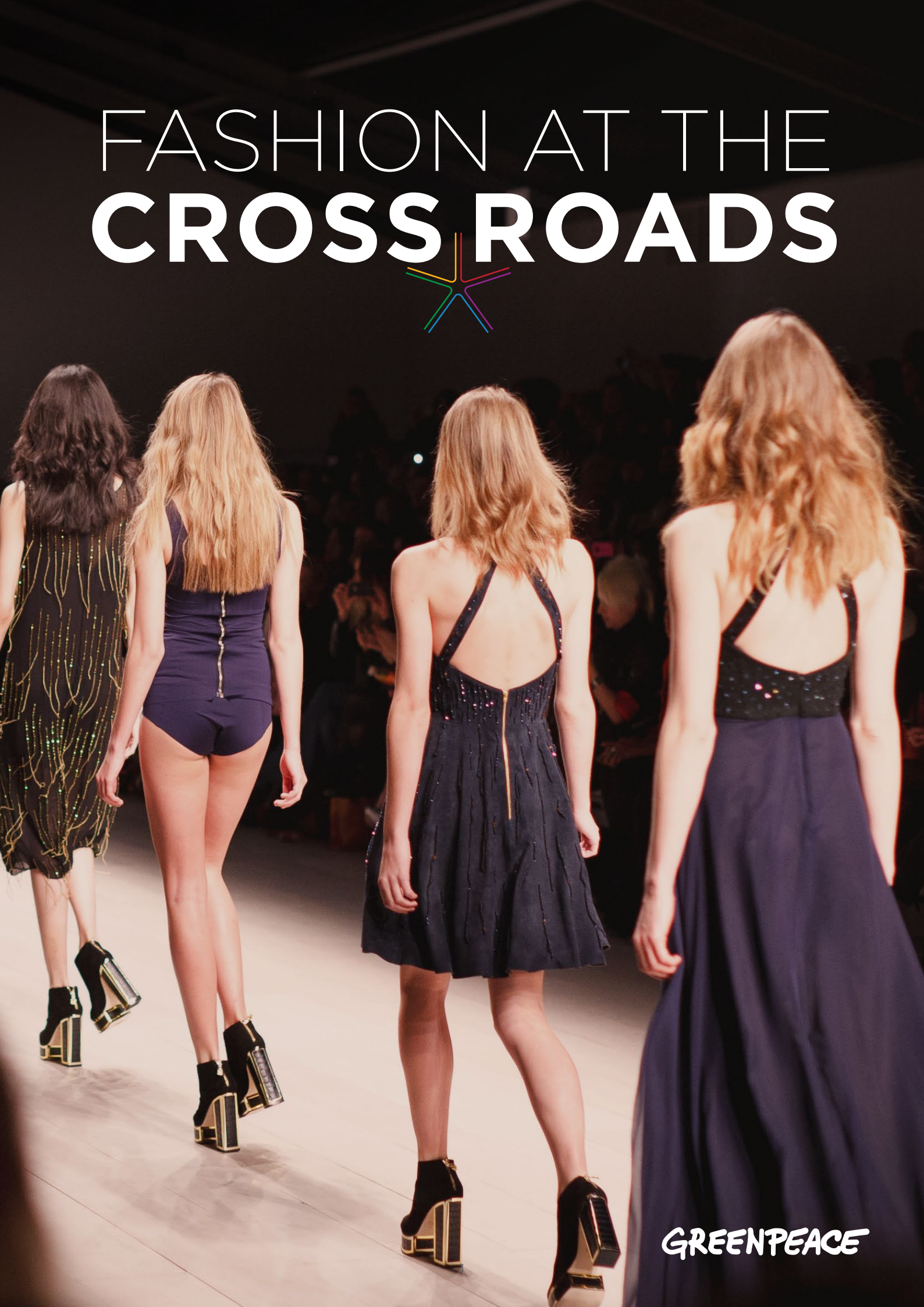
FASHION AT THE CROSS ROADS



GREENPEACE

FASHION AT THE **CROSS ROADS**

A review of initiatives to slow and close the loop in the fashion industry

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TIME TO STEP **ON THE BRAKES**

EXECUTIVE SUMMARY

"Circularity" is being promoted as the latest solution to the environmental problems of our wasteful society, particularly by the fashion industry and policy makers. However, it is mostly being tackled from the downstream up, pushing short term waste management approaches, such as the recycling of problematic plastic waste from other industries as the main solution and betting against the odds that a technological fix will provide an easy solution. Instead, there needs to be a radical transformation through slowing the flow of materials and implementing long-term waste prevention solutions which would design out the waste altogether.

Since 2011 Greenpeace has been calling on major brands to eliminate the uses and releases of harmful chemicals from their production chain, through their Detox commitments,[1] without which the circular dream could well become a toxic recirculation nightmare. However, even this progress could be put at risk if brands fail to recognise that **the overconsumption of textiles is the larger problem that must be tackled.** In addition, the promotion of the circularity myth that clothes could be "infinitely recycled" may even be increasing guilt-free consumption.[2]

This focus on circularity is illustrated by the recently released Pulse Report on the State of the Fashion Industry,[3] (see page 10) which projects a future where the fashion industry continues on its current growth trajectory, with big brands taking an ever greater share of the market and implementing their 'best practices'; **the industry aims to double its use of polyester by 2030** – as part of a so-called 'sustainable materials mix' because it is claimed to be 'recyclable' (see Box 2). **But even if it were possible to recycle all polyester textiles** and close the textiles loop**, are we sure it will lead to environmental benefits? And what potential is there for recycling natural fibres?**

In this report, we witness a different reality. Recycling technologies for the one hundred percent recycling of both natural and synthetic textile waste into new fibres are at an early stage. **Much of the current recycling of polyester by the textile industry does not even deal with textiles waste**; instead this "open loop" recycling focusses on PET bottles, removing responsibility from the food and beverage industry for single use plastics. Initiatives by some brands for recycling plastics waste reclaimed from the sea have more impact on their public relations profiles than on the huge problem of plastics pollution of the oceans. **The industry is mostly turning a blind eye to the inherent problems of polyester, in particular its reliance on fossil fuels and its contribution to the problem of microplastic fibres in the aquatic environment.**

In this investigation, Greenpeace identifies and evaluates initiatives by companies in the clothing and footwear sector that attempt to both slow the flow of materials and close the loop, reflecting the synergies and the dialectic between these two approaches. The diverse initiatives on clothing, shoes and accessories compiled in this report were classified according to **"three design concepts"** that act directly on the 'make – use – end-of-life' cycle and **two "systems and models"** which facilitate these interventions. Together, these make up a **holistic framework which addresses the whole life cycle of clothing and textiles**, including the way that such initiatives interact with each other, instead of tackling individual parts of the system in isolation.

Unsurprisingly, and in common with design professionals and commentators,[4] we found that **design for longer life and promoting extended use** of clothing are the most important interventions to slow down the material flow by reducing purchases of new products while addressing the environmental challenges of the current fashion system.[5] Not only that, strategies for long life include many practical steps that can be implemented with existing skills and know-how - including long warranties, making higher quality clothes which are more durable and repairable, and creating services to repair and refurbish and encouraging more re-use. These are already mainstream practices for some sectors such as the Outdoor industry, and although this could be seen as a core service for these technical products, this is exactly where the large fashion and sportswear brands are currently failing their customers and ultimately the global environment. **Smaller fashion brands are leading the way** by extending not only the physical but also the emotional durability of clothes, equally important for prolonging their use through style, function and fit, both of which the larger brands tend to disregard. New modes of marketing and ownership of clothes, such as sharing or renting, are also being explored in different forms, by companies outside the mainstream.

More challenging, though promising, opportunities are provided by **changes in business models** that not only focus on limiting and reducing damage but are part of a transformation in how clothes are produced, sold, shared, repaired and reused. These facilitate dematerialisation and the traceability of materials, waste and collected clothes; challenge ownership

patterns; redefine sourcing and marketing strategies; and involve customers in a new narrative where there is also space for creative and cultural diversity. Although **these examples of alternative business models are dominated by smaller or medium sized companies**, there are signs that some larger companies are seriously evaluating these options for the longer term. Greater experimentation is therefore required by the big players in order to benefit from the opportunities that lie ahead.

There are many other initiatives besides these two main paths for improvement. For example, **reducing environmental impacts** at all stages of the life cycle through more conventional means, such as better material and energy efficiency; technical solutions for achieving biodegradability, the performance of recycled materials, or techniques which can extend the life of clothing during use; and attempts to reduce dependency on oil or other virgin raw materials through recycling waste from other industrial sectors - or "industrial ecology". All of these initiatives are valuable, but lack a holistic and systematic approach to setting objectives and measuring actual environmental performance, often omitting some significant issues, including microplastic fibres and pesticides. Moreover, they should be considered within the context of the waste hierarchy[6] and Detox principles[7] on the one hand and developing common tools for strict traceability, monitoring and reporting on the other.

Take-back initiatives are also important but need to be developed and co-ordinated strategically, instead of the current piecemeal approach, with consideration for existing initiatives and systems organised by the non-profit sector. **Resources and producer financing for end-of-life logistics and technologies for recycling should not rely on corporate generosity but be made mandatory**, ensuring that externalised costs are internalised and linked to the volumes of output, if they are to have any structural value. Laws on Extended Producer Responsibility (EPR) - such as the EcoTLC system set up in France (see Section 4.1, Extended Producer Responsiblity systems, p.39) - set national collection targets and aim to level the playing field, reward design improvements, provide traceability and reporting, and raise funds for collaborative R&D across industry. Without such a strategic intervention, first movers are penalised, research efforts are scattered, there is no credibility to claims about performance and there is no obvious relationship between collection, recycling technologies, markets for recycled fibres and product design improvements for disassembly, recyclability and increased longevity. For **recycling technologies**, although the focus of the fashion industry is on the recycling of synthetics, the chemical recycling of post-consumer clothing made from natural fibres is also developing rapidly, but both are still at an early stage.

Considering the current focus of mainstream fashion brands on "circularity", **it is surprising that there are few initiatives on design for remanufacture and recycling**, to make clothing easier to disassemble or more suitable for recycling. This tends to confirm that a holistic approach that would be a consequence of EPR laws is missing; the reliance on abundantly available PET bottles and other synthetic non-textile waste for "recycled" materials is at the expense of a textile-to-textile closed loop system. A holistic approach is also needed to ensure that potential conflicts between longevity of clothing and the need for recyclability and disassembling are tackled.

We found a multitude of good ideas and positive initiatives on how to slow down the flow of materials, increase their circularity and reduce their environmental impact. However, these initiatives urgently need scaling up. We also found some questionable examples claiming to be successful recycling but which are far from this in reality, on closer examination. Greenpeace wants to shine a spotlight onto positive examples, to encourage more of the same and to challenge the industry where we believe practices are taking the wrong route.

Closing the loop on textiles in the current circumstances is unrealistic, with recycling in its infancy and many unanswered questions about recycled materials. To create the conditions for this to become a real possibility in the future, the industry needs to take a more responsible approach and slow down the flow of materials as the first priority.

Governmental institutions and politicians can play a big part in helping to encourage and structure these developments by changing the landscape of the economy and our cultural attitudes: this could include initiatives such as tax incentives to repair (as recently implemented in Sweden[8]), setting limits on advertising, mandatory take-back schemes such as the one in France, and other tools that reward best practice design and implement Extended Producer Responsibility.

Contrary to claims by the fashion industry that large brands are clearly ahead on sustainability,[9] many of the best examples are from small or medium sized companies. Governments need to create the conditions and infrastructure for small businesses to flourish and bring their innovations to a wider market, and platforms to facilitate the exchange of knowledge and cooperation between all sizes and types of companies. Financial incentives are also needed to encourage

businesses models which value positive environmental and social improvements.

Nevertheless, large brands have a powerful influence on the market and need to take responsibility for reducing their demand on natural resources to within planetary boundaries as well as tackle the main environmental threats such as climate change, hazardous chemicals, impacts on water systems and land degradation not to mention emerging issues such as ocean pollution from microfibres. The priority has to be on slowing down the flow of materials, while reducing dependency on fossil fuel-based materials and conventionally grown cotton.

So far, the industry has shown that it is not willing to tackle the overconsumption of fashion - all of the environmental and social impacts of clothing from the cradle to its grave are amplified by the fact that people consume far more than they need, so that valuable resources are used up and thrown away at an ever increasing rate. The growth in online shopping looks set to increase the rate of production and consumption even more, with impacts not only on the environment and workers, but on the people buying fashion. A recent Greenpeace survey[10] of international buying habits has found that many respondents bought far more than they need and use, but that the pleasures of shopping are short lived, leaving only feelings of emptiness and guilt. We therefore ask, should we put the brakes on online shopping and how can we encourage a sense of responsible community, sharing and experiencing, rather than more atomized consumers?

In this report we show that many options already exist that can slow down this overconsumption and allow progress toward true circularity, **changing the DNA of fashion** by internalising the best practices for sustainability, using the energy of creativity to redesign future pathways. Instead of continuing the pattern of overconsumption through a “fast fashion fix”, companies have an opportunity to create products and services that represent true value and authentic experience, which also contribute to the adoption of more intrinsic values by customers and society as a whole.

THE PULSE OF THE FASHION INDUSTRY REPORT RE-VISITED

In May 2017 at the Copenhagen Fashion Summit, the Pulse of the Fashion Industry report was released, with the stated objective to "provide a direction and guidance towards a better fashion industry".[11] Published by The Global Fashion Agenda, in collaboration with The Boston Consulting Group, the report intended to "place environmental, social, and ethical improvements on management's agenda". However, Greenpeace did not applaud its conclusions. Instead, the Pulse Report provides a stage for the usual players and exposes the mindset of the fashion industry, "**to continue the growth trajectory".**

Unfortunately, the Pulse report's recommendations to address fashion's environmental and social footprint are proposed in order to continue its inherently unsustainable growth. Despite recognition of the serious environmental and social problems being caused by the fashion industry today, which confirms much of Greenpeace's analysis in its recent **Timeout for Fast Fashion** publication,[12] there appears to be little awareness that the ever increasing turnaround of low quality fashion items is the very problem that needs to be overcome. The question of strategies to **slow down** the flow of materials is barely touched on, despite the results of its own survey;[13] when discussing material selection the question of **recyclability** is prominent compared to the almost complete absence of **longevity**. When it is discussed, existing solutions are derided as unscalable niche options while several other options (such as better quality clothing or warranties) are not even identified by the report. Worse still, it puts the responsibility for disposable fast fashion firmly onto the consumer:

"**Not long ago, most apparel was carefully looked after, repaired, and handed down. With the coming of fast-fashion, in the past decade the number of garments purchased by the average consumer has more than doubled. Some consumers treat garments as nearly disposable, throwing them out after only a couple of wears."**[14]

Following a "business as usual" approach, consumption of clothing is projected to rise by 63%, from 62 million tons today to 102 million tons in 2030, based on increases in population and GDP. The Pulse report warns that "with current trajectories of production and consumption, these [environmental and social] pressures will intensify by 2030 **to the point of threatening industry growth itself**".[15] In other words, it is saying that the biggest concern for the fashion industry would not be the damage it is causing, but the need to protect its profits by continued growth and expansion. The report proposes changes – such as adopting current best practices across the whole industry and co-ordinated action **beyond today's solutions** - that will prevent this from happening and protect the profitability of the fashion industry.

While many of the solutions presented in the Pulse report – such as increasing the use of renewable energy – are obviously positive, the most significant recommendation that will also allow the maintained growth of the fashion industry is to advance towards a so-called "sustainable materials mix" - **increasing the amount of polyester by 92% by 2030 – to 76 million tonnes**, compared to a 9% decrease in cotton (see Box 2: Life in plastic). The basis for this promotion of polyester is a "cradle to gate environmental impact" assessment of the various materials used in textiles, which shows how cotton is a major user of water. However, the assessment completely misses some critical problems with polyester and other synthetic fibres - fundamentally their reliance on fossil fuels and their contribution to microplastic or microfibre pollution (see Box 2).[16] Others in the industry have also noted that the Pulse report "bases its conclusions on incomplete life cycle data, takes a dismissive attitude to microfibre pollution and props up the fast fashion business model".[17]

Instead of taking responsibility for the billions of polyester microfibres already in the environment by working out a strategy to reduce its use, the fashion industry as a whole is choosing to ignore these alarming signals of environmental damage. Not only that, it proposes a massive increase in the use of polyester, with ultimately unknown consequences for living organisms (including humans) and the global ecosystem. It continues to promote sourcing of recycled PET from post-consumer waste and marine plastics for textiles, which only converts the solid plastic into textiles which can also release microplastic fibres. Most proposals to actually tackle microplastic fibres are for the use of bags for laundering and filters on washing machines; others point to the development of "next-generation" polyester which must somehow overcome the problem of microplastic fibre shedding and at the same time produce polyester fibres free from hazardous additives (e.g. antimony).[18] Neither are currently realistic solutions. The report also acknowledges that consumers are not persuaded that polyester can be as appealing as cotton, although its use in blends has become a backdoor route to consumer acceptance.[19]

The report also clearly identifies the positive alternatives to both polyester and conventional cotton - Organic cotton and classical natural fibres (hemp,

linen), which have lower demand for water during cultivation and lesser overall impacts – but these are not proposed as "best practices"; instead, the easier option of "Better Cotton" is proposed (see Box 2).

Who does the BIG fashion industry trust to implement the best practices and action **beyond today's solutions,** such as the proposed substitution of cotton with polyester? The answer is not surprising – only themselves. The report calls for industry cooperation under the leadership of big players (including Fast Fashion, luxury and sportswear leaders) in order to overcome financial and technical barriers for an accelerated fix of the crisis rather than a radical reinvention of the fashion industry. This attitude has not gone unnoticed by smaller players in the textile industry such as the International Wool Textile Association which states that "the report unaccountably, props up the fast fashion business model, which is difficult to reconcile".[20] By pushing for a 'one size fits all' solution dominated by big business, the industry is proposing a monoculture likely to limit its ideas and techniques to fit within its own profit imperative. This will crowd out the diversity of small and medium sized companies and individuals which have alternative approaches and creative ideas that need to be developed from the ground upwards.

