SIFO PROJECT REPORT 5-2023

CONSUMPTION RESEARCH NORWAY (SIFO)

THE PLASTIC ELEPHANT
Overproduction and synthetic fibres in sustainable textile strategies

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Summary

In this report, we examine national, international and corporate strategies for sustainable textiles to understand if and how they embrace the increased production volumes based on synthetic materials, which can be referred to as the 'plastic elephant in the room'. This is done through a lens of four questions. First, we look at whether the strategies discuss growth in production volumes and possible measures to stop this growth. Second, we examine whether they address the plastification of textiles. By plastification, we mean the increasing share of plastic fibres used for textile production. Third, whether they discuss the raw material for plastics, and fourth, plastic waste. The results show that none of these questions that can reduce the environmental impacts of clothing production are given a central role in the strategies.

Keywords

Synthetic textiles, growth, plastic, overproduction, environmental strategy

Sammendrag

I denne rapporten undersøker vi nasjonale, internasjonale og bedriftsstrategier for bærekraftige tekstiler for å forstå om, og i så fall hvordan de inkluderer problemet med økte produksjonsvolumer basert på syntetiske materialer som kan bli omtalt som 'plastelefanten i rommet'. Dette gjøres ved å stille fire spørsmål. Først ser vi etter om strategiene diskuterer vekst i produksjonsvolumer og mulige virkemidler for å stoppe denne veksten. Deretter undersøker vi om de adresserer plastifiseringen av tekstiler. Med plastifisering mener vi den økende andelen plastfibre som brukes i tekstilproduksjonen. For det tredje, om de diskuterer råmaterialene for plast, og for det fjerde, plastavfall. Resultatet viser at ingen av disse spørsmålene relatert til å få ned miljøbelastningene fra produksjon av klær står sentralt i strategiene.

Stikkord

Syntetiske tekstiler, vekst, plast, overproduksjon, miljøstrategi

Preface

The Plastic Elephant is a part of the project Wasted Textiles, the goal of which is precisely to reduce the use of synthetic textiles and the amount that goes to waste. It is situated right at the core of the project's goal and of course, the project is also the reason why our elephant is synthetic textiles (i.e., plastic). At the same time, we are building on work from three other ongoing projects at Consumption Research Norway (SIFO): CHANGE – about quantity, LASTING – about lifetime and REDUCE – about plastics in everyday life; and we thank our good colleagues from all the three projects for fruitful conversations as well as heated debates. We thank in particular Kirsi Laitala, Marie Hebrok, Harald Throne-Holst, Irene Maldini, Kate Fletcher and Kerli Kant Hvass for their thorough reading of the report and constructive comments.

The quality assurance of the report has been conducted by Alexander Schjøll.

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List of acronyms

CEO	Chief Executive Officer
EC	European Commission
EEA	European Environment Agency
EMF	Ellen McArthur Foundation
EPR	Extended Producer Responsibility
ESPR	Ecodesign for Sustainable Product Regulation (Ecodesign Directive)
FESI	Federation of European Sporting Goods
GFA	Global Fashion Agenda
Higg MSI	Higg Material Sustainability Index
LCA	life cycle assessment
MSIs	multi-stakeholder initiatives
NCA	Norwegian Consumer Authority [Forbrukertilsynet]
NCC	Norwegian Consumer Council [Forbrukerrådet]
OECD	Organisation for Economic Co-operation and Development
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PET	polyethene terephthalate (the chemical name for polyester)
PH	Policy Hub
rPET	recycled polyethene terephthalate, recycled polyester
SAC	Sustainable Apparel Coalition
TE	Textile Exchange
TE CFMB	Textile Exchange Corporate Fiber & Materials Benchmark program
TE MCI	Textile Exchange Material Change Index
TPR	Targeted Producer Responsibility
UBA	German Environment Agency [Umwelt Bundesamt]
UNEP	United Nations Environment Program
ZDHC	Zero Discharge of Hazardous Chemicals

Definition of key terms

clothing utilisation	The average number of times a garment is worn before it ceases to be used
decoupling	Two variables are said coupled if one is driven by the other, making them evolve in proportion (for instance, more of A means more of B); and they decouple when they cease to do so
[1] relative	Relative decoupling, for example between GDP and carbon emissions, refers to a situation where the emissions per unit of economic output (the coefficient of proportionality) decline but not “fast enough” to compensate for the simultaneous increase in output over the same period, resulting in an overall increase in total emissions. As a result, although the economy is relatively less impactful per unit of GDP compared to what it was before, the absolute volume of emissions has nonetheless increased
[2] absolute	Absolute decoupling is a situation where more GDP coincides with lower emissions. Relative decoupling becomes absolute decoupling when the growth rate of the economy is overcompensated by the growth rate of efficiency or productivity having to do with the use of natural resources and the generation of pollution
durability	The quality of being able to last a long time without becoming obsolete
[1] technical	Technical durability concerns the physical aspects of a product that determine whether they break or wear easily
[2] emotional	Emotional durability is used in connection with design strategies aimed at creating attachment to products. It is sometimes referred to as non-technical durability, though it also depends on the technical durability of the item as well as other, social factors. The term was coined to grapple with the non-material factors that influence product lifetimes
fast fashion	Inexpensive clothing produced rapidly by mass-market retailers in response to the latest trends; a business-model with connected production systems
growth	In this report, we are discussing growth in quantities, production.
lifetime	The time interval from when a product is sold to when it is discarded, during which time it may pass through the hands of one or several users. Also called lifespan.
overproduction	Production of clothing that is more than what is wanted or needed. Manifests as clothing that is not worn out at the time of final disposal
plastification	The increasing share of plastic fibres used for textile production
rebound-effect	Theorised already in 1865 as Jevon’s paradox, stating that “greater efficiency in the use of a resource can paradoxically lead to greater consumption of it”
replacement rate	The percentage of something that is replaced by something else, e.g., the percentage of new clothing purchases being replaced by second-hand clothing purchases or new clothes bought as replacements for worn-out ones

Executive Summary

Introduction

The fashion and textile industry largely operates on a linear business model driven by the logic of extracting raw materials, manufacturing products, and generating profits at the point of sale. The market is dominated by conventional business models based on growth logic and the sale of large quantities of new products. The issue of growth, specifically growth in clothing production and the related environmental impacts, has been called the elephant in the room, one that the global fashion industry avoids addressing.

The growth can be measured using the relationship between the number of clothes produced and the population: while global clothing sales doubled between 2000 and 2015, the global population grew only 20%. As a result, clothing production per capita has increased drastically. An effective way to reduce environmental impacts (including climate impacts) from clothing and textiles would be to reduce production volumes. The current situation is, unfortunately, that clothing is being thrown away before they are worn out, whether they are being incinerated in Norway and other Western countries or end up in waste streams and landfills in Eastern Europe or the Global South, with much of their potential use time unexploited. The growth in clothing production has also correlated with the growth in the use of synthetic textile fibres. Recent studies have documented a clear connection between the growth in the volume of textiles produced and the share of these that are synthetic. In addition to the waste problem, that is becoming more and more visible, knowledge of the adverse effects of microplastics on the environment and human health is increasing.

In this report we examine whether sustainable textile strategies address the increased production volumes based on synthetic material, and if so, how. This is done through a lens of four questions. First, we look at whether the strategies discuss growth in production and possible measures to stop growth. Second, we examine whether they address the plastification of textiles. By plastification, we mean the increasing share of plastic fibres used for textile production. Third, whether they discuss the raw material for plastics, and fourth, plastic waste.

Method

This study is based on document analyses of environmental strategies from three groups of stakeholders in the fashion and textile industry. In addition, video material was analysed for one actor, as the latest available source to their strategy. Altogether 12 strategies were analysed, selected from large brands/businesses, industry organisations, countries and areas with importance for Norwegian policy processes. The latest strategy included is the “EU Strategy for sustainable and circular textiles” from 30th March 2022, which we consider to be the most important, both because it is the most recent and because of its expected impact.

The analysis is text-based and qualitative. We have sought to answer our four research questions by reading and listening to the strategies, with a focus on content rather than the possible intentions. We responded either *Yes*, *Indirectly/To some extent* or *No* to each question when analysing each strategy, as well as pulling quotes that substantiated the responses.

Our interest was to see whether there was a tendency towards one position or another within different stakeholder groups. We, therefore, scored the answers for each of the 4 research questions for each strategy and calculated an average score. This gave an overall impression of how each stakeholder group positions themselves in addressing each question.

Results and discussion

The answer to our over-arching question "if the stakeholders are now addressing the 'elephant in the room'?" is *No*. In general, the strategies do not address the two fundamental issues of growth and plastification, but we also see a systematic difference between the three stakeholder groups.

The problematic aspects of production growth are included in the public policies, but not in the brand/business strategies, and the industry organisations score in between the two. Overall, the strategies' approaches to growth are based on a green growth logic, where growth is rarely seen as a problem itself but needs to be decoupled from resource use and environmental impacts. When public policymakers discuss growth, they link it to fast fashion or low-quality clothing, without discussing that these clothes are also made of synthetic fibres. Here a discussion of the cause-and-effect relationship between consumption and production is also missing.

The measures presented to address the issues concerning growth are based on a belief that decoupling will eventually lead to the desired decrease in total environmental impacts, despite continued growth in sales. Materials efficiency, elimination of waste in production, durable products, circular products and changes in consumer behaviour are proposed solutions, but without explaining how these will lead to lower production. The only strategy that sets a goal for reduction in production also stands out by being more research-based and penned by a consortium of researchers, namely the Danish strategy: a 2050 roadmap for circular plastics and textiles.

The most interesting findings are related to the reduction of the use of synthetic fibres – the plastification. This is the question that receives the overall lowest scores: none of the strategies present clear, direct measures to halt plastification, though some of the public policymakers indirectly include such a goal, through goals of substituting fossil raw materials in the production with other materials, including bioplastics. Without stating how this tendency is to be reversed, the strategies raise concerns over the increasing volumes of fossil raw materials used in textile production. It is also suggested that synthetic fibres have important qualities that are needed and the strategy of substituting virgin plastics with recycled plastics is particularly present in the strategies of the industry stakeholders.

The majority of the strategies see the dependence on fossil raw materials as a problem because of non-renewability and non-biodegradability, and possibly out of concern for future supply. The differences lay in the solutions proposed and the reasoning for these. rPET, textile-to-textile recycled polyester, biosynthetics, and carbon-capture are among the propositions. Brands and industry organisations high-light commitment and progress towards using a larger share of recycled polyester, currently rPET mainly from plastic bottles but ideally textile-to-textile. Public policymakers are more sceptical of the validity of the various solutions proposed.

If we look at the raw material for plastics and plastic pollution, the tendency is that the brands and public policy strategies receive a better score than industry organisations. To address the plastic waste problem, how the synthetic fibres will or will not end up as plastic waste (both through shedding and at the end of life), the strategies propose few measures that are at the scale of the problem. Sorting, re-use, recycling, washing machine filters and pre-washing all treat symptoms, rather than reducing the cause – the increasing volume produced. The EU strategy goes the furthest in proposing export restrictions so that fossil textile waste does not end up in nature. The strategies also highlight a lack of knowledge needed to propose efficient measures.

Conclusion

If growth is understood as a problem in the strategies, it is as growth in consumption or in waste – and not as growth in production. Consequently, the measures proposed are in the wrong places to address this at the root. They address products and their consequences and not volumes. The strategies are based on a belief that absolute decoupling of economic growth and environmental impacts is possible through relative decoupling. This leads to measures on a product and process level, to reduce the impact of each unit output, rather than a systemic level, to reduce the total volume of output.

Furthermore, the strategies are based on several undiscussed assumptions. These are hypotheses of causation that form the premiss for the intended environmental effects of the strategies and we call for research, or at least a discussion about the validity of these hypotheses:

1. The transition to 'sustainable materials' will lead to a large reduction in environmental impacts
2. Changes in products lead to systemic change
3. New business models will lower environmental impacts
4. Changes in demand will influence production volumes
5. Sustainable synthetic fibres are possible
6. Decoupling - and therefore green growth - is possible

Instead, we propose to turn around these assumptions for more impactful policies: lowering the amount of clothing produced will increase the durability of clothes because they will be better taken care of. The clothing lifetimes will then be longer, and repair and other business models connected to longer use or more users will be more profitable. Fewer synthetics, meaning fewer clothes produced in synthetic fibres or a lower percentage of synthetics in clothes produced, will in itself contribute to fewer clothes being produced. To work politically towards fewer clothes and less plastic is therefore the strategy with the most effect.

1 Introduction

”It’s time to talk about the elephant in the room.”

This is a quote from one of many conferences on sustainable fashion and a heartfelt wish from us. As we recall, it was said during the 2014 GFA Sustainable Fashion Summit in Copenhagen, when Livia Firth, founder of the consultancy Eco-Age and the Green Carpet Challenge, was on a panel with H&M. She challenged the growth issue where “fast fashion brands justify growth by saying that it is the consumers who demand the wide selection and diversity of fashion styles today”. Firth responded to this claim made by H&M’s Helena Helmersson by saying that her children want candy all the time but that does not mean they should get it, and that as a parent she has “a responsibility in addressing this want” (Kant Hvass, 2016, p. 173).

The fashion and textile industry largely operates on a linear business model driven by the logic of extracting raw materials, manufacturing products, and generating profits at the point of sale. The market is dominated by business models based on growth and the sale of large quantities of products. The issue of growth, specifically growth in clothing production and the related environmental impacts, has become an elephant in the room, that the global fashion industry avoids addressing. This growth has been fuelled by fast fashion, offshore manufacturing and a highly competitive retail environment which have brought down the average price of garments, but has also led to an increase in low-quality products (Cooper & Claxton, 2022). The growth can be measured using the relationship between the number of clothes produced and the population. This is done by, among others, the Ellen MacArthur Foundation found that growth in the worldwide volume sold between 2000 and 2015 was 100% while the global population grew 20%, which in all likelihood means that clothes are in average used less (Euromonitor in Ellen MacArthur Foundation (2017). It is urgent to break this pattern, and this requires what can be called systemic change (Fletcher, 2010; Fletcher & Grose, 2012; Fletcher & Tham, 2019). Part of this systemic change involves a recognition that the pursuit of economic growth is the underlying logic, which is also the prevailing logic, resulting in rising volumes, overproduction and overconsumption. Treating these outcomes symptomatically does not address their root causes.

In the same way that the world’s resources and boundaries for CO_2 and other pollutants are given, the world population’s potential for clothing use also has limitations. A discussion around these limitations, such as in the new “Unfit, Unfair, Unfashionable: Resizing Fashion for a Fair Consumption Space”-report from the Hot or Cool Institute (Coscieme et al., 2022), is, therefore, necessary to decrease climate and other environmental impacts. This discussion not only includes overproduction and overconsumption but also how clothing can and should be better distributed globally.

The growth elephant’s existence is one matter. Another important matter is what this elephant is made of. It is made of plastic - materials extracted from fossil fuels, most often called synthetic textiles. Recent studies have documented a clear connection between the growth in the volume of textiles produced and the share of these that are synthetic (Changing Markets Foundation, 2021a; IEA, 2018). The growth can also be attributed to subsidies in the fossil fuel sector, which show a growth tendency as well. It is recently documented that support for fossil-fuel production rose 30% in 2019 in OECD countries (OECD, 2021). In addition, the growing attention to plastic packaging and renewable energy makes textiles an increasingly important output and revenue stream for the global fossil fuel industry (Changing Markets Foundation, 2021a).

These two issues – growth in clothing production volumes and use of synthetic fibres – is a phenomenon that has not received much attention. This report aims to fill this gap and contribute to the globally emerging discussions on how to reduce the textile industry’s environmental impact and bring about much-needed systemic changes. The authors believe that the fashion and textile industry has a

particular responsibility because of the growth-related environmental problems and increasing negative impacts along the textile value chain (incl. use and end-of-life). Hence, the report investigates if and how the ‘plastic elephant phenomenon’ is addressed by fashion companies. Furthermore, as fashion and textiles move into an era where the hitherto unregulated sector is likely to face new regulations, especially when it comes to various aspects of sustainability, at least in the EU, the authors are interested in understanding how governments and policymakers are positioning themselves on growth, synthetics and related environmental issues, and whether they are seeking to enact policies to achieve impact reduction and systemic change.

1.1 Report overview

This report is concerned with understanding the growth in clothing and textile production, and how environmental strategies try to limit this or not. For this, we study the selected national, international, corporate and public sustainability strategies for textiles to understand if and how these embrace the 'elephant in the room', i.e., the issue of growth and synthetics. We have chosen strategies from companies in the Norwegian and Nordic markets, the leading industry organisations, and governments in Norway and our neighbouring countries. The strategy included is the EU Strategy for sustainable and circular textiles from 30th March 2022 (EC, 2022), which we consider to be the most important, both because it is the most recent and due to its expected impact. There is already a robust literature on both the limitations of existing growth-dependent business models (see Hickel & Kallis, 2020; Jänicke, 2012; Lorek & Spangenberg, 2014) and the limited impact of sustainability strategies in the fashion industry (see Clark, 2008; Fletcher, 2010; 2019; Gwilt et al., 2009; Henninger et al., 2016; Leslie et al., 2014). We wish to contribute to the understanding of why the environmental impacts are not decreasing, despite much being thought, written, and discussed about the subject, and whether the latest strategy documents are addressing production growth and plastification.

To unfold the elephant in the room and highlight what the different strategies say about growth, we are asking how the strategies deal with the following questions:

RQ1: Does the strategy include/address growth? (I.e., overproduction, quantities)

RQ2: Does the strategy attempt to stop and/or minimise plastification? (Share of plastic in the total production, compared to other fibre compositions)

RQ3: Is the raw material for plastic addressed? (The source of the material; up-stream supply chain)

RQ4: Is the plastic waste problem addressed? (How the synthetic fibres will or will not end up as plastic waste, in other words, down-stream solutions.)

First, we look at whether the strategies address the growth-related environmental impacts and possible measures to alleviate those. Secondly, we examine whether the reports address the plastification of textiles. By plastification we mean the increasing share of synthetic fibres used in textile production. Thirdly, we assess whether they discuss the raw material for plastics, and finally, whether plastic waste-related problems are addressed, including microfiber release.

The report is organized into 4 main parts. First, Chapter 2 presents a background necessary to understand the context for the research questions, making the discussion that follows more accessible. Chapter 3 introduces the methods, explains the choice of reports and describes our analytical strategy. Chapter 4 presents the results, followed by a discussion and a short summary. The report ends with a brief conclusion.

2 Background

This chapter provides important background information for the research questions and highlights and explains the central themes and concepts used for addressing production growth and plastic issues as part of this research. It is the basis for the questions we asked, listed in the Introduction, and further detailed in Chapter 3, along with the selection of strategies from public policymakers, industry organisations and businesses.

2.1 Production or consumption

There are some very strong arguments being made about the connection between supply and demand. The often-cited words ”there is no production without consumption” obscures and hinders understanding of the complex interaction between the two. It is not clear where the quote originated, but one possibility is a misquote of “A Contribution to the Critique of Political Economy” by Karl Marx (1903): “There is no consumption without production, and no production without consumption” or similar wordings in his texts. Say’s law, however, originating from the 1803 publication titled ”A Treatise on Political Economy” by the French economist and businessman Jean-Baptiste Say, rather expresses that ”production funds consumption” and ”people produce in order to consume”. Another important theory to understand the relationship between consumption and production is ”The law of supply and demand” an economic theory that was popularised by Adam Smith in 1776**.** Supply and demand, in economics, is the relationship between the quantity of a commodity that producers wish to sell at various price points and the quantity that consumers would be prepared to buy at those different price points. It is the main model of price determination used in economic theory. The price of a commodity is determined by the interaction of supply and demand in a market. This interaction is easily spotted in the clothing market, with clothing sales at very reduced prices as a way to ’empty the shelves’ and make room for the next collection. However, one can find examples of both production without consumption, and consumption that drives production. We will examine a few.

During the Covid-19 pandemic, there was an acute need for protective wear and face masks and China’s production capacity was activated for a large scaling up of production. This is an example of clothing produced on the basis of an increase in demand. But what about other clothes? If demand already existed when production was set, why is advertising and clothes sold at extremely reduced prices so important for clothing retail? Instead, there is a vast surplus of clothing (Wijnia, 2016). On the other hand, if supply and demand were well aligned, neither the surplus clothes, nor the need to lower prices to create demand would not exist.

Although much about the intricate relationship between supply, demand, and obsolete inventory is unknown, we know that this relationship is complex, and that increased production is not simply a response to the consumers’ increased demand. Along the same line, the effect of reduced demand on production volumes still needs to be considered, the issue of obsolete inventory discussed below suggests that it may take more than demand reductions to reduce production volumes.

2.2 Overproduction

The work with this report is based on the premise that the problems of the textile industry cannot be solved without taking overproduction seriously. The Oxford Dictionary defines overproduction as

“[e]xcessive production; production in excess of demand”. [1] The industry itself, however, defines it explicitly as unsold goods. With the term overproduction, we mean the overall growing quantities of clothing and other textiles that exceed consumers' actual clothing and textile use, and as such constitutes a surplus, whether these clothes are discarded or stored in the consumers’ wardrobes and cupboards. Continuous production growth has, however, so far “eaten up” the incremental environmental improvements made through eco-efficiency measures. According to Niinimäki et al. (2020), the long-term stability of the fashion industry relies on the total abandonment of the fast-fashion model, linked to a decline in overproduction and overconsumption, and a corresponding decrease in material throughput.

There is little information about the overproduction of textiles. How large is it? What would be the ideal total global production (Coscieme et al., 2022)? How much is produced and never used (Klepp et al., 2022)? How small could the production be if we worked systematically towards longer lifetimes and better clothing utilisation? Overproduction has not been a strong focus within research, but it is visible in different ways all along the value chain.Figure 2-1 is a visualisation of the different manifestations, and terms used for these, from the brand that orders products, to final disposal.

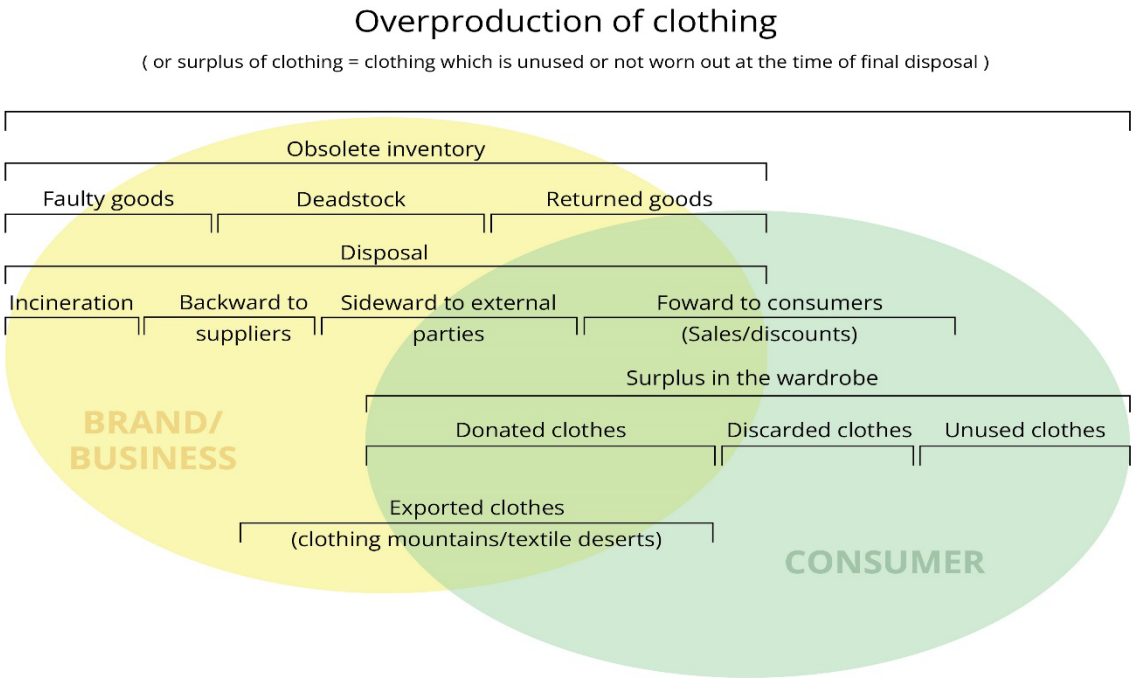

Figure 2-1 Manifestations of overproduction and the related overconsumption.

The categories overlap and interact. Businesses produce more clothes than can be worn out and use strategies such as sales and discounts to reduce deadstock and unsold inventory. Consumers either donate, discard, or keep unused clothes in their wardrobes.

One thing we do know is that the growth in clothing production is partially made up of clothes that have not been – or would never be – sold (Samfunnsøkonomisk Analyse, 2022; Watson, Trzepacz, et al., 2020). Faulty goods, returned goods, deadstock etc. make up a large share of the production (Cullinane, 2022). There is in general little knowledge about such clothes. It is estimated that return rates of clothing sold online range from around 20–60% depending on specific product characteristics (Cullinane et al., 2019), and this is expected to increase due to growth in online shopping. The returns’ journeys are highly complex and vary from company to company, often involving several warehouses and sorting and repacking in a third country (Cullinane & Cullinane, 2021). Many of these returned

[1] Read the full definition of overproduction here.

clothes are not profitable to process and are therefore never resold by the same retailer, but end up sold in secondary outlets, donated to charity, sent to landfill or incinerated (Cullinane, 2022). Even less is known about unsold goods. Some countries are working to limit this, with measures linked to VAT rules, or by introducing a ban on destruction (République Française, 2021).

Wijnia (2016) has mapped the obsolete inventory in the Dutch apparel industry. The survey from 2015 found 2.3% at the level of production, 13.5% at the level of wholesale and 35.2% at the level of retail (Wijnia, 2016). This is lower than the estimates in the academic literature, where the obsolete inventory is estimated to be between 15-20% at the wholesale level and 30-50% at the level of retail (Desai et al., 2012). The variations in estimates are large because of varying definitions and lack of transparency/openness, and reliable sources (Wijnia, 2016). Important in Wijnia's work is that it points to strategies to reduce overproduction. It also points to how fashion trends influence volumes both by having an expiration date and the number of annual collections:

> *"the period that apparel is sourced and the period that apparel is available in store do not overlap. This means that there is (almost) no time to anticipate [based] on feedback of consumers. Actors in the [value] chain are not fully aware of the success or failure of the products they serve since they already have their mind set on the upcoming collection, it's a gamble [sic]*" (Wijnia, 2016, p. 40).

This points to fast fashion as planned obsolescence. The goal of the new collections is to get people to buy more clothes, even though their wardrobes are already full. Both the clothes in the wardrobe and in the sales system will therefore become obsolete because of the steady inflow of new collections.

Wijnia (2016) points to several options that a company has when getting rid of obsolete inventory and divides these into three categories: backward disposal to suppliers, forward disposal to consumers and sideward disposal to external parties. The most important is forward to consumers through reduced prices in line with Adam Smith's theory of price and demand. Hence the consumer is largely doing the job of emptying stocks to make room for new clothes.

The recent WRAP (2022) report estimates that clothing longevity in the UK, e.g., for dresses, has increased from 3.8 years in 2013 to 4.6 years in 2021. The report also estimates that 26% of clothes in the wardrobes have not been worn in the last year (WRAP, 2022). Together these findings indicate that clothes are worn less, and therefore last longer.

In comparison, about 25% of garments in Norwegian wardrobes are either never worn or have only been worn a couple of times (Laitala & Klepp, 2015). This is an increase from 19% found in an earlier Norwegian study (Klepp, 2001). Similar numbers are found in the Netherlands and Germany where 28% and 30% of clothes, respectively, are unused (Maldini et al., 2017). In the EU, more than 30% of the clothes in the wardrobes have not been worn in the last year (Šajn, 2019).

