruit and veg had been discarded in the past, due to not complying with retailers’ appearance/quality standards (Dobson & Edmonson, 2019). It was also explained that fresh produce which is coming close to its best-before date, are also candidates for destruction as most retailers have a minimum shelf-life which they want to guarantee for consumers.

### **Consumer Behaviour**

Several informants discussed the interesting dynamics between retailers and consumers. In many ways retailers claim to build their business models around consumer demand or expectations. Many informants explained that consumers have come to expect shelves to be full all the time and to have on-demand access to all products. Interviewee C highlighted that once these expectations have been established, they are difficult to reverse, and thus individual retailers are unlikely to initiate these changes alone as their commercial models will likely suffer. The same can be said for below specification products, retailers believe that consumers would not accept these products and would avoid purchasing them and thus specifications are rigid to align with consumer preferences and expectations. Informants also discussed that consumers can be very unpredictable when it comes to certain food products as they go in and out of fashion, and thus supply and demand are rarely in perfect equilibrium.

### **Product Characteristics**

Interviewee E discussed how the range of products in a retailer’s portfolio will also influence the levels of waste. It was explained that larger product portfolios tend to result in more waste, as you will always have units that don’t sell. Product design and packaging also influence levels of unsellable stock. Products that have less resilient packaging are more likely to become damaged in transit or handling and thus become waste. Interviewee E recounted a case from a retailer which experienced a large surge in the volume of potatoes that were becoming damaged in transport and handling and thus were deemed unsellable. After working with their upstream suppliers, they discovered that a new strain of potatoes had replaced the previous strain because it had a higher yield, but nonetheless the product bruised more easily, and was responsible for the increased waste downstream. This anecdote highlighted the complexity of addressing waste issues due to the involvement of multiple actors within the supply chain. Informants also highlighted that the very nature of fresh produce presents challenges due to their expiration date and thus they often must be moved on quickly if and when they do not sell.

### **Unpredictable Factors**

Informants also noted that there are always multiple unpredictable events which cause significant fluctuations in demand and result in high waste levels. Many used the example of bad weather to explain why supermarkets might find themselves with an excess of a particular BBQ friendly product. Informants also discussed how the onset of the Covid-19 pandemic in 2019 also saw restrictions to hospitality sector and changes to consumer consumption habits and was thus responsible for increased levels of surplus within the economy.

## **4.1.2 Upstream Solutions**

As highlighted by the waste hierarchy, the most preferable solution to the problem of product disposal would be to intervene upstream and prevent the existence of unsellable stock to begin with. Nonetheless, during the interviews it became apparent that upstream interventions within the food sector pose significant challenges. Many informants noted the difficulties in moving away from the on-demand model as consumers have come to expect to always have access to

the products they desire and thus retailers fear changes would present risks to their commercial viability. Interviewee B also expressed concerns about the desirability of moving away from such a model. They argued that many look back at the ‘old days’ with rose tinted glasses, praising the fact that there was much less waste and failing to acknowledge that many suffered from malnutrition and food related problems. Thus, they believed that eliminating surplus altogether should not necessarily be the goal, as someone will likely go hungry. That said, as detailed in Figure 4, several upstream interventions were discussed which could influence the overall levels of unsellable stock.

In terms of voluntary initiatives, interviewee A discussed the importance of waste considerations when designing new food products. They suggested that if a product is very difficult to manufacture to specification and thus results in high volumes of waste, it should not be allowed in the product portfolio. It was suggested that these kinds of requirements could be built into product design processes to ensure that waste was eliminated from the outset. As previously mentioned, informants observed that many retailers do not accurately measure their waste problem, only accounting for waste disposal costs but not the repurchasing costs. Supermarkets could thus implement environmental management accounting techniques, such as residual waste accounting, which incorporates not only the disposal costs of waste but also the embodied material and production costs. These accounting practices could help companies understand the true cost of their waste and accordingly incentivise action towards waste-reduction (United Nations, 2001). Interviewee A also suggested retailers should revisit specification requirements and perhaps make them less stringent, to avoid unnecessary waste at the manufacturing level. They, nonetheless, highlighted the importance of doing consumer research alongside this to ensure consumer expectations are aligned.

Informants also discussed the potential of market-based instruments. A financial levy placed on unsellable products that are sent to waste or anaerobic digestion was discussed. This would increase costs for retailers and force them to pay more attention to their overall waste levels. In general, however, it was noted that the margins in food sector are rather tight and thus placing additional costs on food retailers would likely be transferred on to consumers or squeeze manufacturers and farmers further, which particularly during the current cost of living crisis and rising energy prices, could do more harm than good. On the other hand, interviewee A noted that particularly in the UK context, food prices are perhaps too low which encourages overconsumption in higher income households, contributing to high levels of consumer food waste. Therefore, increasing prices might have positive impacts by encouraging more thoughtful purchasing and prevent waste, so long as they are combined with redistributive measures to ensure low-income households can continue to meet their needs.

Informants also discussed the potential of consumer awareness and education campaigns around sustainability impacts of rigid product specifications and the waste associated with below-specification products which could help to increase demand for such products and allow retailers to widen their specifications. In the UK context, the “wonky veg” case provides a promising example of how this might be achieved. Consumers became aware that supermarkets were rejecting perfectly good fruit vegetables from farmers, on the grounds that they did not meet aesthetic standards set by retailers, leading to large volumes of waste. This sparked massive backlash amongst consumers and resulted in several supermarkets widening their specifications to allow for the sale of ‘wonky veg’ at lower prices. For example, food retailer Lidl now offer a ‘too good to waste’ box which contains below specification vegetables and can be purchased for £1.50 and has helped the retailer significantly in their commitment to reduce in-store waste (Lidl, n.d.).

Finally, the measure which had the most widespread support amongst informants was mandatory reporting requirements for food that is wasted both at manufacturing and retail level. Informants were confident that by forcing companies to disclose this kind of information publicly would create strong incentives for supermarkets to look upstream and understand which products were common targets for disposal and why the waste was occurring, along with providing incentives for them to remedy the situation. It was noted, however, that this kind of reporting would only be effective for the larger retailers and brands for whom brand integrity was important. In the UK context, several of the leading supermarkets have indeed committed to deliver on halving food waste by 2030 (SDG 12.3) and publish food waste data, including retailers like Tesco, Lidl and Sainsburys. However, informants expressed the need for standardised mandatory reporting to enable comparisons between different retailers. Furthermore, most agreed that reporting would provide important data insights to lay the groundwork for future legislation.

### **4.1.3 Downstream Factors**

#### ***Brand Integrity and Liability issues***

Given some of the challenges and concerns associated with eliminating surplus altogether, it was clear that all informants believed redistribution and reuse has an important role to play in addressing product destruction within the food sector. Nonetheless, informants discussed several factors which prevent retailers from redistributing surplus products for human consumption. Firstly, issues of brand integrity had significant impact on disposition routes for unsellable products. Interviewees corroborated findings from the literature that in the past supermarkets have been reluctant to discount products to sell through stock as they believed this could diminish the brand value and they fear that consumers might delay purchases in order to benefit from discounting. Nonetheless, in recent years many supermarkets have recognised the reputational damage associated with throwing away food that is fit for human consumption, and thus many are making use of discounting strategies, particularly for products nearing their sell-by-date. In terms of redistributing unsellable stock, it was also explained that brands want to avoid the leakage of their product on to grey markets, particularly if it is below specification product as this could impact the brand reputation and create liability risks. Informants reported that retailers need to have confidence that redistribution partners have the right checks in place to ensure that there is no leakage to grey markets. Often it is hard for retailers to guarantee that the right checks are in place, and thus to avoid the potential liability risks they favour product destruction.

#### ***Economic Incentives***

Another driver, particularly prominent in the food sector relates to economic incentives which, contradict the waste hierarchy, favouring recovery over reuse. Interviewee A explained how retailers can gain a financial return, albeit small, for sending food products to animal feed or anaerobic digestion. On the other hand, organising redistribution and donation of the food products for charitable purposes requires significant co-ordination and labour input, and thus entails high costs for the retailer. Thus, for many profit-oriented retailers, redistribution is not the most favoured option. Nonetheless in recent years, informants explained that food retailers have come to understand the benefits in terms of improved brand reputation associated with food redistribution and donation programmes and thus, particularly in the UK context, several retailers have invested heavily in food donation programmes despite the extra costs.

#### ***Profit Margin Considerations***

Many informants commented that significant time and labour resources need to be invested to set up successful redistribution programmes, all of which directly impact the bottom line. Thus,

many within the sector which operate on tight margins favour less costly options such as animal feed and anaerobic digestion as a means for dealing with excess stock. Interviewee A also noted how the impacts of Covid-19 affected vacancy rates, with some businesses operating regularly with 20-30% vacancy, in such scenarios the labour input needed for co-ordinating redistribution or food donation programmes is not given priority.

### **Redistribution Networks**

A common theme which was absent from the initial literature review relates to the capacity of the redistribution network. Even if companies make the effort to co-ordinate redistribution of excess products, they still require a functional redistribution network to absorb the product. One issue that surfaced in several interviews is that charities don't always want the type of products which food retailers have an excess of. Mostly charities are interested in fresh fruit and vegetables and other food staples, however food retailers have many other products in their portfolio which are less attractive to charities. Another issue is that redistribution partners are often charitable organisations such as food banks or homeless shelters, that rely on volunteers and thus don't always have the capacity to redistribute significant surplus volumes. Interviewee D, for example, discussed the challenges for retailers at weekends when many charities are not operating. Redistribution partners also have similar concerns to retailers regarding food expiration dates and quality assurance and they can be reluctant to take products with a short-shelf life as they don't want to be left with the waste burden. To extend the product life, particularly for food products, Interviewee A explained that freezing and relabelling products is a good option, however it was explained that many organisations don't always have the knowledge, capacity, or resources to engage in such activities.

### **Management**

Another important factor which was mentioned by informants relates to management. Even where companies have strong sustainability commitments and redistribution programmes in place, we often see high volumes of waste as this is often the most expedient and convenient option for time-pressed staff. Both Interviewee C and D discussed the success of different retailers' surplus redistribution programmes and noted that the best results are often achieved through personal engagement on the issue from employees. Within their own organisation Interviewee C explained how after receiving training and personally witnessing the benefits and social value of redistribution programmes employees become more engaged and active in ensuring that volumes did not go to waste.