At the same time as pushing to take over the biggest portion of the fashion pie possible, the industry seems quite happy to dilute its producer responsibility by blaming consumers for their supposed buy-and-throw attitude and unwillingness to pay for more sustainable garments. Public authorities are also seen either as an unwelcome threat - in the form of regulation such as implementing penalties, extended producer responsibility, mandatory targets and other tools which risk profitability – or as a cash cow to distribute grants and subsidies for R&D and investments.

Once again, this "privatise benefits, publicise problems" approach completely ignores the legacy of the irreversible pollution already out there, the water and land scarcity, the mountains of waste and the human toll, the lives of workers blighted and the damaging changes to the mindsets of a generation of 'shopaholic' consumers.

1. INTRODUCTION

Circularity has become the new buzz word across industry, particularly in the world of fashion and textiles. The idea that nothing should be wasted - that everything, once it has reached the end of its useful lifetime, should be collected and the materials in it recycled to make more of the same products, or composted to provide nutrients for the soil - is certainly a desirable objective. But how realistic is it? At least for textiles, this goal still seems to be a long way away, as shown by the examples that we reviewed in this investigation.

Figure 1: The rise of fast fashion[28]

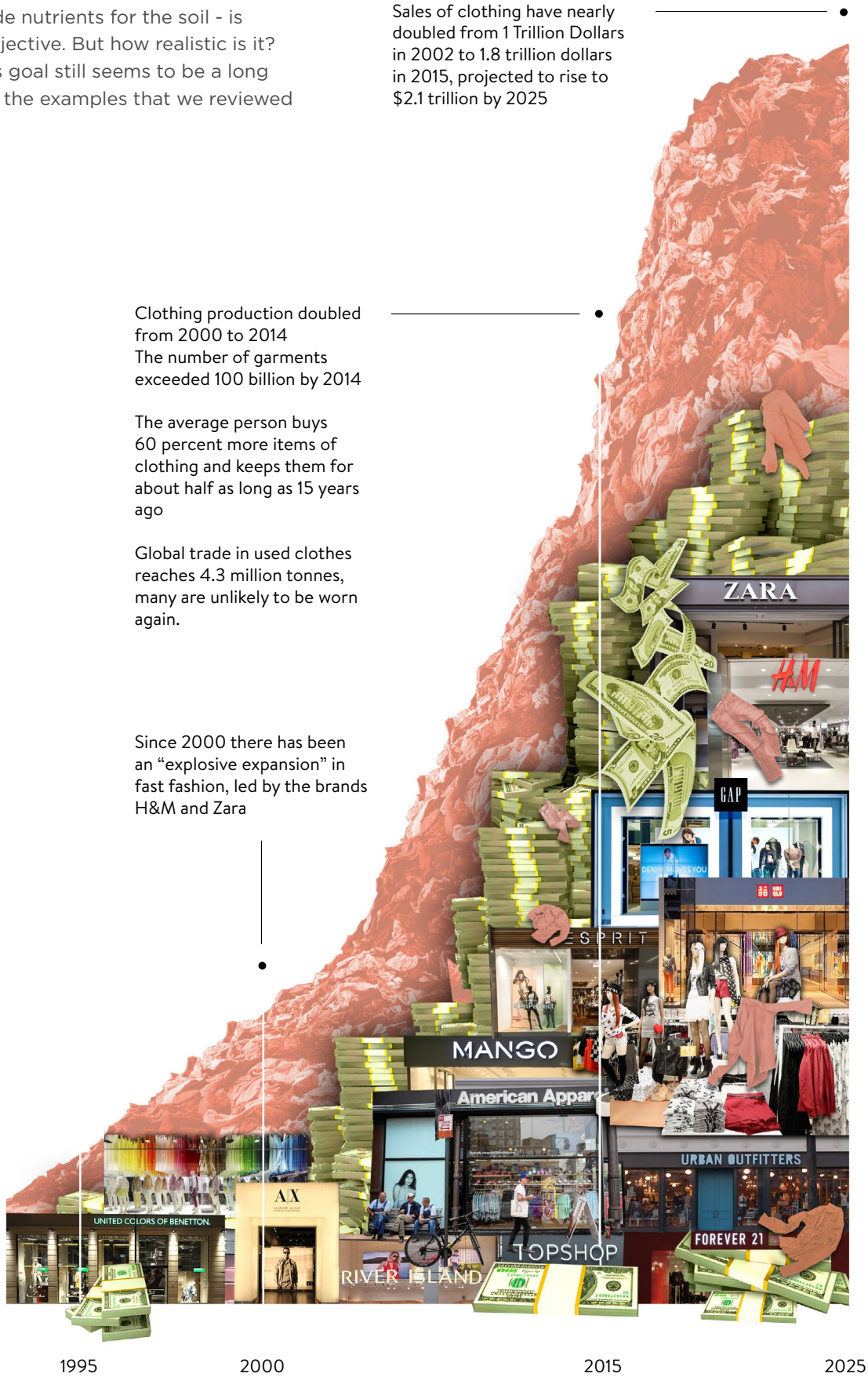
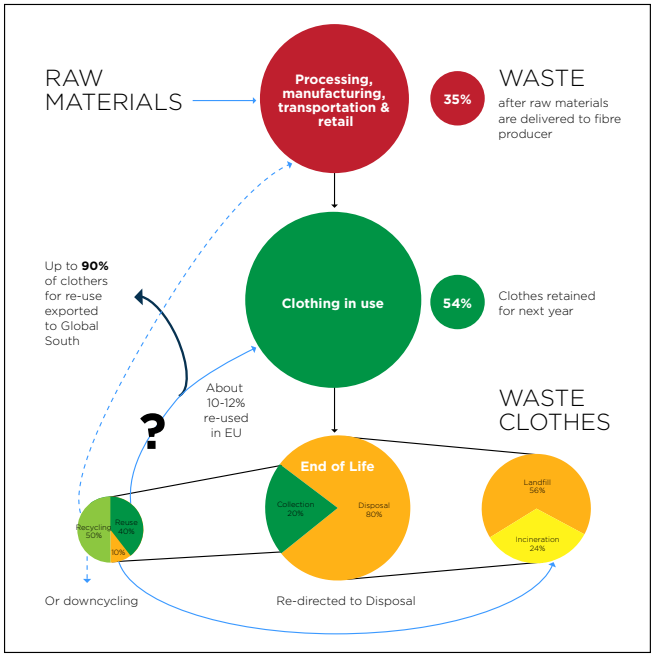


Figure 2: Flow of clothes to waste in the EU27, annually [30]



Fast fashion and the waste of clothing, footwear and accessories

The current system is totally reliant on overconsumption; many clothes are designed as fashion items for short term use[21] and without consideration for their life beyond the first user or their fate once they are thrown away. This avoidance of physical and emotional durability is partly a cost saving strategy but it also puts the burden of responsibility onto the shoulders of consumers, to deal with non-durable items. While some old clothes are collected and some are re-used, few are recycled and re-manufactured into new clothes (see Figure 2).

On Buy Nothing Day, November 2016, Greenpeace called "Timeout for Fast Fashion", highlighting the unsustainable growth of clothes production in recent decades, as a result of the increasingly fast turnaround of fashion trends,[22] with an "explosive expansion" since 2000 when the "fast fashion" phenomenon began.[23] Consequently there is increased consumption of all clothes, including budget and basic items;[24] the average person buys 60 percent more items of clothing every year and keeps them for about half as long as 15 years ago[25] (see Figure 1). There are reports that we might have reached "peak stuff"[26] in some places, with UK sales of clothing decreasing by 0.3% in the last quarter of 2016, compared to a year ago, in contrast to an increase in spending on 'experiences' such as eating out and entertainment.[27]

It has become normal for clothes to be bought, worn a few times, if at all – and thrown away at an ever increasing rate. Reports suggest that almost all of the clothes thrown out with domestic waste could be used again, with estimates that as much as 95 percent could be re-worn, reused or recycled—depending on the state of the textile wastes.[29] Instead, in countries with dominant consumer cultures, the vast majority of old clothes are thrown out with our household waste and end up in landfills or incinerators, amounting to millions of tonnes of textiles waste worldwide. Reports show that this is the fate for over 80% of clothes thrown out in the EU, as shown by Figure 2. Of the small amounts that are re-used in the EU, it is reported that only 10-12% of the best quality clothes are re-sold locally[31] and much of the rest are likely to be exported to countries in the Global South, a trade which has risen dramatically since the year 2000, with 4.3 million tonnes traded in 2014, mainly from the USA, Western Europe and parts of Asia[32] to countries such as Pakistan, Malaysia, Russia, and India – where some of it is re-exported to Africa.[33] Large amounts of used clothes are unsaleable due to poor quality - often associated with the greater use of synthetics and polyester/cotton mixes - and re-saleable items compete with cut price new imported clothing from China.[34] Clothes that can't be used again are downcycled - reprocessed into yarn for cheap blankets and insulation. The second hand clothing system is on the brink of collapse,[35] partly due to the poor quality of cheap fast fashion garments.

The fate of the millions of tonnes of textiles waste in landfills and incinerators is not only a huge waste of all of the resources embedded in these products but creates yet more pollution, through emissions of hazardous chemicals and greenhouse gases from incinerator stacks or landfills. There is no reliable compiled data on the overall volumes of waste globally or even for the EU, but in the UK 350,000 tonnes of clothing is disposed to landfill every year,[36] where it produces methane, CO2 and highly toxic leachate, which filters into the ground and surface water systems.[37]

What it takes to make our clothes

The impact of clothes stretches beyond the large amounts of waste at the end of their lives. The production of clothes - from the raw materials, through to their processing, manufacturing and disposal - is releasing significant quantities of greenhouse gases and hazardous chemicals as well as depleting resources such as water and land.[38] Workers in the supply chain are frequently underpaid and are exposed to unsafe and even deadly conditions,[39] while local communities can also be affected by pollution and impacts on resources.

Much of current clothing relies on the use of unsustainable materials. Polyester, which is made from fossil fuels and can release synthetic microfibres into rivers and seas where it takes decades to degrade if at all, dominates the materials mix, with its use set to nearly double by 2020 (see Box 3). Conventionally grown cotton, which uses large amounts of water for irrigation as well as pesticides, fertilisers and GM seeds, is the second most important material (see Box 2). Large amounts of energy are also used to process, manufacture and care for our clothes, contributing significantly to greenhouse gas emissions[40] another reason why "the textile industry is considered one of the most polluting in the world".[41]

The Detox standard – undermined by over-production?

For decades, many companies have chosen to use the environment and in particular our waterways as a dumping ground for industrial hazardous chemicals, unhindered in many places by effective government regulation. This has led to the continuous and on -going build -up of persistent hazardous chemicals throughout the environment.

Since 2011, Greenpeace's Detox campaign has been challenging the textile industry to urgently take responsibility for its contribution to the problem, past and present and has secured commitments from 80 companies,[42] including fashion brands, large retailers and textiles suppliers, to achieve greater transparency and zero discharges of hazardous chemicals in their supply chain manufacturing by 2020.[43] Many of the committed companies have made significant progress towards this goal, transforming the sector through their influence on the supply chain and on trends. The Detox campaign has set the standard for addressing hazardous chemicals in the textiles supply chain, through a combination of rigorous targets and full transparency on tracing inputs and releases of hazardous chemicals. It has also triggered policy changes in Europe and Asia.[44]

Elimination of hazardous chemicals is also a prerequisite for high quality circularity, by ensuring that clean materials are available for recycling. However, the current rates of excessive production and consumption in the industry as a whole are probably outweighing any gains that are being made on eliminating hazardous chemicals.

A generation of shopaholics – how hunting and accumulating clothes is leading to unhappiness

The overproduction of fashion and its flip side - over-consumption - are also having negative psychological effects on those that are supposedly meant to benefit the most - the customers. A recent Greenpeace survey[45] of international buying habits has found that people buy far more than they need and use. Two thirds of Hong Kong residents admit they own more than they need, as do 60% of Chinese and over half of German and Italian respondents. However, the thrill of buying something new fades fast; many people admitted feeling empty, bored or lost when they are not shopping, and around half feel guilty about their shopping habits. The concern is that overconsumption is fuelling the anxieties of modern life; destroying the planet while undermining true happiness by keeping us from leading more imaginative, fulfilling lives.

The power of advertising has a role in fostering addictive behaviour to increase demand for all products, fashion included. It has been observed how advertisers insinuate themselves by exploiting basic human desires like friendship, happiness and success in advertising for profit,[46] connecting the celebration of life and love with consumption. Advertisers are also capitalizing on social media; a Greenpeace survey of Facebook posts in Hong Kong[47] found that traditional festivals such as the Lunar New Year, Valentine's Day, Father's Day, Mother's Day and Christmas are hijacked for the promotion of consumerism. Nearly 60% of posts contained promotional material which exploited the positive values that people associate with these festivals, such as "happiness" and "love". People are not necessarily aware that these are promotions, especially when they are 'shared' or 'liked'. On average, there were 383 promotional posts every day during the traditional festival period, even more than for Singles' Day (average 248 per day), the East Asian equivalent of Black Friday.

Going online – internet shopping and the increase in compulsive buying

Overconsumption is also being fuelled by the huge rise in online shopping, with faster growth in sales of clothing online, expected to grow at a rate of 17.2% in 2016 - 17 in the USA.[48] However, East Asia is the world's largest digital market, with China overtaking the USA in 2013, and fashion is the biggest e-commerce category.[49] It is easier than ever to buy new clothes by clicking through social media feeds whenever you see something you like. And it is a time consuming habit: the average Chinese customer spends at least two hours online shopping every day. The ease of shopping online for clothes is likely to increase the number of purchases made and fuel the turnover of fast fashion.[50]

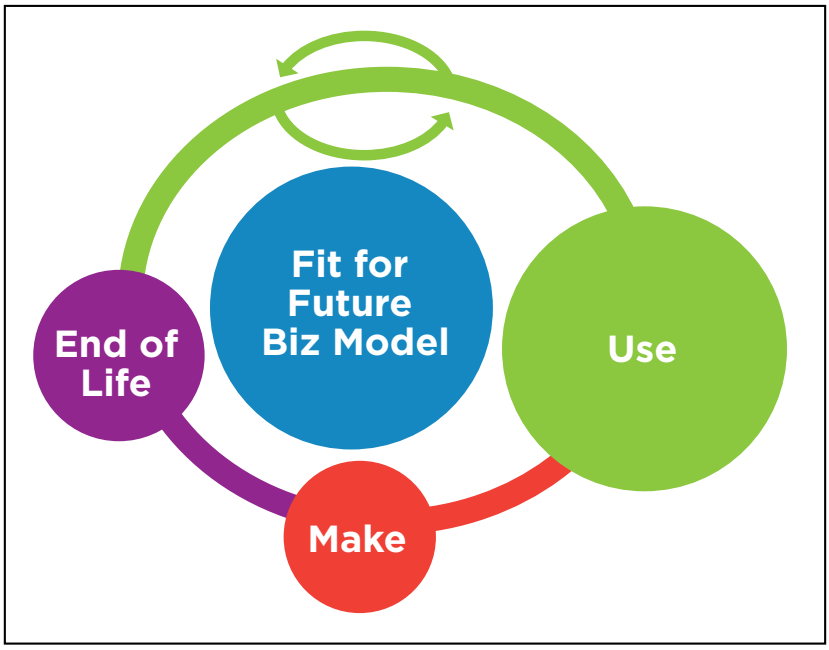
Greenpeace's survey[51] showed that ads, promotions and 1-click buying functions all succeeded in triggering impulse buying. The rate of buying tends to increase the more companies speed up delivery.[52]

… so what is the alternative?

Solutions have to tackle both the scale of the problem – by slowing down the rate that clothes are made and thrown away through improving their quality, repairing them and re-using them – and closing the loop by ensuring that instead of disposing of large quantities of clothes, the materials and resources are recovered and recycled into new clothing. Fashion needs a new narrative , which considers the environmental and human impacts of the whole textiles chain as well as the customers' need to express themselves through the clothes they choose without feeling guilt or emptiness: a fashion industry which does not rely on the addictive behaviour of its customers for growth and profit, or depend on the environment and society as a whole to pay the price. In other words, a business model that is fit for the future.

Figure 3 shows how such a model would need to look, compared to the current situation where the flow of clothes mostly becomes waste, as shown in Figure 2. The one-way flow of clothes becomes circular, through expanding the 'use' phase of clothing.

Figure 3: Slow and circular business model



2. ABOUT THE RESEARCH

How we collected the examples

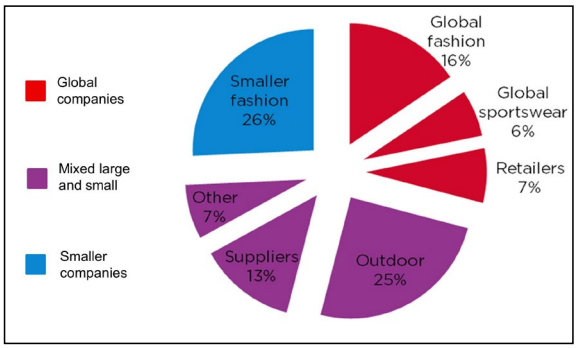
Are there examples of companies or projects that take us in the right direction?

For this investigation, we researched initiatives from a variety of clothing, footwear and accessories brands, to discover what steps are being taken to close the loop but also if and how companies are slowing down the flow of materials behind the fashion industry - and if so what are the strategies they are using.

We looked for examples among the eighty Detox committed companies, made up of fashion, sportswear and outdoor brands, multiple retailers and suppliers (see the Detox standard above, p 14). We also pooled our knowledge of initiatives from smaller or less well-known companies, from work done in Europe and Asia and consulted with experts in the industry for examples of new and groundbreaking ways of designing, making and selling clothes. We do not claim that this investigation is comprehensive – in fact we are sure there are many more interesting examples that could be added – so the result is more of a snapshot that we have put together with limited resources.[53]

The companies or organisations were divided into the following categories, partly derived from the categories of Detox committed companies: global fashion brand / small fashion brand / sportswear / outdoor / multiple retailer / supplier (eg. of technical textile products) / NGO / other (collaboration, consortium, forum, platform, States). Figure 4 shows the numbers and percentage of examples for each of the company types or organisations.