The surplus is also visible through the disposal of clothing. 31 700 tonnes of used textiles are collected each year in Norway (Watson, Trzepacz, et al., 2020), while 50 900 tonnes are disposed of as waste (Miljødirektoratet, 2021). A large portion of these are technically usable clothes (Klepp, Sigaard, et al., 2022). Last but not least, it is also visible in the form of exported used clothing from the Global north to the Global South. In the countries on the receiving end, the clothes become both textile mountains and textile deserts[2] of unwanted but not worn-out clothes (Changing Markets Foundation, 2023; EEA, 2023; Ricketts & Skinner, 2023). In Norway, 97% of the collected textiles are exported to a global market (Watson, Trzepacz, et al., 2020). This shows that Norway imports far more than the Norwegian

[2] Reports from Chile show imported clothes littering the Atacama desert. Read more here.

population is able to wear out. The threefold increase in exports from the EU in the last 20 years would indicate that this is also the case for the EU (EEA, 2023).

In sum, the increase in production has resulted in an overproduction of clothing. This is visible in all stages, among consumers and in commerce and in the used textiles trade. Though there is little available research on the size of and the mechanisms behind the overproduction of clothing itself, it can be quantified as unsold goods, goods sold at greatly reduced prices, and as clothes that are sold but remain unused in the wardrobe. The overproduction is also visible in the large volumes of more or less used clothing that are exported from the Global North and that increasingly remain unused in the importing countries in the Global South. Altogether, data on the volume of these garments could be used to estimate the size of overproduction in the apparel sector, although such a study has not yet been conducted.

The connection between volumes and longer lifetimes and why longer clothing lifetimes in themselves do not decrease the environmental burdens will be discussed in detail in the following sections 2.3 and 2.4.

2.3 Durability, lifetime and volume

There is increasing discussion and knowledge about clothing lifetimes and politics promoting more ‘durable clothes’. This attention is welcomed but it is important to highlight that the connection between durability, lifetimes and volumes is complex. The understanding of the relationship between the three is currently limited, but highly important to be able to discuss whether the problem of volumes is being addressed.

The confusion between durability, lifetimes and volume is based on unclear terminology. Lifetime can be understood as how much/for how long the product has been or will be used, which can be researched by studying consumption dynamics and behaviours. Note that we use the term consumption in its broader sense to encompass acquisition and use, as well as disposal. Lifetime for clothing can be measured in the number of years it was kept by the consumer or the number of wears, the number of washes and/or how many users a product has had or will have on average (Klepp et al., 2020). The term lifetime, when not clarified, is most commonly understood as ’potential lifetime’, hence how long a product can be used or will last, meaning the same as durability. Durability is the quality of being able to last a long time without becoming damaged. There is no causality between increasing durability and prolonging use (Klepp et al., 2023) This is also what the term ‘technical lifetime’ comprises, as opposed to ’emotional/psychological/social durability’. Emotional/psychological/social durability is sometimes/often called ‘non-physical lifetime’, and these terms are all part of efforts to work with why things are not used, though technically they are usable.

The potential for reducing total volumes and thus material extraction, pollution, energy use, overall production and consumption levels, and transportation that increasing product lifetime holds, is often discussed (Cooper, 2010). It is surely the case for many products that prolonged durability prevents new purchases, e.g., for larger things like cars, but this causality is not necessarily valid for clothing (Maldini, 2019). As Maldini (2019) has explained, most clothing is not bought because the wardrobe is empty or because a particular garment has become unusable. Most clothing is not acquired as replacements but in addition to those one already has. Acquisition and disposal are connected but independent processes and the quantity and purpose of garments owned play a main role in this relationship (Maldini & Stappers, 2019). One reason for disposal is limited space in wardrobes, which is a consequence of purchasing behaviour and not a cause for it (Laitala et al., 2015). This is not only true for new purchases but also for second-hand, hand-me-downs, home-made garments and gifted clothes. In Maldini (2019)’s study, only 12 of 312 pieces (4%) of clothing were bought as replacements.

Though this study was small-scale, the results correspond with studies of clothing consumption in Norway the last 20 years (Klepp, 2001; Laitala, 2014a, 2014b). Further studies of replacement rates of both clothing and other consumer goods are needed.

In the discussion about how much second-hand clothing sales reduce environmental impacts, the term 'replacement rate' is used. It describes the percentage of new clothing purchases being replaced by second-hand clothing purchases. There is great uncertainty connected to this, both in wealthier and poorer countries, and the numbers vary from 35% to 85% (Castellani et al., 2015; Farrant et al., 2010; Nørup et al., 2019). According to Farrant et al. (2010) the purchase of 100 second-hand garments saves between 60 and 85 new garments dependent on the place of reuse. In a Norwegian study, we found that whether inheriting clothes prevents new purchases depends on income. Both for those that have the least and the most, being gifted used clothing did not replace anything at all (Klepp & Laitala, 2018). Furthermore, no good studies that distinguish between the garments for which this connection is strong and those for which it is weaker, exist. The economic aspect is also a large part of this calculation – the cheaper something is, the larger quantities of it you can afford. For many people, their income is given, and if spent on clothes (or on other products) that are cheap, there will be more money left over for other things – or for more clothes. This is a part of the 'rebound effect', that we will discuss more in-depth in section 2.10.

Another question that has not been well researched, to our knowledge, is the relationship between increased lifetime for individual garments and increased lifetime for the average garment in a wardrobe. It is possible that if something "lives" for longer, something else will be thrown out more quickly and that the lifetime, therefore, does not affect purchases but rather the relationships within the wardrobe. We can imagine an adult woman with a large number of evening dresses. If one of them gets its lifetime extended through e.g., repair, another one will be used less. If on the other hand, she was lacking evening dresses, then repair could increase use and prevent another purchase. It is obvious that even in a large wardrobe, things can be lacking because of changing body size, occasions for clothing, taste and so on.

Our knowledge of lifetimes for clothing and other products is increasing and from what we currently know, it is not necessarily the case that more durable products are used longer nor that longer lifetimes lead to fewer clothes being purchased. This is because very few clothes are acquired as replacements for outworn, broken or otherwise unsuitable items.

2.4 Clothing utilisation

According to the Ellen MacArthur Foundation (2017, p. 24) "[i]ncreasing the average number of times clothes are worn is the most direct lever to capture value and design out waste and pollution in the textiles system." A potential term for this is 'clothing utilisation', describing use-intensity, measured in "the average number of times a garment is worn before it ceases to be used" (Ellen MacArthur Foundation, 2017, pp. 36, 77).

An advantage of using the term clothing utilisation is that it can be used for individual garments or averages for national or global wardrobes. In the last 20 years, the annual growth in fibre production has been 3-5 % (TE, 2022), while the global population has increased only 1-1.3% (United Nations, 2022). The industry is planning and is expected to increase its production rate while the population growth rate is decreasing. Consequently, clothing utilisation is decreasing at an ever-faster pace as the number of clothes is growing faster than the number of people that will wear the same clothes. That clothing utilisation has gone down is a fact the industry itself is aware of. The Ellen MacArthur Foundation (2017, pp. 36, 77) points out that the number of times clothes are actually worn has dropped by a third compared to the early 2000s. An often-cited study of 2000 UK women from the early

2000s estimates that the average garment is worn only seven to ten times before disposal (Daily Mail, 2015; Ellen MacArthur Foundation, 2017; Farra, 2021). We are thus moving towards single-use clothing (Niinimäki et al., 2020).

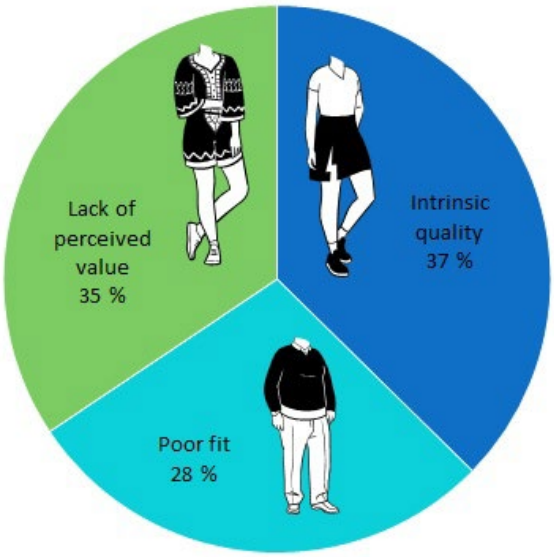

Figure 2-2 Main reasons for clothing disposal (Laitala & Klepp, 2022)

The argument so far relates to the total utilisation rate of all clothing. At the same time, there are great differences between individual garments and types of garments. We know that approximately 1/3 of clothing is disposed of because they are worn out or damaged (Figure 2-2) (Laitala & Klepp, 2022). For parts of this group of clothing, improving technical durability could have an effect on the use time and possibly also on the acquisition of new clothes, that then in turn could influence production quantities. Flipping the two, there is on the other hand a definite connection: if producing fewer clothes led to an increasing utilisation rate, it would in time be necessary to implement measures to increase the lifetime of clothes. The current situation is unfortunately that clothing is being thrown away before it is worn out, whether it is being incinerated in Norway and in the global North in general, or it ends up in waste streams in the Global South, with much of its potential use time unexploited. It will therefore take time before we reach a point where the technical lifetime of clothing will be the most pressing issue. The authors of this report argue that within the current situation of overproduction, it is therefore urgent that we decrease production, it is not urgent that we increase the potential lifetime or durability. Additionally, it is emphasized that working towards an extended lifetime of clothing is not the same as working towards increased utilisation or reduction in production quantities.

Clothing utilisation is the average number of times clothes are worn. An advantage of using the term is that it can be used about individual garments or averages for national or global wardrobes. It, therefore, puts the spotlight on a system and not just individual garments.

2.5 Synthetic textiles

Clothing is the largest group of textile products, which is commonly divided into clothing, textiles for home and textiles for industrial uses (GVR, 2022). Textiles have in common that they are made from fibres that are flexible, strong, and long enough to be spun into thread and yarn or otherwise bound together to become fabrics. Fibre is thus a collective designation for something long, thin, and most

often flexible. Fibres are important building blocks in many different structures because they can bind, stabilise, and connect. [3]

Textile fibres originate from various sources and are divided into natural and man-made fibres. Synthetic textile fibres are man-made fibres that use crude oil as their main raw material but can also be made from coal. [4] The chemical processes are the basis for dividing the fibres into sub-types. The most well-known synthetic fibres are polyamide, polyester, acrylic, elastane and polypropylene. Their usage has increased rapidly, and in 2021 they made up 64% of the global textile fibre production (TE, 2021b, 2022). The largest and most important is polyester, which made up 54% of global fibre production in 2021 (TE, 2022) and has an annual increase of about 5%.

Several linguistic ambiguities exist in the relationship between textiles and plastic. Plastic means “an artificial substance that can be shaped when soft into many different forms and has many different uses” [5] and is used as a common word for synthetic materials. Nothing in the definition of plastic excludes textiles and the feedstock for the world’s most used textile fibre, polyester, is also used in other plastic products, such as bottles, car bumpers and boat hulls. It is therefore also possible to recycle other product groups into textiles - though it is not necessarily a good idea (Changing Markets Foundation, 2021a; Kassatly & Baumann-Pauly, 2022), as we will come back to in the discussion.

In the mounting discussions about the global plastic problems, textiles are by and large excluded, except for the microplastics problem, to which we will come back. For this reason, the role of synthetics in the burgeoning acknowledgement of plastics as a problem is lower for textiles than for other types of plastic. But synthetic textiles are made from fossil materials. Synthetic textiles are plastic. Plastics are the most used textiles today, with polyester as the dominant fibre.

2.6 The environmental impacts of synthetic textiles

There are several environmental issues connected with synthetic fibres. The most important are the spreading of microfibres and the use of non-renewable and non-biodegradable materials (Glover, 2022; Henry et al., 2018, 2019; EEA, 2022)..

Plastic in fibre form have some commonalities that separate them from other types of plastics, most importantly the shape: textile fibres are long and thin. Because of this shape, synthetic (plastic) microfibres bind and attach more to surrounding materials and tissue than microplastic in other forms and from other sources (Henry et al., 2019). A descriptive image of this is when animals or fish get caught in ghost fishing nets or other textiles. This ability to attach and bind, makes textiles unwanted in waste incineration facilities because they get caught in the machinery and cause them to stop, as well as break. The textile fibres also attach more easily to tissue inside the body. Another common trait that textiles have, is added chemicals. This can be everything from dyes to chemicals, meant to make the material more breathable, odour resistant, stain resistant or soften the material. Synthetic textiles are therefore plastic with additional properties and additives which make them extra dangerous when they go astray. The title of this report, “The Plastic Elephant”, is intended to direct attention to the significance of synthetic textiles within the discussions of growth, sustainability, textiles and plastic.

Microplastics have been found everywhere, in blood and breast milk, at the top of Mount Everest and deep in the Mariana Trench, as well as in the air we breathe (Glover, 2022; EEA, 2022). The share of

[3] Read the definition of fibre here.

[4] Chinese businesses are developing polyester from coal. Read about it here.

[5] Read the definition of plastic here.

microplastic from textiles, compared to microplastic from other sources, depends on whether we calculate it from primary or secondary sources. Meaning that it depends if we calculate the microplastics that are shed during use and laundry or also include the microplastic the textiles become as waste.

For a long time, the discussion around reducing plastic pollution has been centred on plastic recycling. As such rPET, polyester mechanically recycled mainly from PET bottles and other packaging, is seen as a solution to the plastic waste problems.[6] However, this is a one-way ticket to landfill or incineration for these textiles as long as textile-to-textile or fibre-to-fibre recycling for polyester is not commercially available. This solution then becomes a linear, 'open-loop' system, as opposed to the closed-loop systems that already exist for plastic packaging, like PET bottles recycled into PET bottles, and it is therefore not an optimal solution. A recent study shows that rPET in knitwear sheds more microfibres in washing than virgin polyester (Özkan & Gündoğdu, 2021). Some studies indicate that it is also weaker than virgin polyester (Roos et al., 2017).

The industry has reportedly been working on developing fibre-to-fibre recycling for polyester for a long time.[7] Most of the technologies are still at the pilot plant stage. Upscaling is problematic due to a lack of investment, fibre mixes, complicated/time-consuming sorting, etc. According to a European Commission report, the first technologies were expected to be deployed in an industrial production line by 2023 (Duhoux et al., 2021).

Some companies and researchers also report having developed methods to capture CO_2 and transform this into plastics[8]. On one hand, the resulting plastic materials are the same conventional plastic materials that are being made from fossil-fuels: non-biodegradable synthetic materials that do not integrate into the biological cycles. On the other hand, they come from a renewable and less polluting source than fossil fuels. Carbon capture, however, remains a costly and energy-demanding process, so its success hinges on the development of technology that reduces these inputs (Clifford, 2021).

The first plastics were bio-based plastics, made from renewable sources,[9] and predate the fossil-based plastics that we have got so used to (Conti et al., 2021; Gilbert, 2017). Some advocate that developing biodegradable materials to replace plastic should be a priority when seeking to reduce plastic pollution (Chen et al., 2022; Cheng et al., 2021).

European Bioplastics define bioplastics as "plastics that are bio-based, bio-degradable, or both" [10]. Bio-based plastics are commonly made from renewable raw materials, such as vegetable oil, corn starch, cellulose etc. An example is polyamide made from castor oil, polyamide 11, but although it is sourced from a renewable source, it is not degradable. Other bio plastics used for textiles are Polylactides (PLA) made from corn and sugar beet, Polyglycolide (PGA) and Polyhydroxy-alkanoates (PHAs) that are both biodegradable; biodegradable thermoplastics made from casein (milk proteins); Polyhydroxy-butyrate (PHB) produced mostly from starch from potato, wheat or corn (Grancarić et al., 2013). Many of these are used for technical textiles within the medical field, for applications where biocompatibility and/or

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[6] An example is organisations making clothing from ocean plastic, as discussed here on the EcoWatch platform.

[7] As an example, the Teijin Group, a Japanese technological innovation company reported having invented a process in 2014 (read about it here), but no chemical recycling technology is currently commercially available.

[8] The technology has been developed by the company LanzaTech and the University of Toronto, Faculty of Applied Science & Engineering.

[9] In 1861, Alexander Parkes patented Parkesine, also known as Xylonite, made from cellulose.

[10] Read their definition on their website here.

biodegradability are of outmost importance, e.g., in internal sutures. For clothing, PLA seems to be promising as a polyester replacement, although production and dyeing processes still need refining (Yang et al., 2020). In addition, clothing fabrics, as well as technical fabrics, are commercially available from casein.[11] Conventional plastics can be made degradable by using additives, e.g., oxo-degradable plastics,[12] but they should not be labelled as bioplastics, as they do not fully biodegrade. The science concerning the issues created by plastics is relatively new. The most important factors are the shedding of microplastics and fibres and the use of non-renewable and non-biodegradable materials.

2.7 The role of plastics in clothing production growth

A deciding factor for our choice to see production growth and plastics in connection is the importance of plastics in enabling increasing production volumes, as discussed in the Introduction. The amount of synthetic textile fibres produced more than doubled between 2000 and 2016 (Changing Markets Foundation, 2021b; TE, 2017). Niinimäki et al. (2020) argue that the decrease in the utilisation of garments has been almost entirely driven by the growth in the consumption of synthetic fibres. This is repeated in the Fossil Fashion report, stating that the "correlation between the rise of fast fashion, the availability of cheap fossil-fuel-derived materials and the plummeting cost of clothes is remarkable" (Changing Markets Foundation, 2021a, p. 13). Figure 2-2 below illustrates the growth in synthetic fibre production, increase in clothing sales and decrease in utilisation.

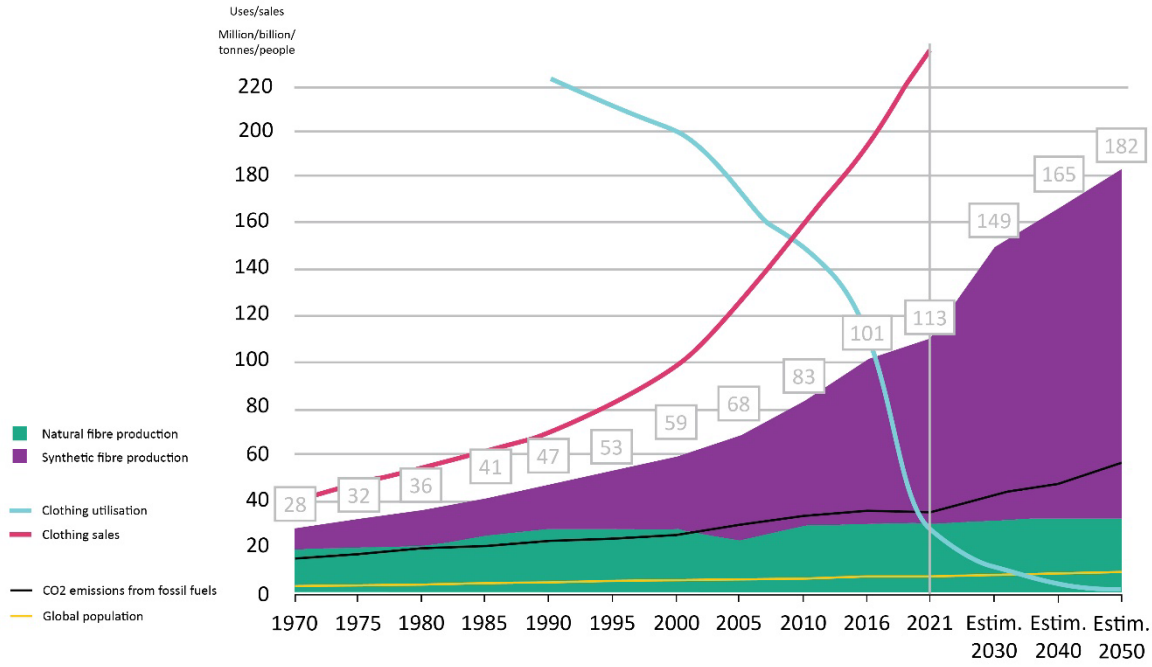

Figure 2-3 Global fibre production compared to clothing utilisation, sales, CO2-emissions from fossil fuels, global population and estimated future production growth.
(Sources: Ellen MacArthur Foundation, 2021; Ritchie et al., 2020; TE, 2017, 2018, 2019, 2020, 2021b, 2022; United Nations, 2022; World Bank, 2020)

There are a lot of unknowns concerning the future of plastics, such as whether other raw materials than those of fossil origin will be viable and how much this will cost. We do not know whether recycling (fibre-to-fibre) will decrease the environmental impacts, it may in fact increase it (Kassatly & Baumann-Pauly,

[11] E.g., Faser have developed a QMILK fiber and fabrics. Read bour it here.

[12] Read what European Bioplastics say about oxo-degradable plastics here.

2022, p. 35). What Figure 2-3 shows, is that there is a correlation between the production of synthetic fibres and the production growth in the textile sector. This growth is also expected to continue.

2.8 Environmental governance in the textile industry

The fashion and textile industry has not seen much regulation and historically has benefitted, and still benefits, from free-trade agreements. This lack of regulation has also left a gap concerning environmental issues (Machek et al., 2020). In this absence of regulations, sustainability measures are governed by voluntary company commitments (Machek et al., 2020). In this report, we will examine strategies from both individual companies and industry organisations. It is, therefore, necessary for the reader to have an understanding of the most important organisations and initiatives that represent the industry's sustainability efforts, and the role these organisations also play in public policy processes.

The voluntary company commitments mentioned above are often organised in multi-stakeholder initiatives (MSIs) (Machek et al., 2020). MSIs can be member organisations made up of several stakeholder groups, including brands and retailers, as well as manufacturers, non-governmental organisations (NGOs), unions and other civil society groups. Many of these charge member fees and some also offer voluntary standards and consumer-facing labels that demonstrate sustainability claims. Notable textile-specific MSIs are Better Cotton Initiative (BCI) [13], the Sustainable Apparel Coalition (SAC), [14] Zero Discharge of Hazardous Chemicals (ZDHC) [15] and Textile Exchange (TE) [16] (Payne & Mellick, 2022). Of the above MSIs, the SAC and TE, along with the Global Fashion Agenda (GFA) [17] and Policy Hub[18] are important because of their size and influence and we will describe them in detail in the Method chapter, section 3.2.2.

The above MSIs are large and interconnected. They also have overlapping member groups, and at least two of them have economic interests vested in selling labelling schemes and tools to enable businesses to decrease environmental impacts and transition to the circular economy. Many of these tools are, as we will examine more closely, contested.

2.9 Contested methods of measuring environmental impacts

In the textile strategies analysed in this report, many of the measures are based on comparing the environmental impacts of products. The most important tools for comparing environmental impacts are made by the industry's own MSIs. Critique has been mounting against this and what aspects are given importance in these tools, in particular against the most used and therefore most influential tool, the Higg MSI.

Payne and Mellick (2022) see a development towards quantification of impact in the way the MSIs work, with an increasing number of tools for measuring, quantifying and reporting on environmental impacts. The tools that the above-mentioned MSIs have created are mainly based on the impact of

[13] Read about the BCI here.

[14] Read about the SAC here.

[15] Read about the ZDHC here.

[16] Read about TE here.

[17] Read about the GFA here.

[18] Read about Policy Hub here.

fibres, and global averages, as opposed to third-party based and government-backed environmental labels such as the Nordic Swan and the EU Eco Label, that base their assessments on product-specific data and all stages of production. The Higg MSI compares fibres based on global averages of LCA data on fibre production for a limited number of parameters, such as carbon emissions, water consumption, eutrophication and land use. As the boundaries for these measurements vary, and more so between natural and synthetic fibres, there is an ongoing discussion concerning the data resulting in numeric scores that appear to favour synthetic fibres over natural fibres. One issue in this controversy is the apparent selectivity of the scores. Synthetic fibre scores are criticised for not taking into account the potentially negative effects of microfibre shedding or the transport of oil and gas with problematic leakages. Natural fibre scores are criticised for not accounting for the potential positive attributes, such as carbon sequestering (Kassatly, 2021; Kassatly & Baumann-Pauly, 2022; Make the Label Count, 2022). Before the Higg MSI became a privately owned for-profit company, the tool and its database were open to scrutiny. However, today it is behind a paywall and the database and methodology are therefore not easily verifiable (Kassatly & Baumann-Pauly, 2022; Klepp, Laitala, et al., 2022).

An important premise for emphasising the choice of fibres is that the fibres make up a large portion of the environmental impacts of textiles. This has been challenged by several studies showing that the fibres only stand for between 12% and 16.3% of a product's lifecycle impact, while the fabric production, dyeing, and finishing has three times the impact (UNEP, 2020; Wennberg & Östlund, 2019), in essence, this means that the focus does not take into account what really matters (Kassatly, 2023).

In the spring of 2022, the Norwegian Consumer Authority [Forbrukertilsynet] (NCA) ruled that using globalised average data on a specific product to make green claims, and especially when the data was neither reliable nor verifiable, was illegal in Norway. A letter of warning was also sent by the NCA to H&M, who had used the Higg Co label in other markets. SAC also received a letter, mandating them to inform all their members of the decision.[19] Following this, the NCA issued a general warning that the Higg MSI could not be used to support sustainability claims in marketing towards consumers in Norway.

The following autumn, the Norwegian Consumer Council [Forbrukerrådet] (NCC) announced that the German online retailer Zalando was awarded the inaugural Greenwashing award,[20] in part based on their use of Higg MSI for filtering for "sustainable" products.

In a later development, the NCA and their Dutch counterpart issued guidelines for the use of Higg MSI (and other similar LCA-based claims) in marketing.[21] These guidelines make it very clear that claims made must be easily understood by consumers, and that the shortcomings (data-gaps, age of the studies, what the data does not include) and significant disagreements around the claims, must be made clear.

A lot of the critique against the Higg MSI does not just affect this specific tool, but the LCA data that underpins textile comparisons in general (see e.g., Kassatly, 2023). The critique concerns how synthetic and natural fibres are compared, the lack of updated and comparable studies, the use of global average data and the lack of understanding of the use phase. That fibres only make up only a small percentage of the environmental impacts of textiles and that there are varying opinions on whether the knowledge to compare the environmental impacts of textiles currently exists, is at the core of the critique. This is in part due to low quality, outdated and inadequate LCA analyses, but also due to the fact that the geographical location of any given fibre production is just as important as what fibre is being produced. The LCA-based tools are also critiqued for favouring plastic fibres, among other

[19] Read the full account from the NCA on their website.

[20] Read about Zalando receiving the greenwashing price on the NCC website.

[21] Read the guidelines on the use of the Higg MSI in marketing here.

aspects, because the negative effects of plastics are not included in the parameters of the LCAs that they are based on. This underlines the importance of addressing production volumes as a direct lever to decrease total environmental impacts.

2.10 Decoupling

The term decoupling is a prerequisite for understanding the discussions about climate and environmental action. Both green growth and circular economy build on a belief that economic growth is possible without leading to increased environmental impacts. The ability to dissociate the two is often called 'decoupling' (Parrique et al., 2019, p. 11). There is a long and ongoing discussion of whether this is possible. In 1973, while giving evidence to the U.S. Congress related to the first Club of Rome report "The Limits to Growth" (Meadows et al., 1972), the American economist Kenneth Boulding famously joked: "Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an economist" (U.S. Congress, 1973). This critique is similar to what e.g., ecological economists challenge traditional economists on (Smith et al., 2021). Ecological economists also state that decoupling is impossible or at least incredibly difficult (Smith, 2021, p. 174; Smith et al., 2022, p. 136), depending on whether one talks about absolute decoupling (impacts decrease while the economic growth continues) or relative decoupling (impact growth is slower than the economic growth) (Parrique et al., 2019, p. 11). Ecological economists highlight the importance of material usage for environmental impact and refer to the law of thermodynamics, also called the law of conservation of energy and materials, to explain why absolute decoupling of material growth from economic growth is impossible. They argue that efficiency cannot increase eternally as any production process requires a minimum of resources and energy inputs and will inevitably create some waste (Smith, 2021, p. 174; Smith et al., 2022, p. 136).