#### **4.1.4 Downstream Solutions**

In terms of encouraging retailers and manufacturers to make use of redistribution networks instead of disposing of food-based products, many different interventions were discussed (Figure 4). In terms of voluntary initiatives, several informants explained that retailers have taken significant strides and most food retailers in the UK have established successful redistribution programmes, however policy is needed to reduce waste further.

In terms of market-based instruments, several informants discussed the need to change economic incentives so that financial value can be recovered from redistributing for human consumption, particularly as financial value can be recovered from sending products to anaerobic digestion or animal feed. Interviewee B discussed that tax rebates could be offered to companies that can evidence the meaningful social value that has been created from their redistribution efforts, whilst a financial penalty should be placed on those retailers that continue to have significant waste volumes. Moreover, given that labour is the most significant cost for businesses looking to engage in redistribution efforts, several informants discussed

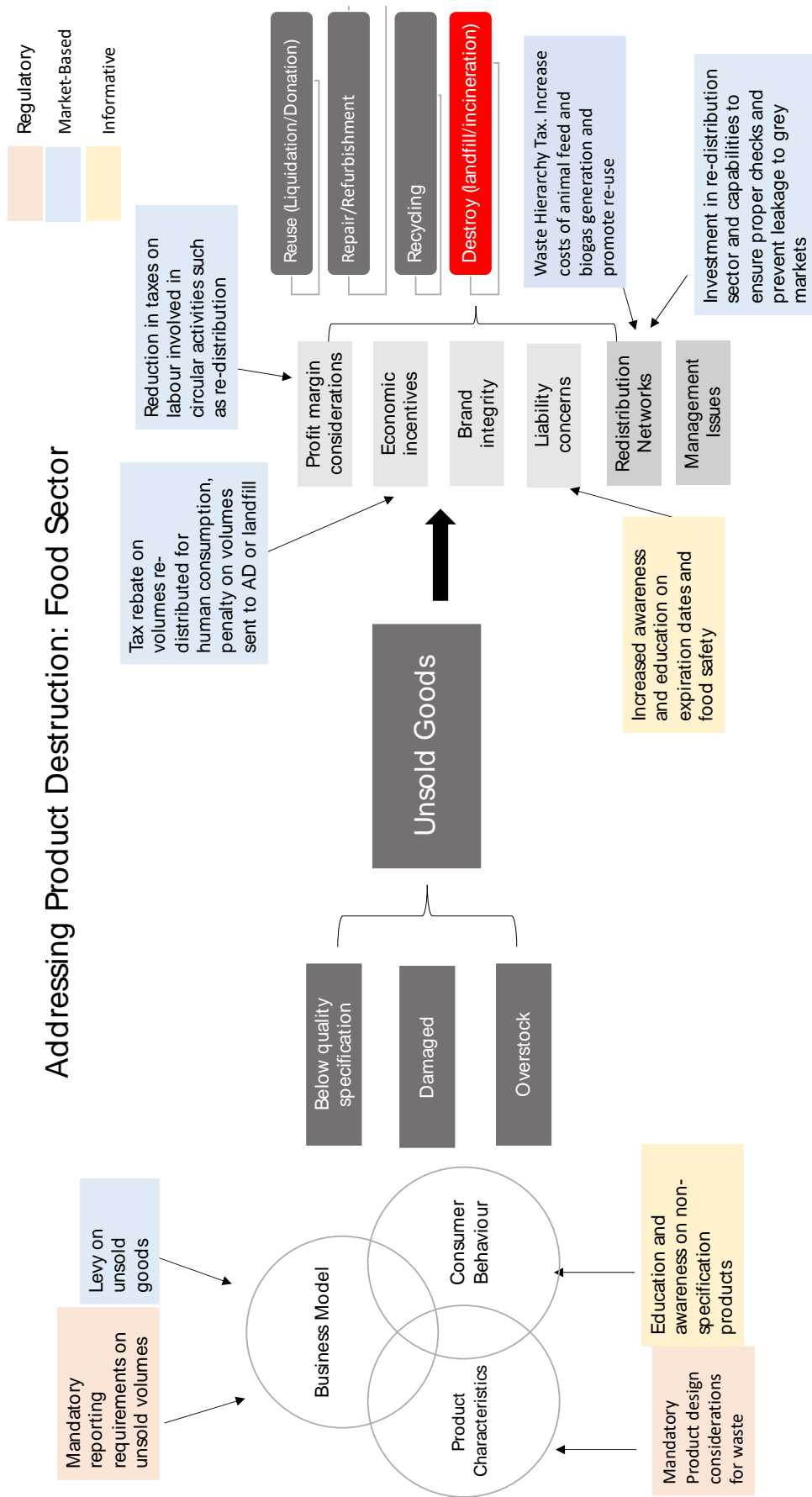


Figure 4 Addressing Product Destruction in the Food Sector

the potential of reduced taxes on labour that is engaged in circular activities around the redistribution of surplus food. In a similar light, informants also expressed support for a Waste Hierarchy tax, a progressive tax structure which places more financial burden on activities lower down in the hierarchy, thus discouraging actors from sending products to animal feed or biogas generation and instead providing economic incentives to ensure reuse and redistribution. At the same time, it was acknowledged that encouraging companies to redistribute stock is not a guarantee that the products will be reused and not wasted. The importance of capacity building amongst redistribution actors and supporting collaboration was thus highlighted. Investment and government support of the redistribution sector is thus essential to ensure the success of such schemes. For example, in the UK context, grant funding from DEFRA has allowed for ‘increases in availability, capacity and capabilities’ of redistribution partners contributing to the 65% increase in tonnage of food redistributed between 2018 and 2020 (WRAP, 2021).

In terms of regulation, informants once again favoured reporting requirements on disposition routes for unsold products for both retailers and manufacturers in the belief that this would be easiest to implement and have most significant impact on behaviour. In contrast, informants were sceptical of the French-style ban on the destruction of unsold goods. Interviewee C expressed minimal hope for the ban to be observed, commenting that businesses can often find loopholes and ways around such bans, particularly if there is limited oversight and enforcement. Moreover, interviewee B was concerned that such a ban could lead to a dumping of undesirable products on charities, which would then leave them to deal with the waste burden and associated costs.

In terms of informative instruments, many expressed supports for awareness and education in terms of the difference between expiration labels and best-before dates. For example, the UK retailer Morrisons, have recently launched a campaign encouraging the public to make use of the ‘sniff test’ to ensure the safety of milk products, and have made a pledge to scrap use-by dates, to avoid unnecessary confusion and high product wastage. Informants also discussed the need for more information regarding strategies for extending the life of food products, such as freezing, relabelling, to better help redistribution partners make use of products, within health and safety constraints.

In general, however, several participants expressed concerns that food surplus redistribution provides retailers with an easy way out of their waste problem, and one with positive CSR implications, thus there is a risk that it does not incentivise them to make the necessary upstream changes to avoid the presence of large volumes of unsellable stock. In the UK context, several informants expressed concerns that redistribution programmes tend to normalise the situation whereby millions of people can routinely not afford basic food necessities and thus become reliant on hand-outs from large corporations. Nonetheless, all agreed that it was preferable to see this food redistributed than thrown away, but that continued attention should be paid to the root causes of surplus food production to ensure the problem is addressed at source. Interviewee B, nonetheless, made a very strong case for the social value that can be garnered from the redistribution of surplus food. In the UK, there are several examples of community projects which use surplus food, not only to provide access to more affordable grocery products, but also through community kitchens and hubs they are able to tackle other issues like loneliness, social isolation, and obesity. As one project explains they “use surplus food to do much more than feed those on the cusp of food poverty...it builds confidence, gives people purpose and nurtures stronger communities’ (Company Shop Group, n.d.).



## 4.2 Understanding Product Destruction in the textiles and electronics sector.

In the next section, the empirical results from interviews with 10 practitioners on the topic of product destruction in the textiles and electronics sector are reported. The two product groups have been grouped together to aid the analysis and avoid unnecessary repetition, nonetheless, important differences between textile and electronics will be highlighted. From the interview process it was confirmed that product destruction occurs in these sectors, primarily as a means for dealing with unsellable stock (excess, obsolete or damaged) and customer returns, (both damaged and functional products).

### 4.2.1 Upstream Factors

#### ***Business Model***

There are many elements of retailers' business models which contribute to high volumes of unsellable stock and customer returns. Firstly, several informants explained how retailers often benefit from bulk purchasing, as it is less expensive to purchase in larger quantities/batches. When the direct costs (material and labour) of producing a product (COGS) are low it is viable for retailers to dispose of those units which remain unsold. Particularly within the fashion sector, Interviewee I explained how the dominant business model is to produce large volumes at low cost, taking advantage of lower labour costs and resource prices in developing countries. For these low-cost products the financial risk of disposing of unsold stock is not significant. Moreover, Interviewee P explained that often suppliers, particularly in the textile sector, will have minimum production volumes, as producing in smaller batches is not economically feasible for them. Interviewee P explained how larger product portfolios also tend to generate higher levels of excess stock. Ultra-fast fashion companies such as SHIEN which have been reported to place a staggering 10,000 new products a day on their e-commerce platform (Williams, 2022), are thus likely to generate high volumes of unsellable stock. Meanwhile, sustainable textile businesses are increasingly looking towards reduced numbers of collections and smaller product portfolios to avoid the associated waste. Nonetheless, it was explained that there are industry wide barriers to limiting the number of collections as many smaller brands sell on to wholesalers and retail outlets who have multiple buying seasons and demand new collections for each. Moreover, Interviewee K explained that most retailers operate with made-to-stock business models, meaning that they have a large product portfolio available when the consumer demands it. Being out of stock is not seen as a viable option for retailers operating in hyper competitive markets. Whilst this is highly convenient for the consumer, it nonetheless entails high waste volumes as inevitably units will remain unsold.

Regarding volumes of customer returns, many informants explained how proliferation of e-commerce business models within retail has contributed to an ever-increasing crisis for returns management. As a key part of their offering, online retailers have established generous returns policies for products that are bought online. Interviewee L gave an example of an online retailer for electronics goods in the UK which offered a 90 day return window for many of the products in their range. Several informants argued that such liberal returns policies have encouraged promiscuous purchasing in which consumers buy six items in the knowledge that they will return five or maybe even all six. Moreover, it was explained that compared to brick-and-mortar stores, customer satisfaction with products bought online tends to be much lower as they are not able to establish whether a product is fit-for-purpose before making a purchase. Thus, informants explained how the rapid expansion in the popularity of at home delivery models has led to an explosion in the overall volume of returned products.