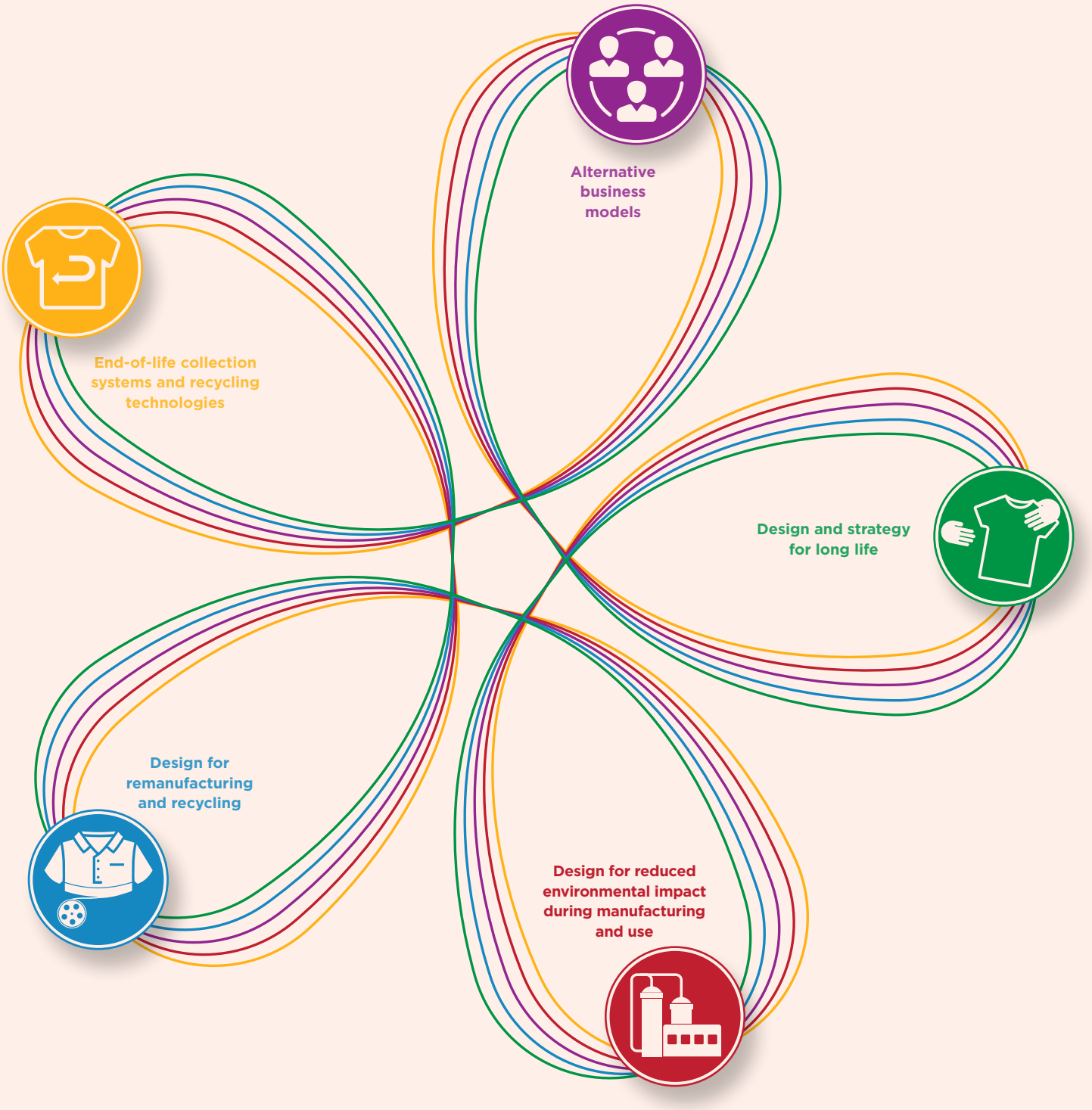
Figure 4: examples by company type - percentage



How we categorised the examples

Each individual example was categorised according to what kind of intervention it makes to slowing the flow and/or closing the loop. Five categories were created – **three "design concepts"** which act directly on the 'make – use – end-of-life' cycle and **two "systems and models"** which facilitate these interventions, as shown in the following diagram. Together, these make up a **holistic framework which addresses the whole life cycle of clothing and textiles**, including the way that such initiatives interact with each other, instead of tackling individual parts of the system in isolation.

Figure 5: Holistic framework for slowing and closing the loop



In the chapters below, the categories are listed in the following order:

DESIGN CONCEPTS AND STRATEGIES

Environmental considerations and solutions need to be embedded at the earliest possible stage of the product design and manufacturing process to enable and implement a change in practice.

Design and strategy for long life – this category is overarching because slowing the flow reduces all the other impacts across the Make – Use – End-of-Life cycle; it is the biggest challenge for the fashion industry to achieve in the current status quo, and is therefore considered first.

Design for reduced environmental impact during manufacture and use – best practice strategies and technologies for reducing these impacts are also vital and are part of a process of continuous improvement taking the industry beyond today's "business as usual". This includes technologies to extend the life of clothing and so also contributes to the strategy for long life.

Design for remanufacture and recycling – designing clothes and footwear to be "closed loop ready" to enable remanufacture and recycling once clothes have truly reached the end of their lives, is vital to closing the textiles loop. However, there is a risk that this could conflict with the two strategies above through designing for a faster turnaround of materials, which will not reduce environmental impacts. Therefore remanufacture and recycling should **not undermine strategies to slow the flow of materials**.

SYSTEMS AND MODELS

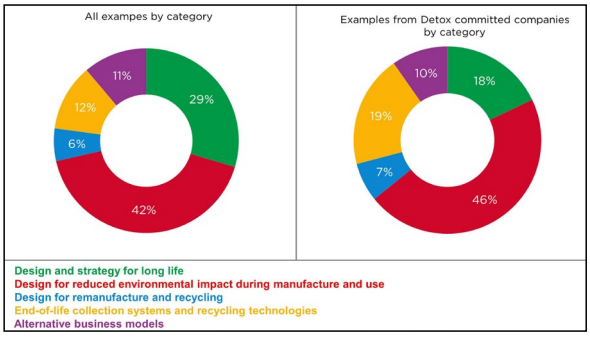
Changes to wider systems and different types of business models are also needed to facilitate slowing and closing the loop.

End-of-life collection systems and recycling technologies – both extending the lifetime of clothes and footwear through collecting them for re-use - and ensuring their recycling is enabled through take-back systems; developing recycling technologies maximising the recycling of waste textiles into new textiles is also vital to 'close the loop'.

Alternative business models – in order to implement many of the systems and design concepts above and to reduce social unfairness and inequalities in textile production, alternative business models are needed, which incorporate these issues in their core business.

A total of 138 companies or projects were assessed, which resulted in 385 individual examples. These were divided into the five broad "design concepts" or "systems and models" categories. The numbers of examples for each category were as follows:

Figure 6: Examples from Detox committed companies, by category compared to all examples



Different types of companies were represented more strongly in certain categories compared to others. For example, large companies dominated the "end-of-life collection systems" category, as many of them have take-back programmes, as well as the "design for reduced environmental impact" category, which includes the largest single category - recycled polyester. On the other hand, small fashion brands dominated the "design and strategy for long life" category, together with outdoor brands. There were 133 examples from Detox committed companies,[54] with a much greater percentage of examples under "End-of-life collection systems" as well as relatively more examples under "Design for reduced environmental impacts", most likely due to greater efforts and investment in manufacturing efficiencies in the supply chain, as might be expected.

As well as being listed in the five broad categories above, all of the examples were given two further descriptive headings to identify the distinctive features of the design concept or strategy being applied, and allow for their review (see Annex 1).

How we reviewed the examples

It was then possible to group the examples together to compare them and identify which demonstrated the best practice or otherwise.

All of the examples were reviewed considering the question whether the example is "on the right track", such as how far it is likely to lead to a reduced flow of materials, with lesser impacts on the environment and society and greater potential to both slow and close the loop, or not (see Figure 7).

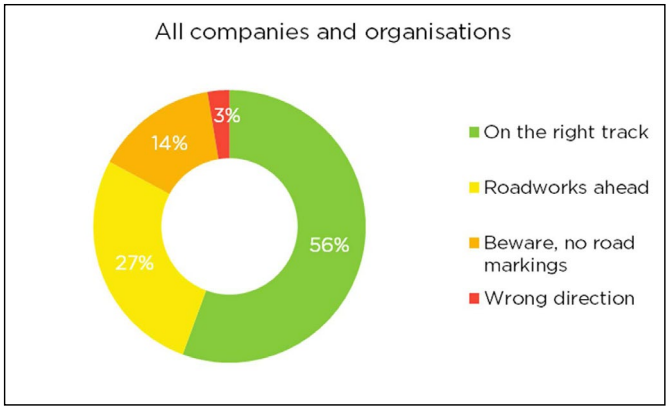
Figure 7: Review of the direction of travel

- On the right track; we think this is a positive step in the right direction
- Roadworks ahead; on the right track but there's further work to do - we are not fully convinced that it is not "business as usual", or that all concerns have been considered, or that it is meaningful or scalable
- Beware, no road markings; the idea is on the right track but certain details are missing which make it difficult to assess
- Wrong direction; we don't think this is positive, could well be counterproductive

During this exercise we discovered that claims made by brands about circularity or their early achievements on slowing and closing the loop are sometimes hard to evaluate as they are not based on a shared standard system of metrics that would enable proper comparison; this can create the suspicion of greenwashing even though this may not be the case.

As shown in the following diagram, most examples are rated "on the right track", with progressively smaller percentages for the other categories. This picture also varies according to company type; for example, more initiatives are rated as "on the right track" among the retailers, the outdoor sector and the smaller fashion brands (see Annex 2).

Figure 8: All companies, rating of examples by percentage



The following sections examine each category in more detail, identifying the most useful examples and trends that became apparent during the research, as well as some of the critical issues to consider.

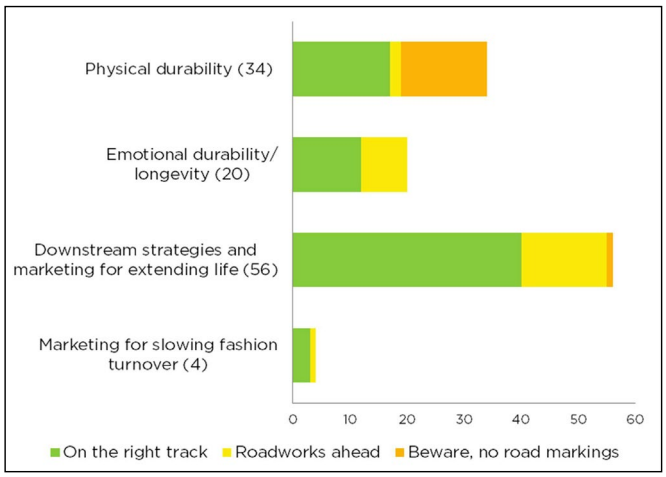
3. DESIGN CONCEPTS AND STRATEGIES FOR SLOWING THE FLOW AND CLOSING THE LOOP – RESULTS AND DISCUSSION

3.1 Design and strategy for long life (slowing the flow during the use phase)

Designed to extend the product's first life and/or provide multiple lives with a number of owners.

The second largest overall category is "design and strategy for long life" with 114 examples: within this, there are 72 examples evaluated as "on the right track" (80%), with the majority of these (39) on downstream strategies for extending life, 17 on physical durability, 12 on emotional durability/longevity and 3 on marketing for slowing fashion turnover.

Figure 9: Design and strategy for long life - examples



Physical durability/longevity:

The most obvious aspect of physical longevity for clothing is the durability of fabrics and components; other factors include the colour and fit retention, fabric treatments for enhancing durability and guidance on correct washing, care and storage.

Durability guarantee: the durability of garments is often the subject of claims or discussion but the best demonstration of a brand's commitment to durability remains an ambitious warranty policy, holding companies accountable to their customers. Examples which are "on the right track" range from the multiple retailer Tchibo which offers guarantees beyond the legal requirement for both fashion and non-fashion products, including 3 years for zips;[55] outdoor brand Vaude which offers an extended 5 year warranty for its Made in Germany collection (which is clearly justified for technical products);[56] to the groundbreaking and inspirational 30 year warranty for sweatshirts from British menswear designer Thomas Cridland.[57] Warranties can equally apply to refurbished products, such as Paramo, which offers a 12 month warranty on all refurbished clothing.[58] Equally important are **criteria** on the durability and longevity of products, particularly if these lead to a methodology of requirements which can then be verified by testing, as being developed

by retailer Aldi in collaboration with the University of Mönchengladbach.[59]

Fabric & component durability: the Levi's brand is well known for building and testing its jeans with durability in mind[60] and also designs reinforced products for specific collections;[61] durability is part of the philosophy and brand identity of Nudie Jeans;[62] products marketed for their durability also include Flint and Tinder's 10 year hoody[63] and Thomas Cridland products (above); while US outdoor brand Columbia ensures durability with rigorous testing and also designs its clothes with **multifunctionality** in mind, so that the garment can be worn in multiple conditions and social settings and used over and over again – reducing general consumption.[64] All of the above are "on the right track".

Fabric treatment: many processes have been developed to extend durability by protecting against abrasion, preventing pilling or enhancing colour retention, some of which involve the use of chemicals. Although the following examples are on the right track, their technical nature and the range of issues they raise mean there are many unknown factors to assess and are classified as "beware, no road markings". There are numerous examples of water repellents developed primarily as alternatives to hazardous PFCs,[65] which also provide abrasion resistance and durability, by suppliers such as Archroma, HeiQ, Organoclick and Rudolf.[66] Novozymes' biological treatment Bioblast imparts anti-pilling, smoother fabric surfaces and colour retention features[67] and Benetton is involved in the development of a plasma process to make wool more long lasting during use - which prevents pilling and felting, known as "B wool".[68]

There are many well tried and tested methods of extending the life of clothing as well as novel developments. Physical durability and longevity is the single most important strategy for slowing down the rate that clothes are used and thrown away. However, it is also important to consider recyclability as part of an overall strategy; for example, certain types of durable fabric, such as jacquard fabric, synthetic/natural mixes, or fabric treatments, might also reduce the recyclability of fabrics at the end of their life.[69]

Emotional durability

The lifetime of a product does not only depend on its physical construction; its style, function and fit make a big difference to the personal value of a garment and these attributes have a significant influence on whether a person looks after it and takes the trouble to repair it.

Classic styling is timeless fashion, offering products that will never go out of style and can be adapted to be worn with many trends. There are four examples that stand out as "on the right track": the outdoor brand Salewa which uses a clear design and colour strategy to maintain products for multiple seasons;[70] Swedish denim brand Nudie Jeans which incorporates the idea of celebrating craftsmanship;[71] French brand 1083 which focusses on jeans and sneakers less subject to trend changes;[72] and the US eco-fashion brand Zady, which has a mission for quality clothing, against the current system that replaces style with trends.[73]

Co-creation/customisation: involving customers at an early stage to create products that will really match their needs and tastes could prolong their attachment and care. Examples "on the right track" include upcycling workshops in Taiwan,[74] and traditional tailoring, which is still a practice in some countries, such as the substantial "Ready to Sew" market in India[75] and the local tailors in Ghana who are also adapting and re-making Western clothes.[76] Examples from some other fashion brands that are on the right track but are considered to have "roadworks ahead" are the Dutch Post Couture Collective, which provides designs based on the principles of open-source so customers can go to a local Fablab or Makerspace with their chosen fabric, to get the pattern pieces cut; however, the techniques appear to depend on the use of polyester fabrics which have inherent environmental problems (see Box 2).[77] US fashion brand Ministry of Supply has created a seamless blazer with a customizable shape mapped to the wearer's body using 3D technology (Wholegarment), manufactured in one three dimensional piece using knitwear technology which also creates minimal waste; however, environmental protection is not the motivation for the design.[78]

Downstream strategies and marketing for extending life

Beyond designing products for physical and emotional longevity, there are strategies which can further extend a product's life, such as hand-me-down, sharing and rental, restyling and remodelling, upcycling, and repairing and reselling refurbished clothes. As stated by the UK Love Your Clothes Campaign, which provides tips for the public on caring and repairing clothes, "the most significant opportunity for reducing the environmental impact of clothing lies in increasing the active life of the clothes we wear".[79]

Large brands and especially fast fashion giants have the greatest responsibility to offer repair as a core service for the products that they sell. In general, we need to see the return of local repair and refurbishing

businesses in neighbourhoods, such as the ReTuna Recycling Mall and Recycling Centre set up by municipal company Eskilstuna Energi och Miljö AB in Sweden, which is an entire commercial centre for the recycling, refurbishing and reselling of used products.[80] Such projects can be assisted by Government tax incentives[81] which could help communities set up repair cafes for all kinds of products.

Repair services: restore a lost "common sense" practice. Outdoor brands are championing the re-birth of repair services for their used products, including Bergans,[82] Jack Wolfskin,[83] Patagonia,[84] Salewa,[85] and Houdini.[86] Vaude[87] also offers its own repair service and has a partnership with iFixit for the DIY repair of its products. Self-repair such as this empowers the user to repair items themselves and will help to shift attitudes and habits. Some small fashion brands also offer repair (Nudie Jeans,[88] MUD jeans[89]) with Nudie Jeans even offering this service for free and without time limitations. All of the above are "on the right track".

Refurbish and resell: this involves giving a second life to garments that are still valuable with the direct involvement of the manufacturer, through refurbishing, repairing and reselling second hand products. Examples which are "on the right track" are dominated by outdoor brands again, with Houdini selling second-hand products;90 Vaude supports the resale of refurbished garments through an online marketplace;91 while Patagonia resells worn wear as "Common Threads" which can be found on its eBay store and sells them via its website.[92] Picture also resells multi-material, non-wearable products (from its take-back system) which have been refurbished into limited edition products.[93] The fashion brand Mode-Off in Japan is the clothing re-use brand of the materials re-use group Hard Off, an entire business model for reselling many different unwanted products.[94] Several brands have set up second hand exchange platforms for customers, for example, in China, Ecowearcn has an online platform to re-sell organic clothes bought from them for reuse;[95] customers of Muka Kids can trade any unwanted pre-loved clothing through the online marketplace, a process called "Re-Gooding";[96] and outdoor brand Haglöfs has a label "Haglöfs Second Hand" to enable people to sell their old garments.[97]

Another downstream strategy is the **Donation** of unsold clothes to charities, as done by Primark[98] for example, which might also be a sign of over-production and are therefore considered to have "roadworks ahead" to overcome.