Relative decoupling of environmental impacts, however, is possible up to a certain point through eco-efficiency measures. To do this, the fashion industry implements eco-efficiency measures, a set of strategies that focus on maintaining or increasing the value of economic output while simultaneously decreasing the impact of economic activity upon ecological systems (Figge et al., 2014). Estimates show that the relative decoupling potential of environmental impacts for the fashion industry through these measures, could reduce impacts by about 25% (Fletcher, 1999, p. 85). Likewise, the relative decoupling of textile waste creation from economic growth has to some extent happened according to the EEA report "Progress towards preventing waste in Europe — the case of textile waste prevention", and waste creation is growing at a slower rate than the economy (EEA, 2021). The report still seeks absolute decoupling and highlights 'waste intensity' as a useful "metric for monitoring progress towards decoupling waste generation from economic growth" (EEA, 2021, p. 16).

However, in many cases, environmental impacts are understood one-dimensionally as CO_2-emissions. In a panel-discussion between degrowth[22] scholar Dr Jason Hickel and green growth[23] scholar Dr Samuel Fankhausher, Hickel highlighted that switching to renewable energy sources will eventually decouple CO_2 emissions from economic growth: Fankhauser, on the other hand, admitted that it is less sure that other environmental impacts can be reduced and that other planetary boundaries[24] are not exceeded in a green growth scenario (Raworth et al., 2022).

[22] The planned decrease of material throughput and a just transition (Hickel, 2021).

[23] Growth within planetary boundaries.

[24] Nine processes that regulate the stability and resilience of the Earth system. A framework developed by the Stockholm Resilience Centre. Read about planetary boundaries on their website.

There is an ongoing critique of green growth and similar perspectives, based on the decoupling not being proven possible and the limitations for reducing environmental impacts while delivering growth (e.g., Haberl et al., 2020; Jackson & Victor, 2019). Scholars point out that there is no empirical evidence that supports the potential for absolute decoupling (Haberl et al., 2020; Jackson & Victor, 2019; Smith et al., 2022, p. 144) and limitations of existing growth-dependent business models have been thoroughly demonstrated (see Hickel & Kallis, 2020; Jänicke, 2012; Lorek & Spangenberg, 2014). Jackson and Victor (2019) further point out that the decrease necessary to avoid unwanted climate change scenarios far outpaces any examples of decoupling shown by any nation. They have calculated this to be an average annual decline in the carbon intensity of global economic output of around 14% every year for the next three decades. The findings point to decoupling strategies being unrealistic. In comparison, they explain that the highest rate of decoupling of CO_2-emissions ever achieved by the world's advanced economies was a little under 3%, in the years immediately following the oil crises of the 1970s, and that current decline rates are 1% (Jackson & Victor, 2019). In comparison, it is estimated that the fashion industry needs to reduce its resource use by 75-95% compared to current levels in order to meet climate targets (Fletcher & Tham, 2019), constituting a 60% reduction in CO_2-equivalents (Coscieme et al., 2022), or a 75% reduction in purchases of new garments (Cornell et al., 2021; Fletcher & Tham, 2019). For high-income households in high-consumption countries, this would represent an 80% reduction in clothing purchases (Coscieme et al., 2022). This resonates with conceptualisations of a sufficiency-based circular economy, that goes a step further than the cycling of products and materials: it proposes that society as a whole needs to make do with less while operating within a circular economy (Bocken et al., 2022).

Decoupling is a term that is used in discussions about whether it is possible to reduce environmental impacts while simultaneously promoting economic growth. The discussion can be nuanced using the terms absolute and relative decoupling. The latter is not questioned the way the former is, meaning that the dispute is not about whether it is possible to use resources more efficiently, pollute less per produced item, etc. The dispute is rather about whether these gains can be large enough to attain the total reduction in environmental impacts that are necessary to halt and reverse climate change and environmental destruction, while simultaneously pursuing growth.

In this chapter, we have explained the background for the questions asked when analysing the sustainable textile strategies, along with the most central terms, actors, institutions and discussions. We have explained why we believe it is important to examine what the strategies say about volume and use of synthetic materials and the premise for the growth in production volumes. The knowledge basis for comparing products' environmental impact is lacking, as well as empirical evidence of the effect of design strategies to reduce consumption, or indeed production. It follows that the evidence that better products, more users or repair have the direct effect of increasing the utilisation rate of clothing and as such the production volumes, also is lacking.

3 Method

This study follows a qualitative research strategy and applies an explorative approach, which is used to understand new topics that have not been researched before in depth. It uses secondary sources for data collection where document analyses of environmental strategies from three groups of stakeholders in the fashion and textile industry were conducted: brands/businesses, industry organisations and public policymakers. In addition, video material was analysed for one actor.

3.1 Document analysis

Documents can be understood as 'social facts', meaning that they are produced, shared, used, edited etc. within a social context (Atkinson & Coffey, 2004). A complete analysis is therefore not limited to the content, but also the context in which these documents exist, their purpose(s), who they are written by and for (addresser and addressee of a document (Thwaites et al., 2002), and how they relate to other documents and to the social and cultural practices they are part of.

Asdal and Reinertsen (2022) describe documents as active, and that therefore they can be analytical tools to understand change. Organisations also exist through document work. They propose six methodological approaches; studying documents as sites (places to find information), tools (what they do), work (the processes they are part of and how they are made), texts (literary and linguistic aspects), issues (that they help shape) and movement.

The advantages of using document analysis include that they are produced without the researcher's involvement and that documents are non-reactive. Therefore, the data already exists, in many cases also freely available online or in public archives without the need for ethical approval. It can hence be *selected* rather than *collected,* which is a less time-consuming and costly approach than many other qualitative approaches.

3.1.1 Environmental strategies as policy documents

Policy documents and environmental strategies are from a specific context, but they also determine and guide context, through the development and communication of ways of thinking around specific issues.

As a genre, policy documents are defined by their distinctive norms and conventions, which include literary and linguistic aspects, choice of information and arguments, appearance and form, etc. (Cardno, 2018). Taylor (1997) suggests studying them from three angles to capture the political struggles over meaning of which they are the outcome:

- *policy context:* historical, social, and cultural contexts of the policy. The societal conditions that the policy was produced within and what issues gave rise to it.
- *policy text:* the document itself that can be analysed according to different theoretical and methodological frameworks.
- *policy consequences*: its implementation and usage.(Taylor, 1997)

Codd (1988, pp. 243-244) emphasises that "[p]olicy documents are ideological texts that have been constructed within a particular context. The task of deconstruction begins with the recognition of that context". Our interest, however, lies in understanding the point of view of the different stakeholders at the time their strategies were written. Our analysis will therefore be of the document, or video, as a site (Asdal & Reinertsen, 2022), a text, not its context, nor its consequences (Taylor, 1997).

Environmental strategies are a type of document that set a course for environmental action by defining problem areas and envisioning solutions for these. They can also include clear goals and commitments. Like policy documents, they are often written following a specific template. This template starts with a description of the problem – why something needs to be done which is followed by a description of the wanted effects and sometimes also the actions and measures that will/should be used to attain these, or at least examples of these.

The latter gives more concrete measures in order to tackle the problems. We are more concerned with measures that lead directly or indirectly to reduction in production, or the share of plastic. By indirectly we mean that the connection is not clear but builds on undocumented or even questionable assumptions, such as those we have shown in the discussion about lifetime.

The selection of documents is explained in the following. Some of the documents are in a grey-zone of what we can call strategies but are the newest available sources for each selected organisation's position on sustainability when the analysis was done.

3.2 Material: the analysed strategies

Table 3-1 gives an overview of the strategies selected and analysed in this report. Wasted Textiles is a Norwegian research project, hence the choice of the strategy documents is based on what is important and strategically relevant seen from the Norwegian perspective: in Norway, like other European countries, the interest in textile regulation is increasing. At the same time, we wanted to examine a larger variety of strategies in connection with the issues. We have therefore looked for strategies in Norway's neighbouring countries, as well as in Norway.

The industry itself and its organisations are the most active and set the tone in the discussions about apparel and the environment. Their strategies are not only influential through what is being produced and how this is marketed, but also because the industry organisations have been given important roles in the development of policy and regulations in the field. We have therefore chosen to include strategies from two stakeholder groups in addition to public policymakers: businesses and industry organisations. The selected strategies are chosen because they are relevant to Norwegian consumers and political discussions. In addition, we examined two strategies from Germany to complement the Nordic perspective.

The data collection for this report took place in the period of November 2021 to June 2022 and consisted of analyses of 11 documents and 1 set of recorded video material from a conference presenting a strategy, detailed in Table 3-1. The documents were all publicly available material. The video material was made available to participants of the conference for 3 months, but not publicly available, which made reviewing and analysis possible.

Table 3-1 Overview of examined strategies

	Reach*	Organisation/Document	Description
Public Policymaker	**NO**	**Ministry of Climate and Environment** Nasjonal strategi for ein grøn, sirkulær økonomi [National strategy for a green, circular economy] (Departementene, 2021a)	Strategy for a green circular economy issued by the Norwegian Ministry of Climate and Environment. It sets out priority areas and measures.
	EU	**European Commission** Strategy for Sustainable and Circular Textiles, 2022 (EC, 2022)	Top-level EU strategy document to promote sustainability and circularity in the textile sector. It sets out focus areas and a plan for measures to be developed to address issues of textile sustainability.
	EU	**European Environmental Agency (EEA)** Plastic in textiles: potentials for circularity and reduced environmental and climate impacts (Eionet, 2021)	Report produced by the EEA European Topic Centre/ Waste and Materials in a Green Economy work program. It provides an overview of: • production and consumption of synthetic fibres in EU • environmental and climate impacts of synthetic fibres and textiles vision and recommendations for CE of synthetic fibres and textiles
	DE	**German Environmental Agency** Fallstudie zur globalen Umweltinanspruchnahme durch die Herstellung unserer Kleidung [Case study on the global environmental impact of the production of our clothing] (UBA, 2020)	Case study from the German Environmental Agency outlining issues concerning clothing consumption and discussing measures to address these.
	DK	Circular Economy with a focus on plastics and textiles – A 2030 and 2050 roadmap (Aalborg University et al., 2021)	The roadmap is funded by Innovation Fund Denmark (IFD) and is developed by all eight Danish universities, the Danish GTS institutes, The Design School Kolding, the Royal Academy and two industrial clusters. This strategy is not adopted on a national level, it is rather an indirect policy document, as it was commissioned based on clear political guidelines. The strategy will serve as a guideline for funding of future research within the fashion and textiles field.
Industry organisation	**DE**	**textil+mode** Wie man die Mikroplastikflut verringert (Textil+mode, 2021)	The German textile and fashion industry organisations' web page about their approach to microplastic prevention.
	Global	**TE** Textile Exchange Conference 2021 (TE, 2021a)	Annual global conference for the textile industry organized by TE. Organised 15th-19th November 2021. Hybrid conference with three months access to recordings afterwards for participants. For the first time in collaboration with the Sustainable Apparel Coalition.
	Global	**Policy Hub** EU Textile Strategy Position Paper (Policy Hub, 2021)	Published August 2021, this paper lays out the Policy Hub's policy propositions for the upcoming EU Textile Strategy, from their perspective as global industry organisation.
	Global	**GFA** The GFA Monitor 2022 (GFA, 2022)	The first edition of an annual report that outlines priorities and opportunities for fashion brands and retailers to set sustainability strategies and take action. It gives guidance on five priority areas, according to the GFA Fashion CEO Agenda framework. It also presents performance data. It is a co-creation with the GFA's "Impact Partners" and stakeholders.
Brand/business	**NO/ Nordic**	**Varner Group** Sustainability Report 2021 (Varner Group, 2022)	The report sets out the groups mission and values and goals, as well as their sustainability journey to date and in the past year.
	SE/ Global	**H&M Group** Annual and Sustainability Report 2021 (H&M Group, 2022a), Sustainability Disclosure Report 2021 (H&M Group, 2022c), Responsible Raw Material Sourcing Policy (H&M Group, 2022b), Circulator Guide (H&M Group, 2021a) and H&M Group Material Categorisation (H&M Group, 2021b)	The H&M strategy is found in 5 documents/web sources linked to their over-arching Annual and Sustainability Report, ranging from annual reports to specific guidance on material sourcing and design. Together they describe the group's goals and practices and are applicable for all brands owned by the group.
	DK/ Global	**Bestseller** Sustainability Report 2021 (Bestseller, 2022b) and Circular Design Guide (Bestseller, 2022a)	Fashion FWD is Bestseller corporation's sustainability strategy for the period of 2019-2025. The overall strategy is gathered in this document which is complemented by goal and theme specific sites. The Circular by Design guidebook was launched in 2022 and it sets the design principles and material related choices for BS products.

*of the organisation

3.2.1 Public policy

On the Norwegian governmental website, Regjeringen.no, we searched the "Rapporter, planar og strategier" [Reports, plans and strategies] section of the Klima- og miljødepartementet [Ministry of Climate and the Environment]. We found a total of 74 documents, none of which had textiles in their title or as their main subject. In the most relevant documents, a word search for "tekstil" [textile] was then carried out, which identified the following documents:

- Noregs Plaststrategi [Norway's Plastic Strategy], 10.08.2021
- Handlingsplan for ein giftfri kvardag 2021-2024 [Action plan for a toxin free everyday life 2021–2024], 02.07.2021
- Nasjonal strategi for ein grøn, sirkulær økonomi [National strategy for a green, circular economy], 16.06.2021
- Nasjonal avfallsplan [National waste plan] 2020-2025, 13.01.2020

Though they mentioned textiles, none of these comprised a comprehensive strategy for them, but we have included the National strategy for a green, circular economy that includes textiles among the 7 prioritised value chains for circularity.

Because of the lack of national legislation on textiles, the political processes in the EU are the most influential in a Norwegian context. Much of the policy that is being developed in the EU will automatically be applicable to Norway through the EEA agreement and is therefore subject to discussions and public hearings [25, 26, 27], as well a public and critical debate.[28] The inclusion of the EU Strategy for Sustainable and Circular Textiles (EU Textile Strategy), was, therefore, a given. This is a top-level EU strategy document to promote sustainability and circularity in the textile sector, both because it is the latest policy proposal but also because it is important for the work in the EU and the EEA-countries such as Norway and will have implications for the Norwegian Industry through both trade and the EEA-agreement. The EU Strategy sets out goals and timelines for a range of policy measures, such as the Directive on Green Claims, [29] the Ecodesign Directive (ESPR), [30] the Product Environmental Footprint (PEF), [31] and Extended Producer Responsibility (EPR) that are currently under development. The analysis includes how these are discussed in the over-arching strategy.

We have included some of Norway's neighbouring countries in the search and identified the Danish strategy "Circular Economy with a focus on plastics and textiles – A 2030 and 2050 roadmap" (Aalborg University et al., 2021) as important. This is not a national strategy for textiles but emerged from an April 2021 call from Innovation Fund Denmark (IFD), that funds industry research. The call was for four roadmaps based on the government's climate goals. In the four calls, relevant workstream themes for future partnerships that will be allocated research funding through IFD[32], are outlined. The "Circular economy with a focus on plastics and textiles" roadmap was developed by all eight Danish Universities, the Danish GTS institutes, The Design School, the Royal Academy and two industrial clusters. The

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[25] Read what the Norwegian government writes about textiles here.

[26] Access the Environmental Directorate's hearing here.

[27] Read about the first open hearing meeting from the Ministry of Climate and Environment here.

[28] The newspaper Dagens Nærlingsliv [Business of Today] has taken a particular interest in the topic, publishing a number of articles here.

[29] Read about the Directive on Green Claims here.

[30] Read bout the Ecodesign Directive here.

[31] Read about PEF here.

[32] Read about the "IFD Innomissions – Mission-driven green partnerships" that funded the report here.

strategy stands out by being a collaboration between research and industry. We have chosen to include it among official strategies because of its expected impact.

We have further included a case study from the German Environment Agency (UBA), to complement the Nordic perspective. The included report from the EEA is at the limit of what one can call a strategy, but its relevance for our discussion made us include it along with the UBA's report.

We have not included initiatives from intergovernmental organisations such as the World Trade Organisation, the United Nations, to focus on the documents that are most relevant to the Norwegian context and the textile policy currently being developed in the EU. Furthermore, UN initiatives, such as the UN Alliance for Sustainable fashion [33] and United Nations Environment Programme (UNEP) for Sustainable and Circular Textiles [34] are currently more focused on creating collaboration than a common strategy. In the latter, one industry organisation included in the analysis, the GFA, are also very active in the ongoing consultations, and it is therefore likely that their views shape also the international initiatives.

3.2.2 Industry organisations

From business, we wanted to include both individual businesses and strategies from industry organisations, including MSIs (such as TE, Policy Hub and GFA) that have a strong influence on companies' strategic sustainability developments. These initiatives have also developed into an orchestrated voice towards policymakers and wider society regarding various sustainability matters.

As stated in section 2.8, SAC, GFA and TE are the most important textile MSIs, with major Norwegian and Global brands as members. As such, analysing their strategies gives an important insight into the global industry's viewpoints. Below we will describe each organisation and their documents.

SAC [35] is a global, multi-stakeholder non-profit alliance for the fashion industry. It is made up of over 250 apparel, footwear and textile brands, retailers, suppliers, service providers, trade associations, non-profits, NGOs and a few academic institutions whose membership is based on a yearly fee. The SAC has developed the Higg Index. With this data, the industry attempts to identify the best material choices through the Higg Materials Sustainability Index (Higg MSI), which is one of the tools within the Higg Index suite. In May 2019, the Higg Index technology platform became a privately owned for-profit company.

The SAC does not have a publicly available sustainability strategy document that can be analysed, but their sustainability approach is driven by the tools in their HIGG Index suite, resources that are not publicly available. Therefore, we have not been able to analyse a document from them. They are however a prominent member of the strategic policy organisation Policy Hub (PH), which represents over 700 partners.

The Policy Hub [36] launched in 2019, and unites the SAC, the GFA, the Federation of European Sporting Goods (FESI), ZDHC and TE and their member brands and organisations "to speak in one voice and propose policies that accelerate circular practices". 28 In total, these organisations represent more than 700 apparel & footwear stakeholders, including brands, retailers, manufacturers and NGOs.

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[33] Read about the UN Alliance for Sustainable Fashion here.

[34] Read about the UNEP work on Sustainable and Circular Textiles here.

[35] Read about the SAC here.

[36] Read about Policy Hub here.

In September 2021, PH published a position paper to express their wishes for future policy development in the sector.

GFA [37] is an off-shoot of the Copenhagen Fashion Summit (established in 2011 by the Nordic Fashion Association), now called the Global Fashion Summit [38], The GFA's website was first launched in 2018. GFA has a strong focus on circular fashion to drive its agenda of transforming the industry. Its partners include brands and retailers like ASOS, Bestseller, H&M, Kering, Nike, PVH, Ralph Lauren and Target, as well as fellow MSIs, the SAC and TE.

Together with the SAC, the GFA published "The pulse of the Fashion industry" report annually, from 2017-2019, recording the sustainability performance of the global fashion Industry.[39] In 2022, they published the first edition of a report called The GFA Monitor "that is intended as a resource to guide fashion leaders towards a net-positive fashion industry. The Monitor builds on the Fashion CEO Agenda framework which was established in 2018 and puts forward a vision statement for the fashion industry that highlights the imperative need for social and environmental sustainability".[40] Here the SAC is also involved through the HIGG Co., as the GFA's data partner, supporting "the presentation of aggregated performance data to contextualise industry progress and start developing baselines". [41]

TE [42] is an NGO that started with organic cotton (under the name Organic Cotton Exchange) and has since branched out to manage several other labelling schemes such as the Recycled Content Standard, the Responsible Wool Standard and the Responsible Down Standard. They recently became a member of the Policy Hub, the Fashion Conveners and the Apparel Alliance. Their focus is raw materials, and some of the earliest stage processes, which means they do not include microplastics in their base data, as this is a larger issue later in the supply-chain and lifecycle of the products. They have recently launched a CLIMATE+ strategy, which aims for a reduction in GHG emissions for Tier 4 of 45% by 2030[43]. One of the 'levers' in this strategy is the Preferred Fiber and Material Matrix (PFMM), which was launched publicly in 2022. The CLIMATE+ strategy has the Higg MSI as its baseline. Comparison of fibres and selling tools to make this possible for businesses, is at the core of TE's goals.

They also propose the tool Corporate Fiber & Materials Benchmark (CFMB) program «to measure, track and compare a company's sustainability progress related to fibres and material, in essence, to manage how they integrate TE's Preferred Fibre and PFMM into their business models. A key component in the CFMB is the Material Change Index (MCI), a peer-to-peer comparison initiative that "tracks the apparel, footwear and home textile sector's progress toward more sustainable materials sourcing, as well as alignment with global efforts like the Sustainable Development Goals and the transition to a circular economy».[44]

TE's strategy is clearly presented in their annual "Preferred Fiber" reports, but is otherwise currently only available to members, e.g., through the "Preferred Fiber and Material Matrix". At the time of the analysis, the 2022 edition of their report was not yet available. Therefore, we have chosen to not only analyse their strategy text but also a conference about the strategy. This also gives a more complete

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[37] Read about the GFA here.

[38] Read about the Global Fashion Summit here..

[39] Read about and access the Pulse Reports on the GFA site here.

[40] Read about the Fashion CEO Agenda on the GFA site here.

[41] Read about and access the GFA Monitor Report on the GFA site here.

[42] Read about TE here.

[43] Read about the CLIMATE+ strategy on the TE website.

[44] Read about the Material Change Index on the TE website.

picture of their goals. The content of the conference is detailed in Appendix C: The Textile Exchange Conference.

3.2.3 Brands / businesses

In their sustainability reports, brands not only describe what they have done in the last year, but also their focus going forward. They also refer to the policy documents in place for specific issues. Therefore, these reports and their related documents represent the over-arching framework of the businesses' environmental strategies, as the communicate them outwards, to their shareholders and to some extent towards their customers.

We have included the Norwegian Varner Group, owner of the second largest clothing brand in Norway, and the global Swedish brand H&M, along with the Danish company Bestseller, that are further large players in the Norwegian market.

3.3 Analysis

The document and video-analysis were done by reading/watching the material and answering the 4 research questions. The selected 12 strategies were divided between the authors, that all participated in the analysis. An analysis form was filled out for each of the strategies (see Appendix A: Analysis form). During this work, we saw that giving simple *Yes* and *No* answers to our questions was not straight-forward. We, therefore, developed an explanation, or delimitation, for each answer option to alleviate this issue and ensure more consistent analysis results. We also added the intermediate response: To some extent/Indirectly. The final version was as follows:

RQ1: Does the strategy include/address production growth? (I.e., overproduction, quantities)?

- A: in the problem statement?
  - YES: Growth is addressed as a problem that needs to be halted.
  - To some extent/Indirectly: Growth is briefly mentioned as a problem.
  - NO: This is not discussed, or continued growth is a goal.
- B: through measures?
  - YES: There are measures directly addressing production growth, e.g., targeted taxation, import restrictions, quotas, reduction goals in % etc.
  - To some extent/Indirectly: No direct measures but durability (technical/social), longer use, repair, circular business models etc. are discussed, and seen as means for reduction.
  - NO: There are no measures addressing production growth.

RQ2: Does the strategy attempt to stop and/or minimise plastification? (Per cent share of plastic in the production; in total compared to other fibre compositions)

  - YES: Clear goals for reducing plastic fibre usage are presented, e.g., natural fibres and other solutions are put forward.
  - To some extent/Indirectly: This is discussed, but no measures are put forward.
  - NO: This is not discussed at all or more plastic is seen as a solution.

RQ3: Is the raw material to plastic addressed? (The source of the material; up-stream supply chain)

  - YES: The problem with virgin plastic is discussed and solutions like biobased, Textile2Textile recycling are put forward.

- To some extent/Indirectly: It is mentioned, rPET is the only solution put forward, if any.
- NO: There is no mention at all of this issue.

RQ4: Is the plastic waste problem addressed? (How the synthetic fibres will or will not end up as plastic waste?)

- YES: The problem is addressed at the root, e.g., decreasing use, compostability.
- To some extent/Indirectly: There is some mention of measures that aim to reduce waste. (E.g., microfiber filters, chemical issues, collection for recycling), or plastic waste is addressed but not plastic fibre waste.
- NO: This is not addressed.

All strategies were analysed by one author each using these specifications as guides. Thereafter we cross-read each other's analyses and negotiated a consensus where there were still differences in interpretation.

We will discuss how the strategies are formulated related to our research questions. Where the answer is *Yes*, this will include how growth and plastification are addressed. If it is not *Yes*, it will concern how close they are to addressing these issues or how they do not address these two problem areas.

3.3.1 Themes

During the analyses, quotes from the documents were extracted. These show how the strategies are formulated related to our research questions. When reviewing these, themes appeared showing similarities and differences in how the strategies discuss the issues. Therefore, the analysis is organised in themes and enriched with extracts of text from the analysed strategy documents. In addition, the quotes show how what our analysis builds on.

3.4 Limitations and scoring

Document analysis has its limitations when conducting qualitative research, as documents are written for other purposes than doing social research, thus they may not provide the complete picture nor be written in an objective manner, or they can be exaggerated and written to tell a good story. This can especially be the case with corporate sustainability reports, that are compiled to infer action taken towards the issues at hand, with the motive of presenting their efforts in the best possible light. They are therefore clearly favourable towards the studied entity. It is not clearly stated who is the audience for these documents, whether it is wider industry, mainly investors, or others. We have studied the strategies as they have been formulated, without considering motive or recipient.

Furthermore, this analysis is based only on publicly available documents (with the exception of one set of web-based recordings that had limited availability), therefore other documents may exist that we do not have access to. In addition, it is argued that document analysis should be combined with other methods, as it might not provide enough detail alone (Cardno, 2018). The fashion and textile industry is, however, an opaque industry, with complex value chains that businesses may or may not have full control over and where businesses are reluctant to divulge information or if they do, it has to be anonymised. These issues have appeared in similar studies (e.g., Changing Markets Foundation, 2021b; Samfunnsøkonomisk Analyse, 2022). The public documents are, however, easily available sources for the industry's strategies. We acknowledge that more sources to provide context and complement the information in the documents using other methods would be ideal, but this would also

be time-consuming and difficult. In Wasted Textiles, the document analysis will provide a preliminary understanding of how dominating fashion and textile-related environmental strategies address the environmental challenges of growth in the production and use of synthetic textiles. This again will provide a basis for the continuation of the work on policy (WP5). Therefore, instead of further data collection, the introduction and literature reviews provide some background and the larger context of the documents. This referenced research is mainly done on clothing, and though the largest group of textile products, other groups of textile products may follow differing use-patterns. Furthermore, some of the strategies discuss the wider term 'apparel', which includes footwear, that comprises both textile and non-textile products.

In addition to the limitation in available information, Yin (2003) points out that the selection process may entail another form of 'biased-selectivity' if researchers are 'cherry-picking' documents in favour of their argument. It is therefore important to explicitly describe the selection process and criteria; how it validates the data material (Bowen, 2009). In our case, we have deliberately selected strategies from large stakeholders that dominate the sustainability discourse and that therefore potentially influence policy on a large scale. We do, however, acknowledge that there are other actors and individuals withing the examined organisations that have differing perspectives from the dominating ones. Furthermore, though the selection criterion was relevance for the Norwegian context, several of the industry organisations and brands operate on a global scale, which suggests that the findings are valid on a larger scale than in the Norwegian/European context.

Policy in the textile area is changing rapidly. The results from this analysis are limited to the textile strategies as they were formulated and publicly available during the analysis period, January-June 2022. At the time of the analysis, TE had not yet published their annual "Preferred Fibers" report. We did, however, have access to the recordings of their conference from November 2021, which was, at the time of the analysis, the most recent presentation of their strategy. Their updated strategy was, however, released before this report was finalised. Its examination, as stated in the Addendum, shows the same strategy as the conference recordings.