### **Product Characteristics/Design**

The type of products in a retailer's portfolio also has significant impact on unsellable and returned volumes. A reoccurring theme was that cheaply made products, tend to be of lower quality and thus are less likely to meet customer expectations and thus be returned. They are also more susceptible to becoming damaged during transit and handling, rendering them unsellable. Interviewee N explained the challenges associated with textile products, as particularly in fast fashion markets where there are multiple product cycles, products quickly become obsolete as trends change and thus, they are no longer in demand. Interviewee P explained that in the fashion sector avoiding unsellable stock stems back to product development and design, ensuring that pieces in the collection are not following short-term trends but rather have a timeless design that remains in demand. The same issues are true for electronic products, however, in these cases the fall in demand is often a result of the launch of a newer model which renders previous products less attractive.

### **Consumer Behaviour**

Again, informants noted the complex dynamics between retailers and consumers. Interviewee J suggested that retailers are often responding to consumer trends and expectations and thus if consumers continue to demand high volumes of cheap products, retailers have no incentive to change their business models. As Interviewee I explained, consumers have a responsibility to slow down their consumption, value their products and make them last longer. In a similar light, made-to-stock, is also seen as an unavoidable model for most retailers, as they believe consumers will take their business immediately elsewhere if they do not find the product they are looking for in-stock. Thus, informants made clear that consumer expectations also have a key role to play in determining levels of unsellable stock. Several informants also highlighted the responsibility of consumers in creating an unsustainable returns culture. Interviewee J commented that many consumers engage in irresponsible purchasing practices online, ordering products that they have no intention of keeping without any appreciation of the true environmental and financial cost associated with returns.

### **4.2.2 Upstream Solutions**

To reduce the total volumes of unsellable stock or returned items a range of different interventions were recommended by practitioners and are detailed in Figure 5. Market-based instruments were favoured to incentivise behaviour change and innovation amongst retailers and consumers. To combat the returns crisis, a tax on customer returns volumes was discussed. Participants discussed the similarities to the UK tax on plastic bags, where despite recognising the environmental challenges, retailers were cautious of initiating fees on a voluntary basis as they feared consumer backlash. Thus, policy intervention helped to level the playing field, and it was argued that the same could be done by placing a tax on customer returns. A similar case was made for taxing the volumes of unsellable stock, this would significantly increase the costs associated with surplus and put pressure on producers to ensure production better aligns with demand. It was also noted that this would place pressure on retailers to re-evaluate their product portfolios and analyse which products routinely resulted in high volumes of unsellable stock and perhaps make the decision to remove them from their product range.

In terms of regulation, mandatory reporting requirements were once again popular amongst informants. Many believed that forcing companies to publicly disclose the volumes of unsellable stock and customer returns will draw attention to the scale of the problem, and incentivise action if companies want to avoid the negative brand image. Interviewee N also explained that minimum a 5-year warranty on consumer products, particularly electronics and also potentially for textiles, would be an effective way to improve the baseline quality of products on the market. Producing products to a higher quality would likely increase prices, which could help to limit

promiscuous consumption and could be paired with redistributive policies to ensure lower-income households can access goods. At the same time fewer products at higher prices, limits the risk of disposal because the products likely cost more to produce and thus the financial risk is greater. Moreover, interviewee F advocated that higher quality products would be less likely to be subject to return as they are more likely to align with consumer expectations. Another mechanism with similar effects would be to introduce minimum product standards, which would help to prevent cheaply made, low-quality goods from being placed on the market and ensure reparability and durability. In terms of regulation, Interviewee L highlighted that in general sectoral approaches which bring together industry representatives and policy makers tend to have more success and can help to initiate a workable joint plan.

The importance of informative instruments was also highlighted by many informants. In terms of customer returns, Interviewee L discussed how consumers need to be made aware of the true cost of returns, suggesting an innovative mandatory label requirement on return packages which explained the environmental impact and resource issues associated with returning products. If consumers are to drive the change and demand higher quality and more durable products, informants expressed support for durability and reparability indexes which provide consumers with the necessary information to purchase sustainable products, with many observing that France appeared to be leading the way in this regard. In general, participants agreed that there was a need to do more in terms of educating younger generations on the impacts of promiscuous consumption and the hidden waste associated with on-demand consumption models. In the long term, it was thought that education could help to re-shape consumer expectations and transition towards a more sustainable system. Several informants nonetheless expressed significant scepticism around consumer led approaches to addressing the problem of product destruction, due to their long-time frame and the presence of systemic pressures which constrain consumer behaviour (Coffin & Egan–Wyer, 2022).

A wide range of voluntary initiatives were also discussed. In terms of customer returns it was clear that whilst significant progress has been made, retailers could do much more to ensure that consumers have enough information about a product at the point of purchase to avoid returns. For electronic products, descriptions of software compatibility, instruction manuals and video tutorials all help to align consumer expectations. Whilst for textiles; sizing guides, pictures of clothes on different sized-models, virtual dressing rooms all have the potential to aid the consumer and reduce likelihood of returns. Interviewee L discussed how retailers can use data analytics to help customers identify the right fit for themselves based on previous purchases. Interviewee P explained that some leading brands have taken the bold step to abolish free returns, and make consumers pay a small fee, and more recently bigger retailers such as Zara and Uniqlo have also followed suit (RTIH, 2022), often this amount is symbolic but encourages consumers to think twice before purchasing. However, as previously discussed due to the centrality of customer returns within the e-commerce business offering, it is unlikely that many companies would introduce return fees voluntarily and thus policy is needed to level the playing field. Given that returns place significant costs on retailers, informants highlighted that any improvements made in reducing the overall volumes of returns will deliver not only environmental gains but also significant financial returns, thus retailers should prioritise these measures and support legislative efforts which would reduce return volumes.

In terms of unsellable stock, Interviewee K discussed how data can also be used along with accounting techniques such as cost-to-serve to help identify profitability of individual product lines and aid decisions regarding the discontinuation of products which fail to meet consumer expectations. As an alternative to the predominant made-to-stock business model of most manufacturers, Interviewee K also discussed the potential of made-to-order models. In such cases consumers could come to physical stores and check if a product is fit for their needs, they

could then place an order and the product would then be manufactured. They explained that such a model would help to eliminate waste volumes associated with both customer returns and unsellable stock as manufacturers have a more accurate idea of demand, whilst customers have already tried-and-tested the product and thus are likely to be satisfied. Interviewee K explained that this model was pioneered successfully by Dell in the 1980s and helped to avoid unsold PCs and value depreciation, however, in 2010 due to the changes in computer industry and changing consumer expectations they adopted an in-stock model. Interviewee K speculated that with the rise of sustainability concerns and consciousness, we may well see a return to the made-to-order model which helps to avoid a significant amount of waste. Businesses would nonetheless need significant incentives to encourage them to move away from highly profitable made-to-stock models and consumers would need to alter their expectations regarding on-demand availability.

### **4.2.3 Downstream Factors**

Having established the main reasons for the existence high volumes of unsellable stock and customer returns and exploring some solutions, the next section will examine why companies favour destruction of these products instead of making use of other more sustainable disposition routes such as liquidation and donation.

#### ***Brand Image***

Informants reaffirmed findings from the literature regarding the centrality of brand integrity risks associated with liquidating or donating products. Particularly in the textile sector, interviewees made clear that any brand which has a trademark will find it difficult to find alternative disposition routes for their products. Such brands can only donate to charities that have capabilities to de-tag and de-brand products so that they are no longer recognisably associated with the brand. Whilst this is possible and there are several examples of brands that engage in such activities, it requires significant resources and investment to ensure the right checks are in place. Interviewee G also made the point that whilst no brand wants to admit it, there is also a hesitation to donate products for fear that products might end up in the hands of consumers which do not fit or reflect the brand image. In general, informants expressed that many brands are ‘paranoid’ about where their products might end up and the legitimate risk of cannibalising their own sales if products find their way into second-hand or grey markets. For this reason, purposefully damaging, landfilling, or incinerating unsellable stock is often seen as the best way to prevent products re-entering the market. Several informants also discussed brands reluctance to discount products, in terms of luxury textiles they fear that reduced prices would signify a devaluation of the brand, whilst fast-fashion brands fear that customers would delay purchases if they believed clothes would be discounted in the future. Informant B, nonetheless, made the important point that there is also a huge brand reputational risk associated with being caught in product destruction scandals. For example, the Burberry scandal in which they were revealed to have burnt £28.6 millions of goods (BBC News, 2018), arguably did significant damage to their brand image and de-valued the product in the eyes of the consumer as incinerating them suggests the products are not of significant value or worth. Thus, informants suggested companies should think more holistically and long-term about their brand image and refrain from such irresponsible practices which ultimately harm their reputation.

#### ***Legal Restrictions/Liability***

Several informants also discussed the liability risks associated with finding alternative disposition routes. In terms of electronics, Interviewee F explained that there are data protection issues associated with electronic products that have been returned by customers and thus companies must be very cautious when finding avenues for reuse. For high value products many companies engage in the necessary precautions in terms of data wiping, however for low value/low-margin products such activities are not economically feasible. It

was also explained that returned electronics also need to be subject to electrical safety testing such as portable appliance testing (PAT) to ensure they are safe for reuse, again for low-margin products these kinds of activities are not economically viable to conduct at scale given the significant costs already associated with returns. Interviewee F explained that some of the products which retailers' stock are classified as dangerous goods or hazardous materials (HAZMAT) products, for example aerosol deodorants, as they may pose a safety risk during storing, handling, and transportation due to containing corrosive, flammable, or other harmful substances. It was explained that it is very uncommon for charities or reuse organisations to have the capabilities to deal with these products as it is expensive and requires significant expertise, thus it is difficult to find avenues for reuse for these products.