Restyle and remodel: this involves repairing and upcycling the unwanted garment into a desirable product again, either DIY (do it yourself), as a service, or as part of a reuse business. There are plenty of examples that may not be scalable enough to solve the problem but can still provide inspiration, education and most of all show "true materialism"[99] in action, where the original material is cherished and conserved as much as possible, including the embedded human work. The following are all "on the right track". An originator of restyling and remodelling is Junky Styling in the UK, which offered "wardrobe surgery", remodelled or redesigned unwanted or worn-out items of clothing.[100] Mima-Te from Mozambique upcycles and redesigns clothes discarded by consumers in the Global North which are re-exported or sold from its studio in Maputo or at exhibitions.[101] Schmidttakahashi in Germany builds on the understanding that even mass-produced can be redesigned into new desirable pieces; it collects unwanted garments from their owners, who can track the 'afterlife' of the items.[102] Finally, tailoring and refashioning western clothes and repair is a major industry in Ghana, where local tailors can be found on every street.[103]

Upcycling is a useful strategy for extending the life of materials, which involves turning one product into another of equivalent emotional value, such as turning old clothes into accessories such as bags or for furnishings, as done by ReBag[104] or UseDem[105]; however, the products made in some of these examples are not "like for like' and although on the right track, are considered to have "roadworks ahead" to overcome. This should not be confused with "downcycling" where materials are reused in a product of lower value, such as the use of old textile fibres known as 'shoddy' in insulation, which takes place on a much larger scale and is often a default option.

Share and rental: there are several good examples which are "on the right track" for keeping clothes in use for longer and providing alternatives to buying new. Houdini provides a rental service;[106] MUD Jeans runs a leasing service for jeans, they remain the owner of the raw materials, returned products are upcycled and sold as unique vintage jeans;[107] while knitwear label 'Keep & Share' was set up to market its sustainable knitwear based on the philosophy that garments should be kept longer or shared with others.[108] Lending libraries include Hamburg based Kleiderei,[109] Gwynnie Bee in New York,[110] as well as Lena and Le Tote which are also discussed under "Alternative Business Models" below.

Care, repair and longevity tips: beyond the standard wash and care labels, many brands offer more detailed guidance for customers on looking after items to extend their life. Projects **"on the right track"** include the UK NGO WRAP which has a Love Your Clothes campaign that offers comprehensive tips, advice and videos to inspire consumers on buying clothes, caring for and repairing clothes.[111]

Marketing for slowing fashion turnover:

Reducing/slowing seasons: instead of inundating people with new styles that also put creative designers and suppliers under constant and unsustainable pressure**,** reducing or limiting seasons can achieve a more reasonable pace which also facilitates better quality. There are relatively few examples of brands which say they are doing this; outdoor brand Salewa[112] maintain products over several seasons, while notably, British luxury brand Burberry decided to reduce the launch of its fashion collections from 4 to 2 seasons as of September 2016.[113]

KEY LEARNINGS - DESIGN AND STRATEGY FOR LONG LIFE

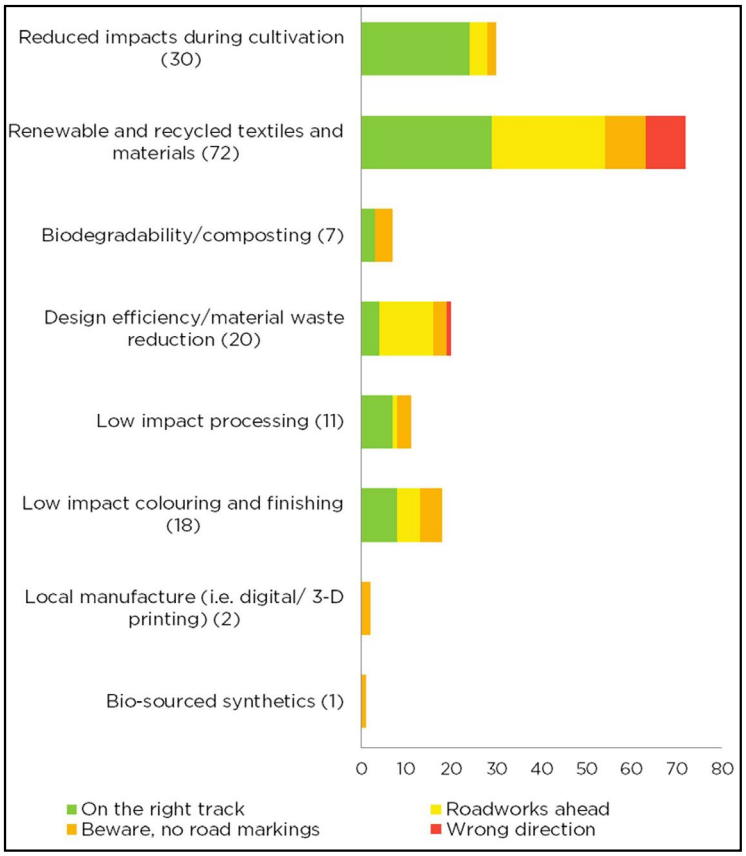
- Extending the longevity of products is the single most important practical strategy for slowing down the rate that clothes are used and thrown away.
- The outdoors sector has developed the furthest on designing for physical durability and extending life, with its production of durable clothes, guarantees and provision of repair services, which include re-marketing of used products and facilitating their exchange.
- There is a clear necessity for other large brands, particularly fashion and sportswear, to take more responsibility for designing and making better quality products and providing repair services to extend their use. To make this happen, regulatory instruments such as setting minimum warranty standards by product type or fiscal incentives (such as VAT rebates) on repair services could be instrumental.
- Extending the emotional durability of clothes through their style, function and fit is equally as important as physical durability; classic styling and multi-functional clothes can be adapted for many different purposes, reducing the need for many different items.
- Smaller fashion brands are leading the way in re-modelling and re-styling used clothes, co-creating and customisation to create garments that are valued and cared for.
- New modes of marketing and ownership of clothes, such as sharing or renting, are being explored in different forms outside the mainstream fashion and sportswear sectors. Such initiatives need greater visibility and encouragement.
- There are many well tried and tested methods of extending the life of clothing as well as novel developments. Most strategies for long life use well known techniques, while fabric treatment technologies provided by many suppliers can also extend the life of clothing; these need to be encouraged within a Detox approach and with consideration for the waste hierarchy.[114]

3.2 Design for reduced environmental impact during manufacture and use (slowing the flow through lower impact at the make and use phases)

All product components and manufacturing technologies are chosen based on their low environmental impact during manufacture, in order to reduce energy and water use and eliminate material waste and pollution, including hazardous chemical pollution.

This is the largest category with 161 examples altogether, making up 42% of the total. Altogether there are 70 examples (40%) which are evaluated as "on the right track", with most of these in the "Renewable and recycled textiles and materials" and "Reduced impacts during cultivation" subsections. The largest subsection by far, with 75 examples (nearly 50% of the category), is the "**Renewable and recycled textiles and materials"**; over half of these examples are rated yellow, amber or red, as shown in Figure 10 below.

Figure 10: Design for reduced environmental impact during manufacture and use - examples



Reduced impacts during cultivation and farming – raw materials

This refers to renewable materials from the cultivation of crops or forestry which take their toll on the environment. In particular, conventionally grown cotton, the second most commonly used fibre, has high consumption of water, pesticides and fertilizers, putting long-term soil fertility at stake, among other consequences (see Box 1 Cotton Sourcing). A review of a variety of textile materials and their potential to be recycled technically and as biological nutrients has been published by Cradle to Cradle.[115]

Organic cotton: Certified Organic cotton is the most appropriate response, especially when it is also Fairtrade, as has been embraced by many brands, including the Swiss retailer COOP[116] who are pioneers in Fairtrade cotton (and lead the Organic Fairtrade rankings[117]), the Chinese company Ecowearcn[118] and smaller fashion brands such as Bleed.[119] Outdoor brand Patagonia began sourcing 100% organic cotton in 1996.[120] Non-Fairtrade Organic cotton is also sourced by Chinese company LangerChen.[121]

Many global fashion brands are major buyers of Organic cotton; global brands that are "on the right track" include the third largest user by volume,[122] Tchibo (where Organic cotton already makes up 75% of its range), and the fourth largest user, Inditex[123] – which has risen from 9th; both set objectives that specify their target for Organic cotton, thus distinguishing it from other types of cotton. German retailer Rewe also has a target to user 70% Organic cotton in 2017.

The world's leading users of Organic cotton by volume[124] are C&A[125] (1st) and H&M[126] (2nd); however, while using organic cotton is a major improvement on conventional cotton, both of these brands make no distinction between Organic cotton and other "sustainable" cotton in their targets to use 100% "sustainable cotton" by 2020, so there are "roadworks ahead" as more encouragement for the rapid development of Organic cotton is needed to address the negative impacts of cotton cultivation. The problem is that "sustainable cotton" can include a variety of sources, some only Fairtrade, some recycled, some Better Cotton as well as Organic and CmiA cotton, for example (see Box 1).

BOX 1: Cotton sourcing – better and best

"Cotton has the potential to provide a sustainable source of textile fibre, notably in that it is renewable, recyclable, and drought and saline tolerant; it can be cultivated in areas where few other cash crops would survive."[127]

Conventional cotton cultivation is associated with various ecological and social problems, in particular, the use of large amounts of water, pesticides and fertilisers, plus the use of GMO seeds, which now makes up 80% of all cotton planted.[128] A range of different standards seek to improve the situation on the basis of their respective sets of criteria, including Better Cotton by the Better Cotton Initiative (BCI), Cotton made in Africa (CmiA) by the Aid by Trade Foundation, Fairtrade by Fairtrade International and the Organic Content Standard (OCS) from Textile Exchange.[129] Organic cotton stems from organic cultivation and is usually certified in accordance with the statutory requirements for organic products in the EU or the United States.

There are big differences between the approach taken by the Better Cotton Initiative (BCI or Better Cotton) compared to the cultivation of CmiA cotton, Fairtrade and Organic cotton.

The BCI is a multi-stakeholder sustainability initiative set up by a number of fashion brands together with WWF, in order to scale up the use of more sustainable cotton, aiming to reach 10 million metric tons (or 30 per cent of global cotton production) by 2020.[130, 131] However, the BCI standard has several weak points; for example, GMO cotton is not excluded for production (while CmiA, Fairtrade and Organic prohibit GMOs) and only a very limited number of pesticides are prohibited. Most BCI cotton is produced on large estates in Brazil and Pakistan.[132] There is no premium for Better Cotton certification.[133, 134] While some farmers are able to improve certain practices under Better Cotton production schemes, the standard requirements will not transform cotton production to the lowest possible environmental impact during cultivation.

Cotton made in Africa: set up in 2005, CmiA aims to sustainably improve the living conditions of smallholder cotton farmers in Sub-Saharan Africa, by using specific farming methods that increase yields and the quality of the cotton, and at the same time, preserve their health and the environment.[135] The verified CmiA and CmiA Organic standards[136] are limited to smallholders and include a requirement for rain-fed agriculture with no irrigation, no deforestation of primary forests, strict rules on labour including a ban on child labour, strict rules on the use of pesticides and the exclusion of GM seeds.[137]

Organic cotton: Organic cotton is grown without using synthetic pesticides and fertilizers or GMOs so promote a healthier farm and environment.[138] It can help farmers find a way out of poverty. Private standards, such as the Global Organic Textile Standard (GOTS), further restrict manufacturing chemicals and require high social standards for workers in textile factories.[139]

Fairtrade: Fairtrade works with the small-scale cotton farmers in Asia and Africa and helps build stronger farmer-owned organisations which can negotiates better with ginners and traders and can support the local community. Fairtrade encourages sustainable cotton production and is the only standard to provide economic benefits, through a guaranteed Fairtrade Minimum Price and additional Fairtrade Premium for seed cotton farmers. Fairtrade currently works with almost 55,000 cotton farmers; globally, there are 90 million small-scale cotton farmers without a fairer deal for their cotton.[140]

Figures for 2014/15 show big increases in the market share for Better Cotton and CmiA, with a decline in Fairtrade and Organic cotton, both already at below 1% of the market. However, all are projected to increase, compared to a decline in conventionally grown cotton.[141] The reality in the market is that less than a fifth of the available "sustainable" cotton is being actively sourced by companies, with the remainder sold as conventional cotton.[142]

On the other hand, some individual brands continue to increase their use of Organic cotton, with the average amount of organic cotton being used by the top 10 Organic cotton users increasing from 20.2% in 2014 to 29.6% in 2016.[143] Clearly, these brands are more than pulling their weight; others need to join them.

"While all are still clearly able to see the advantages of organic farming in terms of soil health, product quality and biodiversity the fact remains that the economic risk of introducing organic farming is just too apparent. Until the farmers are paid for their environmental stewardship, this situation will not improve."[144]

At the moment, Better Cotton is providing fashion brands with cotton which is only slightly better than the unsustainable mainstream cotton (see above), with the lowest possible effort from the brands. This contributes to continued overproduction and overconsumption of clothes and thereby hinders much needed essential change of the current fashion system. Instead of settling for half measures such as Better Cotton, more brands, in particular global brands which hold a significant share of the market, should be prepared to source Organic and Fairtrade cotton and pay a higher price. This is the only way to make a significant positive impact on the environmental and human costs of conventional cotton. However, cotton grown with minimum impact on the environment will limit its availability, which is likely to be at a lower output than is currently squeezed out of the crop. This emphasises the importance of reducing our consumption of clothing and slowing the flow.

Other non-mainstream natural fibres: While cotton and polyester dominate the materials mix for textiles, other non-mainstream natural fibres[145] can have lesser environmental impacts (such as less demand for water) and could have a much greater role to play. Some brands are seeking alternatives by using crops which consume less water, such as linen or hemp, or the ethical sourcing of wool. Examples which are "on the right track" are from large fashion brands such as G-Star with its RAW Sustainable fabric which includes nettle fibres,[146] outdoor brands Patagonia (which uses hemp, tencel, yulex (natural rubber), undyed cashmere and wool)[147] and Salewa (uses local wool, and is developing local hemp and linen), strengthening local production.[148] Alternative fibres are commonly used by smaller brands such as 1083 (organic linen)[149] and La Revolution Textile (locally sourced linen).[150]

Sustainable wool: It should be ensured that wool is produced without the use of hazardous pesticides and that wool processing is energy efficient and eliminates the use of hazardous chemicals during processing. Sourcing of wool and other products derived from animals also presents ethical issues: many brands have policies to address this, including outdoor brands Jack Wolfskin,[151] which uses non-mulesed merino wool under strict animal welfare standards, and Dannah,[152] which uses accredited merino wool from the southern hemisphere. Environmental issues are also addressed by the Fibershed collaboration in the US Northwest which uses "climate beneficial wool", where farmers commit to practices which increase drawdown[153] of carbon to the soil.[154] All of the above are "on the right track".

Tencel/Lyocell: It is also important to consider the sourcing of other natural sources of fibre such as wood viscose. The manufacturing of viscose can also be an environmentally damaging process, and is considered below. For cultivation, the key is to ensure that while sourcing wood, forests are protected and renewed by ensuring that only FSC certified timber not from primary forests is used. Two examples "on the right track" are Stella McCartney, which partners with the NGO Canopy and purchases only from sustainably managed and certified forests in Sweden;[155] and the Join Life range by fashion brand Inditex, using organic cotton, recycled wool and Tencel fibre from supplier Lenzing, which has a Wood and Pulp sourcing policy to preferentially use FSC certified wood and avoid ancient and endangered forests.[156, 157]

Renewable and recycled textiles and materials:

Renewable materials – which are the cultivated natural materials detailed above (reduced impacts during cultivation) – can also be **recycled**. Their impacts from the use of land, energy, water and chemicals can be reduced by recycling fibres - even when 100% renewable materials are sourced there is still a need to reduce the use of virgin materials by recycling end-of-life fabrics, as well as preventing these valuable resources going to waste. Man-made synthetics, based on fossil fuels, are classed as **non-renewable materials**, and some can also be recycled, preventing textile waste and the further use of petrochemical feedstocks from oil. However, there are different limitations and problems with achieving 100% recycling for both synthetic and natural fibres.

Synthetic (petrochemical based OR derived) materials

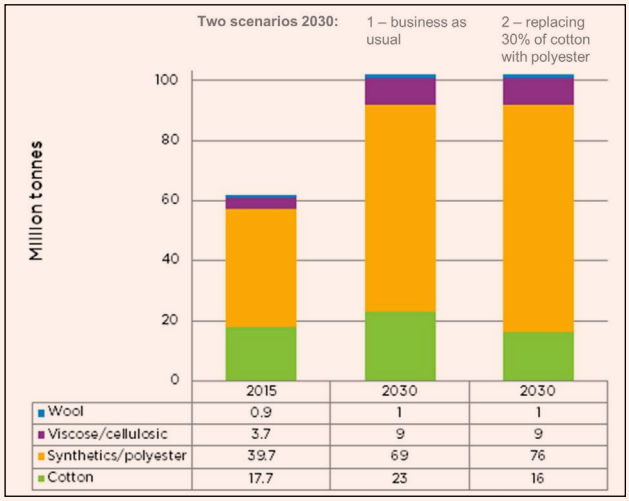
Recycled polyester; Recycled synthetics: with 34 examples, 47% of the 72 "Renewable and recycled textiles and materials" are recycled polyester or other synthetics, much of which is also described as "open loop – industrial ecology" – where the source of the polyester is either plastic bottles from the domestic waste stream or some examples of reclaimed plastics from the ocean.

The use of synthetics continues to grow, mostly due to polyester - which currently makes up 60% of the fibres used in clothing. This has serious consequences for the climate, perpetuating the demand for fossil fuels as a raw material and using large amounts of energy for production, with polyester generating 3 times more CO2 emissions than cotton.[158] Ocean pollution from non-biodegradable microplastic fibres is also a challenge (see Box 2). Therefore, while making clothes from recycled synthetics could help to slow and close the loop by reducing the demand for virgin oil, it cannot be a stand-alone strategy: it should be complemented by other approaches that seek to tackle the release of microplastic fibres at all stages of manufacture, use and after disposal, or that balance the material mix in favour of sustainably grown, renewable and biodegradable materials.

BOX 2: Life in plastic - polyester to the rescue!