3.4.1 Scoring and analysis results

We experienced that it was harder to respond unambiguously *Yes* or *No* to the questions than we had imagined. This is, among other things, due to the fact that, while we do not see a direct connection between e.g., increasing lifetime and reducing production, the authors behind the various documents may take this link for granted. They may in other words think that they are addressing production growth, without our agreement on this. This then becomes a question of their intentions, rather than what is actually stated in the strategies. We have hence analysed text and speech as it has been formulated. The authors may have thought and meant otherwise.

Our aim was to understand whether there was a tendency towards one position or other within different stakeholder groups. We, therefore, scored the answers for each of the 4 research questions detailed above in section 3, for each strategy, and calculated an average score. This gave an overall impression of how each stakeholder group positions themselves in addressing each question. The parameters for delimiting between *Yes*, *Indirectly/To some extent* and *No* responses are also detailed in section 3. For a *Yes*, the strategy received a 100% score, for *Indirectly/To some extent* it received 50% and for *No,* 0%, indicating the degree to which each strategy addressed the question.

As an example, for RQ1A, the results for the 5 public policy strategy documents were three times *Indirectly/To some extent (= 50%)* and two times *Yes (=100%),* resulting in an average score of 70% for the stakeholder group. The details of these calculations can be found in Appendix B: Detailed results of analyses and scoring calculations.

The results of the analysis of each strategy are not weighted according to the importance of the strategy or its authors. However, there are few examples of strategies from each stakeholder group that differ greatly in their positions related to the different questions we have asked.

4 Results and discussion

We will first give an overview of the results from the analysis and then present detailed results for each research question followed by a discussion of these results. In total 12 strategies were analysed: five strategies from public policymakers; four strategies from industry organisations and three strategies from brands/businesses.

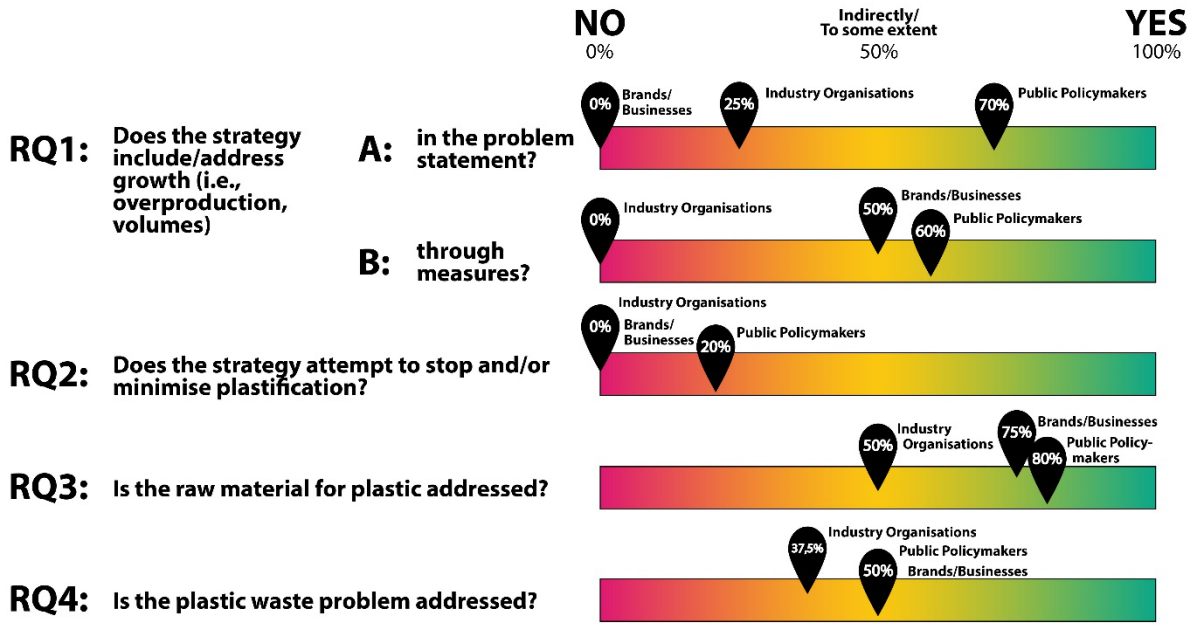

Figure 4-1 Overview of analysis results: average score per stakeholder group (N=12).

Figure 4-1 shows the overall results of the analysis. The simple answer to our over-arching question "are the stakeholders now addressing the 'elephant in the room'?" is *No*. In general, the strategies do not address production growth and plastification. Nonetheless, we do see a systematic difference between the three stakeholder groups. The problematic aspects of production growth are included in the public policies, but not in the brand/business strategies, and the industry organisations score in between the two. If, however, we look at the raw material for plastics and plastic waste, the tendency differs: here the brands and public policymakers score higher than industry organisations. The most interesting findings are still related to reduction in the use of synthetic fibres – the plastification. This is the question that receives the overall lowest scores. Neither the industry nor the industry organisations explicitly include the issue of plastification in their strategies. But more notably, the majority of the public policy strategies do not discuss minimising the use of plastic for clothing and textiles, whereas reduction is a topic that is becoming more and more present in plastic strategies in more general terms (Conti et al., 2021; EC, 2019), in line with rising awareness of the plastic related problems.

In the next chapter, we will examine these findings in detail. We will first show to what extent the strategies address our questions. Afterwards, we will show which main themes appear when the different questions are discussed.

4.1 RQ1A: Growth as a problem

Figure 4-2 shows the responses to research question 1A. The 5 public policy strategies have received an average score of 70% as 3 of these strategies address the question partly and 2 completely. The

industry organisations, however, receive an average score of only 25%. Here two strategies do not address this at all, whereas 2 do it to some extent. None of the brands/businesses includes production growth as a problem. The average score for the brands is therefore 0%.

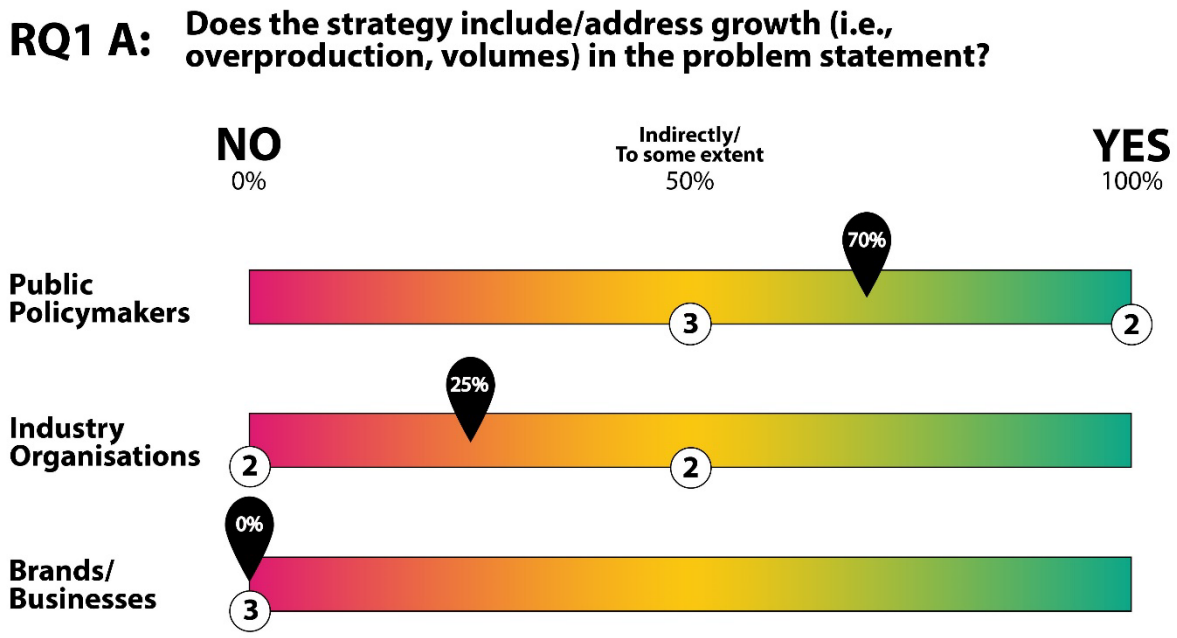

Figure 4-2 Results RQ1A: average score and number of responses per stakeholder group (N=12).

The first question we asked was: "*Does the strategy include/address growth (i.e., overproduction or quantities)?*" The growth, that more clothes are continually being produced globally is, as we have discussed in the Introduction an important reason why the efforts to reduce impacts have shown so few results so far.

Only two strategies get a *Yes* to this question, the Danish along with the EU strategy. The Danish strategy includes this in its "challenge" for textiles:

"Linear thinking has created the perception of customers as a bottleneck in the green transition (GFA/Boston Consulting Group, 2017), but it might be the sector itself that is overproducing without investigating who its customers really are and what they need. A 75% reduction in new products is needed to reach climate goals (Fletcher & Tham, 2019). The use phase has decreased by 36% compared to 15 years ago (Ellen MacArthur Foundation, 2017), but a UK study shows that extending the use of T-shirts by 10% would yield emission savings of approx. 100 kt of CO_2-eq and 2 kt of textile waste per annum in the UK alone (WRAP, 2012). [sic]" (Aalborg University et al., 2021, p. 16). The goal of the Danish strategy is also to achieve a "20% reduction in DK consumption of textiles" by 2030, and further that by "2050 there should be a 60% reduction in production from Danish textile companies compared to today's level" (Aalborg University et al., 2021).

In the EU strategy, growth is also stated as a problem, but not as clearly: "As clothing comprises the largest share of EU textile consumption (81%), the trends of using garments for ever shorter periods before throwing them away contribute the most to unsustainable patterns of overproduction and overconsumption". In the goals for 2030, nothing is included that directly discusses reduction other than the statement that "Fast fashion is out of fashion" (EC, 2022, p. 2).

The responses to the questions show a pattern: some strategies by public policymakers include growth as a problem, whereas businesses and industry organisations are more hesitant to address this.

4.1.1 How production growth is discussed

In most of the strategy documents production growth is not directly discussed as a problem, rather economic growth is something that needs to be decoupled from the environmental effects and/or resource use, in other words, the connection between production growth and economic growth is not discussed. In some cases, economic growth is seen as a premise for reducing environmental footprints. Our analysis illuminates that there are several nuances in how growth is generally addressed. We found four key themes, detailed in Table 4-1, that will be discussed in the following.

Table 4-1 Key themes concerning the problem of growth.

Identified theme	Example (our emphasis in bold)	Stakeholder group
A premise for sustainability	*We **grow our business in a responsible and resilient way** that will contribute to both positive impact in the world around us and **long-term value with financial growth and profitability*** (H&M Group, 2022a, p. 4)	Brand/ Business
	*Our ambition is to **enable more people to choose a sustainable lifestyle** and the group aims to create a **positive correlation between profitable growth and a greater positive impact on customers**, colleagues, business partners, their employees and other stakeholders while respecting planetary boundaries* (H&M Group, 2022a, p. 34).	Brand/ Business
	*In 2021, the Material Change Index for the first time presented **50% growth in the use of preferred materials**, resulting in a **saving** of 1.9 million Tonnes of CO2eq emissions (15%) **when compared to a fully conventional materials** portfolio.* (GFA, 2022, p. 75)	Industry Organisation
	*If the fashion and textile industry is to help protect the 1.5°C pathway, it must reduce its GHG emissions by 45% by 2030. This requires urgent action to drive three key levers forward: **accelerating the adoption of preferred fibers and raw materials, funding material innovation, and rethinking growth.*** (GFA, 2022, p. 62)	Industry Organisation
	*very **hard to address, without hurting poor workers** in the Global South* (Scaling Solutions, TE, 2021a)	Industry Organisation
Consumption and production are the same	*The **production and consumption of textile products continue to grow** and so does their impact on climate, on water and energy consumption and the environment**. Global textiles production almost doubled between 2000 and 2015**, and the **consumption of clothing and footwear is expected to increase by 63% by 2030**, from 62 million tonnes now to 102 million tonnes in 2030* (Aalborg University et al., 2021, p. 3).	Public Policymaker
	*This [low raw material and production costs] **can lead to overconsumption of in particular low cost textiles** that are not suited for repair and therefore have an unnecessarily large environmental footprint* [45] (Departementene, 2021a, p. 47).	Public Policymaker
Fast fashion as a driver	*The **fast-fashion segment** (low-quality and low-cost products mainly sold through chains, supermarkets etc.) **has pushed for more volume and shorter use spans** […].* (Aalborg University et al., 2021, p. 3)	Public Policymaker
	*[…] the **trends of using garments for ever shorter periods** before throwing them away contribute the most to **unsustainable patterns of overproduction and overconsumption**. Such trends have become known as **fast fashion**, enticing*	Public Policymaker

[45] Original text in Norwegian: “Dette kan føre til overforbruk av særleg lågpristekstilar, som er lite eigna for å bli reparerte og difor har eit unødig stort miljøfotavtrykk.”

	consumers to keep on buying clothing of inferior quality and lower price, produced rapidly in response to the latest trends. (EC, 2022, p. 2)	
Aiming for decoupling	*We need to* ***learn how to grow*** *BESTSELLER* ***without increasing our GHG emissions*** (Bestseller, 2022b, p. 12)	Brand/ Business
	Decoupling value from production growth and resource exploitation *is a major challenge for the fashion sector*. (GFA, 2022, p. 96)	Industry organisation
	There is a need for ***innovation that decouples*** *textiles production and consumption* ***from the use of resources*** *with negative environmental impacts* (EEA, 2021).	Public Policymaker
	Objective 3: Decoupling of resource consumption *Consumption has to be reduced at least four-fold to be considered sustainable in absolute terms. This must be achieved through reduction in consumption and* ***a decoupling of resources used in industrial production and provision of societal services from societal growth.*** (Aalborg University et al., 2021, p. 8)	Public Policymaker

4.1.2 A premise for sustainability

The analyses show that the sustainability sensemaking that is embedded in green growth what Wiedmann et al. (2020, p. 6) would describe as a belief that "economic growth can be decoupled from environmental impacts and is necessary to provide sustainable technical solutions", is particularly visible in brand strategies and communications. Economic growth is therefore to be achieved by making sustainable products and services (new business models) more accessible and affordable to many. For example, H&M calls this 'meaningful growth', which means growing in a way that makes a difference to colleagues, customers, business and our planet. It is unclear to what extent this economic growth relies on production growth but the goal of more people accessing their "sustainable" products indicates at least some increased production.

In H&M's reports, limiting the impacts of production growth is addressed from the perspective of virgin material use and reducing this using what we would call eco-efficiency. In addition, scaling up circular business models is highlighted to reach climate goals. The H&M reports also say that conventional production cannot keep growing by stating that the new business models need to be a "*substitution of (rather than addition to) existing business models*" (H&M Group, 2022c, p. 43). However, their strategy does not substantiate the claims that the new business models have lower environmental impacts.

Slowing down growth was mentioned in other strategies. For example, The Textile Exchange Conference opened with a keynote speaker, Dr. Jason Hickel, addressing the problem of production growth: "*Any increase in efficiencies has been 'eaten up' by growth, we actually need to halve consumption*" and *"scale down through a binding agreement*". This is a clear message addressing production growth, and an interesting start to an industry conference, but in the following sessions and discussions, the topic was only to some extent addressed, in the form of lower growth rates, as 1% growth instead of 3%, or 6%, in their actual plan for a 45% reduction of Tier 4 (material production stage) impact (Recycled Polyester Round Table Summit, TE, 2021a). The reduction of impacts would therefore come from other measures than reducing production: aggressive substitution and innovation (see Figure 4-3).

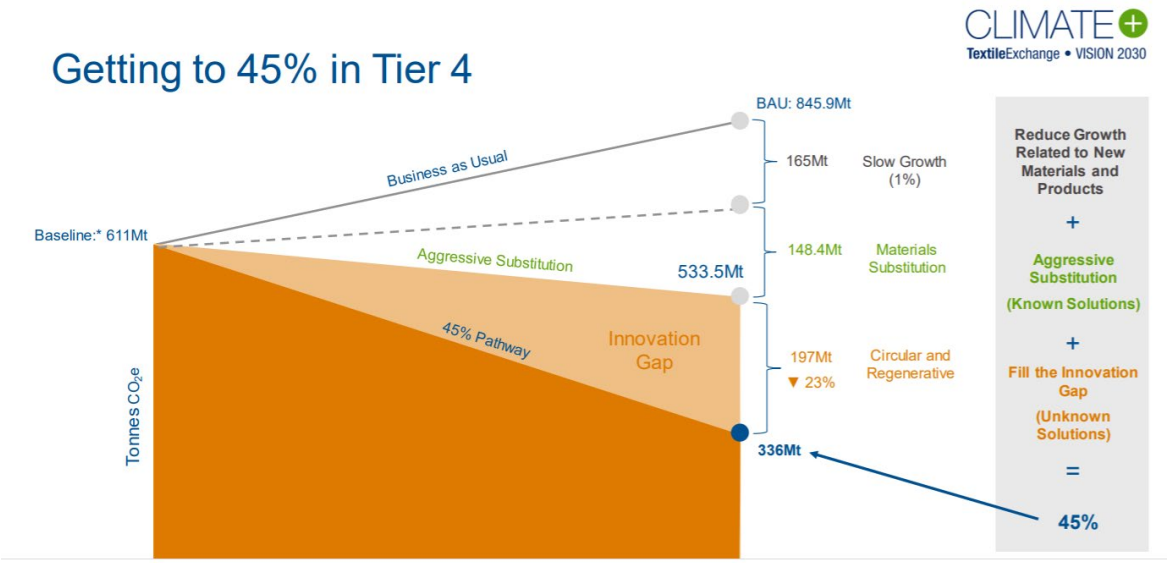

Figure 4-3 TE's CLIMATE+ strategy, growth over time according to different measures (Recycled Polyester Round Table Summit, TE, 2021a).

As also seen in Figure 4-3, TE's main strategy is aiming to grow slowly (1 %) and reduce growth related to new materials and new products. We also recognise TE's arguments in the GFA report (GFA, 2022), stated as the need to 'rethink growth', alongside innovation and a switch to 'preferred fibers' (GFA, 2022)

Finally, we see that growth as a premise for sustainability is seen from a triple-bottom-line-perspective, where, through the green growth ideology, economic growth is a given, and social dimensions also are mentioned. For example, at the Textile Exchange Conference, the argument was that economic and production growth is necessary to uphold employment for poor workers. It follows that the textile industry has to keep growing out of concern for poor textile workers in the Global South. These are arguments that can be recognised from mainstream economic theory that economic growth is the prerequisite for improving people's livelihoods (Piketty, 2014).

Our analysis confirms Payne and Mellick (2022)'s previous analysis of the textile MSIs' capacity to address production growth which concluded that they "are firmly embedded within a green-growth paradigm" that puts economic interests before environmental concerns. As a result, major sustainability initiatives in the fashion industry have economic gains rather than environmental imperatives at heart, believing that the industry can keep growing as long as decoupling happens, despite the limitations of the current sustainability strategies (see Clark, 2008; Fletcher, 2010; 2019; Gwilt et al., 2009; Henninger et al., 2016; Leslie et al., 2014). Hence, before there is a serious motivation to decrease environmental impacts, "green growth" is an excuse for eternal growth and circular economy" Fitch-Roy et al., 2020). This could be one of the reasons why, despite intense efforts from the fashion industry over the last 15 years to improve sustainability with reports, MISs, design tools, conferences, webinars etc., the environmental impacts keep growing (GFA/SAC, 2019; Palm et al., 2021; Tham, 2008).

4.1.3 Consumption and production are the same

We see in our analyses that consumption and production are juxtaposed by being mentioned alternatingly. Similarly, growth in production or consumption are mentioned alternatingly linked to growth in environmental impacts. This is illustrated for example in the EU Strategy for Circular and Sustainable Textiles, which states that "[t]he production and consumption of textile products continue to grow and so does their impact on climate, on water and energy consumption and the environment.

Global textiles production almost doubled between 2000 and 2015, and the consumption of clothing and footwear is expected to increase by 63% by 2030, from 62 million tonnes now to 102 million tonnes in 2030." (EC, 2022, p. 1).

Consumption is used both for resources used in production and for buying new textiles.

The "National strategy for a green and circular economy" [46] mentions consumption as a problem by saying that:

> *"[t]his [not integrating environmental costs etc. in pricing] can lead to overconsumption of in particular low cost textiles that are not suited for repair and therefore have an unnecessarily large environmental footprint [our translation]"* [47] (Departementene, 2021a, p. 47).

We have therefore concluded that this strategy only partially addresses growth. Here it is the consumption and not the production that is addressed as a problem. When the Norwegian strategy does not view the growth in production as a problem, is this potentially because the production happens outside the Norwegian borders? Norway does not use a consumption-based carbon accounting system where these environmental impacts would stand out.

In a society like Norway, with little domestic production, it is only natural that it is the consumption in the form of the purchase of new goods[48] and therefore the waste that is the most visible. At the same time, it is the production that determines the environmental impacts. The products have the same production impact regardless of being sold or not. It is therefore important to elevate the discussion of how to achieve a reduction in a supply-driven supply chain where the surplus of goods and extensive use of price reduction is a natural consequence. In Norway, a country with little production, a reduction in production might be seen as a reduction in imports to Norway, private imports through the likes of eBay and Shein included.

4.1.4 Fast fashion as a driver

Several strategies other than those of brands/businesses explain the growth by referring to fast fashion similarly to the Danish strategy: "The fast-fashion segment (low-quality and low-cost products mainly sold through chains, supermarkets etc.) has pushed for more volume and shorter use spans." (Aalborg University et al., 2021, p. 3).
When fast fashion or "low-quality" products are given the blame for the growth it is unclear what exactly "low-quality" means. In the EEA report the connection between growth and the growth in synthetic fibres is made:

> "*The global consumption of synthetic fibres increased from a few thousand tonnes in 1940 to more than 60 million tonnes in 2018, and continues to rise. Since the late 90's polyester has surpassed cotton as the most used fibre. […] Synthetic fibres are inexpensive and versatile,*

[46] Nasjonal strategi for ein grøn, sirkulær økonomi.

[47] Original text in Norwegian: "Dette [manglande prissetjing av mellom anna miljøproblema i tekstilproduksjonen i mange lågkostland] kan føre til overforbruk av særleg lågpristekstilar, som er lite eigna for å bli reparerte og difor har eit unødig stort miljøfotavtrykk."

[48] This could also be called turnover of clothes, or clothing sales. Here we would like to point out that as consumption researchers, we define consumption as acquisition, use and disposal, spanning the whole consumer journey of the product, whichever way the consumer came to be in possession of it.

> *allowing the production of cheap fast fashion as well as high-performance textiles for durable clothing"* (EEA, 2021, p. 5).

In the short briefing about the report, they also touch upon how volume is an important factor when the environmental impacts of different fibres are discussed. "It is important to keep in mind that impacts also depend on the production volumes of the fibres and fabrics. For example, while the manufacturing of polyester uses less energy than nylon, its annual production rate is much higher resulting in higher overall impacts" (EEA, 2021). Here the example concerns two synthetic fibres, but considering the production volumes and therefore aggregated impacts is also very relevant for the discussion around the environmental impacts of natural fibres compared to synthetic fibres given that we, as we have demonstrated in the introduction, have had a rapid growth in synthetic fibre production, whereas the natural fibre production has remained fairly stable.

4.1.5 Aiming for decoupling

The core belief behind green growth is that absolute decoupling is possible (as explained by e.g., Hickel & Kallis, 2020). As discussed in section 2.10 Decoupling, the empirical evidence that this is possible is lacking (Haberl et al., 2020). This perspective and the emphasis on it is still found among public policymakers, industry organisations and brands/businesses alike, as the quotes in Table 4-1 exemplify.

The GFA states that

> *"[b]y moving to circular business models, the industry will be able to decouple economic growth from the use of natural resources, taking advantage of increasing end user demand for new ways to access fashion. are decoupled from production and finite resource consumption*" (GFA, 2022, p. 3).

This further links the industry's understanding of a circular economy to a belief in decoupling. When MSIs like the GFA promote material decoupling as a solution through the implementation of a circular economy, it is a continuation and renaming of the previous eco-efficiency measures that focus on reducing chemical, material and energy consumption in production, and specifically per unit consumed (Figge et al., 2014), rather than production volumes, that have been highly criticised (Fletcher & Tham, 2019). This critique builds on the limitation of eco-efficiency measures due to the rebound effect, which explains how efficiency measures, e.g., energy savings, in the end increase overall consumption rather than decrease it (Berkhout et al., 2000). This major obstacle to decoupling was theorised already in 1865 as Jevon's paradox, stating that "greater efficiency in the use of a resource can paradoxically lead to greater consumption of it" (Throne-Holst et al., 2007; Zink & Geyer, 2017). An empirical example of the results of the rebound effect in the fashion industry is Payne and Mellick (2022)'s analysis of the Kering Group's reports, placing the environmental impact of their production alongside their revenue. They found that some decoupling of environmental impacts from revenue growth is possible through deploying cleaner processes, but this has a clear limitation as the total environmental impacts are still growing, due to growing production.

The Danish public policymakers also use this terminology in their "Objective 3: Decoupling of resource consumption", but add the next "Objective 4: No surplus production" (Aalborg University et al., 2021, p. 8). This is in line with the critique levered at this popular strategy practised by corporations for its limited ability to lower resource consumption and emissions. Therefore, while eco-efficiency improvements are important from a business and environmental perspective, they need to be coupled with a more radical agenda to produce the kind of change necessary (Göpel, 2016).

To summarise the above, the elephant (growth) is still a difficult topic. The development of the industry and its interests is prioritized and reduction is discussed mainly as eco-efficiency and decoupling. It is promising that the two most ambitious plans have an understanding of growth in production as a problem and that several point to the business model of fast fashion as a driver for growth.

4.2 RQ1B Measures against growth

The next question we have asked is directed at whether the measures discussed and proposed in the strategies address production growth and reduction in volumes. Figure 4-4 shows the average score for each stakeholder group and the number of strategies from each group that got each response.

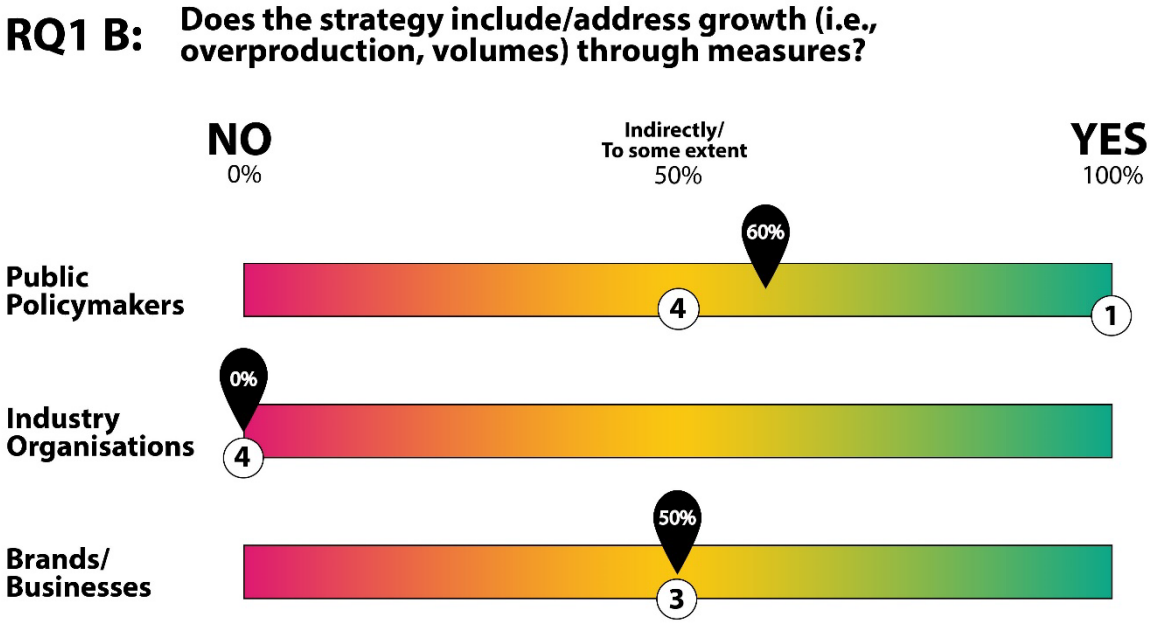

Figure 4-4 Results RQ1B: average score and number of responses per stakeholder group (N=12).