### **Profit Margin Considerations**

In general informants explained that disposal is much more likely for low-value goods (textiles) or high value goods with a small margin (electronics), as the costs involved in finding alternative disposition routes (in terms of labour, storage, handling) impact the bottom line. In terms of unsellable stock, informants explained that it is often difficult to find a liquidator for such products given there is limited resale value for low-value products. In terms of customer returns, it was explained that companies are already making a loss by the time products come back to them, they have already credited the customer for the original purchase, paid for shipping costs and labour costs of handling. In an e-commerce setting the process of then grading a returned product to determine whether it is suitable for resale or needs some refurbishment is labour intensive and thus given the volume of returns, many companies opt to not engage in the process for goods that are low-value or have very small margins as it is not economically feasible. Interviewee O explained that in the reuse sector there is a certain threshold in terms of product value, below which they cannot justify selling the product as there is no way to cover costs involved in preparing it for reuse. Informants also explained that for products that have been damaged either in warehouses or transportation, even if they are high value, it can be extremely costly to repair them as they were often not designed with repair in mind and retailers do not have the right infrastructures set-up to reintegrate them back into stock. For retailers with a very wide product portfolio, selling everything from Kayaks to phone cases, they often do not have the knowledge, tools, nor expertise to repair and refurbish all of the products in their range.

A reoccurring theme during the interviews was that labour costs near the consumer (in high income countries) are typically too high, as compared with the labour costs involved in production in developing markets, and thus it is difficult to rationalise investment in grading, repair, or refurbishment, when a brand-new product can be procured for a lower cost. Interviewee I pointed out that commercial retail models have been optimised for a linear throughput of goods for decades, and thus it is not surprising that retailers do not have the necessary reverse logistics systems and infrastructure to deal with customer returns. Interviewee O also commented that most companies are streamlined for their main type of business, in the e-commerce setting this means they have been optimised the forward logistics processes, doing something outside of this thus becomes very expensive. Establishing the necessary infrastructure and systems requires major investment of time, resources, and labour, they thus cannot be established overnight, and need to be properly incentivised.

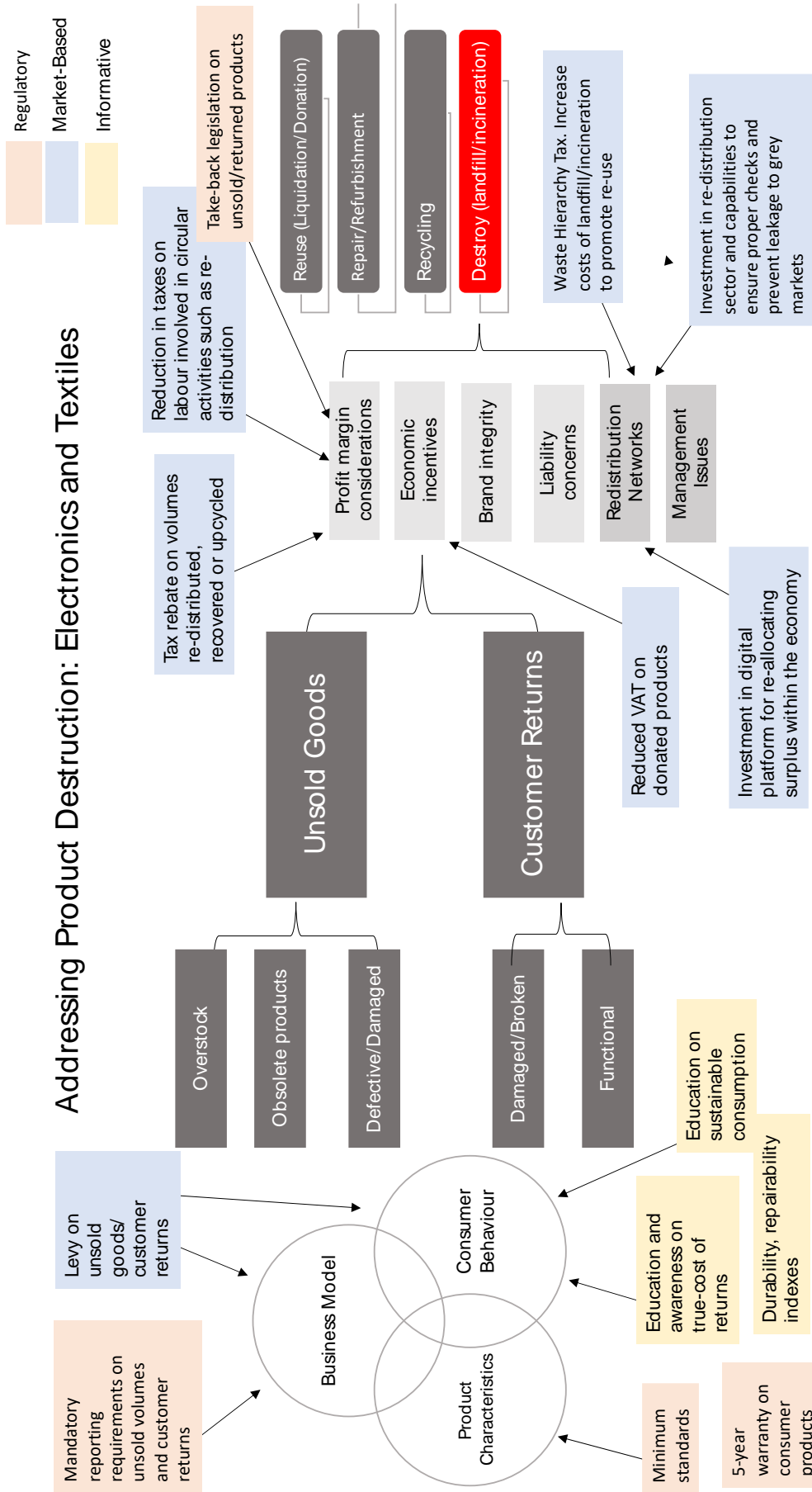


Figure 5 Addressing product destruction: Electronics and Textiles

### **Economic Incentives**

The importance of economic incentives to help companies recover value from their unsellable products or customer returns was also highlighted. In the UK context, informants explained that under the 1994 Value Added Tax companies are not required to pay VAT on products that they donate to charity so long as the goods are resold. This has created a thriving ‘charity shop’ sector in which charitable organisations have created ‘trading-arms’ where they sell products in their shops and use the proceeds to fund charitable activities. Informants described how that has allowed charities in the UK to absorb vast volumes of unsellable and returned stock from retailers and find a secondary use for the products. Informants shed light on the importance of these economic incentives to enable companies to donate products without significant costs. In other European countries, companies are required to pay VAT on the products which they donate to charity and thus sending the products to disposal is more cost-effective, leading to adverse environmental outcomes.

### **Redistribution Networks**

In many cases informants argued that some retailers are very willing to donate products and take on the associated costs, but often struggle to find charities or reuse organisations that need their products or have the capacity to absorb their volumes. As Interviewee M explained, electronics and textiles are not like food items, as there is not always a societal need for them. For many products within the textiles and electronics sector it is thus difficult to find a reuse case, particularly for the large volumes of surplus which retailers have to offer. As Interviewee M recounted, a charity which works with homelessness and has a hostel of 30 people, would surely find it difficult to find use for two lorries of dinner shirts or twenty pallets of HDMI cables. Thus, it was explained that whilst reuse is often preferable, for some products particularly those which retailers could not sell, there is often no clear use-case and other organisations do not want to be left with the waste burden, thus as Interviewee N explained, in such cases recycling and recovering the resources might actually be preferable.

Informants explained how the UK charity shop model allows for the absorption of large volumes of unsellable or returned products, as charities have trading-arms where they resell the goods and use the profits for social purposes. On the other hand, Interviewee O explained that there are also an increasing number of for-profit businesses which are offering solutions for handling e-commerce returns or damaged products by repairing, refurbishing, and reselling the products on second-hand marketplaces. These actors are working to ‘industrialise the reuse sector’, operating with their own logistics networks and vast storage facilities. Such large-scale operations can provide a cost-effective and efficient solution to retailers’ waste problems. Nonetheless, not all informants were convinced of the long-term sustainability of such scenarios. Interviewee N highlighted that only a small proportion of the clothing collected for reuse is actually absorbed domestically, in the UK around 30% of the is resold in charity shops, with the remaining 70% being shipped abroad, mainly to East African countries (Rodgers, 2015). A recent report from Greenpeace Germany explains how ‘textile waste is often disguised as second-hand clothing and exported from the Global North to the Global South’ (Cobbing et al., 2022, p. 5). The report highlights how global brands often export brand new products that have simply been overproduced and claim that they are being reused, however investigators have found that the overwhelming majority end up in dumpsites, rivers or are incinerated in the open, having detrimental environmental consequences. For these reasons, informants expressed scepticism about the long-term sustainability of such large-scale donation or reuse schemes.

There were also concerns regarding the quality of products which are in circulation, as low-quality products have limited resale value in second hand markets. Interviewee N commented that a fast-fashion dress which originally retails at less than £5 is difficult to resell with any margin in a second-hand market. This is because consumers are reluctant to purchase such

products aware of their original price and the quality of the product. Interviewee M, nonetheless, explained that for many lower income households having access to these types of goods at lower prices in second hand markets or charity shops can make a big difference to their budgets. Interviewee M was, however, concerned that discounting such products tends to perpetuate a culture of consumerism and does nothing to address the issue at its source. In a similar vein to issues surrounding food donation, interviewees expressed concern that establishing large-scale donation and reuse schemes provides retailers with a positive PR story and does not encourage them to look upstream and make the necessary changes to their product portfolios and purchasing behaviours. Moreover, several informants remarked that traditionally second-hand items have been worn and used by a consumer, perhaps for several years. The pre-loved nature of such products is thus very central to the concept of second-hand. Participants were concerned that if second-hand markets now become flooded with large volumes of excess stock and customer returns, products which have never been used, the very meaning and value of second-hand is brought into question.

### **Management issues**

Interviewee I made an important point that often business organisations are heavily siloed and those working in operations which deal with unsellable and return volumes, don't necessarily engage with those in CSR departments who traditionally handle sustainability issues or donation programmes. Those is CSR departments which have strong relationships with charitable organisations, may not be aware of volumes of stock which could be donated, particularly if management have not recognised the problem to begin with. Thus, informants shed light on how management and organisation structures can prevent efficient redistribution efforts.

### **4.2.4 Downstream Solutions**

Given the significant barriers to finding alternative disposition routes for unsellable or returned electronics and textiles, informants agreed that there is a strong need to intervene upstream to prevent the existence of such large volumes of unsellable and returned stock to begin with. Nevertheless, there were also discussions of some downstream interventions which would aid product reuse and refurbishment (Figure 5). Interviewee O explained how through their companies' innovative business model, which harnesses the efficiencies from digitalisation, they have industrialised the reuse sector. Over the years they have garnered significant in-house expertise regarding repair and upgrading of damaged goods, along with developing digital marketplaces which allow them to resell around 83% of the volumes they receive from e-commerce companies, thus suggesting that if infrastructure and expertise is sufficiently developed it is possible to find more sustainable disposition routes for these product streams.