The most significant recommendation proposed in the Pulse report on the State of the Fashion[159] is to allow the continued growth of the fashion industry by advancing towards a "sustainable materials mix" - by nearly doubling the amount of polyester by 2030 (see Scenario 2, Fig 11 below), compared to small decrease in cotton (with an unspecified portion of this to shift from conventionally grown to 'sustainable' cotton (see Box 1). The basis for this promotion of polyester is a "cradle to gate environmental impact" assessment of the various materials used in textiles, which shows how cotton is a major user of water and cause of eutrophication: however, one of the things that the assessment completely misses[160] is a critical problem with fibres made from petrochemical polymers such as polyester and other synthetic fibres - their contribution to microplastic fibre pollution.[161]

Figure 11: The fashion industry's projected increase in use of fibres by 2030, two scenarios[162]



Plastics including microplastics are one of the main anthropogenic footprints of our age.[163] Microplastic fibre pollution from synthetic fabrics - with polyester the most commonly used - is much less visible than other plastic waste, but it is also an unfolding global problem that should raise substantial concerns. Microplastic fibres have been found in diverse habitats, including remote polar glaciers.[164] Recent studies of the plastic waste along the western coast of Sweden found that more than 90 % of the microplastics found in ocean surface waters (which are themselves a portion of overall marine plastics) consisted of synthetic textile fibres.[165]

Polyester is not easily degradable; synthetic microplastic fibres are released from clothes, particularly when they are washed, eventually making their way into rivers and seas, where they can potentially take decades to degrade. Once in the environment, fibres can reach concentrations up to thousands of particles per cubic meter, being available to be ingested by a broad range of species.[166] They can also attract and concentrate hazardous chemicals from the surrounding environment such as Persistent Organic Pollutants.[167] They are easily taken up by living organisms which mistake them for sources of food.[168] As well as the known impacts of the persistent and hazardous chemicals that they carry, there is a range of impacts from microplastic fibres themselves once they reach the aquatic environment, such as impacts on feeding activity,[169] or carrying invasive bacteria that can be harmful to humans.[170]

Microplastic fibres are also not the only problem with polyester; other problems throughout its life cycle include its reliance on non-renewable fossil fuels as a raw material and for energy use, which the analysis in the Pulse report shows is greater than for conventional cotton, as well as toxic by-products during production, which were not quantitatively assessed[171] such as the use of antimony trioxide in traditional PET.[172] Cheap and thin polyester also epitomises the disposable "fast fashion" that is the cause of the problem. As acknowledged in the Pulse report, there are current limitations to recycling which mean fast fashion polyester clothes will continue to become waste for the foreseeable future.

A strategy to reduce the use of polyester

It is important to reduce the use of all virgin fibres, particularly those with high environmental impacts. A strategy to limit the spread of microplastic fibres as much as possible has to go beyond attempts to capture them through physical means such as filters in wastewater treatment plants or washing machines. As polyester is currently the dominant fibre used in clothing (and other textiles), this strategy should seek to reduce its use in textiles by addressing the following questions.

a) Which fabrics shed the most microplastic fibres, eg. fleeces, fabric mixes, low quality fabrics? Given the current state of knowledge, what steps could be taken to progressively phase out the use of the most problematic fabrics?

b) Identify technical uses of polyester where there are clear benefits from its use compared to other materials – eg. outdoor clothing, where the material may be an essential part of the functionality of the product - and develop techniques that prevent the shedding of polyester microplastic fibres from these fabrics. What systems would be needed to ensure full producer

responsibility including take-back and recycling to close the loop for these materials?

We should recognise that there is a conflict between promoting the long life of polyester clothing and the need to prevent the increased release of microplastic fibres from ageing fabrics.

Any use of recycled polyester must close the loop for textiles for technical uses of polyester as far as possible (b); it should not rely on 'open loop' sourcing of post-consumer plastic or collected marine plastics, which simply speeds up the conversion of solid material into more bioavailable microfibres.

Regulatory strategies are needed, which should consider tools such as the development of a mandatory textiles shedding standard, for the labelling of all clothes and textiles, or interventions in the form of restrictions or taxes on the worst examples, that will further discourage the use of fabrics which shed large amounts of microplastic fibres.

Because of these issues, none of the examples of recycled polyester and synthetics are rated as "on the right track". Out of the 32 examples, 20 are considered to have "roadworks ahead" to overcome, in this case, the microplastic fibre problem and the issue of achieving textile to textile recycled fabric, without the need for adding virgin fibre. Many of these examples are products from the outdoor industry, where polyester is used as a technical fabric because of its specific properties which are useful for waterproof outdoor clothing. In some cases – including examples from the global fashion or sportswear brands - there are attempts to close the textiles loop – aiming to recycle polyester textile waste into new textile products.

Attempts at closing the loop on polyester: For example, the supplier Sympatex makes its waterproof membranes from 100% recycled polyester and the membranes are in turn recyclable. Sympatex is also working with brands such as Bleed,[173] to ensure take-back and recycling of these products.[174] Some outdoor brands are also aiming for the polyester they use to be both recycled and recyclable, such as Fjallraven, which has this as a short term goal.[175] The retailer Tchibo is testing recycled fibres for sportswear, and reports that high quality yarns are a challenge for some suppliers.[176]

Open loop - industrial ecology - plastics: most of the examples of recycled synthetic fibres are sourced from post-consumer wastes from other industries, usually plastic bottles from the food and beverage industry. This kind of recycling is not strictly speaking "closing the loop", as it is not recycling fabric from old clothes (within the boundaries of the textile industry), but is "open loop" recycling where, under the principles of industrial ecology, a waste stream from one activity becomes the source of materials for another, at the same time solving a waste disposal problem for the industry which is the source of the waste.

For example: sportswear brands such as adidas and Nike are re-grinding and reusing solid plastics in their shoes. In the case of adidas, polystyrene packaging waste is used along with EVA and rubber from production (see Annex 3, adidas 2), while "NIKE grind" is made of manufacturing scrap, old shoes and other waste streams – including rubber, foam and textile scrap: as well as being used again in new shoes, it is also downcycled for use in surfaces such as running tracks (see Annex 3, Nike 2). Both these examples are considered to have "roadworks ahead" to overcome, in these cases, the question of microparticles and the ultimate fate of materials that are downcycled.

Some examples of this "open loop" sourcing for recycled synthetics are considered to be going in the "wrong direction" as they may not lead to positive environmental gains, and could well be counter-productive. For example, the use of recycled polyester from food and beverage waste as part of the material mix for clothes, where virgin fibres are still required and without sufficient consideration for the microfibre issue or for the need to close the loop on these products at the end of their lives. There are many examples of brands that are doing this and which promote this practice to their customers as a positive initiative, including Nike, which is the world's top user of recycled polyester; H&M, which is also a major user; Puma, which sources recycled polyester from bottles; and Levi's Waste<Less™ collection.

Ocean plastics: The most well-known example of open loop recycling is the use of plastic wastes reclaimed from the sea – many brands have developed fashion collections promoting this practice which is iconic of their commitment to circularity, such as adidas, with its "UltraBOOST uncaged Parley" shoe,[177] G-Star which has a "RAW for the Oceans" collection,[178] and H&M with its Conscious Exclusive collection.[179] At best, such projects should be seen as a communication tool to raise public awareness about plastic pollution of the oceans but they cannot be regarded as a serious step towards circularity: firstly because such initiatives are insignificant compared to the scale of the problem; secondly because plastic pollution of the oceans goes

far beyond the visible macro plastic wastes that are collected on beaches or from the surface of the water (as the majority of plastics sink to the seabed); and last but not least because strategies to prevent this pollution have to be implemented upstream, and in particular, by the textile industry, which must take full responsibility for its contribution to the problem, by preventing the generation and release into wastewater of non-biodegradable synthetic microfibres. Any corporate communication that fails to acknowledge this is misleading their customers and could be seen as greenwashing and as a result of all the above, these examples are considered to be going in the "wrong direction".

Microfibres – polyester: As mentioned above, polyester has technical properties which are useful for outdoor clothing:

A couple of outdoor brands are in the forefront of addressing the microfibre problem and are rated as "on the right track" for these additional efforts. For example, Houdini claims that its products generally release very little microplastics due to the quality of the fabrics and construction methods, which has been shown by its testing over many years, in comparison to "fast-fashion" synthetics (see Annex 3, Houdini 2). Patagonia has also invested in research to learn more about the scope of the problem and develop an understanding of the steps that can be taken to address microfibres.[180] Other examples rated as "on the right track" are from fashion brand G-Star which has joined forces with the Plastic Soup Foundation to tackle the microfibre problem[181] and is also supporting research.[182] H&M is also one of three fashion brands involved in research for a recently released report from Mistra Future Fashion on microplastics shedding from polyester.[183]

Renewable materials

While renewable materials can be replaced through cultivation, there are large variations in how they are used and their impacts on the environment. Any industrial use of biomass should follow the principle of 'cascading use', where biomass is preferentially used for maintaining soil fertility, food, feed and materials that store carbon, and should deliver significant reductions in greenhouse gas emissions compared to fossil-fuel-based systems. All the examples below are considered to be "on the right track".

Open loop - industrial ecology – natural materials: Open loop recycling is not limited to synthetics as illustrated by examples where secondary materials are sourced from agriculture wastes; in some cases these are mixed with synthetics, such as S-café's fabric made from recycled coffee grounds and PET,[184] while other examples of recycled textile fibre are biodegradable such as Qmilch, made from surplus milk,[185] or Orange Fiber which uses citrus juice by-products.[186] This kind of open loop recycling is a legitimate response to the need to maximise the value of by-products, while in the case of plastic bottles it could have the counterproductive effect of allowing the packaging industry to avoid taking responsibility for its own circularity challenges.

Reclaimed natural fibres: Recycling and reclamation is not limited to synthetic fibres. Although much recycling or reclamation of natural fibres results in diminishing quality as fibres are shortened in the process, there are also options for textile to textile recycling of natural materials without loss of quality, which may achieve greater recycling rates with less impact (see Box 3; Textiles recycling - a reality check). Examples of reclaimed natural fibres include G-Star, which has a RAW Recycled collection which blends post-consumer denim with organic cotton,[187] Patagonia, which uses reclaimed wool and reclaimed cotton,[188] while French fashion brand 1083 uses recycled rubber and viscose for shoes.[189]

Transparency/traceability: these are key for keeping control over the quality of textiles (which is vital for complex recycling processes involving blends of various fibre mixes with both virgin and recycled fibres) and ensuring information is available to evaluate the environmental footprint and social conditions of sourced materials. To avoid recirculation of toxic chemicals, companies should also develop a strict recycling policy framing the conditions under which secondary materials are deemed eligible for recycling. An exemplary system is practiced by Nuova F.lli Boretti s.r.l. in Italy's Prato district, which has a short and traceable recycling supply chain and production, from both post and pre-consumer waste, to regenerate wool and cashmere repeatedly.[190] A new fibre from Lenzing, Refibra™ the first cellulose fibre featuring recycled material on a commercial scale and made using the Tencel process, includes a new identification system which makes it possible to identify the Refibra™ fibre in the finished textile.[191]

Biodegradability/Composting:

Examples of newly developed biodegradable polyesters (or other synthetic fibres) could potentially offer a solution to the problem of microfibres. However, common standards used to evaluate biodegradability/compostability use strict industrial conditions, which are not replicated in natural ecosystems, such as in the ocean; current collection schemes and waste management facilities are also not set up to identify or separate such materials. Biodegradable synthetics are not necessarily toxic free as additives or degradation

by-products could be hazardous, therefore Detox principles should equally apply. Moreover, claims about biodegradability should not encourage guilt-free consumption or lead to the sacrifice of durability, therefore messaging should be more cautious. The challenges are also practical, i.e. there is nowhere the consumer could successfully compost their clothing, even if it were technically possible. Last but not least, there can be a conflict between biodegradability and recyclability in synthetic fibres and until we manage to accurately sort streams of secondary materials, recyclers could face technical hurdles. Therefore, despite some promising developments, biopolymers are unlikely to provide an appropriate response in the short or mid-term.

Examples which are "on the right track" include Swedish outdoor company Tierra, who's Deterra hood anorak is a good illustration of using 100% non-fossil materials for a complex product. It has also developed an alternative to synthetic fleece using a strategy to mitigate the release of synthetic microfibres with a 3D knitting system to make a 2-layer material combining fleece with wool.[192] Organic cotton T-shirts which are also biodegradable, by C&A and retailer Tchibo are also "on the right track".

In general, other examples of biodegradability/ composting, including as a prototype shoe by adidas[193] and an eco-friendly biodegradable polymer from supplier Lauffenmühle,[194] are classed as "beware, no road markings" due to the need for further details and evaluation of claims about compostability.

Design efficiency/ material waste reduction:

Reducing fabric waste: Examples of efficient design which are "on the right track" include Vaude, which reduces the complexity of its products to use fewer resources and reduces material wastage;[195] and Nike for its innovation of Flyknit knitting technology for shoe uppers, which has recently been extended to clothing with a Flyknit sports bra.[196]

Fashion collection: Re-Muji, the clothing upcycling line of Japanese fashion brand Muji, is also "on the right track"; unsold stock from Muji's warehouse is upcycled, repackaged and resold as a new clothing line.[197]

Most examples in this category are classed as "roadworks ahead" mainly because although they are going in the right direction they do not go beyond "business as usual". For example:

Fashion collection: Bleed's 2016 collection of "upcycled" products which is 100% made from manufacturing remnants of organic cotton, Tencel and "recyclable" polyester,[198] and H&M's capsule collection made of leftover materials.[199]

Design challenges/innovation: Design challenges and awards such as C&A's annual design challenge[200] encourage innovative ideas, but there are questions on how such ideas can be scaled up and/or replicated for the mainstream, so this is considered to have "roadworks ahead".

Production efficiencies; reducing fabric waste: Other examples with "roadworks ahead" are Reebok's Liquid Factory manufacturing lab, which will house additive manufacturing units to create or modify shoes on demand;[201] this could be limited to a 'niche' high tech market and is also limited to synthetics. Other 'niche' examples are Holly Mc Quillan's "Kindest Cut" pattern technique to eliminate waste from garment production, which is customised for the wearer as tastes and seasons change.[202]

Low impact processing; Low impact colouring and finishing:

Water/energy/chemical savings: There is a wide variety of innovations in textiles manufacturing that result in savings of water, energy and chemicals, mostly at the manufacturing stage but also during use by consumers. An important caveat is that it was not possible to evaluate any of these technologies for their use of hazardous chemicals, GMOs or other concerns, regardless of the quality of information available.

There can be major differences in production efficiencies which can reduce or eliminate chemical discharges and the use of water and energy. For example, a recent report has highlighted pollution from the manufacturing of viscose, a man-made cellulose fibre derived from wood pulp, which could be sustainable, but is often not, due to its prevalent production methods.[203] In this case new viscose production methods already exist, which do not rely on the use of toxic chemicals and where manufacturing takes place in a 'closed loop' to prevent the release of any chemicals which are used, as shown by Lenzing's production of Tencel, EcoVero, Modal Black and Modal colour, which are considered to be "on the right track". EcoVero has 50% lower emissions and uses 50% less water, compared to standard viscose and Modal Black and Modal Colour incorporate direct dyeing of fibres during the solvent process, resulting in savings of 90% on chemicals and significant savings in water, electricity, heat and wastewater.[204]

Other examples "on the right track" include SpinDye, for its thorough approach where colour is integrated into the material from the start, eliminating the use of water or toxins;[205] French fashion brand 1083[206] is

using laser washout for jeans, provided by Spanish company Jeanologia,[207] also using thorough standards. Archroma is open sourcing natural dyes for its Earth Colours range, made from leaves and non-edible shells of nuts (see Annex 3, Archroma 2). Sympatex is a good example of a company which is evaluating its entire textile process, from sustainable use of raw materials, consumed energy and water, to avoiding harmful climate gases and banning of hazardous chemicals.[208] The Ethical Apparel Network Partner factories have standards that include waste reduction initiatives, use of renewable energy, lean (efficient) production processes, versatile production capabilities and rigorous quality systems, which are exemplary for Africa.[209]

Techniques such as the digital printing used by Italian brand Miroglio also result in water savings,[210] but as it is now a well-established technology it can be considered business as usual ("roadworks ahead") while more information is needed ("beware - no road markings") to assess alternative dyeing techniques such as Colourkind, as used by Berghaus, where the polyester or nylon chips are dyed before being spun into yarn, saving 90% on water use.[211] Other examples where more information is needed include DyeCoo, which uses supercritical carbon dioxide instead of water,[212] and Novozymes, which manufactures enzymes to modify the surface of cotton fabrics, in order to provide anti-pilling, smoother fabric surfaces and colour retention features for extending the life of products; it's claimed that these solutions are biodegradable, natural proteins which are only required in low dosages and do not contribute greatly to effluent loads.[213]

Local manufacture (ie. digital/ 3D printing):

Novel techniques such as digital or 3D printing can facilitate the design of customised clothing as well as local manufacturing (see also Design and strategy for long life and Alternative business models): it "enables rapid prototyping, on-demand, segment-of-one products, and local production with no inventory, and no waste, among other benefits."[214] However, the future direction of such technologies is unclear. On the one hand, 3D technologies have huge potential to decentralise manufacturing by devolving it to local areas, democratising the means of production so that it becomes a more collaborative and community driven system which redistributes wealth. On the other hand, their novelty could potentially increase consumption and little is known about the materials that might be used by some technologies, especially where plastics are involved, so for the moment, these are classed as "roadworks ahead" to raise these issues. Two examples were examined: the US sports brand Under Armour which facilitates the design of custom products through 3D design and body scanning, 3D printing and rapid prototyping, apparel and footwear prototyping and a pilot lines;[215] while US start-up Electroloom team set out to build a technology that could enable consumers to design and manufacture clothes from scratch, a project that was never implemented.[216]

More examples of 3D printing and manufacturing can be found in the Pulse of the Fashion Industry report,[217] including 3D printed sports shoes, printing of fabrics and 3D knitting. The report also considers the future of automation in the textiles industry, both as an opportunity and as a potential social threat.[218]

KEY LEARNINGS - DESIGN FOR REDUCED ENVIRONMENTAL IMPACT

- Design for reduced impacts during manufacture and use remains a grey area where despite numerous initiatives by many big brands and developments by the industry, objectives and actual environmental performance lack a holistic and systematic approach which omits some significant issues, including microplastic fibres, pesticides and GMOs.