This part of the question is more difficult than the first one. The strategies might be more clear on the goals, than on how to reach them. There is also a lack of knowledge of the effects of different measures (Maldini & Balkenende, 2017). We have found that only one strategy, the Danish roadmap, does this in such a clear way that we have answered *Yes*. Several of the measures are directed at improving products, without documenting or discussing the assumption that this will lead to a reduction in production. The Danish strategy, in addition, suggests “Increasing local production with more production on demand” (Aalborg University et al., 2021, p. 16), addressing not only reduction but also the production system. Four of the public policy strategies have received the medium score and also brand/business place themselves at *To some extent*. Industry organisations, on the other hand, do not address how overproduction can be reduced. Of these, TE comes closest to addressing this, by discussing “Producing Less”, explained as “making fewer new products” through materials efficiency/elimination of waste, durable products and circular products (Recycled Polyester Round Table Summit, TE, 2021a).

4.2.1 Key measures against overproduction

Altogether, the strategies present unclear reasoning around how the reduction is practically going to happen if they even state this as a goal. Where this perspective is included, it is primarily through three, sometimes four perspectives:

1. Materials efficiency/elimination of waste
2. Durable products
3. Circular products
4. Consumption

The first three are for example used in TE's Climate+ strategy to achieve the goal of slower growth and are in their visuals summarises under 'producing less' (see Figure 4-5).

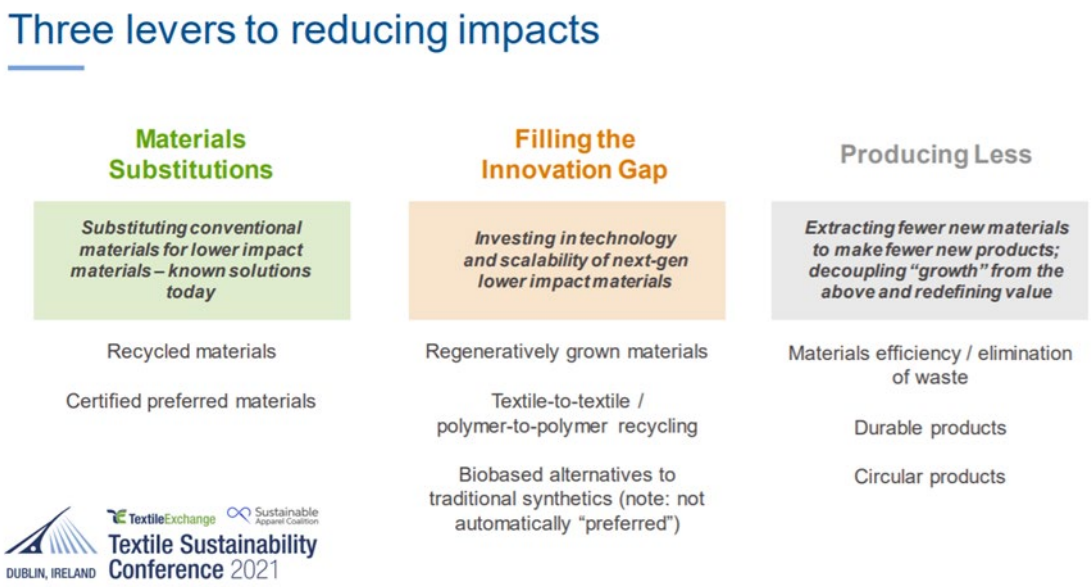

Figure 4-5 TE's Climate+ strategy for reducing impacts in Tier 4. (Recycled Polyester Round Table Summit, TE, 2021a).

The fourth type of measure, directed at consumption, can be found both in the Danish and in the EU strategy, and concerns using the information to educate/encourage the consumer to consume less. Altogether, the four types of measures represent different ways of attempting to decouple resource use and environmental impacts from growth, as we have shown in section 4.1.5 Aiming for decoupling, in the belief that this will eventually ensure the needed reduction in impacts.

The four recurring measures can be exemplified and summarised like this (see Table 4-2 Key themes concerning measures against growth.):

Table 4-2 Key themes concerning measures against growth.

Key theme	Example (our emphasis in bold)	Stakeholder group
Material efficiency/ elimination of waste in production	*To reach our North star and achieve the ambitious goals we have set for ourselves, we need to increase our contributions to – and investments in – innovation, as well as* ***take concrete steps to sever the connection between business growth and resource consumption****. This is far from an easy undertaking and it demands collective action in all areas from* ***raw materials to end consumer and beyond. Business aspirations can no longer come at the planet's expens****e (Bestseller, 2022b, p. 4).*	Brand/ Business
	This involves a **dramatic increase in terms of resource efficiency***, in particular within production and manufacturing but also with respect to consumption patterns. Value creation needs to be absolutely decoupled from resource consumption****, and the utilisation rate of products and infrastructure maximized*** (Aalborg University et al., 2021, p. 8)	Public Policymaker
Durable products	*By 2030 textile products placed on the EU market are* ***long-lived and recyclable****, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment.* ***Consumers benefit longer from high quality affordable textiles****, fast fashion is out of fashion, and economically profitable re-use and repair services are widely available.* (EC, 2022, p. 2)	Public Policymaker
	Based on risk assessment and customer expectations we ***aim to elevate the durability and quality of our products*** *to minimize the risk of claims and potential waste* (Varner Group, 2022, p. 86).	Brand/ Business
	Our products must be used longer (Bestseller, 2022b, p. 7)	Brand/ Business
	*Develop industrial processes supporting sustainable and circular product/production designs to enable low waste****, long service-life, repairability, reuse and recycling at the highest possible level*** (Aalborg University et al., 2021, p. 11).	Public Policymaker
	The ***mandatory design requirements*** *for sustainable and circular textiles that will be introduced under the Ecodesign for Sustainable Products Regulation* ***will extend the lifetime of clothing*** *and, together with new rules on extended producer responsibility under the Waste Framework Directive, will become the steppingstone to a new paradigm of attractive alternatives to fast changing fashion trends. (EC, 2022, p. 8)*	Public Policymaker
Circular product	*By 2030 […] In a competitive, resilient, and innovative textiles sector,* ***producers take responsibility*** *for their products along the value chain,* ***including when they become waste****. The circular textiles ecosystem is thriving, driven by sufficient capacities for* ***innovative fibre-to-fibre recycling****, while the incineration and landfilling of textiles is reduced to the minimum (EC, 2022, pp. 2-3).*	Public Policymaker
	Our products must *[…]* ***be reusable and recyclable****, and we must continuously work on disconnecting our financial growth from resource consumption* (Bestseller, 2022b, p. 7)	Brand/ Business
	Reducing dependency on such limited resources and instead developing new sources creates business advantages and reduces impacts on the planet. ***Moving from virgin materials*** *with a high environmental impact* ***to recycled, regenerated and more sustainably sourced*** *ones is* ***therefore important for our long-term sustainable growth*** (H&M Group, 2022a, p. 30)	Brand/ Business
	There is a need to develop ***textile-to-textile sorting and recycling infrastructure*** *that 1) Can be* ***upscaled to industrial level*** *to take a large part of the textile waste generated in Denmark and 2) Can provide economic value to collectors and recyclers of textile waste - one key challenge in developing fibre-to fibre recycling is that very little information exists on what the non-reusable textile waste will comprise of in terms of material composition.* (Aalborg University et al., 2021, p. 19)	Public Policymaker
	BY 2050 […] 60-80% ***increased recyclability of*** *products […]* ***A closed loop system for textile recycling and 1:1 fiber recover*** (Aalborg University et al., 2021, pp. 22-23).	Public Policymaker
	We continued to ***examine the possibility of recycling post-consumer polyester textiles using scalable, automated sorting techniques and chemical recycling****.* (H&M Group, 2022c, p. 34)	Brand/ Business

	*By offering **a more circular customer journey** we support customers with services throughout their garment's entire lifespan: from first-hand to second-hand, from a second chance to a second life. Our **circular services include re-sell, remake, repairs, garment rental**, and **garment collecting for textile recycling** and more (H&M Group, 2022a, p. 24).*	Brand/ Business
Consumption	*The government will examine **how the textile industry and consumers can be challenged to reduce consumption** and environmental impacts from textiles* [our translation]" [49] (Departementene, 2021a, p. 47).	Public Policymaker
	***Increased user demand for circular models** will enable a circular economy to become ever more economical, setting in motion a virtuous cycle. Brands should portray circular business models as attractive, purpose-driven propositions that enable end-users to combine self-care with care for the environment and for the people who work in the fashion industry.[…] Generally, brands should provide users with **accurate, reliable on-product information and storytelling** to support sustainable choices and encourage end-users to take good care of the garments they buy to keep products in use longer. Moreover, brands should engage users to buy clothes made from recycled materials and feed clothes back into the system for recycling or repurposing at the end of their use life*. (GFA, 2022, p. 96).	Industry Organisation
	*By offering **a more circular customer journey** we support customers with services throughout their garment's entire lifespan: from first-hand to second-hand, from a second chance to a second life. Our **circular services include re-sell, remake, repairs, garment rental**, and **garment collecting for textile recycling** and more (H&M Group, 2022a, p. 24).*	Brand/ Business
	*Five tips for more sustainable **clothing consumption**:* • *Buy consciously instead of carelessly! Appreciate clothing!* • *Buy durable, high-quality clothing* • *Pay attention to sustainability seals or get information from the provider!* • *Repair instead of bin - have damage repaired, if possible* • *Use second-hand and clothing exchange. Rent clothing for special occasions [our translation*] [50] (Textil+mode, 2021, p. 39)	Public Policymaker

4.2.2 Materials efficiency/elimination of waste in production

The discussions of measures in the strategies are vague. This might be because they don't go into detail about how the strategies' goals can be met. When measures are mentioned, it is mainly based on a belief in decoupling and therefore close to the previous discussion, where innovation and technology are central factors (see section 4.1.5). This is equally the case with the Danish strategy, which mentioned specific reduction targets. The primary concern is lowering consumption, meaning the consumption of materials and resources by the industry as well as by consumers.

> *"Consumption has to be reduced at least four-fold to be considered sustainable in absolute terms. This must be achieved through reduction in consumption and a decoupling of resources used in industrial production and provision of societal services from societal growth. This involves a dramatic increase in terms of resource efficiency, in particular within production and manufacturing but also with respect to consumption patterns. Value creation needs to be absolutely decoupled from resource consumption, and the utilisation rate of products and infrastructure maximized. Furthermore, reductions in unnecessary consumption of resources are a must."* (Aalborg University et al., 2021, p. 8)

[49] Original text: "Regjeringa vil vurdere korleis tekstilbransjen og forbrukarane kan utfordrast til å redusere forbruk og miljøpåverknad frå tekstilar".

[50] Original text: "Fünf Tipps für einen nachhaltigeren Kleidungskonsum: Bewusst kaufen, statt unbedacht zugreifen! Kleidung wertschätzen!; Langlebige, hochwertige Kleidung kaufen; Auf Nachhaltigkeitssiegel achten oder sich beim Anbieter informieren!; Reparatur statt Tonne - Schäden reparieren lassen, falls möglich; Second-Hand und Kleidertausch nutzen. Kleidung für besondere Anlässe mieten."

Hence it seems that the industry is to be made more efficient and use fewer resources to produce the same amounts. Resource efficiency is the most important factor, which, according to TE should be related to new materials and products (Recycled Polyester Round Table Summit, TE, 2021a), indicating that using recycled materials is important, but also that changes in consumption, such as re-use are a part of the solution. It is unclear whether the number of produced clothes is also going to be reduced. This is probably what they mean by "maximized utilisation rate" and reducing "unnecessary consumption". The formulations are, however, on a level of goals more than how to reach them. More concrete measures are touched upon in the following themes.

4.2.3 Durable products

According to the analysed strategies, regardless of type, the changes in consumption are to be achieved by utilizing the garments longer and increasing the possibilities for repair, reuse and/or redesign. These are the usual circular economy strategies that are primarily directed toward products, and the associated new business models and activities across the value chain such as "Develop[ing] industrial processes supporting sustainable and circular product/production designs to enable low waste, long service-life, repairability, reuse and recycling at the highest possible level" in the Danish strategy (Aalborg University et al., 2021, p. 11).

More durable products are seen as a way to reduce impacts. A good example is from the EU strategy, which is summarised with these words:

> "*By 2030 textile products placed on the EU market are long-lived and recyclable, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment. Consumers benefit longer from high quality affordable textiles, fast fashion is out of fashion, and economically profitable re-use and repair services are widely available*" (EC, 2022, p. 2).
>
> "*The mandatory design requirements for sustainable and circular textiles that will be introduced under the Ecodesign for Sustainable Products Regulation will extend the lifetime of clothing and, together with new rules on extended producer responsibility under the Waste Framework Directive, will become the stepping stone to a new paradigm of attractive alternatives to fast changing fashion trends*" (EC, 2022, p. 8).

The issue with both quotes is that they do not explain how increased product durability will influence the quantity that is being produced.

In Varner's strategy, we see that the same measures, longer lifetimes, better products, can be desirable from a business point of view for other reasons than environmental: "Based on risk assessment and customer expectations we aim to elevate the durability and quality of our products to minimize the risk of claims and potential waste" (Varner Group, 2022, p. 86).

A common factor for the quotes is that this important assumed connection is not documented, commented on or substantiated. Products that last longer, can, as we discussed in the introduction, have many effects but they do not directly influence the volumes produced. As Heidenstrøm et al. (2021) point out, for lifetime extension to have this effect, they have to slow down the replacement rate of products which in turn has to lead to lower production volumes. While longer lifetimes are relevant in a sustainability perspective for some products such as large household appliances, this link is less strong for clothing. Maldini (2019, p. 520) pointed out that this confusion "leads to regarding product lifetimes as if they [the product lifetimes] had environmental impact, when it is clothing production that poses environmental challenges". She argues that one political measure will not necessarily affect both volume and speed.

If the industry and public policymakers desire a continued increase in volume, the clothes should be made for a shorter lifetime, meaning that they should be less durable. This has already been discussed by Fletcher (2008). Such products exist in the form of paper tissues and napkins and of course widely in the health care sector. If we increase the technical strength of the products at the same time as production increases, clothing utilisation goes down. Ever more of the products' potential use time is not exploited and the environmental impacts increase. Working for increased lifetime and increased production at the same time will mean that an increasing amount of clothing will have to be destroyed, a development that very many seem to be against,[51] and some want to make illegal (Rödig et al., 2021).

4.2.4 Circular products

The term 'circular products' is used by TE, as we have seen, but also by many more. This includes the elements that we have discussed separately, such as durability and several users, but above all it is recycling that will ensure the 'circularity', as stated in e.g., the EU strategy:

> "*By 2030 […] In a competitive, resilient and innovative textiles sector, producers take responsibility for their products along the value chain, including when they become waste. The circular textiles ecosystem is thriving, driven by sufficient capacities for innovative fibre-to-fibre recycling, while the incineration and landfilling of textiles is reduced to the minimum*" (EC, 2022, pp. 2-3).

We see that the same circular economy strategies that are directed at improving products and not the quantity of them are mentioned. Also in the Danish strategy recycling is an important factor to achieve circularity:

> *"There is a need to develop textile-to-textile sorting and recycling infrastructure that 1) Can be upscaled to industrial level to take a large part of the textile waste generated in Denmark and 2) Can provide economic value to collectors and recyclers of textile waste - one key challenge in developing fibre-to fibre recycling is that very little information exists on what the non-reusable textile waste will comprise of in terms of material composition."* (Aalborg University et al., 2021, p. 19)

The strategy also has an explicit goal of "60-80% increased recyclability of products" and "A closed loop system for textile recycling and 1:1 fiber recovery" by 2050 (Aalborg University et al., 2021, pp. 22-23). The same features as in the strategies from public policymakers are mentioned in the industry's own strategies. Bestseller has noted it in their Design Guide – the idea of slowing down consumption is embedded in the design for durability and design for longer use principles with the words: "*Our products must be used longer, be reusable and recyclable, and we must continuously work on disconnecting our financial growth from resource consumption*" (Bestseller, 2022a, p. 7).

H&M follow the same logic by saying:

> "*We're scaling sourcing of recycled materials such as cotton, polyester, wool, MMC fibres, nylon, plastic, down, feathers, cashmere and silver. We prioritise recycling textiles into new textiles, in particular by expanding sourcing of fibres from post- consumer waste [our emphasis]*" (H&M Group, 2022b).

This is further underlined by H&M's efforts during the reporting year:

> "*We continued to examine the possibility of recycling post-consumer polyester textiles using scalable, automated sorting techniques and chemical recycling*" (H&M Group, 2022c, p. 34)

[51] NGO's in the EU are advocating for a ban on destruction of unsold goods. Read about it here.

TE's strategy for Tier 4 is exemplary in the way it clarifies what they believe is the potential and the goal. Again, we see that 'decoupling' constitutes the bulk of the potential for reduction of the environmental impacts with two main measures at the centre: "material substitution" and "filling the innovation gap", which both have recycling as their core measure. This claim is made despite decoupling not fulfilling its environmental promises, whether we examine it theoretically, through the waste hierarchy lens, or concretely, using studies that have been done (Jackson, 2009; Jackson & Victor, 2019; Wälti, 2012).

4.2.5 Consumption

We have already seen that the Danish strategy mentions changes in consumption patterns in connection to its reduction goal, for example by saying "but also with respect to consumption patterns" (Aalborg University et al., 2021, p. 8). Following that train of thought, it also comprises consumer involvement and education. The same is valid for the Norwegian strategy, which states that "the government will examine how the textile industry and consumers can be challenged to reduce consumption and environmental impacts from textiles [our translation]" [52] (Departementene, 2021a, p. 47). It does not, however, say how and when this is to be done. It seems that the changes in consumption patterns will primarily be a result of better products and new business models, not for instance, consumer laws, rights and protections. In other words, the primary changes will be in the industry, and the changes in consumption will come from these.

At the same time, we observe headlines that seem to give the consumers a position as drivers for change, like in the GFA report: "User engagement as a catalyst of change" (GFA, 2022, p. 96). But it is not in the form of reduced consumption directly, rather the paragraph discusses how to "create increased user demand for circular models" (GFA, 2022, p. 96). Though both longer use times and care are mentioned, nothing is said about the consumer buying fewer clothes.

The same logic is found in the German industry association's strategy where they recommend buying clothes more consciously, to appreciate the value, buying more durable and higher quality, as well as mending, the use of second-hand clothing, swapping and leasing (textil+mode, 2021).

The uncertainty of these propositions is highlighted in a literature review of publications on design strategies, done by Maldini and Balkenende (2017). The effect of these strategies on the volumes consumers buy, or production volumes has been examined empirically by neither scholars nor businesses. Later wardrobe studies by Maldini et al. (2019) found that personalised garments (made to order, to measure etc.) did not have longer lifetimes nor were they used more than ready-made garments in the wardrobe. Hence, it could be argued that stating that design strategies such as production on demand, service-based fashion systems, multifunctional, transformable and modular garments, design for slowness and longevity, repair and user involvement in design and/or manufacture have an impact on production volumes is a theory without empirical evidence – hence merely a hypothesis.

4.3 RQ2 Minimizing plastification

As explained in the Introduction, we see a clear connection between plastification and the growth in the production of textile fibres. The increased use of fossil raw materials has enabled growth and continued

[52] Original text: "regjeringa vil […] vurdere korleis tekstilbransjen og forbrukarane kan utfordrast til å redusere forbruk og miljøpåverknad frå tekstilar".

growth is dependent on continued plastification. The plastification also comprises after treatments with fossil-derived materials in conventional dyeing and finishing techniques, but we have limited the discussion to fibres and asked the following question: Does the measure attempt to stop and/or minimise plastification? By plastification, we understand an increase (in %) in the share of synthetic fibres compared to other fibres.

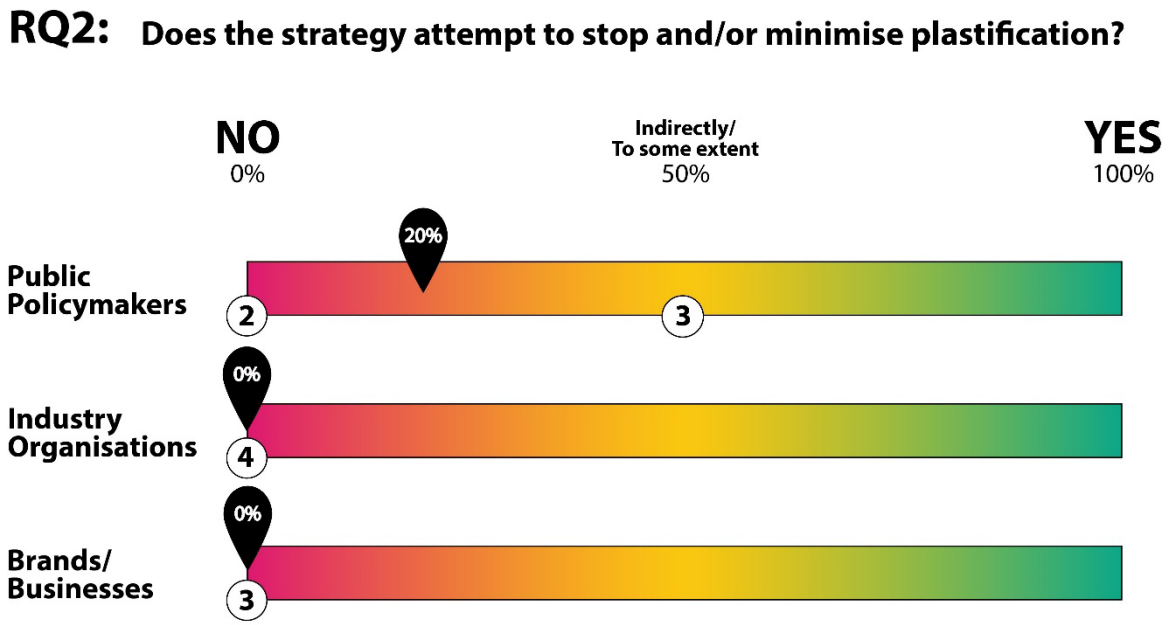

Figure 4-6 Results RQ2: average score and number of responses per stakeholder group. (N=12)

As Figure 4-6 shows, in answer to our question, we have given none of the strategies a *Yes*. In other words, none of them has a clear goal to halt or reduce the ongoing plastification. Admittedly, some public policy strategies can be said to indirectly include such a goal, namely those from the EU, DK and the EEA. They may have goals of reducing the use of fossil raw materials in production by replacing them with other raw materials, which we will discuss later. We do, however, not see bioplastics as a way to reduce plastification, though it may reduce the use of fossil raw materials (if not just a biodegradable version of a fossil fibre: see 2.5 Synthetic textiles). This is surprising all the while reduction in plastic usage is an explicit goal of strategies concerning other plastics than those in textile form (Conti et al., 2021).

4.3.1 Key themes concerning plastification

In Table 4-3, the key themes concerning plastification are exemplified. In the following, we will look closer at how they discuss this and will start with the official strategies before we examine how the businesses discuss a potential decrease in the use of plastic.

Table 4-3 Key themes concerning plastification.

Identified theme	Example (or emphasis in bold)	Stakeholder group
Fossil-free	*As fast fashion is linked to the growing use of fossil-fuel based synthetic fibres,* ***shifting to more sustainable business models will reduce both the dependency of clothing producers on fossil fuels*** *and their impacts on climate change and microplastic pollution. (EC, 2022, p. 8)*	Public Policymaker
	by 2050 […] **40% of the Danish textile sector should be fossil-free.** (Aalborg University et al., 2021, p. 23).	Public Policymaker
	[…] reducing industry's dependence on fossil fuels with ***bio-based innovation in the textiles sector,*** *through the Circular Bio-based Europe Joint Undertaking, which aims to boost the development of new types of textile fibres (EC, 2022, p. 4).*	Public Policymaker
	obtain ***bio-plastics substituting of 10-30% of textile fibres and packaging*** *(Aalborg University et al., 2021, p. 22).*	Public Policymaker
Fibres are not comparable	*While a shift to natural or biobased fibres may reduce the impacts from the use of fossil fuel resources and greenhouse gas emissions,* ***these fibres do not always have equivalent properties and are not necessarily more sustainable over the entire life cycle*** *(EEA, 2021, p. 41).*	Public Policymaker
" Preferred Fibers"	*The sourcing and production of fibres and materials used by the fashion industry puts substantial pressure on natural resources and comes with implications for water, energy, and land use, as well as emissions and waste.* ***At least two thirds of a brand's environmental footprint can be attributed to its choice of raw materials*** (GFA, 2022, p. 62) .	Industry Organisation
	Working on emission reduction: *We now have a primary overview of major hotspots within our emission footprint. Based on the overview, we have drafted our reduction roadmap in 2021. Strengthening the uptake of* ***preferred fibres with lower footprint*** (Varner Group, 2022, p. 103)	Brand/ Business

4.3.2 Fossil-free

The dependence on fossil materials is mentioned in connection with the problem of 'fast fashion' that the EU Strategy is aiming to address: "*Moreover, the growing demand for textiles is fuelling the inefficient use of non-renewable resources, including the production of synthetic fibers from fossil-fuels*."(EC, 2022, p. 1) In the discussion of microplastic pollution, the connection between the plastification and fast fashion is clearly stated*: "fast fashion, which is associated with the growing use of fossil-based synthetic fibres, has a high impact on microplastic pollution*" (EC, 2022, p. 5). However, in line with previous discussions of growth, this issue is addressed through the same business models and circular economy strategies that have previously been mentioned, and it is assumed that these will "*reduce both the dependency of clothing producers on fossil fuels and their impacts on climate change and microplastic pollution"* (EC, 2022, p. 8).

It is unclear how or why these business models would have such an effect. In addition, the authors behind the EU strategy imagine *"reducing industry's dependence on fossil fuels with bio-based innovation in the textiles sector, through the Circular Bio-based Europe Joint Undertaking, which aims to boost the development of new types of textile fibres*" (EC, 2022, p. 4). Nothing is mentioned about reduction or the already existing alternatives to plastic, that up until a few decades ago made up the majority of textile production. This includes the EU's own fibres, wool, linen, hemp and nettle, which are closely connected with the development of textile traditions such as weaving and tailoring.

The Danish strategy is also lacking a discussion of the role of natural fibres in the past and the future, and in minimizing plastification. Admittedly, traditions are mentioned a few times, but in terms of design traditions, not fibre production traditions. However, the strategy says that "*emissions are 20-30% higher for synthetic fibres than natural fibres"* and that alternatives, therefore, should be found for the production of yarns and fabrics. One of the key milestones in the roadmap is that by 2050 40% of the Danish textile sector should be fossil-free (Aalborg University et al., 2021). The latter number is indeed a slight decrease compared to current levels of 64-70% fossil-based fibres (depending on the source of the statistics), but combining this reduction with their goal of a "60% reduction in production from DK textile companies*"* (Aalborg University et al., 2021, p. 23), the volume of natural fibres used by Danish companies would decrease. In addition, if adding at least 10% bio-plastic fibres is what is meant by "10% of all Danish textiles are produced with DK bio based fibres" (Aalborg University et al., 2021, p. 23), the plastification would in reality increase.

For both of the above strategies from public policymakers, the answer to our question is that they mention plastification (the increase in plastic fibres), but they do not suggest any direct measures to reduce this. They assume that the new business models will reduce the total volume of textiles and that new technology will make plastics bio-based and therefore not dependent on fossil raw materials. Whether there will be other issues connected to these materials, is only briefly mentioned by the EEA related to land use competition with food production (EEA, 2021). The strategies of the two companies, H&M and Bestseller, are relatively similar. They do not propose minimising the overall use of polyester, but they aim to increase the use of recycled polyester, an issue we will get back to later.