To incentivise businesses to adopt these business offerings, a range of market-based instruments were suggested, including tax rebates on the volumes of products companies can repair, refurbish and reuse, whilst increasing taxes on volumes sent to landfill or energy recovery (similar to a waste hierarchy tax). Interviewee O represented a company with a re-commerce business model in which they handle the returns process for several large online retailers. Through their product life extension activities (repair, refurbishment, and reuse) they provide significant environmental benefits, and thus Interviewee O argued that such businesses should face lower tax pressure than those which cannot offer the same environmental returns. Moreover, given the significant costs posed by the labour intensity of organising reuse and repair initiatives, some form of tax reduction or rebate on labour involved in circular activities was deemed to be beneficial. Given the significant barrier posed by VAT levies on donated products in other European markets, most informants agreed that reducing such barriers would help to incentivise donations. Moreover, the centrality of brand integrity issues, means that reuse actors require investment and additional resources to ensure that they have the necessary infrastructure



to de-brand and de-tag items, thus there is a role for government to help with capacity building in the reuse sector. Interviewee H also discussed how governments could potentially sponsor and invest in the development of centralised online platforms that could be used to locate and redistribute surplus product streams by connecting retailers with those in need. As explained by Interviewee O the success of their re-commerce business, has hinged upon the development of online second-hand marketplaces which have allowed for the efficient resale of products. Such platforms are thus highly important for ensuring effective reuse and product life extension, and thus governments could play a role in initiating and supporting their development.

In terms of regulation, several interventions were suggested. Interviewee L argued that ideally manufacturers and suppliers would be forced to take-back returns or unsold items and retailers should not be allowed to discard them on their behalf. This would obviously entail increased costs for the manufacturers but would encourage them to find better disposition routes for these goods in order to maximise the economic recovery, or encourage them to improve product design, information, and production volumes such that returns, and surplus goods were less prevalent. Interviewee L, nonetheless, did not think such measures were likely to be introduced anytime soon. Again, the importance of mandatory reporting requirements regarding the volumes and types of products which are sent to liquidation, donation, and recycling respectively, would help to provide better transparency on retailer's practices and place pressure on them to optimise their disposition channels. Interviewees once again expressed scepticism regarding the efficacy of a French style ban on the destruction of unsold goods. As discussed, for electronics and textile products, there is not always a suitable disposition route or reuse case for the volumes of unsold or returned products, and thus introducing a ban could have some adverse impacts, leading to the dumping of undesirable products on reuse organisations or charitable organisations. Interviewee I also pointed out that in the UK, under the 2011 Waste Regulations, companies are required to follow the Waste Hierarchy which effectively prevents the destruction of unsold goods and operates in a similar way to the French ban (Elia, 2019). However, the informant expressed that due to minimal enforcement or oversight from the government, and limited alternative disposition routes, companies do not comply with this law, highlighting the limits to this kind of regulatory instrument.

Interviewee O also explained that for reuse schemes to be successful, there must be significant demand from consumers for second hand or repaired products. They thus argued for policy changes that encourage consumers to buy second-hand and change the cultural norm of buying everything new. Interviewee O maintained that to change such norms at a cultural level, there needs to be more education regarding the true environmental costs of new production and the scale of the associated waste. They explained that very few consumers understand the true environmental impacts of their consumption and the climate, biodiversity, waste, and pollution implications. In a similar light the sustainability benefits associated with reusing and extending the life of products are not always well communicated. Government campaigns that helped to increase awareness and understanding in this regard, could thus help to alter consumer preferences towards second-hand, repaired, and refurbished products. Interviewee O also explained how their company produces sustainability reports which calculate the environmental benefits of their reuse activities. Over the last decade they have found such information highly beneficial in educating their clients (retailers) on the importance of engaging in re-commerce/reuse programmes. The informant highlighted how this kind of information, which explains the environmental benefits of product recovery and reuse, will become increasingly important for retail companies, due to new sustainability reporting requirements under the EU taxonomy legislation (European Commission, n.d.).

It was nonetheless clear from the interviews that given the nature of electronic and textiles products, and the volumes of surplus and customer returns, there will always be challenges in

finding appropriate disposition routes and thus the most optimal solution is to intervene upstream to contain the problem at source.

Table 9 Summary of Interview Findings

Upstream Factors	Business Model	<p>On-demand and on-shelf availability leads to overstocking for many products</p> <p>Rigid quality specifications guidelines, result in high volumes of unsellable product</p> <p>Bulk purchasing strategies to save costs, result in unsellable volumes</p> <p>Liberal returns policies, (free returns and extensive return windows) results in high return volumes</p> <p>Large product portfolios with limited product vetting/screening before placing on site.</p> <p>Manufacturers operate on made to stock models; often resulting in mismatch between demand and supply.</p> <p>Waste allowances built into manufacturers budgets</p>		
	Product Portfolio	<p>Larger product ranges lead to higher wastage levels as some units inevitably remain unsold.</p> <p>Products which are of poor quality more likely to be damaged during handling and become unsellable, they are also more likely to be returned by consumers or to not sell.</p> <p>Products which quickly become obsolete; textiles often subject to psychological obsolescence if they are not part of the current trend, whilst electronics subject to technical obsolescence.</p> <p>Seasonal products or products manufactured for special events e.g., world cup often subject to obsolescence</p>		
	Consumer Behaviour	<p>Consumers expect on-demand access to most products.</p> <p>Consumer demands new product ranges and lines</p> <p>Consumers are comfortable shopping from home.</p> <p>Limited effectiveness in manufacturing longer lasting, higher quality products, if people don't want them to last longer and continue to consume frequently, because all we are left with is better quality waste.</p>		
	Unexpected events	<p>Demand can fluctuate based on very unpredictable events such as good or bad weather, so it is difficult to make perfect predictions</p> <p>The Covid-19 pandemic created surplus as people changed habits and preferences overnight- impossible to predict</p> <p>Ukraine war, demand drops dramatically for certain products and surplus generated overnight.</p>		
Upstream Solutions	MBI	Regulatory	Information	Voluntary
	<p>Financial levy on products that are sent to landfill/incineration.</p> <p>Increase the cost of waste, forcing retailers to pay more attention to waste levels</p> <p>Levy on customer returns to level the playing field</p> <p>Waste hierarchy tax</p>	<p>Mandatory reporting requirements on unsellable volumes</p> <p>Mandatory reporting on returns volumes</p> <p>Standard 5-year warranty on all products.</p> <p>Eco-design requirements; minimum standards</p>	<p>Consumer awareness around 'not to specification' products</p> <p>Awareness and education around expiration dates vs best before.</p> <p>Consumer awareness around true cost of returns.</p> <p>Labelling requirement that returns have environmental impacts</p> <p>Consumer awareness on buying quality and making</p>	<p>Made to order business models for manufacturing</p> <p>Product portfolio evaluation using data analytics, cost-to-serve accounting.</p> <p>Use of technology, virtual fitting rooms, video tutorials etc to</p>

		<p>Limit to volume of product on market</p> <p>Sectoral approach: policy makers come together with industry representatives and make a joint plan that is workable</p>	<p>products last.</p> <p>Durability/repairability index</p> <p>Education in schools on sustainable consumption, how to repair, what production processes involve etc.</p>	<p>manage consumer expectations</p> <p>Data analytics: particularly for repeat customers on what fit is best</p> <p>Stop doing business with serial returners</p> <p>Make returns policies less generous, add return fees.</p>
Downstream Factors	Brand Integrity	<p>Reluctance for brands to let below standard products get on secondary market for fear of brand reputation not being upheld.</p> <p>Brands that have a trademark find it very difficult to donate unless charities have de-tagging abilities</p> <p>Discounting opposed as seen as a ‘de-valuation’ of the brand</p> <p>Brands don’t want products in second-hand/ charity sector, de-value brand image and cannibalise their own sales.</p> <p>Companies concerned about where their products might end up, and so landfilling or incineration are seen as the safest options</p> <p>On the other hand, brand reputation issues for companies caught up in destruction scandals, particularly as consumers becomes more environmentally conscious</p>		
	Economic Incentives	<p>Companies can gain a financial return (albeit small) for sending food to animal feed and anaerobic digestion, whilst in most cases donating food for human consumption costs food retailers, due to labour costs and organisation.</p> <p>VAT law in UK incentivises donation to charity. As VAT is zeroed on charitable donations so long as product is resold, this allows them to recover some value.</p>		
	Legal Restrictions/ Liability	<p>For food products which pass their expiration date, food health and safety law requires them to be disposed of.</p> <p>Whilst products past best-before dates are safe in terms of health and safety, they are sub-standard in terms of the quality retailers want to assure and so companies often don’t want to take the risk of distributing such products, as the liability risk can be high</p> <p>Particularly for food products that are returned, there is no way for retailers to be able to assure the quality and food safety, thus the liability risks are too high.</p> <p>Electronic products need to have PAT test if they have been repaired to ensure they are safe and compliant, this is costly.</p> <p>Dara protection on customer returns means some electronics need to be wiped, this is done for high value items but for low value not seen as economically viable</p> <p>HAZMAT products or dangerous goods need to be stored and transported in specific ways, and thirds parties often do not have capabilities to do so.</p>		
	Profit Margin Considerations	<p>High labour costs in countries where products need to be repaired/up-graded or redistributed vis-a-vis costs in countries where they were produced, make it expensive for companies to engage in circular activities</p> <p>Particularly challenging given labour shortages due to Covid impacts (20-30% vacancy rates)</p>		