- On cotton, there are many examples of companies using Fairtrade and Organic cotton, which offers the best opportunity for reducing environmental impacts during cultivation. Some large fashion brands and retailers have specific goals; however, too often brands set a general "sustainable" cotton objective mixing very different standards that could be misleading. A larger share of Organic cotton and other sustainably grown fibres in the fibre mix would not only reduce the impacts at all stages of the lifecycle but would also necessitate "slower" strategies to compensate for the additional costs and lack of land to supply demand.

- Recycled materials used in textiles often come from the wider industrial 'ecosystem' and are not closing the loop by recycling old clothes into new textiles – but open loop. While this seems relevant for certain waste materials, the common practice of recycling PET bottles removes responsibility from the food and beverage industry for the prevention of single use plastics. Textile-to-textile recycling should be encouraged through incentives and funding for R&D.

- Open loop recycling includes the collection of and recycling of reclaimed plastic waste from the sea. While these initiatives are helping to raise awareness about the problem of marine plastics, their impact on this huge problem is limited, and at worst, brands could be using the profile of this problem for greenwashing. Open loop recycling of waste plastic bottles could also create the unintended consequence of increasing the consumption of single use plastics.

- Far greater attention must be paid to the issue of microplastic fibres from synthetics, both in virgin and recycled textile materials. The design of apparel products needs to prioritise essential and technical uses of synthetics, such as outdoor wear and question its use for short life, poor quality "fashion" items.

- When recycling, care must also be taken to prevent the recirculation of hazardous chemicals from discarded consumer products and marine plastics. The industry should act preventatively by ensuring that all products made from now on are free from hazardous chemicals according to Detox principles, while developing clear guidelines, such as restricted substances lists for recycling, to track the content of hazardous chemicals in current discarded products and sort and treat them accordingly.

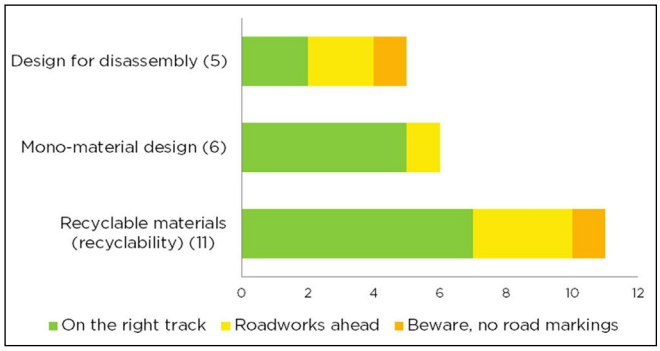
3.3 Design for remanufacture and recycling (for closing the loop at the end-of-life stage)

Design for remanufacture and recycling plans for a product's life beyond its first life, in order to enable disassembly, remanufacture and recycling to create new products of the same or higher value. The ultimate aim for the future is to design out waste altogether.

This section addresses upstream strategies to ensure that products are better suited for recycling at the end of life stage; the questions of collection and take-back are discussed in Section 4.1.

The need to optimise materials and construction methods for recycling **can run counter to design and strategy for long life,** as it is possible to design a garment with a short life in mind which is easy to dismantle and recycle. The potential for speeding up the textiles cycle and increasing the disposability of clothes is being explored as part of the circularity objective.[219] Therefore, care must be taken to consider the life expectancy of products in conjunction with the need to recover, recycle or remanufacture materials once the product can no longer be used. This is the smallest category with just 23 examples, perhaps a reflection of the fact that designing for closed loop – textile-to-textile recycling where fibres can be recycled over and over – is at an early stage, or perhaps that lower priority is being given to this compared to other strategies which might be easier to achieve and communicate. The examples do include materials sourced from an open loop system, but only when the products are also designed for further recycling.

Figure 12: Design for remanufacture and recycling - examples



There are 22 examples of "Design for remanufacture and recycling", including 2 on Design for disassembly, 5 on Mono-material design, and 7 on Recyclable materials (recyclability) which are "on the right track".

Design for disassembly:

This can facilitate refurbishing and recycling and reduce costs, as demonstrated by examples which are "on the right track" such as German retailer Tchibo, which is refining and defining its products at the design phase to cover both materials used for the product (how easily they can be disassembled and recycled) and the recycling systems and capacity.[220] **Disassembly technology**, such as the microwave technique for removing labels, branding and separating seams, developed by UK based Wear2 consortium would require an up - and downstream strategy where manufacturers would collect back their own clothes; this is considered to have "roadworks ahead" as it would be hard to implement across the board.[221] Similarly, the conceptual collection 'Shed Me Clothes', proposes water-soluble stitching, in order to separate layers to reveal different colours, or change the style, i.e. from long-sleeve to short sleeve, to provide the user with a garment with longer-lasting appeal.[222] This could be considered niche but there is not enough information to assess and so is classed as "beware, no road markings".

Mono-material design:

Mono-material design also facilitates recycling by using single fibres for the fabric and sometimes also for components, reducing complexity. There is substantial value that may be generated if there are mechanisms to recover fibres effectively, however, the use of blended materials makes them difficult to recycle. Techniques such as overprinting used by sportswear brands make

materials difficult to recycle. Examples which are "on the right track" include UK outdoor brand Paramo which avoids mixed materials by using 100% polyester for its fabric, membranes and seams enhancing recyclability though monomaterials, which is backed with a full slow/close loop strategy including chemical recycling (see Annex 3, Paramo 3); Levi's Wellthread™ Collection, which uses single fibre (cotton) waterless fabric with closed loop recycling in mind;[223] Lidl will have textiles in stores in 2018 using mono-materials and easy disassembly;[224] MUD Jeans' leasing system in which they remain the owner of the raw materials, a mono-material of least 98% cotton used for jeans which are designed with recycling in mind and can be recycled and blended with virgin cotton to produce new raw material for new pairs of jeans, if returned products are too worn out;[225] and the Corner Jacket from outdoor brand Houdini, made from 100% recyclable polyester which is made to be recyclable - Houdini ensures that it never mixes natural materials with synthetics, so that its products are either recyclable or biodegradable (or both).[226]

Recyclable materials (recyclability):

Examples that are "on the right track" are: a three year project from adidas for a fully recyclable sports shoe which aims to identify and develop recyclable, partly waste-based, textile fibre reinforced composites - these materials enable the fast production of easily customizable sporting goods (see Annex 3, adidas 7); outdoor brand Fjällräven's aim is for all the polyester it uses to be recycled and recyclable, through the recycling project Eco Circle™ which allows garments to be recycled again and again without reducing fibre quality;[227] Another example is Picture, which created the 100% recyclable Welcome jacket in 2013; however, it is considered to have "roadworks ahead" as Picture continues to use C6 PFCs as durable water repellent, which should preferentially be substituted with one of the many alternatives on the market,[228] instead of recycling them.[229] The materials in Timberland's boot collection are made from recycled materials (tyres from open loop recycling) which are also recyclable.[230]

KEY LEARNINGS - DESIGN FOR REDUCED ENVIRONMENTAL IMPACT

- Considering the current focus of mainstream fashion brands on "circularity", it is surprising to see so few examples of design for remanufacture and recycling initiatives. In line with our previous findings, it clearly shows that the industry is not effectively closing the loop on textiles but is mainly relying on the waste products of other industries for its recycled materials.

- While design for longevity is the single most important intervention to reduce the volumes of clothing consumed, it is also important to consider recyclability as part of an overall strategy which considers what happens when clothes can no longer be repaired and reused. It should be ensured that recyclability does not undermine longevity and vice versa.

- The practical realities of dismantling used clothing for reuse, repair and recycling need to be communicated to designers so that they can consider problems and come up with new strategies at the product design stage.

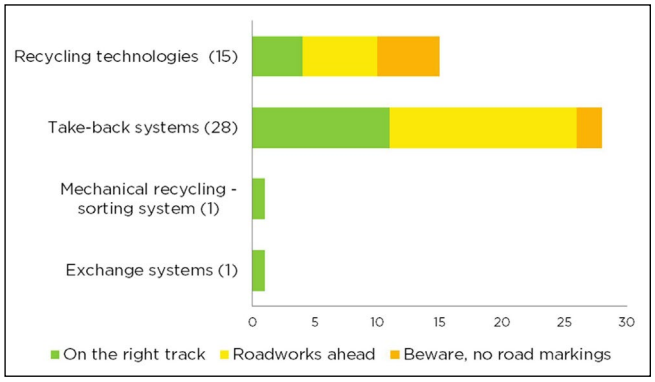
4. RESULTS AND DISCUSSION – SYSTEMS AND MODELS THAT FACILITATE SLOWING THE FLOW AND CLOSING THE LOOP

4.1 End-of-life collection systems and recycling technologies

Systems that facilitate both slowing the flow - the re-use, remarketing and upcycling of second hand clothes - and closing the loop - recovery of materials by recycling, as well as innovations in recycling technologies

There are 45 examples of end-of-life collection systems and recycling technologies, most of which are take-back systems, which involve the collection of used clothes for either re-use, recycling and disposal of any which cannot be either reused or recycled. Most of the remainder are various different recycling technologies for either synthetics or natural fibres, as well as a mechanical sorting system and an exchange system.

Figure 13: End-of-life collection systems and recycling technologies - examples



Recycling technologies:

Currently the status quo is dominated by open loop recycling technologies using secondary synthetic materials from wastes originating in other industrial sectors, mostly plastic bottles, as described in the "Design for reduced environmental impact" chapter. In this context, it is worth highlighting initiatives to develop specific textile-to-textile recycling technologies/strategies.

Projects "on the right track" include Teijin's Eco Circle™ **Chemical closed loop recycling** for polyester; Teijin claims that "after textile products are collected, they are broken down and processed to create new polyester fibre with no compromises in quality or variations."[231] Although there may be unknown issues on releases of hazardous chemicals, this was the first ever commercial recycling technology which can recycle used textile polyester fibres into new polyester. **Chemical Recycling** from the Resyntex project brings together 20 project partners from 10 EU member states and has aims that include designing "a new value chain from textile waste collection through to the generation of new feedstocks for chemicals and textiles".[232] Maintaining the highest material value of recycled products and avoiding the easier but dead-end option of downcycling is key, as also illustrated by Paramo, which aims to use a chemical recycling process which, unlike traditional textile recycling, preserves the value and quality of the material, for clothes that can't be reused.[233] Also "on the right track" for its system and scalability is the **Mechanical recycling** of **natural fibres** by the Prato: Re.Verso™ consortium of suppliers and brands,[234] which have developed a sophisticated system of sorting and classifying wool scraps for maximum recycling, developed and perfected over many years; although currently mostly focussed on pre-consumer waste there is also collaboration with brands on the take-back of post-consumer textiles.

More details are needed for some projects, which are classed as "beware, no road markings". For example, under **Research & Assessment,** G-Star is a member of Circle Economy's Circular Textiles Program which

aims to create a business case for high value (textile-to-textile) recycling of post- consumer garments; no doubt the direction of this project will become clearer over time.[235] Another interesting example is the **Chemical recycling** of **synthetics** in Aquafil Econyl's Regeneration System for the production of Nylon 6 from regenerated post-consumer Polyamide 6 waste materials, including clothing and pre-consumer waste, which results in ECONYL® nylon which it claims "can be recycled an infinite number of times, without losing any quality".[236] However, more details are needed plus evidence of how microplastic fibres will be considered. **Chemical recycling of natural fibres** is also becoming more feasible, as demonstrated by a project by VTT Research in Finland which is turning cotton waste into new fibres using a cellulose dissolution technique similar to viscose manufacturing; this is reported to be scalable but it is still at a pilot stage.[237] Similarly, Lenzing is using the Tencel production process for remanufacturing cotton scraps for its Refibra™ recycled cellulose fibre.[238] In addition, start-up Evrnu™ has collaborated with Levis to produce the world's first prototype jeans made from regenerated post-consumer cotton waste.[239]

Sorting and exchange systems: There are also several examples rated "on the right track". Firstly a **Sorting system** for **mechanical recycling** by Picture, where both the design of products and the system for return and sorting considers mono-materials to be separated out for recycling.[240] Secondly, the **Exchange system** Circle Market, a project of the Circle Economy, is a marketplace which facilitates the trade of recyclable materials between parties; it aims to provide the best possible recovery, reuse, resale of resources and to become a catalyst for a zero waste industry. It is currently focussed on pre-consumer textile waste but is a good model for co-operation.[241]

BOX 3: Textiles recycling – a reality check

At the moment closing the loop through the recycling of textile fibres into new textiles is not sufficiently developed.

Synthetics: the fibre that is easiest to recover is polyester, however, the most common source of recycled polyester is from other sectors (open loop) – the molecular weight of PET bottles is perfectly suited for textile fibres.[242] The problem is that this does not 'close the loop' within the boundaries of the textile industry.

The chemical recycling of synthetic fabrics is much more limited with only a few companies offering chemical recycling of synthetic fabrics at the moment. There are also questions about whether the present technique is feasible in terms of cost and the amounts of energy and chemicals used.[243]

Natural fibres: the mechanical recycling of cotton is an established process, but this results in a loss of quality - new garments can only contain a maximum of 20% recycled fibre, with the remainder virgin raw material.[244]However, wool can be regenerated more than once.[245]

Natural cellulosic fibres can also be recycled chemically which results in a considerably higher recycling rate, with some start-ups processing used cotton to manufacture Lyocell-like fibres, which is a chemically modified cellulose.[246]

Despite a lot of interest in chemical recycling, there are calls for more investment by big brands in the tech companies pioneering a more circular model, to make recycled fibres more commercially viable compared to virgin materials.[247]Chemical recycling technologies for both synthetics and natural fibres should be developed using a Detox approach, to ensure that no hazardous substances are used or released.

Mixed materials challenge: the recycling of mixed textile waste poses a serious challenge. Technical problems that impede textile recycling include:[248]

- The complexity of clothes, which are often composed of disparate fabrics, with the stitching and trims made of different materials. Buttons, zips and other non-textile parts need to be removed before processing, while colour pigments, coatings and prints cause additional problems.

- The increasing use of fibre mixes in fabrics, such as cotton/polyester. What looks and feels like a wool pullover may contain 50 % synthetic fibres.

These mixed fabrics cannot be recycled chemically without prior separation of the fibre fractions. This separation is becoming technically possible for poly/cotton fabrics, as polyester but not cotton dissolves under alkaline conditions, but the process is still at a trial stage. Other fibre mixes, especially if they contain elastane, pose substantial challenges.[249]

Even when these technical challenges are overcome, the current methods of design, such as mixed fibres and components, favour disposal rather than closing the loop (see section 3.3).

Take-back systems

Take-back systems are a common strategy used by many of the larger brands as well as some smaller ones, primarily to extend the life of clothing through re-use, although the level of take-back is currently very small.

Several examples which are considered to be "on the right track" are in collaboration with the non-profit sector which has well established systems for second-hand clothes in many countries. For example outdoor brand Vaude collaborates with Fairwertung (100 non-profit organisations) and Gift your Gear UK,[250] and UK retailer Marks & Spencer which collaborates with Oxfam and also has a tracking system for the distribution and reuse of clothes.[251] German retailer Tchibo is taking a transparent, systematic and analytical approach to implementing its take-back programme which is recognising the key role of the non-profit sector.[252] Global fashion brand Inditex is in the process of rolling out a global take-back programme in co-operation with local non-profit partners such as the Red Cross, Caritas, Oxfam and CEPF in China; the programme is currently running in eight countries with a further twelve planned for 2017 and 2,000 stores by 2020.[253] Smaller outdoor brands such as Houdini also organise take-back, where a "closed loop recycling system" has been in place since 2006, with recycle units at Houdini retailers; and German brand Pyua has collection boxes for closed loop recycling in partnership with Textil Recycling K. & A. Wenkhaus.

Many take-back systems involve an incentive for customers to return their used clothing, such as discounts on new clothing, which could be seen as encouraging the continued overconsumption of clothes. However, incentives do not necessarily need to promote further consumption but can take the form of other rewards. In some countries, they may be necessary to ensure the success of the take-back programme and to encourage the habit of returning used clothes, particularly where this is not a well-established practice. Therefore, brands need to develop their take-back programmes on a case-by-case basis, appropriate for the relevant country and ensure transparency and justification for 'take-back' offers.

There needs to be greater focus on the fate of used clothing after collection; there are some good attempts at tracking downstream such as Marks & Spencer (see above) and some, such as C&A who are on the right track for reporting data but need to overcome "roadworks ahead" by including percentages and objectives. This connects to questions about potential downcycling, for example Levi's partnership with I:CO where collected clothes which are not reused "will be transformed into things like insulation for buildings, cushioning material and new fibers for clothing" and doesn't appear to differentiate or prioritise the recovery of textiles for true circularity, which could also mean "roadworks ahead" .[254] There is a similar concern about the example from The North Face, which has a sophisticated sorting system but much of the textile waste is downcycled,[255] as well as the schemes by Mammut,[256] and GoHiking[257] in Taiwan.

However, without a wider strategy to increase resource-efficiency (such as those detailed in this report), some question the ability of take-back programmes to effect real change. Dilys Williams, Director of Sustainable Fashion at the London College of Fashion, warns that in isolation, they could **"encourage a guilt-free consumption attitude where customers think it's a good idea to buy and wear (or not) in ever increasing amounts without thought for clothing's inherent precious value in terms of people and resources."**[258]

The collection of used clothing and its distribution for resale to places like Africa has also had a negative effect on local textiles and clothing industries; in the 1990s, the industry in Sub Saharan Africa experienced a near collapse throughout the region which many attribute to the huge influx of used clothes, although in East Africa this now seems to be changing.[259]

Extended Producer Responsibility systems

In 2008 France adopted Extended Producer Responsibility (EPR) legislation for Clothing, Linen and Footwear (CLF), intended to "engage producers in considering the end of life of their products when putting them on the market".[260] Every company selling their own brand products on the French market must either set up its own accredited internal collecting and recycling program or pay a contribution to Eco TLC[261] to provide it for them.

The funds collected are used to support the administration of the system, for R&D projects on recycling solutions and finding new outlets; and for communication campaigns to motivate changes in the public's waste sorting habits. Currently the contribution is an undifferentiated fee levied on sales, however Eco TLC has begun research to see if the fee can be adjusted (rebated) to incentivise further environmental protection.