4.3.3 Fibres are not comparable

In the EEA report, a new element enters into the discussion. It gives a lot of space to the issue of plastification, with phrases such as: "The global consumption of synthetic fibres increased from a few thousand tonnes in 1940 to more than 60 million tonnes in 2018, and it continues to rise." (EEA, 2021, p. 6) The rapid growth is also explained by saying that "[s]ynthetic fibres are inexpensive and versatile, enabling the production of cheap fast fashion and high-performance textiles for durable clothing" (EEA, 2021, p. 5). Nonetheless, no measures are suggested to halt this development, rather the argument used is that all fibres should be used for what they are best suited for and that all have environmental impacts:

> "*While a shift to natural or bio-based fibres may reduce the impacts from the use of fossil fuel resources and greenhouse gas emissions, these fibres do not always have equivalent properties and are not necessarily more sustainable over the entire life cycle. The guiding principle is that the choice of fibre should match the textile product's application, the properties required, and the expected lifespan and end-of-life processes*" (EEA, 2021, p. 41).

We of course agree with both claims, but we question if the synthetic fibres are indeed suited for more and more applications, as their growth would indicate. Why is it then that they are increasingly suited for more uses? The report has in reality answered this already in the descriptive part – "cheap fast fashion" - but the connection is not discussed. Here our views differ, as with the premise that the natural fibres need to be brought in as a replacement in order to reduce the use of synthetics. The synthetic fibres have increased almost exponentially without affecting the natural fibres (see Figure 2-2 in the Introduction). On the contrary, it should therefore be possible to reduce the use without having to substitute them. To agree with this reasoning, first one has to be willing to discuss growth, which the strategies do not.

4.3.4 'Preferred fibres'

So far we have repeatedly mentioned that the strategies highlight some fibres as better than others, e.g., that H&M and Bestseller aim to increase the use of recycled polyester, which is seen as a sustainable choice, and that GFA sees "Smart Material Choices", as the main element and suggests comparison tools and labelling schemes for both natural and synthetic fibres. Varner seeks the same, and have put forward a preferred material and fibre portfolio, which is based on the Higg MSI and TE MCI and Corporate Fiber & Materials Benchmark (CFMB) program. Varner's goal is that by the end of 2025, 100% of their sourced fibres are considered preferred fibres, which include recycled polyester (Varner Group, 2022). The most important tools and references are from the Higg Index and TE. This is in other words the basis for the changes suggested. TE presents these under the heading "Preferred Fibers". To understand their position and argument, it is necessary to know more about this organisation and their strategy, as we have detailed in sections 2.8 and 3.2.2.

An important premise for emphasising the choice of fibres and transitioning to preferred materials is that the fibres make up a large portion of the environmental impacts of textiles. The strategies concerning best material choices or preferred materials build on this belief that the fibres are important factors in determining the environmental impact of the sector. GFA formulates it like this:

> "*The sourcing and production of fibres and materials used by the fashion industry puts substantial pressure on natural resources and comes with implications for water, energy, and land use, as well as emissions and waste. At least two thirds of a brand's environmental footprint can be attributed to its choice of raw materials[154] "* (GFA, 2022, p. 62).

Footnote 154 refers to the GFA and Boston Consulting Group's "Pulse of the Fashion Industry" report (GFA/Boston Consulting Group, 2017). But are two-thirds of the environmental impacts from fibre production? Reading the report referred to, the only related phrases are the following: "The industry's greatest impacts on the climate is from processing, followed by the use of apparel and the production of raw materials" (GFA/Boston Consulting Group, 2017, p. 11) and "H&M estimates that 47% of the climate impact and 6% of the water impact occurs in processing" (GFA/Boston Consulting Group, 2017, p. 45). In both cases, they refer to the same reports by Levi Strauss & Co. (2015) and the H&M Group (2017). These numbers differ from the 12-16% of CO_2-emissions from fibre production found in other studies (UNEP, 2020; Wennberg & Östlund, 2019) and discussed in section 2.9. It's unclear what is included to reach such high numbers – that they possibly include yarn (10.4-12%), fabric (10-14.1%) or wet treatment (23.5-36%) (UNEP, 2020; Wennberg & Östlund, 2019). The only explanation found is that "the raw materials stage has a disproportionately large impact on sustainability, partly because of the effect it has on recyclability" (GFA/Boston Consulting Group, 2017, p. 41).

Another important question is how large the difference in environmental impacts, in reality, is between the conventional and preferred fibres. Some of the critiques against the Higg MSI is based on this exact point, that it invents differences between fibres that in reality do not exist, such as saying the water consumption of conventional cotton is substantially higher than that of organic cotton (Transformers Foundation, 2021). The point is that these numbers (the fibres' share of total environmental impact and the difference between conventional and 'preferred fibers') are important for 'preferred fibers' as a strategy to have impact.

We conclude that none of the strategies argument for reducing the increasing use of synthetic fibres, whether this is through reducing the total amount of textile fibres, the share of synthetic fibres or wish to enhance the natural fibres' competitiveness against the synthetic fibres. The increased use of synthetic fibres is on the contrary well known and discussed in connection with fast fashion. The solution proposed is not reduction but substituting the fibres with fibre versions with factual or fictitious lower impacts. In the following, we will look more closely at the latter solution, by discussing the raw materials for the synthetic fibres.

4.4 RQ3 Raw materials for the synthetic fibres

Plastic, including synthetic fibres, can be made in many different ways. Conventional plastics are made from fossil fuels, but plastics can, among other things also be made of recycled materials from several different waste streams, from biobased materials or from CO_2 captured from the air. The source determines the environmental impacts of the material. Figure 4-7 shows to what extent the examined strategies address the issue of raw materials for plastic.

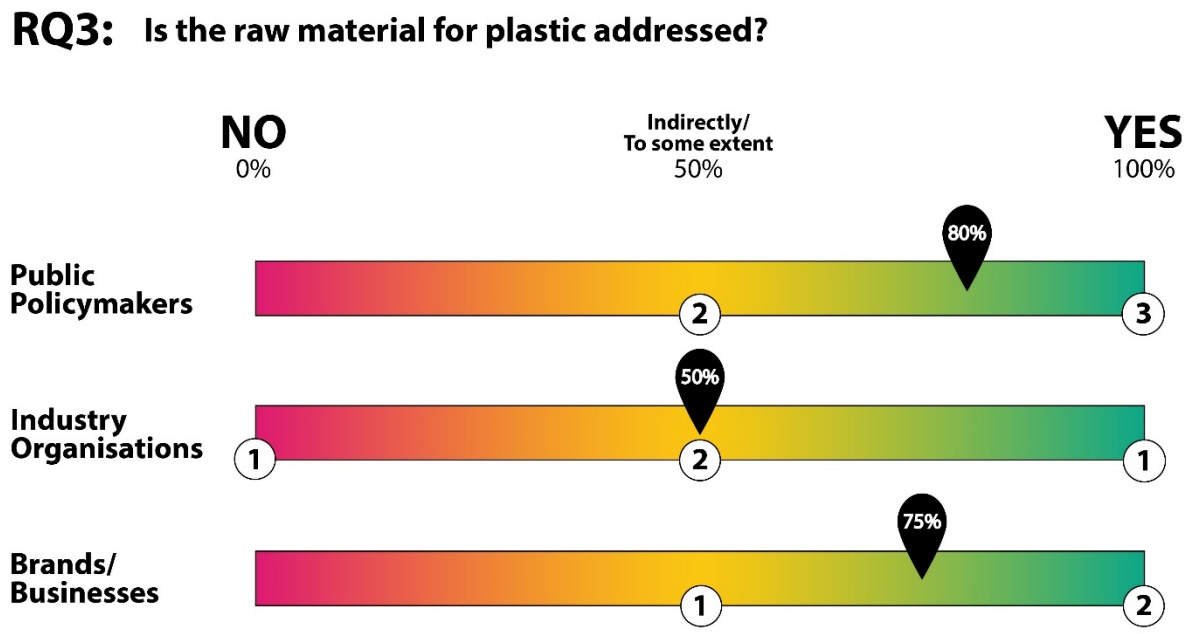

Figure 4-7 Results RQ3: average score and number of responses per stakeholder group (N=12).

We say *Yes* to the question "Is the raw material for plastic addressed?" when the problem with virgin plastic/fossil materials is discussed and solutions like biobased and textile-to-textile recycling are proposed. The answer is *To some extent/Indirectly* where this is only briefly mentioned or where rPET is the only solution put forward. What separates *Yes* and *To some extent/Indirectly* is the type of raw material source that is seen as a solution, namely how strictly they define what is a 'sustainable solution' for synthetic materials, and particularly for the 'short term'. Some strategies do not discuss the suitability of their proposed source at all. Table 4-4 below shows what raw material sources for plastic are discussed by each stakeholder group and whether they problematise its use.

Table 4-4 Plastic raw materials sources discussed by the different stakeholders.

Type	Organisation/Document		Raw material source discussed				
		None	rPET	Textile-to-textile Fibre-to-fibre	Bio-based	CO_2-capture	Other
Public Policymaker	**Ministry of Climate and Environment** (Departementene, 2021a)						Unspecified recycling; circular textiles
	European Commission (EC) (EC, 2022)		X*	X	X		
	European Environmental Agency (EEA) (EEA, 2021)		X	X	X*		
	German Environmental Agency (UBA) (UBA, 2020)		X*	X*			
	Danish consortium (Aalborg University et al., 2021)			X		X	
Industry organisation	**textil+mode** (textil+mode, 2021)		X*				
	TE (TE, 2021a)		X	X	X	X	Unspecified recycled a preferred alternative to virgin
	Policy Hub (Policy Hub, 2021)	X					
	GFA (GFA, 2022)		X	X	X		
Brand/business	**Varner Group** (Varner Group, 2022)		X	X**	X***		
	H&M Group (H&M Group, 2022a) etc.		X	X*			
	Bestseller (Bestseller, 2022b)		X	X	X	X	

*Problematised/questioned as a solution ** Only for polyamide *** Only for packaging

4.4.1 The issues concerning the source of plastics

The key themes in Table 4-5 come up in connection to the strategies' discussions of the source of plastics.

Table 4-5 Key themes concerning the source of plastics.

Identified theme	Example (our emphasis in bold)	Stakeholder group
Problematic, yes - but why?	*The production of **synthetic fibres is estimated to use 342 M barrels of oil every year.*** (Aalborg University et al., 2021, p. 15)	Public Policymaker
	*reduce **the industry's reliance on petrochemicals**, ensuring that alternatives are lower-impact* (GFA, 2022, p. 65)	Industry Organisation

	Polyester accounts for more than half of all the fibres used in the textile and apparel industry, but it is ***based on non-renewable petroleum and it is non biodegradable*** [sic] (Bestseller, 2022b, p. 43)	Brand/ Business
rPET	*80-100%* ***recycled polyester commitments*** *from the brands in our community will be essential to reaching our 2025 45% recycled volume target and for building critical mass to reach an absolute 90% recycled volume share by 2030..* (Basics of Sustainability workshop 1 & 2, TE, 2021a)	Industry Organisation
	Depending on the production process, the ***use of rPET can save between 40 and 85 percent of energy*** *and is therefore an interesting alternative. However, she [Caroline Kraas from WWF Germany] specified* ***that rPET is not per definition more sustainable****. When using rPET, just like when producing new PET, aspects such as working conditions, the energy consumption of the entire logistics and production chain, transport and processing must always be taken into account - in other words, the entire life cycle. [our translation]* [53] (Textil+mode, 2021)	Industry Organisation
	A specific source of growing concern is the accuracy of ***green claims made on using recycled plastic polymers in apparel*** *where these polymers do not come from fibre-to-fibre recycling, but in particular* ***from sorted PET bottles****.* (EC, 2022, p. 6)	Public Policymaker
	[…] we aim for 100% of our ***materials to be either recycled*** *or sourced in a more sustainable way by 2030, including our new goal of* ***30% recycled materials by 2025*** (H&M Group, 2022c, p. 31)	Brand/ Business
	Being able to ***repurpose plastic waste and incorporate it into new fashion pieces*** *is a great way of* ***avoiding harm to our planet*** *[…] a way of* ***preventing plastic waste from ending up in landfills*** (H&M Group, 2022b).	Brand/ Business
Textile-to-textile	*We will continue to* ***scale our use of recycled materials****. This includes increasing the supply of fibres available for recycling as well as developing the technologies needed to process fibres into new materials. Our initial focus will be on* ***expanding textile-to-textile recycling for synthetic materials****, and on increasing our use of recycled cotton and viscose* (H&M Group, 2022c, p. 35)	Brand/ Business
	Polyester for textile fibres can be obtained from melted PET beverage bottles. The ***recycling of old polyester textiles into new clothing, on the other hand, is not widespread****. Above all,* ***the lack of grade purity due to mixed fibres makes the recycling of old textiles difficult****. Corresponding recycling technologies are still in their infancy* [our translation] [54] (UBA, 2020, p. 24)	Public Policymaker
	There is a need to ***develop textile-to-textile sorting and recycling infrastructur****e that 1) Can be upscaled to industrial level to take a large part of the textile waste generated in Denmark and 2) Can provide economic value to collectors and recyclers of textile waste - one* ***key challenge*** *in developing fibre-to fibre recycling is that* ***very little information exists on what the non-reusable textile waste will comprise of*** *in terms of material composition* (Aalborg University et al., 2021, p. 19).	Public Policymaker
	*Unlike mechanical recycling****, chemical recycling is still not widely used, but is expected to see more growth*** *as technology matures. Chemical recycling has the potential to enable the industry to make much better use of both pure and blended post-use materials* (GFA, 2022, p. 64)	Industry Organisation
Bio-synthetics	*by 2050 […] upscaling bio-fibre and bioplastic production to ton scale […] by 2030 […] obtain* ***bio-plastics*** *substituting of 10-30% of* ***textile fibres*** *and packaging […] 10% of all Danish textiles are produced with DK bio-based fibres* (Aalborg University et al., 2021, pp. 22-23)	Public Policymaker

53 Original text in German «Die Nutzung von rPET könne je nach Produktionsverfahren zwischen 40 und 85 Prozent Energie sparen und sei damit eine interessante Alternative. Sie schränkte indes ein, dass rPET nicht per se nachhaltiger sei. Stets müssten bei der Verwendung von rPET genauso wie bei der Produktion von neuem PET Aspekte wie Arbeitsbedingungen, der Energieverbrauch der ganzen Logistik- und Produktionskette, der Transport und die Verarbeitung berücksichtigt werden – mithin der gesamte Lebenszyklus.»

54 Original text in German: "Aus eingeschmolzenen PET-Getränkeflaschen kann Polyester für Textilfasern gewonnen werden. Das Recycling von alten Polyestertextilien zu neuer Kleidung ist hingegen kaum verbreitet. Vor allem die fehlende Sortenreinheit aufgrund von Mischfasern macht das Recycling alter Textilien schwierig. Entsprechende Recyclingtechnologien stecken noch in den Kinderschuhen."

and from the air	*…bio-based synthetic fibres **are often mentioned as environmentally friendly alternatives** to traditional, virgin fossil-based ones. This might be true in terms of fossil resource use, but **the key to bio-based synthetics lies in innovative bio-based feedstocks that do not compete in land-use terms with food**, that do not rely heavily on water or chemicals and that can be cultivated sustainably*. (EEA, 2021, p. 24)	Public Policymaker
As good as virgin materials?	*There is also **insufficient proof** of whether or not the use of **recycled fibres influences shedding rates.** (EEA, 2021, p. 26)*	Public Policymaker
	*We **consider the amounts of recycled materials in a product** compared to the **durability and quality** needed for a long and useful life for the customer.* (Varner Group, 2022, p. 83).	Brand/ Business

4.4.2 Problematic, yes – but why?

The raw materials for the synthetic fibres are widely discussed in our source material, and several stakeholders are aware of the unfortunate aspects of being dependent on fossil raw materials. This is highlighted by both official strategies and company strategies, but what are the problematic aspects? Do they concern the wish to be "self-sufficient" in terms of raw materials that cannot run out? Or reducing environmental impacts?

The problematic sides of the source of the raw materials and their importance are well known. Several of the strategies point to the quantities of oil used in synthetic fibre production, e.g., the Danish, citing that their production "*is estimated to use 342 M barrels of oil every year*" (Aalborg University et al., 2021, p. 15).

Finding another source than fossil fuels is a main element in the previously discussed 'Preferred Fibers' strategy from TE, GFA and businesses. All the strategies say something about the raw material for synthetics. It, therefore, seems like there is consensus about the importance of the source of plastics, and as we have already seen, this is promoted the solution by both government bodies and industry.

4.4.3 rPET

Fibres from rPET, recycled packaging and other plastic waste are the 'solution' we currently see a fair amount of on the market. The main critique against presenting this approach as sustainable is that it is based on taking materials out of a closed loop system and into a linear system, but also that the plastic properties are not maintained through this type of recycling (Roos et al., 2017; Özkan & Gündoğdu, 2021). Discussions about the source of polyester in the strategies often centre on rPET but there is no consensus between the strategies on whether this is a solution, a temporary solution or not a solution at all.

The German industry strategy are stating that the use of rPET could reduce the use of energy between 40 and 85 per cent and therefore would be an interesting alternative. On the other hand, they say that the use of rPET is not more sustainable per se. Aspects such as working conditions, the energy consumption of the entire logistics and production chain, transport and processing – in other words, the entire life cycle – must always be considered when using rPET, just as when producing new PET (Textil+mode, 2021). They highlight an important point, namely that for all materials the difference between versions of the same can be as large as between two different materials. Using global averages can, as we demonstrated in the Introduction, rightly be criticised on this basis. Even so, it is exactly saying that a fibre is "per definition" better, that is the basis for many of the other strategies through the implementation of 'preferred fibres', meaning a strategy where the industry will reduce its environmental impacts through their fibre choices.

One example of this is that when the GFA are "Removing the synthetics' dependency on fossil fuel", this is primarily through increasing the share of recycled materials, independently of the source of these materials, and other aspects of the production:

> "*Fortunately, the share of recycled synthetic fibres is growing with recycled polyester market share increasing from 13.7 per cent in 2019 to 14.7 per cent in 2020 mostly obtained through mechanical recycling of PET bottles*" (GFA, 2022, p. 162).

The report arguments for businesses increasing the use of recycled materials, that per now can only be rPET, as follows:

> "*Commit to increasing the volume share of recycled polyester from 14 per cent (2020) to 45 per cent by 2025 and reach a 90 per cent volume share by 2030.[163] Moreover, drive the development of responsibly produced next-generation synthetics[164] to reduce the industry's reliance on petrochemicals, ensuring that alternatives are lower-impact"* (GFA, 2022, p. 65).

Footnote 164 explains that "[b]io-based synthetics are polymers made from renewable resources such as corn, sugar cane, and beetroot either wholly or partly", while 163 refers to "Textile Exchange (2021). Preferred fibre and Materials Market Report 2021". (GFA, 2022, p. 102). The GFA are hence detailing their goals with numbers from TE and counting the number of businesses committing to TE's *'2030 Recycled polyester challenge'.* TE are on their side explaining the importance of this by saying that "80-100% recycled polyester commitments from the brands in our community will be essential to reaching our 2025 45% recycled volume target and for building critical mass to reach an absolute 90% recycled volume share by 2030. We need all of you to join this challenge" (Basics of Sustainability workshop 1 & 2, TE, 2021a).

H&M are committed to this challenge, and the same strategy is presented by Varner. Their "preferred material and fiber portfolio" is also based on the HIGG Material Sustainability Index and TE MCI, in addition to the Corporate Fiber & Materials Benchmark (CFMB) program, described in sections 2.8 and 3.2.2. Varner's goal is that by the end of 2025, 100% of sourced fibres are considered 'preferred fibers', which includes recycled polyester from rPET (Varner Group, 2022).

rPET is consequently seen as an important step away from dependency on fossil raw materials, that in the next step will be solved more permanently. It is this next step that is named "next-generation synthetics" and defined as materials from "waste, by-products, regenerative or renewable resources" (GFA, 2022, p. 78).

The EU strategy agrees with the GFA and TE that next-generation synthetics are important, but not that rPET is a solution. On the contrary, in the EU strategy, rPET is used as an example of a misleading green claim:

> "*A specific source of growing concern is the accuracy of green claims made on using recycled plastic polymers in apparel where these polymers do not come from fibre-to-fibre recycling, but in particular from sorted PET bottles. Beyond the risk of misleading consumers, such a practice is not in line with the circular model for PET bottles, which are fit for being kept in a closed-loop recycling system for food contact materials and are subject to extended producer responsibility obligations, including fees, with a view to meeting the objectives of the EU rules on single-use plastic products and on packaging*" *(EC, 2022, p. 6).*

Certain companies take this approach deemed greenwashing by the EU quite far. They do not only see rPET as a temporary, unsatisfactory solution, nor as greenwashing. On the contrary, they argue that "[b]eing able to repurpose plastic waste and incorporate it into new fashion pieces is a great way of avoiding harm to our planet", and "a way of preventing plastic waste from ending up in landfills" (H&M Group, 2022b).

Here H&M frames rPET as a waste solution when knowledge about plastic recycling shows that 99% of rPET is made from plastic bottles (TE, 2022), leaving other, potentially more problematic plastic waste unmanaged.

There is in other words no consensus on whether rPET deserves the status as a "preferred fiber" that TE and many others give them. If we look at sustainability labelling and "Conscious" collections, it is exactly rPET that dominates as a fibre (Changing Markets Foundation, 2021b).

4.4.4 Textile-to-textile

There is no doubt about TE's vision for the future but it is unclear whether this vision is about securing unlimited raw materials for the textile industry, independently of the petroleum industry, solving a waste problem or actually contributing to environmental improvements. They say that in the future they envision, textile-to-textile recycling is being scaled up to meet the growing demand for sustainable feedstock (TE, 2021a). The expression "growing demand for sustainable feedstock" is in itself problematic, for how can growth be sustainable when there is already a large overproduction? Even if sustainable feedstock takes market share from unsustainable feedstock, these improvements in environmental impact are incremental and currently lack scientific basis, as explained in the Introduction and section 2.9. This dilemma does not affect the strategies since, as we have pointed out several times, growth is something that is not discussed.

Common for the discussion about textile-to-textile recycling is that it is seen as an important solution, but also a difficult one. This is the case for the German public policymakers (UBA). They state that the recycling of used synthetic textiles into new clothes is not widely spread because of the use of mixed fibres and that recycling technologies in this area are not yet sufficiently developed. UBA's strategy also high-lights the issues with fibre blends (UBA, 2020).

As we see, there is neither disagreement about the need for developing textile-to-textile recycling nor the need for more information about what textile waste consists of, as the Danish strategy says:

> "*There is a need to develop textile-to-textile sorting and recycling infrastructure that 1) Can be upscaled to industrial level to take a large part of the textile waste generated in Denmark and 2) Can provide economic value to collectors and recyclers of textile waste - one key challenge in developing fibre-to fibre recycling is that very little information exists on what the non-reusable textile waste will comprise of in terms of material composition*" (Aalborg University et al., 2021, p. 19).

Both the fact that the materials are mixes of natural and synthetics; cellulose, protein, plastic and metal; and that they, in addition, contain unknown quantities and types of chemicals is often used as an explanation of why it is difficult to establish textile-to-textile recycling, and in particular of post-consumer waste.

There is disagreement around how difficult this is and therefore how close to the goal of textile-to-textile recycling we are. Bestseller writes about this as technologies that do not yet exist, but that they are "tracking innovation" that "*would be a major breakthrough for the fashion industry*" (Bestseller, 2022b, p. 43). The GFA describes the issue more as being one of scale – that the solution has yet to be scaled up sufficiently - but also that the technologies are not mature.

> "*Unlike mechanical recycling, chemical recycling is still not widely used, but is expected to see more growth as technology matures. Chemical recycling has the potential to enable the industry to make much better use of both pure and blended post-use materials*" (GFA, 2022, p. 64).

At the TE conference Recycled Polyester Round Table Summit, predictions of when rPET should be replaced by textile-to-textile as a feedstock for "sustainable materials", were presented (TE, 2021a). In

the long-term (defined as 2030 forward) this needs to be textile-to-textile recycled, bio-synthetics or synthetic feedstock captured from the atmosphere.

When, at the same conference, discussing the 'mitigation alternatives', e.g., regenerative farming practices vs. recycled polyester, the fact that rPET delivers on data is an argument for choosing rPET as a mitigating solution; they are still lacking 'reliable data' for regenerative farming practices. Using the argument of lacking data is interesting because there is general discord around the data used in the Higg MSI, as discussed in the introduction, section 2.9.

The EU Textile Strategy has, in stark contrast to this, criticised rPET as a sustainable solution but has yet not questioned the more fundamental issues concerning "preferred fibers" as a strategy, such as whether there in reality are significant differences between the environmental impacts of fibres, whether there is reliable data and the status of the Higg MSI in this work, as discussed in section 2.9. On the contrary, the development of PEF – a central element of the strategy – is hinged on such disputable premises. That exactly rPET as a sustainable material for textiles is high-lighted as greenwashing in the strategy is, therefore, extra noticeable.

4.4.5 Biosynthetics and from the air

Many strategies do not name concrete technologies but discuss complex, new fibres more generally. Some of the strategies speak of bio-based materials and extracting carbon from the air as potential solutions. For example, among the key milestones for plastics and textiles in the Danish roadmap are to "obtain bio-plastics substituting of 10-30% of textile fibres and packaging" by 2030 and "upscaling bio-fibre and bioplastic production to ton scale" by 2050. Furthermore, "by 2030 […] 10% of all Danish textiles should be produced with DK bio-based fibres" (Aalborg University et al., 2021, pp. 22-23).

Of the strategies we have examined, the EEA-report goes the furthest in this questioning and has a whole sub-section about "Bio-based and biodegradable fibers". The report gives an overview of global bioplastic consumption by sector, their application in the textile sector, environmental and climate impacts, and challenges related to bio-based textiles.

> "…*bio-based synthetic fibres are often mentioned as environmentally friendly alternatives to traditional, virgin fossil-based ones. This might be true in terms of fossil resource use, but the key to bio- based synthetics lies in innovative bio-based feedstocks that do not compete in land-use terms with food, that do not rely heavily on water or chemicals and that can be cultivated sustainably."* (TE (2019) in EEA, 2021, p. 24)

As we have seen, a product's 'sustainability' depends on many aspects and it is, therefore, questionable to create strategies and marketing of these based on global averages or ideas that bio-based (or organic or recycled) is in principle better, regardless of knowledge on the concrete example.

4.4.6 As good as virgin materials

Increasing the use of recycled materials is important in many strategies. Simultaneously, there is a discussion about how this will affect the use properties through weaker fibres and consequently, textiles, or through increased microfibre shedding during the use phase. This discussion is not an important part of the strategies, but Varner writes:

> "*We consider the amounts of recycled materials in a product compared to the durability and quality needed for a long and useful life for the customer"* (Varner Group, 2022, p. 83).

Such concerns are also raised regarding bioplastics, as we saw in section 4.3.3. “There is also insufficient proof of whether or not the use of recycled fibres influences shedding rates”, as the EEA points out in their report (EEA, 2021, p. 26) – a topic we will get back to in section 4.5.6.

4.5 RQ4 Plastic waste

Our last research question concerns synthetic textiles as waste. We have asked the question: “Is the plastic waste problem addressed?” We understand the question as how the synthetic fibres will or will not end up as plastic waste (both through shedding and at the end of life). *Yes* to this question is awarded when this issue is addressed at the root, e.g. decreasing use or compostability. *To some extent/Indirectly* is awarded when it is not addressed at the root cause but rather it aims to reduce waste later in the lifecycle (e.g., microfiber filters, chemical issues and collection for recycling), or plastic waste is addressed but not plastic fibre waste. As before, *No,* means that the question is not addressed at all.