		<p>For many retailers and manufacturers, a certain amount of waste is costed in and so there is little incentive to reach zero waste</p> <p>Many businesses only look at waste disposal bill and do not account for the products that have to be repurchased, so underestimate their waste costs</p> <p>Lack of investment in reverse logistics infrastructure so processes are very expensive. Requires significant investment and long-term vision to implement, will impact bottom-line in short run</p> <p>Low value products (textiles) not economically worthwhile to pay for grading and inspection as the labour costs to do so quickly outweigh the products value.</p> <p>Also, expensive goods with low profit margin (electronics), are subject to disposal as the costs involved with reintegration are too high.</p> <p>Many products not designed with repair or reuse in mind so when they become damaged or unsellable, they are difficult to fix. Takes too much manual labour to undo and repair, the low value products don't have any resale value</p>		
	Management Issues	<p>More expedient to mark items value down to zero and dispose of them in bulk than to grade sort them for repair, resale etc, so often favoured by staff</p> <p>Unless staff feel personally engaged in the issue and see the value in doing something else, they will go with the easiest option which is often landfill</p> <p>Siloed structures: often it is inbound logistics teams that have to deal with waste volumes. Whilst CSR departments usually handle donations and charity departments, so you need companies to join the dots and take-action</p> <p>Need to have vision from management and structures in place that allow for redistribution</p>		
	Redistribution network capacity	<p>There is a lot of surplus in the economy, and the volumes can often be significant, so you need charities that can absorb those volumes and find use for the products, and that is not always the case.</p> <p>Charities often don't operate on weekends and are reliant on volunteers so don't always have the capacity to accept volumes.</p> <p>Some redistribution partners don't have the right checks in place to prevent grey market leakages etc</p> <p>Charities often don't have the capacity to de-tag and de-brand products</p> <p>Low quality products that didn't sell first time, might not have a use in second hand markets- can't resell low value. Some products that don't sell, sold because no one wants them- fast fashion fad, out of date electronics thus there might not be any demand. In such cases recycling and getting component parts might be more beneficial.</p>		
Downstream Solutions	MBI	Regulatory	Information	Voluntary
	<p>Investment in redistribution sector to build capacity and foster collaboration</p> <p>Change economic incentives so that reuse for human consumption can recover value- tax rebate for social value recovered</p> <p>Reduced tax on labour for circular activities, to incentivise businesses to</p>	<p>Mandatory reporting requirements</p> <p>Force manufacturers to accept returned items, don't allow them to discard them</p>	<p>Better education and understanding of expiration labels and how to extend product life</p>	<p>Target, Measure, Act</p> <p>Develop strategic partnerships with charity partners</p>

	set up necessary infrastructures. Invest in platform which can be used to locate surplus and find use for it. Waste Hierarchy Tax			
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## 5 Discussion

### 5.1 Knowledge Contribution

Chapter 4 of this thesis reported the findings from interviews with relevant practitioners on the topic of product destruction. The next section discusses these in accordance with the original research questions put forward at the beginning of the study, in order to assess the extent to which they have been addressed and how the findings of the study contribute to existing academic knowledge on this topic. In relation to RQ2, the European Commission's new Sustainable Products Initiative will be analysed, as it is an ambitious product policy framework which could have significant ramifications for the issue of product destruction.

#### **RQ1: What are the main factors driving product destruction?**

In terms of the factors driving product destruction, empirical findings in many ways corroborated the insights from the literature review. The unique contribution of this study has been its distinguishment between upstream and downstream factors. Upstream factors are those which determine the overall volumes of excess stock and customer returns to begin with. Such factors can thus be understood as the 'root cause' of product destruction. This study has shown that retailers' business models, consumer expectations and product characteristics all have significant impacts on levels of unsellable and returned stock. Moreover, empirical findings have demonstrated the complex and interdependent relationship between these factors. For example, one key finding is that while on-demand retail models contribute significantly to the presence of excess stock, such models are nonetheless premised on assumed consumer expectations and their desire to have immediate access to a wide product range on demand. It's a similar picture in terms of customer returns, too. Although product quality and information do have an impact on the level of returns, retailers' liberal returns policies along with purchasing behaviour and return culture among consumers also contribute significantly. Empirical findings thus indicate that multiple actors within the production-consumption system influence levels of product destruction. This study has therefore demonstrated the roles that manufacturers, retailers, and consumers can play in addressing the problem and transitioning to a more sustainable system.

Downstream factors, on the other hand, referred to those factors which influence companies' decisions to dispose of products rather than making use of more sustainable alternatives such as resale or redistribution. In many ways, the empirical findings from this study aligned with the insights from the literature, and key drivers such as profit margin considerations, economic incentives, legal issues, and brand integrity were observed. One important factor which was not discussed in the literature relates to the presence of a redistribution network. The results from the study indicate that it is not enough for companies to make the necessary arrangements to liquidate or donate products; if the sustainability benefits are to be realised, there must be a demand for such products. In the case of food products, it was clear that there is often such demand, and that surplus redistribution can provide significant social value – not only in addressing food poverty, but also in terms of health benefits and community resilience. Nonetheless, there remains a real need to invest in the necessary redistribution networks and infrastructure to ensure that surplus food reaches those most in need. In the case of textiles and electronics, the issue was more profound, as in many cases there may not be sufficient demand for these products in second-hand markets due to their low value or consumer concern regarding quality of reused goods. Moreover, in terms of donation, it is not clear that there is always a societal need for the large surplus volumes of electronic or textile products, particularly for charitable organisations that work with vulnerable people.

Furthermore, even where there is sufficient demand for products, reuse actors need to have the necessary capacity and infrastructure, often involving logistics networks, storage facilities and even digitalised inventory management systems, to be able to absorb the surplus volumes which are observed in the e-commerce sector. In markets where there is an absence of these industrial-scale reuse actors, it is difficult for companies to find viable alternatives to product destruction. Meanwhile, another important factor uncovered from this study which was absent from the literature relates to management issues and the need for circular activities to be properly embedded within a company's operations. If redistribution and reuse programmes are to be institutionalised within a business, significant investment is needed to develop systems and processes, and staff must be properly trained and resourced in their roles.

## **RQ2: Which policy interventions are needed to eliminate the practice of product destruction?**

In terms of the policies needed to address product destruction, this empirical study has found that a wide range of different policy instruments – market-based, informative, administrative, and voluntary – could be leveraged to eliminate this unsustainable practice (summarised in Figure 6). In line with the literature on the waste hierarchy framework, this study supports the need for policies which focus on the higher levels of the hierarchy in terms of prevention and reuse over recovery, recycling, and disposal. Furthermore, this study has shown that policies need to target upstream factors, in order to influence the overall volumes of customer returns and unsellable stock. Such policies can be seen as targeting the root cause of product destruction and thus are most likely to be effective in delivering environmental gains in terms of resource-efficiency and reduction in material throughput. Examples of some potential key upstream policy interventions include minimum product standards, five-year warranty guarantees, durability and repairability standards and sustainable consumption education. Ultimately, intervening upstream to tackle overall volumes of unsold and returned stock demands far-reaching changes to mainstream business models, along with the volume and type of products manufactured, and changes to consumer norms. This is not a simple endeavour that can be achieved overnight. Yet, if correctly designed, policies to target the root causes of product destruction have the potential to radically transform the production-consumption system, and they should be approached with enthusiasm. Such a task nonetheless requires significant policy innovation.

When discussing upstream policies, it is important to analyse the ambitions set forth in the European Commission's Sustainable Products Initiative (SPI) announced at the end of March 2022. The SPI forms the cornerstone of the European Green New Deal and is a highly ambitious policy package aimed at accelerating the transition to a more circular economy. The SPI covers four key areas: Eco-design reform, sustainable textiles, consumer empowerment and sustainable construction products. The first two elements are of particular relevance to the topic of product destruction as they aim to make sustainable products the norm within the EU. Under the Eco-design reform, eco-design requirements which have been successfully rolled out for electronics will be expanded to all product groups, except food and medicines. This means that any product being placed on the EU market must firstly provide information on the environmental and functional performance of the product, but also comply with upcoming legislation on durability, repairability, reusability and recyclability (Monfort & Chopova-Leprêtre, 2022). A product passport containing all relevant sustainability information has also been proposed, which would leverage the efficiencies of digitalisation in order to facilitate communication with consumers (Huestebeck & Bellot, 2022). As highlighted by the study, ensuring the quality of products entering the market is the fundamental starting point for addressing product destruction, as low-quality, non-durable, and non-repairable products are usually the primary targets for disposal. The Commission will begin by targeting several product

groups with the highest emissions reduction potential, including textiles, furniture, mattresses, tyres, detergents, paints, lubricants and intermediate products like iron, steel, or aluminium. It also intends to adopt 18 new delegated acts under the expanded Eco-directive between 2024-2027 and a further 12 between 2028-2030. (Huestebeck & Bellot, 2022).

The Sustainable Textile Strategy is also highly relevant, particularly given that textiles are one of the primary product groups subject to destruction. Under the strategy, fashion retailers are encouraged to reduce the number of collections per year (EEB, 2022), which will likely have an impact on the levels of surplus stock. Moreover, the eco-design requirements will help to ensure higher product quality by creating mandatory standards on durability and repairability (EEB, 2022). As previously discussed in Chapter 4.2.2, such regulations could result in the ‘fewer products at higher prices’ scenario, minimising overproduction while reducing return volumes due to higher consumer satisfaction with product quality. Moreover, the higher costs associated with producing goods to such standards, could provide sufficient economic incentives for companies to reintegrate returned stock into their inventory and avoid destruction.

Thus, it is clear that the EU SPI is a broad and ambitious product policy framework which if implemented effectively could have important ramifications for the issue of product destruction. Moreover, due to the presence of the ‘Brussels effect’, the EU is effectively able to externalise their high consumer and environmental standards, as companies in other jurisdictions are forced to comply with the proposed standards in order to gain access to the European market (Bradford, 2012). The Sustainable Products Initiative could thus have important consequences for production processes and standards outside the European bloc, helping to improve overall product sustainability globally. This legislative package is nonetheless highly complex to implement and could take many years to become operational. (EEB, 2022) and in the meantime product destruction will likely continue for many product groups, wasting valuable resources and burdening waste management systems. Therefore, member states should not wait for policy developments at the bloc level, in the meantime this study has highlighted the importance of focusing on some of the more easily implementable measures that could help to reduce overall volumes of customer returns and unsold stock with immediate effect, for example the introduction of a levy on returned goods and unsold items.