This system can act as a powerful lever to ensure that producers do not overproduce. To help close the loop, it already provides rebates for the use of more than 30% of pre-consumer waste in products; a previous system with rebates of 15% failed to provide sufficient incentive. To help slow the loop, Eco TLC will be introducing up to 75% rebates for meeting durability

criteria (based on resistance tests); these will be introduced for shoes from 2018 on, with jeans, jumpers, T-shirts and sheets following in the near future.[262]

Eco TLC also provides communication kits to all stakeholders, measuring tools to analyse and develop reliable statistics about the industry, and real time mapping of all French collection sites with free access for local citizens and communities.

The Nordic Council of Ministers commissioned a report, released in 2015, which discusses Extended Producer Responsibility systems and "**ways to identify new business models to increase reuse and recycling of textiles in the Nordic region**", looking at the pros and cons of several scenarios.[263]

KEY LEARNINGS – END-OF-LIFE COLLECTION SYSTEMS & RECYCLINGTECHNOLOGIES

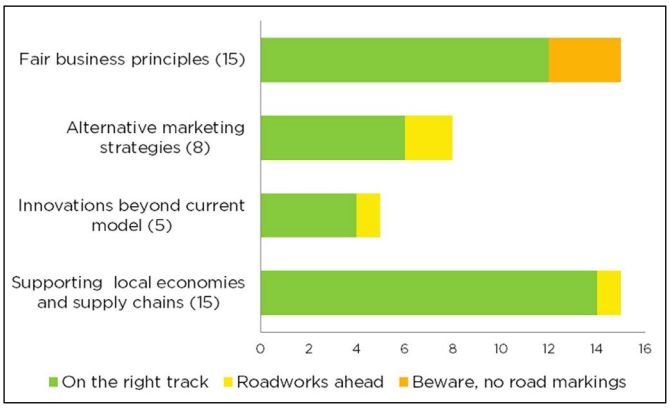
- The level of recycling technologies and innovation in this field shows that the idea of circularity is a long way from reality, increasing the urgency of slowing the flow as the first priority.
- Although the focus of the fashion industry is on the recycling of synthetics, the rapid development of chemical recycling of post-consumer clothing made from natural fibres could greatly reduce the use of virgin fibres and their impacts during cultivation and manufacturing.
- Take-back systems are developing but many lack strategy on the final fate of clothes collected. Laws on Extended Producer Responsibility (EPR)- such as the EcoTLC system set up in France - are needed to level the playing field, as currently take-back is mostly voluntary without meaningful targets, beyond public relations, which might encourage further consumption. EPR would provide mandatory targets and ensure that every producer pays a fee proportionate to volumes put on the market; this would be a positive development particularly in Global North countries, such as those in the EU, but needs to be developed strategically, with consideration for existing initiatives and systems, many of which are organised by the non-profit sector, or informal recyclers.
- Without the strategic intervention of EPR laws, first movers are penalised, research efforts are scattered, there is no credibility to claims about performance and there is no obvious relationship between collection, recycling technologies, markets for recycled fibres and product design improvements for disassembly, recyclability and increased longevity.

4.2 Alternative business models

Business models that seek to work within environmental boundaries and create positive societal impacts by design

There are a total of 43 examples in this category, with most of these being "supporting local economies and supply chains" and "fair business principles". A large proportion of these are rated as "on the right track" (36 examples or 80%), the highest of any of the categories.

Figure 14: Alternative business models - examples



Fair business principles:

The widespread and caricatured business model of maximising profits for anonymous shareholders while manipulating consumers into buying more products, should not be accepted as normal practice or as an acceptable way of doing business. There are other ways to run a successful business, based on **Sustainable economics**, for example Vaude, a family business without external shareholders, which states:

"Our values are based on the idea that sustainability does not preclude successful business and are not aligned with pure profit maximization. We are convinced: sustainable management pays off in the long term. We are also willing to invest in this concept."[264]

Another outdoor brand, Rotauf, is totally independent with no investors with a goal to cover costs and re-invest which allows the sourcing of sustainable Detoxed material;[265] fashion brand Bleed describes itself as 100% self-sufficient, with sustainable growth and no debt.[266] All of the above are on the right track but classed as "beware, no road markings" because this territory is less well explored than some of the other options.

Fairtrade/ethical manufacturing:

Fairtrade has a long history of challenging the mainstream clothing industry in response to poor working conditions and the violation of human rights in developing countries. Better social conditions often lead to safer workplaces and more sustainable production patterns even if ecological requirements are not always at the core of Fairtrade practices. Today, environmental concerns are increasingly tackled by Fairtrade businesses.

All of the examples of Fairtrade are "on the right track" showing that a sustainability strategy built on local traditional know-how can deliver on both social and environmental objectives: the small French brand Veja works closely with Indigenous Amazon communities for rubber production;[267] the Lovely Taïwan platform aims to keep the native culture alive in Taiwan by supporting small fairtrade business;[268] Zady's model is to create products which address each issue in its supply chain, that "celebrate" craftsmanship[269] and states that "great design does not have to come at the cost [of] mistreated workers".

Outdoor brands Paramo and Patagonia have also based their business on ethical manufacturing conditions, while several African initiatives such as Ghana based Ethical Apparel Africa[270] or Soko in Kenya,[271] show that Fairtrade can be tackled at supplier level. Fairtrade requirements are also included under Organic cotton certification (eg. GOTs), as shown by German brand Bleed[272] and championed by the Swiss retailer COOP.[273]

Alternative marketing strategies:

Crowdfunding: To move towards sustainability, it can be very useful to rely on committed shareholders who support the long-term direction of change: innovative shareholding through crowdfunding gathers people based on their common values to support a project. As well as being an different way to connect with potential customers, crowdfunding is an alternative financial model, although it does not exclude a future growth driven model.[274] French brand 1083, iconic of the Made-in-France revival, was created from a crowdfunding initiative that raised €110000 capital in 2013 and now has a community of 20000 Facebook supporters.[275] Both 1083 and Rotauf, which also has a crowdfunded business model[276] are "on the right track" - funding their projects on the basis of sustainability with interested individuals rather than traditional investors, meaning that slowing the flow is part of the DNA of the company.

Marketing for less consumption: Two examples are rated as "on the right track": as well as being effective PR, is there a clearer and more provocative message than the "Don't buy this jacket" campaign launched by Patagonia to encourage people to consider the effects of consumerism on the environment and purchase only what they need?[277] French fashion brand Veja has set itself clear boundaries by adjusting production to the availability of natural resources such as rubber – instead of making suppliers match the expected sales volumes at any cost (and avoiding overproduction by not accumulating stock) they reduce pressure on the supply chain by ordering at least 6 months in advance; in addition no money is spent on advertising.[278]

Sharing economy: Service business model:

Alternative ownership models which challenge the dominant way of doing business, such as service-based businesses are often an afterthought in the current circular economy debate. Ideally they should slow down the flow of materials which would be easier to achieve in peer to peer models where there's no middle man or where value is properly distributed. Few examples have been identified so far, despite the fact that other business-to-business sectors (computers and photocopiers) have used this approach for decades. Rated as "on the right track" is Lena, located in Amsterdam, which is a 100% service-based fashion project and has established a Fashion Library where members can access the library's full closet of vintage and designer clothes and lend out their own clothes.[279] On the other edge of the spectrum, German discount retailer Tchibo claims to be investigating new modes of ownership strategies - delivering on this commitment would be a major breakthrough.[280] As this is still at an early stage it will need to overcome "roadworks ahead" to see how this develops. In addition, the monthly clothing and accessory subscription service Le Tote has both benefits and drawbacks – the rapid turnover of clothes by mail order has environmental costs, however, the dematerialisation service-based proposition helps slowing the loop.[281]

Innovations beyond current model:

Large brands that are "on the right track" for developing new strategies to move beyond the current business model are C&A, which has several initiatives to develop circularity as its root policy, including the creation of a hub focused on incubating and accelerating technologies that support the circular economy (although focussed on closing rather than slowing the loop)[282] and Marks & Spencer, which is one of 89 signatories to the Sustainable Clothing Action Plan.[283] Another entirely different approach which is based on the principles of improving ecological health is shown by Fibershed, which is developing regional and regenerative fibre systems on behalf of independent working producers, providing connection and ownership of 'soil-to-soil' textile processes designed to build soil carbon stocks and enhance the strength of regional economies through working landscapes.[284]

On a wider level, it is worth exploring how the potential for new peer to peer and collaborative business models or networks, could be enabled by new technologies such as IoT (Internet of Things),[285] Blockchain,[286] 3D manufacturing as well as Artificial Intelligence. New systems may also be able to facilitate increased transparency of the production chain and traceability of materials.

Supporting local economies and supply chains:

Many of the examples in all the categories above also support local economies and supply chains to some degree, with the result of increased environmental benefits and greater traceability; this is a more notable feature for the cases highlighted under 'alternative business models'. Examples of **local manufacturing** which are "on the right track" include the traditional family businesses of the Prato District suppliers in Italy, which have maintained their commitment to quality and environmental progress against the tide of globalisation, with a supply chain of excellence based on the collaboration of 5 premium Italian textile producers;[287] The North Face has a Backyard Project collection which aims to significantly increase the quantity of products made through new relationships and collaborations within the American textile industry (including Fibershed – see above).[288] Fashion brand Miroglio also has 100% Italian production, tailored to the customer and including printing technologies.[289] Other initiatives "on the right track" that favour a short supply chain include 1083,

which manufactures across France using integrated production/distribution to reduce intermediates (see Annex 3, 1083 6); and Flint & Tinder which has a 100% American made hoody guaranteed for 10 years (see Annex 3, Flint & Tinder 2).

There are also many traditions and countries which do not yet completely follow the pattern of mainstream "Ready-to-Wear" fashion, such as the Ready-to-Sew market in India, which is still a large market of local tailoring for the general masses, where a skilled person or group of persons cater to local orders, with minimal exposure to fashion trends and technology.[290] Similarly, local tailoring is a major industry in Ghana, which now includes the re-fashioning of Western clothes.[291]

In parallel, there is the conceptual development of an emerging productive model that builds on the convergence of the digital commons of knowledge, software and design with local manufacturing technologies, known as "Design Global, Manufacture Local (DGML).[292]

BOX 4 L'Herbe Rouge

The unfortunate story of the French eco-fashion brand L'Herbe Rouge illustrates how difficult it is to succeed with an alternative business model in the current market environment. L'Herbe Rouge was created in 2008 as part of a movement to revive the fashion industry in Northern France (in the traditional textile cluster of Roubaix) with ethics and sustainable development at the core of its business strategy. Over 8 years, the brand managed to attract customers and was a commercial success, proving that the public is interested in quality and strong sustainability values. However, the brand could not scale up sufficiently to fully achieve its business model: its commitment to treating suppliers fairly required faster returns of income than its distribution system could deliver, as it was reliant on external players, while investments from the financial sector to mitigate this failed to materialise. The costs of maintaining a presence in "bricks-and-mortar" in Paris and Lille to increase visibility also proved prohibitive. In December 2016, the company went into liquidation. In a press interview, co-founder Arielle Levy bitterly declared: "**We were on the verge of succeeding and are a reference for the future of eco-design, consumption and responsible distribution in the textile industry...**" regretting that "**we have always been judged not as an innovative start-up for the new low-carbon, sustainable economy with a strong project for textiles in France but as a classic player judged on short-term criteria ...** "[293]

KEY LEARNINGS – ALTERNATIVE BUSINESS MODELS

The potential for developing new business models running on principles that extend beyond profitability, deserves much more attention, beyond the scope of this report. More examples of businesses which show the current potential for new models to succeed and be sustained commercially would be welcome. Levers to help these models to go from "niche" to mainstream and barriers that prevent this from happening, should be identified.

- Where economic principles such as profit sharing (as in cooperative models) and fairtrade form the heart of the company, this has a positive influence on the environmental and human impacts of clothing.
- Publicly listed or shareholder owned businesses are focussed on immediate short term profits with less consideration for their medium or long term sustainability; much greater financial support for new business models needs to be made available.
- Valuing local and traditional know-how supports individuals and communities with these skills and replenishes much more than financial gain.
- Strategies which aim to regenerate the environment through textiles production show that industry attempts to become more "sustainable" do not have to only focus on limiting and reducing damage but can be part of a transformation in how clothes are produced, sold, shared, repaired and reused.
- Smaller fashion brands also lead the way on alternative business models, with some notable exceptions (Vaude) particularly on fairtrade sourcing. Some multiple retailers – eg. Tchibo - and fashion brands – C&A – also show some promising signs of adapting their business models to innovate in the right direction for slowing the flow, in contrast to the growth model proposed by the global fashion industry in its Pulse of the Fashion Industry report. However, most larger brands are still in research mode on the question of business model adaptation. Greater experimentation is therefore required by these players in order to capture the opportunities that lie ahead.

5. CONCLUSION

What we learned from the examples

This research has scratched the surface of the efforts being made by the textiles industry and beyond to address the current problem of wasteful overproduction and overconsumption of clothing. It shows that there is a lot of innovation by a wide range of companies and organisations, both small and large.

Both positives and negatives have been revealed: the majority of examples are on the right track, with a proportion of these needing to consider issues such as scalability or lack of information.

The best examples of "design concepts and strategies" show the importance of embedding environmental considerations and solutions at the earliest possible stage of the product design and manufacturing process to enable and implement a change in practice.

Common themes

The fashion industry stands at the crossroads, with a choice of routes to follow. It can continue along the same road, leading to the same wasteful practices and throwaway styles, which will put greater pressures on ecological boundaries and our social fabric. Or it can be truly creative and innovative and take another route, one that will require transformative business models to enable the design of fashion with limits in mind, instead of making disposable designs to feed the wants of increasingly unhappy consumers. Such a route would reject throwaway materialism in favour of **"true materialism" - "a switch from an idea of a consumer society where materials matter little, to a truly material society, where materials – and the world they rely on – are cherished."**[294]

There are a number of common themes which run through many of the examples, which may be useful to consider as signposts to point the fashion industry in the right direction, with the help of governmental authorities, academics, civil society and the public.

"Niche" to mainstream

While some strategies will inevitably remain niche because they are designed that way, others are forced into this category by the dominance of less sustainable common practice or "second best" alternative. It is urgent that these strategies for slowing the flow or reducing environmental impacts are not ignored so that they remain niche – as is happening with Organic and Fairtrade cotton - but are supported and promoted so that they become the new 'normal'. The same could be said for making better quality clothes designed to last and services to support the repair, refurbishment and reuse of clothing. There is a greater role for big brands which have more influence on the market, to support the best possible options to increase their prevalence.

Diversity

There is no single solution for the future of fashion but room for many, using the creativity of fashion and leading to "market biodiversity". The diversity of examples that we found is a positive sign that the textiles industry has the potential to innovate and recreate itself to be fit for the future. A variety of options need to be kept open when charting unknown territory - both from well tried and tested traditional techniques and craftsmanship as well as novel developments.

Mainstream fashion could also slow the material flow by diversifying - and transforming their business models at the same time, to make them more responsive to the needs of their customers. Inspiration can be taken from other cultures which have not adopted the "one size fits all" model, where local tailoring is still the norm, taking account of diverse body shapes and tastes, and from the examples of both small and large brands which are contributing to functioning local economies both within Global North countries and in the rest of the world. Unfortunately, the fashion industry foresees the opposite of greater diversity, by increasing the market share and control of large brands at the expense of small and medium sized businesses.[295]

Online vs. "real world"

Diversity is both encouraged - and held back - by online marketing. The smaller fashion brands rely more on online marketing, perhaps due to the fact that in many countries conditions in the 'real' world make it difficult for small enterprises to trade from a physical location, leading to a "monoculture" where big brands dominate the high street and shopping malls. The growth of online marketing has the potential to further increase over-consumption of fashion, making the current situation worse and limiting the available space for the emergence of new ideas and strategies. The diversity and choice which is currently available online also needs to be visible in the 'real' world where it can contribute to local communities and encourage intrinsic values, which in turn can reduce people's dependency on the quick fix of fast fashion. Vital

strategies for slowing the flow - such as repairing, sharing, re-using and customising our clothes - are much more effective if they are also physically present in the "real world" where customers can find them.

Experience vs "stuff"

If the indications are correct and we are reaching "peak stuff" this will not be a moment too soon, however, there is no room for complacency in tackling the need to slow down the flow of materials. This presents both opportunities and threats to the clothing industry; a decrease in revenue from sales adds pressure and could lead to sales and cutting prices, to maintain customers' overconsumption habits. The desire for transient, one-off experiences driven by the "fear of missing out" (FOMO)[296] might only increase environmental impacts from other activities, swapping one type of overconsumption with another. However, there is "a rising expectation that brands will make a meaningful contribution to our personal well-being and that of the wider world."[297] This is a longer term opportunity to connect the marketing of clothing to the desire for "experience" if done in an authentic way. Many of the strategies for "design for longer life" such as sharing and leasing, providing repair services or helping with DIY repair for better quality clothes designed to last, encourage meaningful engagement with customers, between individuals and within communities, such as "swap parties". Reducing impacts in the supply chain and alternative business models which put greater value on the resources and the skills of workers lead to more positive experiences of work. Showing that there are positive changes to people's lives from better, more meaningful work and real environmental benefits from changing practices could become a vital part of our experience of fashion.

Re-thinking the "materials mix":

Natural fibres vs. man-made cellulose fibres vs. petrochemical synthetics vs. bio-polymer synthetics

Textiles are complicated and it is sometimes hard to untangle the threads. While there is no support for continuing the use of large amounts of conventional cotton, there are methods of cultivating cotton (already mentioned above) and other natural fibres with markedly reduced environmental impacts. The processing of cellulose fibres is not without problems in common practice, such as the use and discharge of process chemicals, but significant improvements have been achieved using alternative methods and closed loop processing. The growth of fashion through reliance on petrochemical synthetics – especially polyester - is clearly unsustainable, even if the "best practices" of big fashion are also applied across the board, as proposed in the Pulse report.[298] Finally, bio-polymers might be a useful option but are relatively unexplored, so questions about their fate in the environment and competing pressures on land needed for food production, biofuels or as untouched habitats, would need to be considered.