As we now have seen, plastic waste is also used as a raw material for synthetic fibres. This is not what we will focus on now, but the challenges that synthetic textiles represent when they become waste. By waste, we mean both the product after use and the fibres shed during use, in short, the issue around microplastics in the form of fibre and textiles. This question is therefore closely related to the previous because textile-to-textile recycling can potentially solve the first, but not the second waste problem that synthetic textiles create.

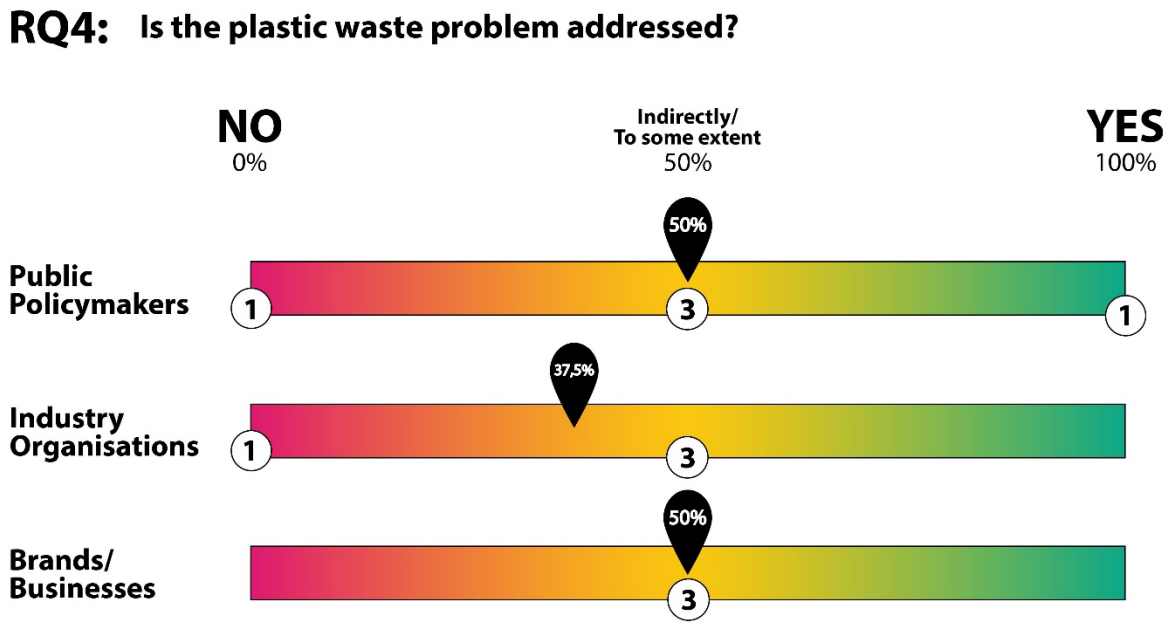

Figure 4-8 Results RQ4: average score and number of responses per stakeholder group (N=12).

The results in Figure 4-8 how that the three types of strategies are similar and that the response *To some extent/Indirectly* dominates. We have only awarded one strategy a clear *Yes* to this question. As for the other questions, it is not easy to delimit between the *Yes, To some extent/Indirectly* and *No*. Varner, as an example, has moved away from plastic bags; they recognise the microfibre challenge and have joined two research projects; and they have collection for reuse and recycling in collaboration with Fretex, the Norwegian Salvation Army’s re-use and charity shop branch. It is therefore clear that Varner see plastics as a problem, but, but as many of the others do not go to the core of the issue: reducing the use of synthetic fibres or other solutions that tackle both problems and that do not create new ones.

4.5.1 Key themes concerning the plastic waste problem

Table 4-6 shows thematically how the strategies discuss the plastic waste problem.

Table 4-6 Key themes concerning the plastic waste problem

Identified theme	Example (our emphasis in bold)	Stakeholder group
Understanding the problem	*…it is estimated that in 2015,* ***42 million tonnes of plastic textile waste was generated globally****, making the textiles sector the* ***third largest*** *contributor to plastic waste generation (Geyer et al., 2017). Unfortunately, since only about one third of post-consumer textile waste is collected separately for reuse or recycling (Watson et al., 2018), the majority of the textile waste ends up in the residual waste and is incinerated, landfilled, or enters the environment as litter* (EEA, 2021, p. 2).	Public Policymaker
	The total amount of textile waste generated annually in the EU is unknown*. It is estimated that EU consumers discard about 5.8 million tonnes of textiles annually,* ***about 11 kilograms per person*** *(Beasley & Georgeson, 2014). As about 60 % of textiles are synthetic (FAO/ICAC, 2013), this suggests that about 3,5 million tonnes of plastic textile waste is discarded in Europe each year* (EEA, 2021, p. 17).	Public Policymaker
	*..****no significant recycling is taking place*** *for fibrous plastics, such as* ***synthetic textiles****. To date, end-of-life textiles, both natural and synthetic, almost entirely end up in landfill or are incinerated, either in Europe or, after export, in other regions of the world* (EEA, 2021, p. 2).	Public Policymaker
	When reaching the end of their useful lives, some textiles are collected for recycling but ***most of the textile waste is burned in a municipal waste incinerator****, largely without energy recapture,* ***or landfilled*** *– plastic- based fibres, however,* ***do not biodegrade and remain*** *present in landfill sites for at least multiple decades* (EEA, 2021, p. 21).	Public Policymaker
Sorting, re-use and recycling	*[…] also joined Fashion for Good's Full Circle Textiles Project for polyester, which aims* ***to scale promising chemical recycling options for polyester*** (Bestseller, 2022b, p. 44).	Brand/ Business
	Through our 2021 pilots, we successfully utilised around 500 tonnes of ***textile waste*** *from our garment production factories across most of the production countries,* ***recycling this back into our products****. Next year, we plan to scale this process, partnering with our suppliers and with a wider network of recyclers to increase traceability of material waste within the value chain and accelerate the uptake of new recycling technologies* (H&M Group, 2022c, p. 38).	Brand/ Business
	We tested our new ***Waste Recycling Strategy*** *to learn how best to link fabric leftover from our orders with reuse and recycling. More than 50 of our tier 1 suppliers in five regions are participating in pilots with Reverse Resources and Circular Fashion Partnership, to* ***segregate cutting waste before handing it onto recyclers*** (H&M Group, 2022c, p. 37).	Brand/ Business
	[…] ***improve*** *the* ***valorisation of clothing waste*** *in the EU through better collection and the* ***development of large-scale automated sorting technologies*** *such as Fibersort* (EEA, 2021, p. 28).	Public Policymaker
Export restric-tions	*Under the recent Commission proposal for new EU rules on the shipment of waste,* ***the export of textile waste to non-OECD countries would be allowed only*** *under the condition that such countries notify to the Commission their willingness to import specific types of waste and demonstrate their* ***ability to manage it sustainably*** (EC, 2022, p.13).	Public Policymaker
More knowledge is needed	*A particular point of concern is the release of microplastics, the small plastic fibres that are shed from synthetic textiles during the production, washing and end-of-life treatment. The* ***long-term consequences*** *that these microplastics have on the marine, terrestrial and aerial environments, soil health, aquatic and terrestrial species and human health* ***are still unclear****, as are the specific conditions that promote or reduce their release* (EEA, 2021, p. 41).	Public Policymaker
	Improved understanding *and* ***extended knowledge sharing*** *are* ***required*** *on the composition of the fibres released, microplastics* ***shedding mechanisms****, the associated* ***ecosystem and health risks****, and potential* ***mitigation approaches*** (EEA, 2021, p. 35).	Public Policymaker

	An environmental challenge related to synthetic fibres is their large contribution to microplastic pollution, of which the ***long-term consequences on the aquatic environment and species as well as human health are still unclear*** *(Henry et al., 2019). This type of pollution is currently not taken into account in state-the-art environmental impact assessment methodologies, but mainly occurs during the washing of synthetic fabrics* (EEA, 2021, p. 21).	Public Policymaker
	We will continue developing a ***groupwide roadmap for microfibres*** *in line with the Microfibre Consortium 2030 commitment. To inform this roadmap, we are* ***resuming testing microfibre emissions*** *with HKRITA and our suppliers as Covid-19 restrictions ease.* ***Learnings from this work will be shared with policymakers*** *as H&M Group participates in consultations on potential legislation* (H&M Group, 2022a, p. 36).	Brand/ Business
Filters and pre-washing	*In addition to product design,* ***measures will target manufacturing processes, pre-washing at industrial manufacturing plants****, labelling and the promotion of innovative materials. Further options include* ***washing machine filters****, which can cut by up to 80% the volume released from laundering* (EC, 2022, p. 5).	Public Policymaker
	Our 24-month research project — ***A Management Tool for Microplastics from Textile Production Process*** *— continued in partnership with the Hong Kong Research Institute of Textiles and Apparel (HKRITA). Restrictions due to Covid-19 disrupted planned tests of microfibre emissions at H&M supplier factories. Instead, the team worked to develop new concepts in the HKRITA laboratory, such as using* ***soundwaves to separate microfibres from water*** (H&M Group, 2022a, p. 36).	Public Policymaker

4.5.2 Understanding the problem

The goal of the EEA report follows from its title "Plastic in textiles: potentials for circularity and reduced environmental and climate impacts" (EEA, 2021). It is therefore not surprising that it is clearly addressing, both synthetics as part of an overall plastic waste problem (see section 2.3 in their report) and microplastics. Here state-of-the-art information about textile-related microplastics is presented and negative environmental impacts are highlighted. They go into detail about the amount of plastic textile waste produced annually and the issues with collection and lack of recycling, as the quotes in Table 4-6 shows thematically how the strategies discuss the plastic waste problem.

Table 4-6 above, show:

> "A *specific concern is that synthetic textiles do not naturally degrade, but stay in the biosphere as waste unless they are incinerated*" (EEA, 2021, p. 2).

The report does in other words, give a good overview of the problem, and as many others have also said: it is urgent to stop spreading plastic and microplastic to the air, soil and sea.

4.5.3 Sorting, re-use and recycling

The EEA does not only describe the problem but highlights the need to "improve the valorisation of clothing waste in the EU through better collection (ECAP, 2020) and the development of large-scale automated sorting technologies such as Fibersort" (EEA, 2021, p. 28).

The EEA agrees with H&M that also want to improve technologies to enable reuse and recycling (H&M Group, 2022a), and Bestseller, that "also joined Fashion for Good's Full Circle Textiles Project for polyester, which aims to scale promising chemical recycling options for polyester" (Bestseller, 2022b, p. 44). Both measures have wide support and are important political goals. All the same, whether they actually reduce microplastic pollution, can be discussed: textile-to-textile recycled polyester can potentially lead to more use of polyester and as a consequence, more microplastic. At the same time, more re-use can mean more export of apparel with an increasing synthetic fibre content from countries like Norway with a waste-to-energy incineration system, to countries without a proper waste-

management system. As a consequence, there is increased microfibre release to nature as the apparel decomposes.

The challenge with these statements is not only that they do not necessarily solve the problem, but that they are delaying a solution process and long term will increase the problem. If we use Norway as an example, general waste is burned for energy recovery. If more clothes are collected for reuse instead of being collected as waste, they will be exported, mainly to countries that have a less functioning or no waste management system. When Bestseller wishes to "make textile-to-textile recycling a reality for polyester, which would significantly reduce the amount of polyester that ends up in landfill" (Bestseller, 2022b, p. 44), we are not so sure about this - it would depend on where the textiles otherwise would have ended up. If they would have been incinerated (as in Norway), recycling would not prevent landfill, and in any case, it might increase the use of polyester as it can be seen as a greener alternative in line with Bestseller's argument and the rebound effect.

4.5.4 Filters and pre-washing

H&M do not address the overall plastic waste problem directly, but indirectly through general waste management and recycling initiatives. The microfibre problem is both in their Sustainability Disclosure report and on a dedicated page on the H&M website. They report that they are committed to researching and addressing the issue of microfibre emissions and their "*approach is:*

- *Design yarns and fabrics to minimise microfibre shedding and seek alternative materials.*
- *Investigate new production processes and requirements to minimise shedding.*
- *Provide customers with repair services and microfibre- reducing laundry bags, and support the development of laundry machine filter systems.*
- *Improve technologies that enable reuse and recycling."*
  (H&M Group, 2022a, p. 36).

In addition, they are part of the MinShed project led by the Swedish research institute RISE and they are associated members of The Microfibre Consortium, which seeks to develop solutions to minimise microfibres across textile product lifecycles. The focus is both on the manufacturing stage and the consumer stage:

> "*Our 24-month research project — A Management Tool for Microplastics from Textile Production Process — continued in partnership with the Hong Kong Research Institute of Textiles and Apparel (HKRITA). Restrictions due to Covid-19 disrupted planned tests of microfibre emissions at H&M supplier factories. Instead, the team worked to develop new concepts in the HKRITA laboratory, such as using soundwaves to separate microfibres from water*" (H&M Group, 2022a, p. 36).

They highlight learnings from the development of their Microfibres Roadmap: "*Garments made completely from biodegradable fabric cannot be seen as the one solution to microfibre shedding, because these often have chemical finishes added which can hinder the fibres degrading*". They recognize the problem of mixed fibres, but explain the need to mix fibres to guarantee the usability and durability of products.

The different strategies focus on reducing micro-plastic pollution by collecting the shed fibres both before sale and during the use phase with the help of the consumer.

Here H&M has a lot in common with the EU's plan:

> "*The Commission plans to address the different lifecycle stages at which synthetic fibres are shed into the environment by a set of prevention and reduction measures, notably through binding design requirements to be introduced under the Ecodesign for Sustainable Products Regulation, as well as under the forthcoming Commission initiative to address the unintentional release of microplastics in the environment, to be presented in the second half of 2022. In addition to product design, measures will target manufacturing processes, pre-washing at industrial manufacturing plants, labelling and the promotion of innovative materials. Further options include washing machine filters, which can cut by up to 80% the volume released from laundering, development of mild detergents, caretaking and washing guidelines, end-of-life textile waste treatment, and regulations for improved wastewater and sewage sludge treatment*" (EC, 2022, p. 5).

There are several important measures here, but their common denominator is that their potential impact is too small compared to the increased use of synthetic fibres. Washing machine filters and laundry bags only reduce what is shed during laundry. The fibres shed during use ending as house dust and in the air, will not be affected. And, while the fibres lose some mass during use, they will still degrade into microplastics in the end – unless incinerated. Furthermore, it will take a long time before these solutions are in place and in widespread use.

4.5.5 Export restrictions

One of the most promising measures to prevent the spread of microplastics is found in the EU Textile Strategy:

> "*Under the recent Commission proposal for new EU rules on the shipment of waste, the export of textile waste to non-OECD countries would be allowed only under the condition that such countries notify to the Commission their willingness to import specific types of waste and demonstrate their ability to manage it sustainably*" (EC, 2022, p. 13).

But whether it will actually deliver on its potential of course depends on how both "waste" and "manage it sustainably" is materialised. Another issue is that the export of used clothing to the Global South rarely happens directly, but through a 3rd country (Changing Markets Foundation, 2023; EEA, 2023; Watson, Hvass, et al., 2020). This can make controlling the export more difficult. So far, the export of plastic has been regulated and reined in, e.g., from Norway, but without synthetic textiles being included in the legislation (Departementene, 2021b). Why this type of plastic is not included is not discussed. One possible reason is that used clothing is not defined as waste, hence it falls outside the scope of the legislation in the case of the exported clothes. This will, however, change with the EU mandate to implement separate textile collection by 2025. This will not change the problem that "usable" clothes will not be used if there are too many. The quantity and not only the quality of the export is important for the fate of the products.

4.5.6 More knowledge is needed

That we need more knowledge is obvious, but the argument can also be used as a way to postpone action on the basis of the knowledge we actually have. Microplastics are not a new problem, but still so new that there is a lot we do not know. As mentioned in the Introduction, the most used rating tools for textiles do not include microplastics and the lack of knowledge is an important argument for not including these plastic-specific challenges.

The microplastic issues are addressed throughout the whole EEA report and from a life-cycle perspective:

> “Microplastics are shed from synthetic textiles along their entire lifecycles: from fibre and fabric manufacturing, through use and washing, to their final disposal whether by landfilling, incineration or recycling” (EEA, 2021, p. 26).

There is a separate section entitled “Microplastics” (EEA, 2021, pp. 25-27), and there are statements throughout the report, that highlight the problem as well as address that more knowledge is needed about the long-term consequences on all aspects of the living environment, whether shedding rates are influenced by the use of recycled fibres, and as a consequence, what the best approaches are for mitigating these risks (EEA, 2021, p. 41).

The same measures are repeated in several strategies. More research and knowledge about how the clothing loses fibres and how this can be measured and documented is requested. H&M state their commitment

> “to researching and addressing microfibre emissions, as we develop a groupwide Microfibres Roadmap” (H&M Group, 2022a, p. 36), so that they can eventually take measures to reduce their emissions and measure their progress as they do.

4.6 Summary of results and discussion

On average, the responses to all research questions are closer to *No* than to *Yes*. There are systematic differences between the questions: the strategies are clearer in their formulations of growth as a general problem than in their proposals of measures and solutions to limit the problem. The same can be said for plastic: here they are also defining the issues concerning the plastics, such as waste and raw material sources more clearly than the measures to combat these issues. There are also systematic differences between the three stakeholder groups and we found that the answers are closest to *Yes* for the strategies from public policymakers. However, it is possibly most surprising to not find a clearer *Yes* to the questions from these strategies because they set out to protect people and the environment and set limits for businesses’ room for action in environmental destruction.

The responses and key themes that occur related to each question can be summarised as follows.

RQ1A: Does the strategy include/address growth in the problem statement?

There is a clear pattern in the responses to this question, where public policymakers address growth at least *to some extent*, some industry organisations also *to some extent* say that growth is problematic, while brands/businesses do not address the issues concerning growth at all. Only two strategies are awarded a *Yes* to this question: the Danish along with the EU strategy. We found the following themes in the strategies’ discussions of growth:

1. A premise for sustainability

   There is a focus on green growth and very few of the strategies see economic growth in itself as a problem, i.e., not connecting it to production growth, but rather discuss “rethinking growth” (GFA, 2022, p. 62) and “meaningful growth” that creates benefits for all involved and that allows more people to choose sustainable options (H&M Group, 2022a, p. 34). The necessity of both economic and production growth is also mentioned regarding “poor workers in the Global South” (Scaling Solutions, TE, 2021a).

2. Consumption and production are the same

   Consumption and production are mentioned alternatingly in the strategies, stating that they are both growing along with their negative environmental impacts, but without their cause-and-effect relationship being addressed explicitly. This obscures the discussion of where the majority of the environmental impact is created, namely in production, and how to achieve a reduction in a supply-driven supply chain where the surplus of goods and extensive use of price reduction and other marketing strategies are embedded in the business models.

3. Fast fashion as a driver

   Fast fashion and low-quality of garments are discussed as drivers of overconsumption by public policymakers. This is because they have "pushed for more volume and shorter use spans." (Aalborg University et al., 2021, p. 3). However, the fact that these low-priced clothes are also most often made of synthetic textiles, is omitted. Hence, the connection between the fast fashion business model and the growth in the use of synthetic textiles is in most strategies not discussed.

4. Aiming for decoupling

   Decoupling is the premise for green growth's success and the strategies all mention this term in connection to either resource use, environmental impacts or climate impact. The underlying premise is that absolute decoupling of economic growth (hence increased sales) is possible, despite empirical evidence to the contrary, including taking the rebound-effect into account. The strategies highlight the need to "take concrete steps to sever the connection between business growth and resource consumption" (Bestseller, 2022b, p. 4).

RQ1B: Does the strategy include/address growth through measures?

Overall, the reasoning and measures for reducing growth are weak. However, one strategy, the Danish, includes this in its "challenge" for textiles and sets a goal for a 60% reduction in the production of Danish textiles by 2050. In addition, it suggests "[i]ncreasing local production with more production on demand" (Aalborg University et al., 2021, p. 16).

The measures presented are mainly based on a belief that decoupling will eventually lead to the desired decrease in total environmental impacts, despite continued growth in sales. To what extent these sales consist of new products, is not directly discussed. The measures presented to move towards this goal are:

1. Materials efficiency/elimination of waste in production

   Lowering the impact or resource use of each unit of output is a clear goal, that follows from the decoupling logic, but the discussions of concrete measures are vague. Resource efficiency is the most important factor, which, according to TE should be related to new materials and products (Recycled Polyester Round Table Summit, TE, 2021a), indicating that using recycled materials is important, but also that changes in consumption, such as re-use are a part of the solution.

2. Durable products

   Regardless of the stakeholder, the strategies emphasise changes in consumption through longer use and increasing possibilities for repair, reuse and/or redesign. These are measures

recognisable from circular strategy, and that require durability in products, and focus on improvement of physical aspects of clothing, such as strength, obtainable through industrial processes and innovation. The issue here is that it is not explained how increased product durability will influence the quantity that is being produced, rather it is taken for granted that production will decrease if products last longer.

3. Circular products

   The focus on circular products and circular business models is present in all strategies. In this discussion, repair, reuse, etc. is given some space, but a large amount of attention is directed at recycling, citing goals of 60-80% recyclable products and scaling up textile-to-textile recycling. In TE's strategy, we again see that 'decoupling' constitutes the bulk of the potential for reduction of the environmental impacts with two main measures at the centre: "material substitution" and "filling the innovation gap", which both have recycling as their core measure.

4. Consumption

   The strategies high-light the need for changes in consumption patterns, where the industry needs to offer better and more circular products to consumers, but where also consumer demand must be increased for these business models, e.g., through consumer education. The businesses and industry organisations do not speak of reduced consumption directly. The exception is the Danish strategy, which sets a goal for reduction in Danish textile consumption.

RQ2: Does the strategy attempt to stop and/or minimize plastification?

None of the strategies present clear, direct measures to halt plastification. Admittedly, some strategies from public policymakers can be said to indirectly include such a goal, namely those from the EU, DK and the EEA. They may have goals of reducing the use of fossil raw materials in production by using other raw materials. We do not see bioplastics as a way to reduce plastification, though it may reduce the use of fossil raw materials if not just using a biodegradable version of a fossil fibre.

1. Fossil free?

   The dependency on fossil materials is discussed and quantified in most of the strategies, as well as the need to halt this, but the overall plastic volumes are not addressed directly. Instead recycled or bio-based solutions are proposed to decrease dependency on fossil raw materials. The exception is the Danish strategy, which proposes a goal for the Danish textile sector to be 40% fossil free by 2050, which constitutes a minor decrease from the current level.

2. The fibres are not comparable

   Though there seems to be a consensus that dependence on fossil materials is unfortunate, the EEA report enters an additional aspect to this discussion, asserting that "[s]ynthetic fibres are inexpensive and versatile, enabling the production of cheap fast fashion and high-performance textiles for durable clothing" (EEA, 2021, p. 5). Nonetheless, no measures are suggested to halt this development, rather the argument used is that all fibres should be used for what they are best suited for and that all have environmental impacts. We agree with the latter proposition but question whether it is not the price and availability, rather than the suitability for so many applications, that has spurred the exponential increase in their use.

3. “Preferred Fibers”

   Many of the strategies, in particular those penned by the industry itself, highlight certain fibres as better than others. What the GFA call “Smart Material Choices”, the TE call “Preferred Fibres”, etc. These strategies are all based on substitution, where recycled polyester (currently rPET, but preferably textile-to-textile), plays a major role. The role of substitution is disproportionally large compared to the small share of the total impact of apparel production that fibre production constitutes.

RQ3: Is the raw material for plastic addressed?

A majority of the strategies see the volume of fossil fuels used as raw material for plastic textiles as problematic because it makes the industry dependent on a non-renewable, non-biodegradable material, that may potentially run out. They do, however, differ in the propositions for alternative raw materials. The type of source that is seen as a solution reflects how strictly they define what is a “sustainable solution” for synthetic materials, and particularly for the “short term”. Industry goals are to increase the share of rPET, based on preferred fibres and HIGG MSI. The strategies discuss the solutions in this way:

1. rPET

   The brands and industry organisations high-light their commitments to increasing the share of recycled material in their products, and their progress towards this goal. TE, in particular, emphasise the importance of the brands’ commitment to their Recycled Polyester Challenge, which inevitably means rPET, given the current recycling technology. Here public policy makers nuance the picture by that the environmental savings depend on the production process, and that the raw materials for the rPET come from sorted PET bottles and are therefore taken out of a closed-loop recycling system.

2. Textile-to-textile

   Textile-to-textile recycling is a clear goal for most of the strategies – it is the desired solution but a difficult one for many reasons: lack of knowledge of textile waste, lacking technology, fibre mixes, unknown chemical content, etc. or even scale – that the infrastructure and facilities have not been built and scaled to fit the industry. The industry further argues that rPET delivers on data, in comparison to other fibres, and the pursuit of textile-to-textile recycled polyester follows this logic. TE explain that in the future they envision, textile-to-textile recycling is being scaled up to meet the growing demand for sustainable feedstock, possibly allowing for continued growth.

3. Biosynthetics and from the air

   Innovation of new fibres and materials are mentioned by many of the strategies in a general manner and speak of bio-based materials and extracting carbon from the air as potential solutions. In particular, upscaling the use of bio-fibre and bio-plastic production is in focus in the Danish strategy. The EEA report questions the belief in bio-based synthetic fibres as environmentally friendly alternatives if they compete with food production in terms of land use and depend on heavy chemical or water usage.

However, the strategies also question whether these solutions are as good as virgin materials, stating that there is insufficient knowledge about shedding rates of recycled polyester and that recycled materials may lower product quality related to *"the durability and quality needed for a long and useful life for the customer"* (Varner Group, 2022, p. 83).

RQ4: Is the plastic waste problem addressed?

We understand this question as how the synthetic fibres will or will not end up as plastic waste both through shedding and at the end of life. There are large differences in how the strategies understand the problem, where the major focus is on microfibre shedding in use. In general, clothing waste is seen as a problem, and some see that "clothing mountains" and deserts are also problematic, but this is not directly connected to the plastic waste created in these situations. Therefore, most of the strategies address this issue only to some extent, through reduction of waste (e.g., microfibre filters, chemical issues and collection for recycling), or plastic waste is addressed but not plastic fibre waste. But, none of the strategies goes to the core of the issue: reducing the use of synthetic fibres or other solutions that tackle both problems and that do not create new ones. The solutions proposed are related to:

1. Sorting, re-use and recycling

   To limit the amount of textile waste, or revalorise it, the majority of the strategies propose improving infrastructure for sorting textile waste for re-use and recycling.

2. Filters and pre-washing
   The different strategies focus on reducing micro-plastic pollution by collecting the fibres being shed, both before sale and during the use phase (with the help of the consumer), namely indirect ways to hinder microfibre shedding. This includes the European Commission that proposes e.g., washing machine filters and H&M, that in particular high-light their efforts to design yarns and fabrics, investigate production processes and provide customers with laundry bags. There are several important measures here, but their common denominator is that their potential impact is too small compared to the increased use of synthetic fibres, and the fibres shed during use ending up as house dust and in the air, will not be affected.

3. Export restrictions
   The only strategy that received a *Yes* to our question is the EU strategy that goes to the root of the issue by proposing that "*the export of textile waste to non-OECD countries would be allowed only under the condition that such countries notify to the Commission their willingness to import specific types of waste and demonstrate their ability to manage it sustainably"* (EC, 2022, p. 13).

Furthermore, several strategies point out that more knowledge is needed to be able to make good decisions about measures. In particular, they cite lacking knowledge on microfibre shedding and health and environmental impact, and as a consequence what can be done to limit these effects in production and use. Again, this focuses on symptoms rather than underlying causes of the synthetic textile waste problem.

5 Conclusions

In the introductory chapters, we have shown the premises for the questions we have asked, and the knowledge we build on when interpreting the texts. In the method chapter, we have substantiated our choice of strategies and methods. The discussion shows how the strategies are formulated in connection with the questions we have asked. We have now reached the concluding chapter. It consists of two parts; first a text and visualisation of how the proposed measures do not address the main issues; second, a summary of the undiscussed assumptions that lay within the strategies' way of thinking. These are theories of causation that form the premiss for the intended environmental effects of the strategies and we call for research, or at least a discussion about the validity of these hypotheses.