The SPI package also speaks directly to the issue of product destruction. The Commission chose not to introduce a ban on product destruction at this stage, instead announcing a proposal to introduce reporting requirements on the discarding of unsold consumer products. This will require business at every stage in the supply chain (from manufacturers to online marketplaces) to disclose the exact disposition routes for products, including volumes prepared for reuse, remanufacturing, recycling, energy recovery and disposal (Huestebeck & Bellot, 2022), thereby helping to provide a comprehensive picture of product flows. Given the lack of transparency on this issue, the results from this study support the introduction of mandatory reporting requirements for the volumes of products to be destroyed and the reasons for their disposal. Public disclosure of such data, particularly among larger brands, would incentivise retailers to change their practices, but more importantly will provide the much-needed information to inform future policies and decision-making. Nonetheless, as this thesis has highlighted, unsold goods are only one stream of products subject to destruction. Customer returns represent the other significant product stream, and thus reporting requirements must be extended to include these goods.



		Targeted Actors			
		Manufacturers	Retailers	Consumers	Reuse actors
Market-Based	<ul style="list-style-type: none"> <li>Reduced VAT on products donated to charity</li> <li>Tax rebate on products re-distributed, recovered or re-used</li> <li>Reduced taxation on labour involved in circular activities; re-use/repair</li> </ul>	<ul style="list-style-type: none"> <li>Levy on unsold and returned volumes</li> <li>Reduced VAT on products donated to charity</li> <li>Tax rebate on products re-distributed, recovered or re-used</li> <li>Reduced taxation on labour involved in circular activities; re-use/repair</li> </ul>	<ul style="list-style-type: none"> <li>Economic incentives for consumers to buy second hand or repaired goods- subsidies/tax relief</li> </ul>	<ul style="list-style-type: none"> <li>Subsidies/government support to develop re-use infrastructure and capacity – particularly digital infrastructure to support efficient redistribution</li> <li>Tax rebates on volumes recovered and re-used.</li> <li>Tax reduction on labour involved in circular activities such as repair and re-use</li> </ul>	
Informative	<ul style="list-style-type: none"> <li>Durability, reparability indexes for products</li> </ul>		<ul style="list-style-type: none"> <li>Education on sustainable consumption</li> <li>Education on true-cost of returns</li> <li>Education on benefits of re-use</li> <li>Awareness regarding below specification and close-to expiration products (food sector)</li> <li>Durability and reparability indexes to inform consumer choices</li> </ul>	<ul style="list-style-type: none"> <li>Information and education for re-distribution actor regarding product-life extension strategies such as repair, refurbishment or freezing and re-labelling (food sector only)</li> </ul>	
Regulatory	<ul style="list-style-type: none"> <li>Minimum product standards; durability, reparability, modularity</li> <li>5-year warranty on consumer durables and textiles</li> <li>Manufacturer take-back legislation on unsold/returned products</li> </ul>	<ul style="list-style-type: none"> <li>Mandatory reporting on disposition routes for unsold goods and return volumes</li> </ul>			
Voluntary	<ul style="list-style-type: none"> <li>Eco-design innovations</li> <li>Product quality improvement, durability, modularity, reparability</li> <li>Waste considerations in product design</li> <li>Better information for customers on product characteristics and information, sizing, compatibility etc.</li> <li>Made –to-order business models</li> </ul>	<ul style="list-style-type: none"> <li>Better information for customers on product characteristics and information, sizing, compatibility etc.</li> <li>Stricter returns policies, return fees</li> <li>Discounting to sell through surplus stock</li> <li>Donation schemes for surplus product/ returned goods</li> <li>Use of data analytics to determine which products sell/meet consumer expectations including Cost-to-serve accounting</li> <li>Environmental Management Accounting techniques-residual waste-reduction</li> <li>Revisit product specifications, and see where they could be widened to avoid waste (food sector)</li> </ul>	<ul style="list-style-type: none"> <li>Limit unnecessary online purchases and try to avoid returning items</li> </ul>	<ul style="list-style-type: none"> <li>Capacity build to ensure right checks are in place to prevent leakage of product to grey markets</li> <li>Improve in-house repairing and upgrading skills</li> </ul>	

Figure 6 Summary of policy interventions for addressing product destruction

The empirical findings from this study also helped to identify several other policies that can be introduced downstream which would encourage companies to make use of more sustainable disposition routes for their products. Discussed policies include reduced VAT to incentivise donation, tax rebates on recovered products, reduced VAT on circular activities such as repair and reuse, a waste hierarchy tax, and government investment in reuse organisations and circular actors. Such policies can be effective in remedying the situation in the short term and could improve immediate environmental outcomes by diverting products from landfill and incineration. Nonetheless, in the long term such policies do little to address the root causes of product destruction relating to the nature of our production-consumption system, from linear business models and consumer attitudes to product design and characteristics. As such, these policies are likely to be limited in their overall effectiveness; continued attention must therefore be paid to upstream policy innovation.

Another significant finding from this study is that policies should differentiate between different product groups. As highlighted in the empirical findings, product groups such as food are very different from others such as electronics and textiles. Food must be considered a necessity, while in most cases textiles and electronics are luxury items for which there is not the same societal need. Food should thus be treated differently from other product groups, and policy makers ought to be cautious when legislating in this domain and ensure that there are no significant impacts on price and availability, particularly given current cost of living challenges across Europe. In contrast, electronics and textiles are sectors in which more stringent policy interventions could be considered, as higher quality, more durable and sustainable products should arguably become the norm, even if this results in price increases. The need for differential treatment of certain product groups is recognised in the European Commission's Sustainable Product Initiative, whereby food products are exempt from the eco-design requirements, as a result of valid concerns that such measures could result in price increases for consumers.

This study has also highlighted the need for a policy mix in this domain. As highlighted by RQ1, there are multiple factors which drive product destruction, occurring both upstream and downstream and involving a wide range of different actors. Therefore, as highlighted by Figure 6, many different policy interventions targeting the behaviour of different actors in the system are needed to address this issue effectively. For instance, while France has proved to be a first mover on this issue, its simple ban on the destruction of unsold goods in isolation is unlikely to be effective in solving the problem. Other countries should therefore be more ambitious when adopting legislation to tackle product destruction. This study has also highlighted the potential of several market-based instruments in addressing this issue, such as VAT reductions on labour for circular activities, a levy/tax on unsold and returned goods, a waste hierarchy tax structure and tax rebates on volumes of products reused or recovered. As highlighted in Section 4, two of the key drivers of product destruction relate to profit margin considerations and economic incentives; there is thus a strong need to change these incentives and provide companies with an economic case for adopting more circular practices. Moreover, the revenues generated from tax/levies could be ear-marked for the development of necessary reuse and recycling infrastructure, which is urgently required to deal with existing volumes of product flows. Policy makers should thus carefully consider how market-based instruments can be most effectively used to reach desired outcomes in terms of eliminating product destruction.

## **5.2 Limitations**

Due to the relative infancy of the topic of product destruction in the academic literature, particularly from a policy perspective, this study has taken an exploratory methodological approach. The exploratory approach allows the researcher to build a holistic understanding of a problem and offer potential solutions, providing the necessary building blocks for addressing the problem. Nonetheless, the findings are of limited utility for providing conclusive evidence

to directly inform policy decisions. To provide concrete findings that could serve as a scientific basis for decision-makers, policy analysis would have been a preferable method, particularly if able to leverage both quantitative and qualitative data. Nonetheless, given that policies to address product destruction have only recently been introduced in France, Belgium and Germany, there was limited data availability; the language limitations of the researcher would also have significantly hindered data collection. Furthermore, it was clear from an initial literature review that the existing legislative proposals are unlikely to fully address the problem, and exploratory methods were thus seen as more appropriate to ensure that policy considerations were not limited to already identified measures. This exploratory study provides a strong foundation for conducting ex-ante or ex-post policy analysis in the future, to produce concrete findings that could directly inform decision-making.

The qualitative methods used in this study also entail certain limitations. In qualitative research, the researcher must interpret the findings, which is ultimately a subjective task. Moreover, the sample size for this study was limited to 16 practitioners with experience in the topic of product destruction. As three distinct product groups were analysed, the sample for each sector was limited to approximately five interviewees. A larger sample size would thus have helped to improve the reliability and generalisability of results. Another limitation of the sample is that interviewees were largely representative of large retailing organisations, and thus the findings are not necessarily representative of small to medium-sized operations.

This study could have also been improved by supplementing qualitative methods with some quantitative methods, for example, by surveying a large sample of companies based on the findings from the interviews to determine which factors are most significant and which policies they think would be most effective. Nonetheless, due to the sensitivity of this topic along with brand reputational risk, it was unlikely that companies would participate in the research, and in-depth interviews with relevant practitioners from different sectors were deemed to be the most effective data collection method. This study also relied on several proxy stakeholders, namely academics in the field of retail and supply chain management. Despite not working directly in companies that engage in such practices, these informants had the necessary knowledge to explain the factors that would drive destruction decisions, but due to not being employed by any specific company they were at liberty to discuss the policy problem and propose potential solutions.

This study offers a comprehensive picture of the factors which drive destruction decisions. The empirical findings indicate that this was indeed a legitimate research question, as it is only by understanding the mechanisms and dynamics which influence companies' decisions to dispose of unsold and returned goods that we can hope to design effective policies to address the problem. Many interviewees lamented the fact that policy makers do not fully understand the nature of the problem, and thus, despite good intentions, fail to provide effective solutions. In terms of research question two, this study has helped to map out a range of different policies that are needed to address this issue, both upstream and downstream, targeting a range of different actors. That said, due to the nature of exploratory methods, this study has not been able to determine the precise measures that should be implemented in any specific context. This is because policy contexts vary significantly, and thus further research is needed to assess which measures would be most feasible in different socio-economic and geographic jurisdictions.

This study focused on three distinct product groups to demonstrate the differences among them and the need for differentiated policies. That said, product groups are incredibly complex and contain many different types of products with wildly different characteristics, making it very difficult to generalise. Further studies would therefore benefit from conducting in-depth analysis of the problem in one specific product group, potentially using a case company that could

provide meaningful data. Moreover, global supply chains are very complex and relationships between manufacturers and retailers vary significantly in different contexts, making generalisations in this area a further challenge.

## 6 Conclusions

Current levels of resource consumption are having devastating impacts on the planet, fuelling climate change and exacerbating biodiversity loss and water stress. The benefits associated with this consumption are concentrated in the Global North, while tens of millions still struggle to meet basic needs. (IRP, 2019) With this context in mind, the idea that companies are destroying viable consumer products before they have ever been used is not only environmentally disastrous but morally reprehensible. Product destruction is an extreme expression of the linearity of our current production-consumption system and is the antithesis of sustainable resource use, due to the high material throughput, negligible product life span and significant associated levels of waste. Through 16 interviews with key practitioners, this thesis has shed light on the complex and diverse set of factors, both upstream and downstream that drive companies' decisions to engage in this environmental and socially detrimental outcome. Moreover, it has been shown that a broad range of policy interventions must be leveraged to effectively address the problem, particularly targeting the root causes of product destruction which relate to retailer business models, consumer norms and product design. Policy makers – particularly those in countries with high ambitions in terms of resource-efficiency and climate neutrality – must thus recognise the enormity and complexity of this problem and show political willingness to make the necessary efforts to halt these unsustainable practices.