5.1 Measures in the wrong place

Examining clothing consumption from a systemic perspective can help identify causal loops and leverage points, points to intervene within the system (Meadows, 1999), and compare the various proposed measures in terms of their potential effect on the system. This can be illustrated by a causal loop diagram (Bala et al., 2017).

The causal loop diagram on the next page (**Figure 5-1**) shows where in the system we (SIFO) would propose measures to decrease the environmental impacts of clothing production – directly aimed at reducing production. This is in opposition to public policy, here exemplified by the EU Strategy and the strategies of brands/businesses, here exemplified by the H&M strategy. It illustrates how the proposed measures in the strategies examined are aimed at products instead of the system and consumers instead of production. This is based on a set of assumptions, also shown on the diagram.

Neither the industry nor most of the public policymakers seem to be ready to talk about the elephant in the room based on their strategy documents. From our point of view, most strategies are strikingly similar: they are dominated by a belief that improvements on a product level will solve the challenges we are facing. This is despite the fact that this strategy has failed, as the growth has eaten up any gains from product improvements. In other words, absolute decoupling is still a hypothesis and not a verified theory. If growth is understood as a problem in the strategies, it is as growth in consumption or in waste – and not as growth in production. The above comments on the strategies are in line with previous critiques of environmental work in fashion (Fletcher & Tham, 2019; Machek et al., 2020; Payne & Mellick, 2022), the growth paradigm (Hickel & Kallis, 2020; Jackson & Victor, 2019). and calls to support sufficiency within the circular economy (Bocken et al., 2022). A recent study of sustainable initiatives and green marketing shows that they likely have the opposite effect than intended due to a psychological rebound effect - reducing consumer guilt and unease, through this, furthering increased consumption (Olson, 2022). The same effect was found in a study of consumer fibre preferences (Sigaard & Laitala, 2023).

This lack of systemic approaches when facing the environmental challenges is most striking in the EU Textile Strategy because it has great ambitions. Of all the strategies, it is the Danish that goes the furthest in addressing the elephant. It is probably a result of it being born out of a collaboration between researchers and not solely industry and bureaucracy. This speaks in favour of including other stakeholders than the industry itself and their organisations when new policy is being developed.

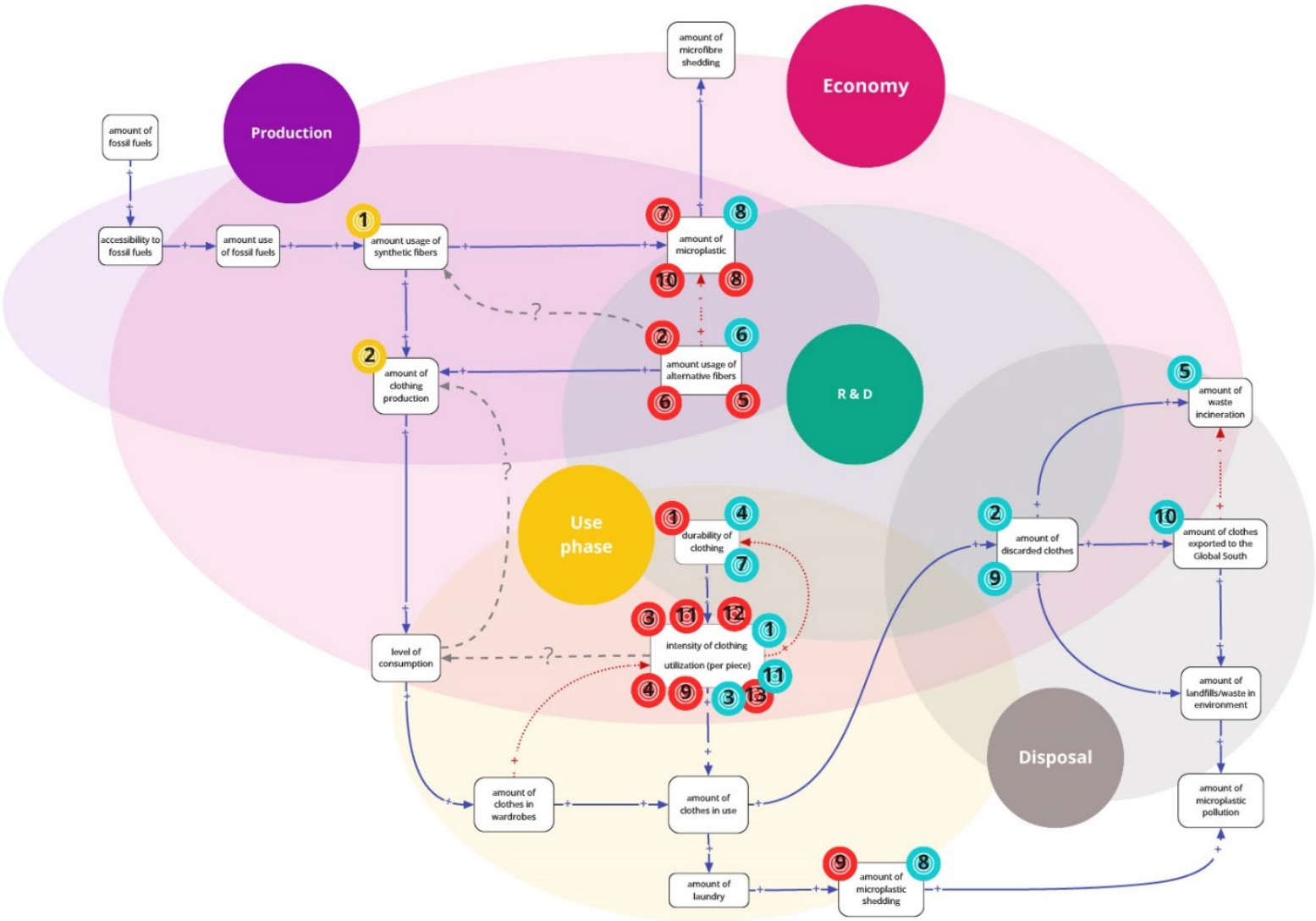

Figure 5-1 Causal loop diagram: proposed leverage points vs. strategy measures. [55]

Developed with System Mapping Academy (no date) based on Wright and Meadows (2009). © Lea Gleisberg 2022s

[55] Causal loop diagrams help to understand a system, find leverage points and reveal the patterns that underlie the problems that are produced by the system. They can also be used to visualise causal loops - how the different parts of a system are interconnected and influence each other.
The blue arrows stand for both: the more the more or the less the less (+ + , - -).
The red arrows stand for both: the more the less or the less the more (+ - , -+).
The arrows are given a symbol (+ or -) for how the system "behaves" at the moment. For example: the higher the usage of synthetic fibres, the higher the amount of clothing production. That also means in turn: the lower the usage of synthetic fibres, the less the amount of clothing production.
The grey arrows with a question mark stand for causalities that are based on assumptions that have not been verified or proven. As systems are so complex, causal loop diagrams focus on a particular pattern or message that the map should communicate.

Figure 5-2 Details of leverage points and strategy measures in Figure 5-1.

The majority of the proposed measures do not touch upon volumes, but rather the durability of products. There is, however, no point in extending durability or even the product lifetimes if the production volumes are not reduced. We are already in a situation where so much is being produced that the utilisation of each garment is decreasing. The strategies will therefore not contribute to a

reduction in environmental impacts, on the contrary, they will most likely increase them. More durable clothing with reduced use time means an increase in unused potential.

Instead of discussing production growth, the strategies put forward measures based on unverified theories of connections between durability, lifetime and environmental impact. There is a lot we do not know, but there is significant consensus that radical change is urgent in order to prevent catastrophic consequences for the living conditions of humans and other animals, fish and birds. In such a situation, we do not think it is appropriate to put all our bets on measures without verified effect. We, therefore, need to examine the premises for current strategies, but more than anything, make the case for using the knowledge we *actually* have and build strategies going forward on the basis of measures we know work. This will be in line with the "Earth Logic: Fashion Action Research Plan" (Fletcher & Tham, 2019) and the "Wellbeing Wardrobe: A wellbeing economy for the fashion and textile sector" (Sharpe et al., 2022).

5.2 The strategies build on a series of hypotheses

There are several hypotheses that form the premiss for most of the strategies:

1. The transition to "sustainable materials" will lead to large reductions in environmental impacts

This hypothesis is important both for the industry and for public policymakers. It is the basis for labelling schemes and rating tools (Higg Index, PEF etc.). It presumes a number of conditions, such as there being large differences between products, that reliable and comparable knowledge about materials exists. It also presumes that indexes and labelling schemes will not have unintended consequences that affect the volume that is being *sold, despite research stating the opposite (Olson, 2022). The LCA data used for these tools are* old, not very representative and not fit for making comparisons (Kassatly & Baumann-Pauly, 2022).

The Norwegian Consumer Authority (NCA)'s, decision that Norrøna is in breach of marketing regulations by its use of Higg data also points out that the data is not connected with the specific product marketed and does not show significant differences in environmental impact.[56] When, in addition, studies show that the fibre choice itself amounts to only a small proportion of environmental impacts and that none of the comparative tools includes the specific plastic-related issues (microplastics, the lack of biodegradability and renewability) and therefore the problems that plastic pellet trade, etc. create, it is evident to us that this hypothesis falls short.

2. Changes in products lead to systemic change

More durable apparel, longer lifetimes or reuse do not "save the environment". It is in itself positive, but only if fewer clothes are being produced. When the focus on lifetime increases, in the form of more durable clothes or repairs, it is urgent to produce knowledge about the conditions under which this leads to the consumer acquiring fewer new clothes. In other words, how the potential increases in lifetime can have an effect on the environmental impacts, and for which types of apparel and consumers this applies.

The way changes on the product level are thought to influence the system is through the actions of consumers. It is of course possible, *even likely*, that the consumers will change their behaviour, but only *over time*. It is also likely that this change in consumer practices is too slow for the rapid change we

[56] Read the NCA's decision here and the following guidance on environmental claims to the textile industry here.

need. As already mentioned, the systems in itself, with the labelling of some products as better than others, will have the opposite impact.

This hypothesis is also based on the assumption that fast fashion is bad quality clothing, whereas it is a business model based on speed and large volumes of cheap clothes, some which are also very durable. Therefore, instead of developing measures that do not affect the system or the problem directly, it is now time to develop policies that have the need for systemic change as their starting point and not the design of single products.

3. New business models will lower environmental impacts

The environmental gains from new business models have not been sufficiently examined (Johnson & Plepys, 2021; Maldini et al., 2019). This concerns the whole range of business models directed at prolonging lifetimes, such as repair, rental, re-use etc. The studies that do exist show very different results depending on a variety of factors (e.g., Gray et al., 2022; Johnson, 2020; Johnson & Plepys, 2021; Zamani et al., 2017). Yes, it is important that the industry is encouraged to evolve, but if we are to reduce the environmental impacts, measures with a higher probability of success should be prioritised. All the mentioned business models would on the other hand become important (and profitable) if clothing production volumes were reduced.

4. Changes in demand will influence production

The relationship between what is bought and what is produced is very complex for apparel. This is due to the fact that the collections commonly are produced long before they hit the market. They are therefore not produced on the basis of demand but on estimates for what will be sold. As long as the industry (or public policy makers) do not have a plan for reducing production, it is therefore difficult to see how the demand can influence production, in the current set-up, where production of garments and footwear is based on the projected sale of these that often no longer are in production at the time of sale. Knowledge is therefore needed about this relationship and how it is possible to reach a system with less overproduction, understood as deadstock (including apparel sold at heavily reduced prices, dumped in the second-hand system, or stored unused in wardrobes) that ends up as discarded useable apparel.

5. Sustainable synthetic fibres are possible

We have less control over synthetic fibres than other plastics. This is because they both shed in use, are exported to other countries without proper waste management and that they to a large extent are mixed with natural materials and problematic chemicals. How they simultaneously can be labelled as “sustainable” is difficult to understand. It is evident that they could be produced in a better way, e.g., so that they shed less during use, or be made from other raw materials. These kinds of alterations will not change the fundamental issue that we do not have control over synthetic textiles. None of the solutions that are being discussed for synthetic fibres solves the upstream and downstream issues simultaneously because these fibres’ low price is the condition for growth in the sector.

6. Decoupling - and therefore green growth - is possible

Absolute decoupling, of not just economic growth and environmental impacts but also of increased production and environmental impacts is so far not backed by empirical evidence. There is some evidence of relative decoupling and therefore of stagnation of increase in impacts or resource use. A much larger decrease in impacts, through absolute decoupling, is needed for continual economic growth to be possible. Still – as we have shown – this forms the backbone of the environmental strategies we have examined.

Instead, we propose to turn around these assumptions for more impactful policies: lowering the amount of apparel produced will increase the durability of apparel because it will be better taken care of. The apparel lifetimes will then be longer, and repair and other business models connected to longer use or more users will be more profitable. With fewer clothes, consumers will be more interested in buying apparel they really like from brands supporting them with good information on both the possible duration of the products and their use-related performance. Less synthetics, meaning less apparel produced in synthetic fibres or a lower percentage of synthetics in apparel produced, will in itself contribute to less apparel being produced. To work politically towards less apparel and plastic is therefore both an easier and more targeted strategy. In the proposal for targeted producer responsibility (TPR), we have shown how this can be done for example as a part of a producer responsibility scheme (Klepp, Måge, et al., 2022). The same system can be used related to PEF, ESPR and so on. An important change is not to focus on each garment but on how long the company's products are used on average.

6 Addendum

This report draws its name from a 2014 quote by Livia Firth, urging the fashion industry to talk about the elephant in the room: growth. The analyses for this report were conducted between March and June 2022, based on the most recent documents available documents. However, a lot is happening in the field of clothing and textiles. After we had finalised the analysis of the strategies, but before the report was finalised, TE published their new "Preferred Fiber & Materials Market Report" in October 2022.

It kicks off with the following ambitious statement:

"*The industry must: 1. Rethink growth—**the elephant in the room** [our emphasis]*"

(TE, 2022, p. 2)

In the following, however, it presents the same strategy and visuals already presented at the conference we have analysed in this report. Their solutions to the environmental problems of the industry remain "to decouple value creation from resource use", transition to "slow growth", "preferred fibers" and increased recycling (TE, 2022)

This shows that despite now mentioning the elephant in the room, their strategies for improvement remain the same as before.

Since the analyses for this report was conducted, amendments have also been proposed made to the EU Strategy for Circular and Sustainable Textiles. Several of these amendments strengthen the EU's propositions in the direction of our arguments and proposed measures.

In terms of production growth, the wording in "Compromise Amendment 3 – End Fast Fashion" more directly addresses reduction by calling "on the Commission in collaboration with Member States and in consultation with researchers, civil society and industry stakeholders to establish a clear definition of fast fashion which is based on high volumes of lower quality garments at low price levels", by welcoming "the encouragement in the Textiles strategy for businesses to reduce the number of collections per year; stresses the need in particular for measures to reduce the global use of primary materials and overproduction of textiles" and additionally saying that "the Textiles strategy and the envisaged measures should better tackle overproduction and overconsumption" (Burkhardt, 2023, p. 6).

In terms of plastic textiles, "Compromise Amendment 23 – PET" further underlines the misleading nature of claiming that making textiles out of recycled bottles is sustainable by adding "that this should be taken into account inter alia in the review of the EU Ecolabel criteria" (Burkhardt, 2023, p. 41).

These are positive statements in our view. We can see emerging will to face the elephant and hope the discussion around sustainability will mature, be more based on research and less on assumption in the near future.

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Appendix A: Analysis form

Written sources

NAME	
Type:	**Published:**
Responsible:	**Downloaded:**
Description:	
Link	

Oral sources

NAME	
Organizer:	Place:
Type:	Date:
Description:	
Name	
Type:	Participants:
Responsible:	
Date:	
Description:	

Name	
Type: **Responsible:** **Date:**	Participants:
Description:	

Questions (give overall answers, explanations and quotes from source):

RQ1: Does the strategy include/address growth? (i.e., overproduction, quantities)?

- A: in the problem statement?
  - YES: Growth is addressed as a problem that needs to be halted.
  - To some extent/Indirectly: Growth is briefly mentioned as a problem.
  - NO: This is not discussed or continued growth is a goal.
- B: through measures ?
  - YES: There are measures directly addressing growth, e.g., targeted taxation, import restrictions, quotas, reduction goals in % etc.
  - To some extent/Indirectly: No direct measures but durability (technical/social), longer use, repair, circular business models etc. are discussed, and seen as means for reduction.
  - NO: There are no measures addressing growth.

RQ2: Does the strategy attempt to stop and/or minimize plastification? (Per cent share of plastic in the production, in total compared to other fibre compositions?)

- YES: Clear goals for reducing plastic fibre usage are presented, e.g,. natural fibres and other solutions are put forward.
- To some extent/Indirectly: This is discussed, but no measures are put forward.
- NO: This is not discussed at all or more plastic is seen as a solution.

RQ3: Is the raw material to plastic addressed? (The source of the material; up-stream supply chain?)

- YES: The problem with virgin plastic is discussed and solutions like biobased, Textile2Textile recycling are put forward.
- To some extent/Indirectly: It is mentioned, rPET is the only solution put forward, if any.
- NO: There is no mention at all of this issue.

RQ4: Is the plastic waste problem addressed? (How the synthetic fibres will or will not end up as plastic waste?)

- YES: The problem is addressed at the root, e.g. decreasing use, compostability.
- To some extent/Indirectly: There is some mention of measures that aim to reduce waste. (E.g., microfiber filters, chemical issues, collection for recycling), or plastic waste is addressed but not plastic fibre waste.
- NO: This is not addressed.

Appendix B: Detailed results of analyses and scoring calculations

YES = 100% To some extent/ Indirectly = 50% NO = 0%

Type	Document origin and title	RQT1		RQT 2	RQT 3	RQ T4
		A	B			
Public Policy Maker	**NO** Nasjonal strategi for ein grøn, sirkulær økonomi	50	50	0	50	50
	EU Strategy for Sustainable and Circular Textiles, 2022	100	50	50	100	50
	EEA Plastic in textiles: potentials for circularity and reduced environmental and climate impacts, Report (EEA, 2021)	50	50	50	100	100
	DE Fallstudie zur globalen Umweltinanspruchnahme durch die Herstellung unserer Kleidung (UBA., 2020)	50	50	0	50	50
	DK Circular Economy with a focus on plastics and textiles – A 2030 and 2050 roadmap (Aalborg University et al., 2021)	100	100	50	100	0
Industry organisation	**DE (textil+mode)** Wie man die Mikroplastikflut verringert	0	0	0	100	50
	TE Textile ExchangeConference, overall score	50	0	0	50	0
	Policy Hub EU Textile Strategy Position Paper, 2021	0	50	0	0	50
	GFA MONITOR 2022	50	0	0	50	50
Brand/business	**Varner Group** Sustainability Report 2021	0	50	0	50	50
	H&M Group. Annual and Sustainability Report 2021 ++	0	50	0	100	50
	Bestseller Sustainability Report 2021 and Circular Design Guide	0	50	0	100	50

Scoring calculations

Research Question		Stakeholder	Number of policies/Average score				
			NO 0%	25%	TSE/ I 50%	75%	**YES** 100%
Does the initiative include/address growth (i.e. overproduction, quantities)	**in the problem statement?**	Public Policy Maker			3	70%	2
		Industry organisation	2	25%	2		
		Brand/business	3 0%				
	through measures?	Public Policy Maker			4	60%	1
		Industry organisation	4 0%				
		Brand/business			3 50%		
Does the measure attempt to stop and/or minimize plastification?		Public Policy Maker	2	20%	3		
		Industry organisation	4 0%				
		Brand/business	3 0%				
Is the raw material to plastic addressed?		Public Policy Maker			2	80%	3
		Industry organisation	1		2 50%		1
		Brand/business			1	75%	2
Is the plastic waste problem addressed?		Public Policy Maker	1		3 50%		1
		Industry organisation	1	37,5%	3		
		Brand/business			3 50%		

Appendix C: The Textile Exchange Conference

(TE, 2021a).

An overview of all the talks at the conference can be found here:
https://na.eventscloud.com/website/13767/agenda/

Below are details of the sessions.

Textile Exchange Conference	
Organizer: Textile Exchange (TE) **Type:** Hybrid conference	Place: Dublin, Ireland Date: 15th -19th of November 2021
Description: Annual global conference for the textile industry. For the first time in collaboration with the Sustainable Apparel Coalition.	
Key note speech	
Type: Lecture - hybrid **Responsible:** TE **Date:** 16th of November 2021	Participants: Dr. Jason Hickel
Description: An explanation how degrowth works, as opposed to a Capitalist system where growth is a given. Putting fast fashion into perspective. What is the goal of the industry? Meeting human needs or the need for corporations to generate profit? He addressed the impacts of inequality and resource extraction, new forms of value creation, and decoupling growth from business status quo.	
Basics of Sustainability workshop 1 & 2	
Type: Hybrid lecture with Q&A **Responsible:** TE **Date:** 15th of November 2021	Participants: TE staff and Treadle Tree
Description: Explaining the Climate+ strategy, Maturation Model Overview & Preferred Fiber and Material (PFM) Toolkit Sneak Peek, Business Model Integration, developed a Preferred Fibers and Materials Portfolio: Part 1 & 2, Traceability, Supply Chain Mapping and Standards; Calculating fiber volume; Setting Targets; Tracking Uptake of targets/volume; Measuring volume and reporting on fiber volume / progress, Corporate Fibers and Materials Benchmark. Most of what was said, was stated by staff from TE.	
Policy Hub session	

Type: Hybrid with Q&A **Responsible:** TE and Policy Hub **Date:** 16th of November 2021	Participants: Policy Hub Chair Baptiste Carriere-Pradal and members Lenzing and Zalando
Description: The session is intended to give to the participants an overview of the current Policies conversations in the EU regarding textile and sustainability and how those have a direct impact in the operations of all actors inside the textile value chain.	
The Future of Textile Exchange Standards: Climate+ and Accelerated Impact	
Type: Hybrid with Q&A **Responsible:** TE **Date:** 16th of November 2021	Participants: TE staff (NB Chatham House Rules)
Description: Discussion on having a unified standard for all the TE standards.	
Recycled Polyester Round Table Summit	
Type: Hybrid with Q&A **Responsible:** TE **Date:** 16th of November	Participants: Textile Exchange staff Tengiva and gr3n group
Description: Round Table discussing the Recycled Polyester Challenge, Preferred Fiber and Material Index, a new division for synthetics within TE, targets for recycled polyester, technologies and with two invited speakers who offer specific solutions. Publicly available recording: https://www.youtube.com/watch?v=MFfONzMslHM	
Achieving Science-based Targets with the Apparel Alliance	
Type: Panel discussion (hybrid) **Responsible:** TE **Date:** 16th of November	Participants: Textile Exchange staff Sustainable Apparel Coalition, Apparel Impact Institute, World Resources Institute, ZDHC
Description: Continuing a discussion started during SAC member meeting, true industry-alignment necessary to reach the shared goal of a 45% net reduction, specific interventions related to the adoption of preferred fiber and materials. Presentation of Roadmap to Net Zero report. Description of a new alliance, the Apparel Alliance.	
Plenary 2: Leveraging Partnerships in the Industry	

Type: Panel discussion **Responsible:** TE **Date:** 17th of November	Participants: SAC (Amina Razvi), Global Fashion Agenda (Federica Marcchioni), TE and Responsible Business Coalition (Cara Smyth)
Description: Hear from Fashion Conveners: SAC, Global Fashion Agenda, Textile Exchange and Responsible Business Coalition/Fashion Makes Change on how they are collaborating together to streamline tools, resources and messaging for industry's climate vision. Naia Renew is sponsor, recycled (including plastics – "that would otherwise end in landfill").	
Powered by Nature: A «Leaderful" pathway for the Textile Industry	
Type: Hybrid **Responsible:** TE **Date:** 17th of November	Participants: TE, The Biodiversity Consultancy, Primark, Kering, Norrøna, Plastics for Change, and more
Description: A discussion about the Biodiversity Benchmark, beyond standards, with case studies. Trying to find one goal to move towards collectively. Companies are getting bombarded by tools, reports, etc. and this seems daunting. Setting science-based targets, take actions from fiber production and further down the value-chain, reporting.	
Textile Exchange LCA+ approach to understanding and assessing impacts	
Type: Hybrid **Responsible:** TE **Date:** 17th of November	Participants: TE staff Joël Mertens, HIGG Product Tools Ed Ellis, Integrated Biodiversity Assessment Tool; Michael Moeller, Hohenstein/Oeko-Tex (with Quantis)
Description: TE is taking an "LCA+" approach to understanding and assessing Tier 4 impacts related to climate, biodiversity, soil health, and water. Update on TE's ongoing work to track and map the development of relevant impact data sources and partners, and to identify the needs and next steps for measurement of industry progress against priority outcomes within the Climate+ impact areas.	
Circularity in the apparel sector	
Type: Live panel **Responsible:** TE	Participants:

Date: 17th of November	Laura Balmond, Ellen MacArthur Foundation Lewis Perkins, Apparel Impact Institute, Karla Magruder, Accelerating Circularity
Description: The circular economy can seem abstract and vague. The Ellen MacArthur Foundation framed the core principles of circularity and share examples of their Make the Fashion Circular initiative is putting some of these core guidelines into use. Accelerating Circularity aims to put circularity into action – and at scale.	
Home and Hospitality Round Table	
Type: Hybrid **Responsible:** TE **Date:** 18th of November	Participants: TE WRAP
Description: Round Tables are fiber specific, for the most part; however, this Round Table is for a sector. The main aim is to garner better uptake of the 'challenges', there are currently two, where one is for recycled polyester. The Norwegian brand, Kid Interiør is active here. Publicly available recording: https://www.youtube.com/watch?v=zDfv1wYldtg	
Scaling solutions	
Type: Live panel **Responsible:** TE **Date:** 18th of November	Participants: TE Ken Bruder, The Climate Board Cara Smyth, RBC/Gabelli Business School/Fashion Conveners
Description: How to level up as an industry, from Level zero to Level four (transformative). New ways of thinking how to move forward and pull the levers, including where the friction points are.	
Scaling Smart Materials	
Type: Hybrid panel **Responsible:** TE & GFA **Date:** 18th of November	Participants: Lenzing, Bestseller, FullCycle Climate partners, Reverse Resources
Description: GFA hosted the break-out, mirroring on of the five priorities of the Fashion CEO Agenda, discussing the availability and scalability of 'more sustainable material choices, financial mechanisms and pre-competitive collaborations needed to meet industry targets. (Chatham House Rules applied to this session)	

Preferred Fiber and Material Matrix	
Type: Hybrid **Responsible:** TE **Date:** 18th of November	Participants: Williams Sonoma Inc GAP Inc (who actually gifted the tool to TE)
Description: Second, more in-depth dive into the subject.	
COP 26 and the Future of Fshion: What Comes Next	
Type: Virtual conversation **Responsible:** TE & UN **Date:** 18th of November	Participants: UN Climate Change Lead Lindita Xhaferi-Salihu TE Claire Bergkamp
Description: About the Fashion Industry Charter for Climate Action, what it is asking of the industry.	
Final Plenary	
Type: Live session **Responsible:** TE **Date:** 18th of November	Participants: TE employees VF
Description: Summary and how to move forward.	

Consumption Research Norway (SIFO) is a non-profit, transdisciplinary research institute at OsloMet – Oslo Metropolitan University. SIFOs research aims to understand the role of consumption and consumers in society and to provide the knowledge basis for public consumer policy in Norway.

SIFO's core research areas are:

- Sustainable consumption, centering on environmental impacts of consumption and consumers' participation in a green transition.
- Market based welfare, focusing on financialization processes, consumer debt and non-state procurement of welfare services.
- Technology and digitalization, looking at consumption of and through digital media.
- Clothing and textiles, looking at consumption history and culture, procurement processes and consumption practices related to these product groups.
- Food, nutrition and food culture.

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