### 6.1 Practical implications and recommendations

This thesis has highlighted the importance of a policy mix in addressing product destruction, drawing attention to the wide range of interventions (informative, administrative, and market-based) needed to target the behaviour of different actors within the system (manufacturers, retailers, consumers, and reuse actors). Given that many actors need to be engaged in order to address this problem, a collaborative approach to policy making which brings all the relevant stakeholders to the table and seeks workable solutions is thus recommended (Innes & Booher, 2003). As highlighted in this study, although French efforts to ban the practice outright grabbed headlines and offered a simple fix to the problem, these efforts are largely misguided as they do not sufficiently address the incentive structures which lead companies to engage in product destruction and are thus unlikely to be successful in remedying the situation. On the other hand, although a wide range of potential policy interventions have been identified, policy makers should also be wary of the dangers of a 'smorgasbord' approach to policy making, and instead identify the minimum number of interventions needed to meet policy objectives in a given policy context, ensuring efficiency and cost-effectiveness (Gunningham et al., 1998).

This thesis maintains that to effectively address product destruction, downstream changes enabling companies to better reuse and redistribute returned items or excess inventory, whilst important, can offer only a partial solution. To solve this problem at source, policy makers must pay attention to the upstream factors which result in the presence of such large volumes of surplus stock and unsold product to begin with. Achieving this aim demands fundamental changes to retailer business models, consumer behaviour and product design. Thus, significant policy innovation and experimentation is needed in this area. There is simply no easy fix to this problem: product destruction is in many ways a consequence of the structures and incentives of the linear economy, in which resources are under-priced, goods are overproduced, and individuals consume well beyond their needs. Radical changes to the entire production-consumption system are thus required if PD is to be meaningfully addressed.

In general, the empirical findings of this study are supportive of a future in which consumer products, particularly electronics and textiles, have longer lifespans and are manufactured to higher standards under environmentally sustainable conditions. Such conditions would likely

increase costs for manufacturers, disincentivising overproduction and leading to fewer products and higher prices for consumers. Unsurprisingly, policy makers have so far been very reluctant to increase prices for consumers. This position is also reflected in the new Sustainable Product Initiative, in which the EU Commission maintains that eco-design requirements should not be implemented in such a way that leads to significant price increases for consumers (Monfort & Chopova-Leprêtre, 2022). However, increased prices are perhaps exactly what is needed, as products have arguably been too cheap for too long, resulting in overconsumption and high environmental externalities. Price increases are likely to result in consumer backlash in the short run, particularly as consumers have long been accustomed to an economy and price structures built for profit maximisation, not environmental sustainability. Policy makers thus have a responsibility to educate the next generation of consumers, acting with integrity and vision to ensure the future viability of the planet's life-sustaining systems.

Policy makers need not necessarily fear the economic consequences of such changes. As highlighted by one informant, as long as incomes remain the same, the purchasing of fewer goods at higher prices does not automatically mean a fall in GDP. National expenditure will likely be constant, yet the physical products and their volume within the economy could look very different. Moreover, given that many mature industrialised economies have a history of producing higher-cost quality goods, such a transition will likely favour these economies and thus could have positive consequences in terms of employment and global competitiveness. Furthermore, the expansion of repair, upgrading and maintenance activities will likely accompany this transition. Since such activities need to be located close to the consumer, they could potentially provide further employment opportunities.

There are very legitimate equity concerns involved in such a transition, particularly regarding lower-income households' purchasing power. However, this should not be used as an argument for inaction. Instead, governments must engage to understand how redistribution efforts can be organised to support poorer communities and remedy such equity concerns. Moreover, in terms of price per use, higher-quality products are likely to provide better value for money over the long term, and thus instalment payment schemes which are becoming increasingly popular among online retailers (Shevlin, 2021) could help to ensure that individuals on lower incomes can still access such products. Such changes will also have important international consequences, potentially leading to negative impacts in terms of employment and prosperity in countries where global production is currently concentrated (Monfort & Chopova-Leprêtre, 2022). Continued attention must therefore be placed on these equity issues to help mitigate adverse impacts and ensure a just and equitable transition.

## **6.2 Future Research**

Due to the convenience and accessibility it affords to consumers, e-commerce has become a wildly popular retail model, one with large future growth projections. Even before the outbreak of the Covid-19 pandemic, global e-commerce sales had soared to 26.7 trillion dollars by 2019, equivalent to 30% of global gross domestic product (UNCTAD, 2021). This study has, nevertheless, brought to attention the significant sustainability challenges associated with mainstream e-commerce business models. The on-demand availability of a large selection of products and liberal returns policies may be integral to the e-commerce offering, but they have nonetheless been shown to have high environmental costs and contribute significantly to the problem of product destruction. Moreover, with these elements now institutionalised in our PCS, and consumer expectations shaped around them, it is difficult to imagine them being eliminated from companies' offerings. Thus, significant innovation and creativity is needed to find transformation pathways within the e-commerce retail sector to ensure its environmental sustainability. For example, product-service-systems or made-to-order business models, particularly if combined with efficiencies associated with digitalisation (Pouri & Hilty, 2021)

have the potential to overcome many of the issues relating to excess stock and customer returns, whilst also retaining consumer satisfaction. Future research should thus focus on how such innovative business models can be operationalised and mainstreamed. Another path could also focus on the previously discussed macro-economic consequences of the widespread adoption of these sustainable business models, to provide policy makers with a solid case for action.

While recognising the need for significant changes to retailer practices, this study has also brought attention to the important role which consumers play within the system, particularly regarding their preferences towards products which have been reused, repaired or refurbished. To avoid product destruction scenarios and ensure product life-extension, it is essential that there is sufficient demand for these kinds of products. Similarly, if we are to improve product standards to make goods more durable, we also need consumers to look after their products and utilise them for their entire lifetime instead of replacing them continuously. As one interviewee highlighted, if product standards are improved and yet consumer behaviour remains unchanged, we will simply end up with a better-quality waste stream. Further research is thus needed to understand the mechanisms by which consumer norms can be shifted and to identify the key leverage points for behaviour change. Further research is also needed to better articulate the role of consumers within circular economy transformations.

This thesis has aimed to explore the complexities of product destruction and highlight the wide range of policy interventions that can be leveraged to address this issue. Nonetheless, to provide a concrete case for action, further studies should look to evaluate the effectiveness of different measures within a specific policy context. Future studies could perhaps conduct ex-post policy analysis of current French, Belgian, German and the recently announced EU-wide proposal, in order to determine the environmental effectiveness of these policy measures. Alternatively, future studies may benefit from evaluating the proposed measures in terms of different evaluation criteria, such as cost-effectiveness, efficiency, equity, or political acceptance.

Future research could also focus on a case company, particularly larger retailers, to understand the exact factors driving product disposal and the kind of products most susceptible. Such studies would also be able to generate more granular recommendations regarding how to reduce overall volumes of unsold and returned goods, and the mechanisms that would enable the case-company to make use of more sustainable disposition routes.

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## Appendix

### *Appendix A – Interview Guide*

This interview guide is structured in two parts. In line with the aim of this research project, the first set of questions aim to unpack the factors involved in disposal decisions, whilst the second set of questions relates to potential solutions. The interviews will be semi-structured, some guiding questions are detailed below, however the interview will be open, allowing for more in-depth questions depending on the expertise of informants.

#### Section 1: Product Disposal

- To the best of your knowledge, what are the common reasons for companies to dispose of finished consumer products?
- What is most common reason within your sector [food/electronics/textiles]?
- Can you explain in further detail, what factors influence companies' decisions to dispose of these products? E.g., Profit margin considerations, legal restrictions, health and safety, supplier agreements etc.
- Why do you think companies dispose of the products instead of reusing or donating them?

#### Section 2: Potential Solutions

- Do you think companies are working to address this problem? Are they doing enough?
- What do you believe are the advantages/disadvantages of these voluntary initiatives?
- Do you think that policy/legislation is needed in this area? Why?
- What kind of legislative interventions do you think would encourage the donation/reuse of these products?
- In terms of the waste hierarchy, reuse, whilst important, is still sub-optimal and prevention would be preferable, are there any policies that you think would help to prevent the presence of these unsellable stocks to begin with?
- Are these solutions only suitable in your sector [food/clothing/electronics] or do you think they could solve the problem more widely?
- Do you think any specific policies are needed in your sector to address this issue directly?
- Do you foresee any downsides or problems with the interventions discussed?

### *Appendix B - Consent Form*

This form is to ensure that you have been given all the information about the research project and to give you opportunity to confirm that you are willing to take part in this research. For all activities below, please indicate (with X) which applies to you:

	I have been <b>familiarized</b> with the thesis project, I have had the possibility to ask questions and I have received satisfactory answers to my questions.
	As a research participant, I am <b>aware of my right</b> to withdraw participation at any time.

	I give my consent that the interview can be <b>audio-recorded</b> – for the private use of the researcher for note-taking purposes.
	I give my consent to be <b>reported anonymously</b> - only being identified by my position title, but neither my name nor the name of my organisation to be included.
	I give my consent that the <b>content of my interview can be transcribed, analysed, and published</b> in research outputs for the project.
	I give consent for the data collected from interviews to be <b>stored on secured university servers for 10 years</b> , in line with Lund University guidelines.

**Note:** Your participation is voluntary. As an interviewee, you do not have to answer all the questions that are asked; you reserve the right to refuse or cease participation in the interview process without stating your reason and may request to keep certain materials confidential. At any stage of the research (until May 20, 2022), you have a right as a research participant to gain access to your own personal data, request its correction or deletion or limitation to processing of data as well as file a complaint about how your personal data is used.

Please, sign below to confirm your consent:

	Participant(s)	Researcher(s)
<b>Name(s)</b>	[Insert Name]	
<b>Signature(s)</b>	[Insert Signature]	
<b>Date(s)</b>	[Insert Date]	

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