Technologies for the chemical recycling of both synthetics and natural materials are in their infancy; for natural materials a similar process to the manufacture of cellulose fibres is utilised, using cotton textile waste as the raw material. The fact that natural fibres do not contribute to plastic pollution of the oceans or depend on fossil fuels means that ultimately this is a more sustainable route, if the processing can be shown to have minimal impacts. If chemically recycled cotton or other natural fibres could be produced in sufficient quantities and without additional environmental burdens, the impacts of virgin raw materials would be reduced considerably, but the need for better cultivation techniques such as organically grown cotton is still vital. While the use of natural materials is inherently more likely to be sustainable, with these caveats, and is often preferred by customers, there are currently limited alternatives to match the performance of synthetics for technical uses in outdoor gear, swimwear and so on. However, even with these limitations, it is perhaps time to re-think the materials mix in line with a "fit for future" business model.

Transparency and traceability

It is essential to have transparency about the conditions and impacts of the whole clothes supply chain – from cultivation through to what happens to last year's trend once it becomes waste. We found examples of many different techniques and tools which allow traceability of clothes and fibres, which can help to show exactly how they are made and their impact, from tracing the factory of manufacture, to identifying the specific recycled fibre in a product. Making these issues visible so that they become a topic of conversation makes it easier to tackle concerns and make improvements - all of which have a real impact on conditions in the supply chain and elsewhere. Transparency can also be the basis for developing common tools for strict traceability, monitoring and reporting, which can be considered within the context of the waste hierarchy and Detox principles. Large brands should be taking the lead on making transparency and traceability the norm for all.

Creativity - within the boundaries of sustainability

We need to limit ourselves and prevent unsustainable growth while at the same time providing for our

needs. The way to do this is to encourage small businesses with a human element where value is distributed fairly and to re-invent large businesses to take account of limits on growth and human and environmental limits - as well as re-engaging with their customers on this basis. Future businesses should only be allowed to flourish if they contribute to the good of the planet and society and empower and serve their customers by providing them with goods. Big brands must take responsibility for fostering the addiction to fashion over-consumption which is damaging the psychological health of shoppers, by adjusting their business models to offer an alternative vision of meeting people's need for clothing without creating unsustainable 'wants'. This can be done by showing the true value of materials and the people and processes which contribute to clothing and by creating opportunities for natural human exchanges through buying, renting, sharing and repairing clothes.

"Fashion fades, only style remains the same". Coco Chanel's famous words should invite us reappraise the meaning of fashion. It is about the creation of identity, not about constant change. When people, resources and the environment are at stake and the promises of individual happiness so obviously empty, this statement takes on even more significance.

What next

Both slowing the flow of materials and planning for the ultimate closing of the loop are needed. However, in the immediate term, a focus on slowing the material flow must take priority. Closing the loop will only become truly achievable once the unsustainable quantities of clothes that are consumed and thrown away have been reduced through changes in production and consumption – enabled through adjustments to the quality and design of clothes, including their repair and end-of-life.

Companies need to commit **to extend the emotional and physical durability of our clothes**. Such a commitment needs a two pronged approach: firstly to address the psychological aspects, such as marketing for long life clothing that also addresses the emotional attachment of people to their clothing; and secondly, the practical questions of environmental efficiency through design for longevity - including quality, durability, repairability, low impact materials and processes. Both the above will encourage a change in attitude towards clothing, allowing greater creativity and versatility to add to the enjoyment and novelty that fashion brings, balanced with the questions of need and value for money through quality and longevity that will reduce overconsumption.

Recommendations

It's clear that the intensive materials model has reached a dead end and that the industry needs to open up and explore more options before it can achieve circularity. The following steps are recommended to take the industry and its customers on an alternative route:

SLOWING

All players need to prioritise strategies to slow down the flow of materials; in particular, larger brands can bring strategies for extending product lifetimes into the mainstream, such as:

- Stop the trend for decreasing lifespans and quality by designing for long life - including better quality, classic styling, repairability, durability, guarantees and emotional longevity;
- Put an end to the accumulation of clothes in people's wardrobes by developing services, with a priority on repair, but also take-back systems, sharing and leasing, re-selling and customisation;
- Stop reinforcing the disposable/fast fashion mindset with their marketing and advertising; instead brands should promote the true value of their products and encourage a change in their customers' attitudes;

These are concrete initiatives that can be implemented immediately and in the mid-term as part of a larger strategy for slowing which should be addressed through the business model, recognising that slowing the materials flow can be innovative as well as economically and environmentally sustainable;

REDUCING IMPACTS

There is no escaping the need to re-think the materials mix in line with a "fit for future" business, which will have to include:

- Much greater sourcing of Organic and Fairtrade cotton and other sustainable cultivated materials by global brands which should be prepared to pay a higher price. This is the only way to make a significant positive impact on the environmental and human costs of cotton.
- A reduction in the use of cheap synthetic materials such as polyester for fast fashion items, leading to reductions in the overall use of petrochemical synthetics, in line with objectives to tackle climate change and protect the oceans.

- Far greater attention on the issue of microplastic fibres from synthetics, both in virgin and recycled textile materials. The design of apparel products needs to question the purpose of these synthetics in short life, poor quality "fashion" items as a priority, while alternatives for what may be more essential and technical uses of synthetics, such as outdoor wear, should be developed within a longer term perspective.

CIRCULARITY

With textile-to-textile projects as a priority, the industry needs to connect the dots between the design of products for long life and recycling, systems for the practical collection and sorting of end-of life products and the recycling technologies, while also ensuring that the economic viability of making recycled fibres/fabrics is equally or more attractive than for virgin fibres/fabrics. All of this may require regulatory intervention. This is a prerequisite if closing the loop on textiles is to become reality.

- **Designers** can make a difference. Instead of being pressurized to deliver on an increasingly faster turnaround of styles, product designers have a critical role in designing for slowing the flow and closing the loop through early intervention. To do this, feedback about the practical realities of dismantling used clothing for reuse, repair and recycling is needed.

- Industry needs to invest in textile-to-textile recycling projects as a priority.

- Design for circularity needs to include Detox of manufacturing and products, the use of recycled and recyclable materials, the use of renewable resources and designing products with disassembly and recycling in mind.

- Guidelines are required to prevent the recirculation of toxic ingredients as much as possible while also allowing the recycling of less contaminated consumer products.

ACROSS THE SYSTEM

Large brands should be taking the lead on making transparency and traceability the norm for all, including:

- Developing more rigorous and comparable systems and metrics for measuring material flows, such as those outlined in Greenpeace's criteria for assessing retailers,[299] so that they can start challenging themselves with the right questions. This will enable the reporting of efforts in a harmonised and transparent way so that they can be measured in association with the setting of concrete milestones to slow down the material flow and progress towards circularity.

There is also an important role for **policy makers** at a local, national and international level to facilitate the systems that are needed for managing end-of-life clothing.

- Extended Producer Responsibility (EPR) regulations - there is a need to replace voluntary take-back with mandatory EPR policies, where a small fee is collected at the point of sale to fund take-back logistics, traceability systems and critical R&D projects, and targets are enforced to avoid any landfilling or incineration of valuable material and limit downcycling. EPR policies should also take an individual responsibility approach to reward improvements in design that extend life, against set legal longevity standards or tests, as well as extended warranties, while phasing out the use of hazardous substances across the production chain.

Likewise, **policy makers** need to provide the right environment for diverse business models to flourish, by changing economic and market conditions.

- Tax incentives for repair, that will also encourage local repair economies, peer to peer models as well as business models which distribute value among those that create it.

- Lower business rates, financial incentives, facilitated investment and access to city centres for small, Fairtrade and sustainable businesses to encourage them to establish themselves in local communities as well as online.

- Platforms to facilitate the exchange of knowledge and cooperation between all sizes and types of companies, which need to also involve other organisations and academics and must reflect a holistic approach such as the one outlined in this report.

The initiatives represented in this report are a snapshot in time, limited by design, and cannot possibly capture all of the good examples that exist; however, these examples have been the inspiration for a holistic framework to slow down the flow of materials and close the loop on textiles. All players should consider this context as a starting point for the development of initiatives and designs which take the whole lifecycle of textiles into account - with the priority on slowing the pace of fashion. It should also provide inspiration for new avenues of research as well as regulations and measures to enable a comprehensive transformation of the whole fashion system. As the pathways ahead are still uncertain, Greenpeace knows that many more examples, ideas and developments will be needed and looks forward to an open and positive response to this report.

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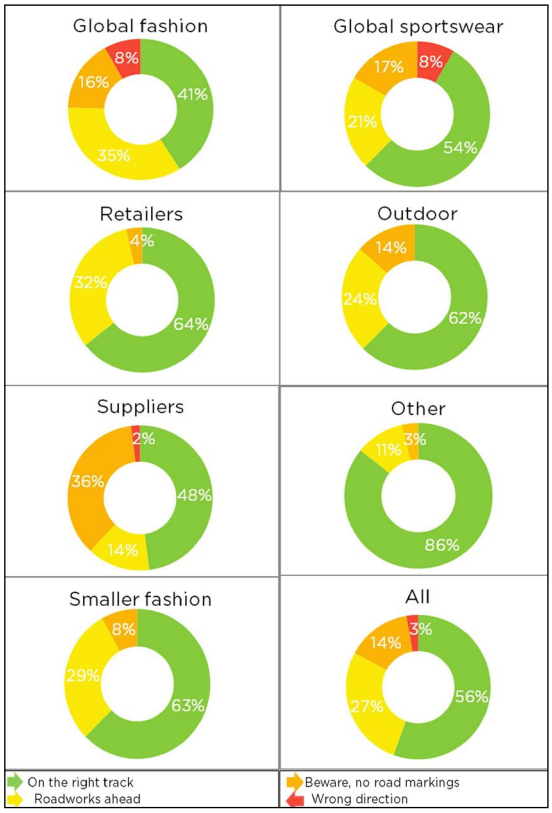
293: La Voix du Nord (2016), La marque d'habillement l'Herbe Rouge ne repoussera pas au printemps, 21st December 2016 (in French); http://www.lavoixdunord.fr/mobile/93398/article/2016-12-21/la-marque-d-habillement-l-herbe-rouge-ne-repoussera-pas-au-printemps
294: Fletcher, Kate (2016), Craft of Use - Post-Growth Fashion, Routledge, April 2016, page 141.
295: See Pulse of the fashion industry, page 31 and 111 which states that "a unified agenda with clear goals" would be led by the large industry brands which as we have shown in Chapter 2,are clearly ahead of the game when it comes to sustainability."
296: The Drum (2017), In a world of "peak stuff", how can brands connect with people? 12 June 2017; http://www.thedrum.com/opinion/2017/06/12/world-peak-stuff-how-can-brands-connect-with-people
297: The Drum (2017), op.cit.
298: Global Fashion Agenda and The Boston Consulting Group (2017), op.cit. As acknowledged "even if the entire industry caught up to the best practice front-runners, it would not be enough ... The industry needs coordinated action beyond today's solutions." A major part of the proposed coordinated action is the increase in polyester use. p.2
299: Greenpeace eV. (2017), Detox interim report II: How seriously are retailers taking responsible fashion? http://www.greenpeace.org/international/Global/international/publications/detox/2017/How-Seriously-Are-Retailers-Taking-Responsible-Fashion.pdf?utm_campaign=Press%20Release&utm_source=Native&utm_medium=AMS op.cit
Greenpeace eV (2017), Detox Retailer Check 2017 - Campaign and Criteria explained http://www.greenpeace.de/sites/www.greenpeace.de/files/20170606-greenpeace-retailer-check-criteria-explained.pdf

6. ANNEXES

Annex 1: Further analysis of examples by company type

The data collected for all of the examples listed above allows for some further insights. When considering the examples rated as "on the right track" (see Figure 7), the picture varies according to company type, with more examples are among the retailers, the outdoor sector and the smaller fashion brands. Suppliers have the largest proportion of examples rated "beware, no road markings", mainly due to the technical nature of the examples that were assessed, where a conclusion on whether the example is "on the right track" is not possible without evaluating a range of wider issues, beyond the scope of this report.

Figure 15: Rating of examples by percentage, according to company type

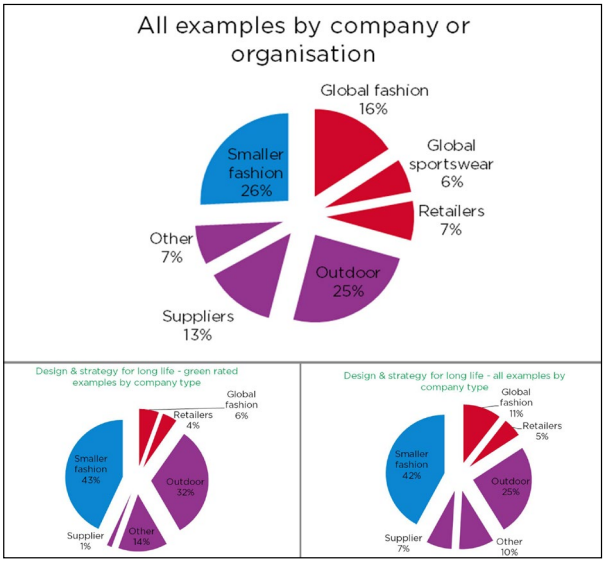


For each of the three "design concepts and strategies" and two "systems and models", the types of company or organisation represented in each category differs substantially from the overall percentage of company type or organisation, showing that the some strategies used are more prevalent in certain company types. This differs further when examples "on the right track" are selected. The charts below show how the pattern varies for each of the five categories.

Design and strategy for long life (slowing the flow during the use phase)

Relative to the examples as a whole, a greater percentage of smaller fashion brands, outdoor brands and other companies, organisations or systems are extending the life expectancy of their products through a variety of strategies. It is also striking that as a whole, global fashion brands and retailers are less focused on long life, while the global sportswear brands are not represented at all.

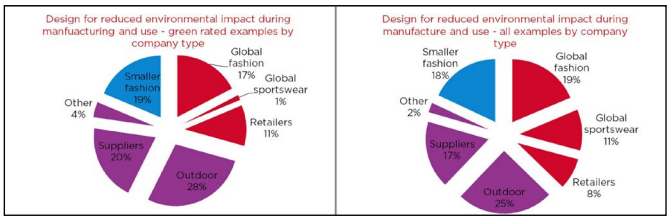
Figure 16: Design and strategy for long life - examples by company type



Design for reduced environmental impact during manufacture and use

In general, the number of examples from the various different types of companies – both those which are **"on the right track" (a)** and when all the examples are shown (b) – does not differ significantly from the overall breakdown of examples by company type (c); there is slightly greater representation of suppliers, outdoor brands and global fashion and less representation of smaller fashion and "other". The only exception is sportswear, which makes up 11% of 'all examples' compared to 6% of the overall sample (see Figure 15 above), and which has only 1% (one example) rated as "on the right track".

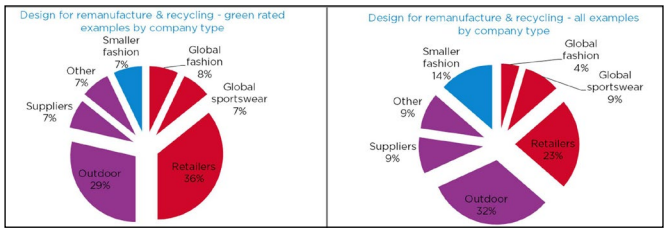
Figure 17: Design for reduced environmental impact during manufacture and use - by company type



Design for remanufacture and recycling

A total of 13 (60%) examples were rated as green, shown below as quantities rather than percentages as the numbers are so small. The majority come from the large retailers, perhaps reflecting greater engagement in the process of slowing and closing the loop due to Greenpeace's recent Retailers Assessment, and outdoor brands. As already noted, outdoor brands typically invest more in the technical performance of the products they make and are more likely to consider sustainability issues in response to customer awareness.

Figure 18: Design for remanufacture and recycling – examples by company type



End-of-life collection systems and recycling technologies

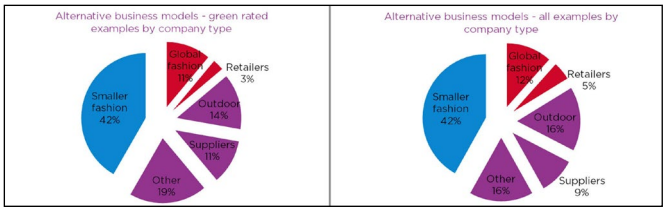
There are a relatively small number of green rated examples (15 or about 40% of the total), perhaps because of the experimental nature of new recycling technologies and some take-back systems (eg. some are pilots). Outdoor companies have by far the most green-rated examples, possibly connected to the greater number of examples in the "design for long life" category, as the take-back systems enable the clothes to be returned for re-use and refurbishing. This is followed by suppliers with 3 examples, with only one example each for global fashion, retailers, smaller fashion and "other".

Figure 19: End-of-life collection systems and recycling technologies – examples by company type

Alternative business models

When these green rated examples are analysed by type of company, the smaller fashion brands have the most examples. There is also a relatively higher representation of the "other" classification, compared to the previous categories – this classification includes four collaborations or platforms, three "non-western" examples, and a pilot project. Representation of suppliers was slightly below average while Global fashion brands, retailers and outdoor brands have less representation.

Figure 20: Alternative business models – examples by company type



Annex 2: Table of design concepts and strategies; systems and models

DESIGN CONCEPTS AND STRATEGIES FOR SLOW AND CLOSED LOOP – OVERALL CATEGORY	2ND CATEGORY	3RD CATEGORY
Design and strategy for long life (SLOWING THE FLOW) **Designed to extend the product's first life and/ or provide multiple lives with a number of owners.**	**Physical durability** (colour and fit retention, fabric and component durability, correct wash care and storage, fabric treatment enhancing durability)	Care, repair and longevity tips: Classic styling: Durability guarantee: Colour, fabric and fit retention: Durable components: Fabric and component durability: Multi-functionality: Fabric treatment: Long life fashion collection: Refurbish - upcycling: Refurbish and resell: Repair service: Share and rental:
	Strategies and marketing for slowing fashion turnover	Reducing/slowing seasons: Fashion collection:
	Emotional durability/ longevity (co-creation/ customisation, versatility/ adaptability/ multi-functionality, classic styling)	Classic styling: Craftsmanship: Co-creation/ customisation: Long life fashion collection: Multi-functionality: Refurbish - upcycling:

	Downstream strategies and marketing for extending life (hand-me-down, share and rental), restyle and remodel, repair, resell	Care, repair and longevity tips: Co-creation/ customisation: Donation: Long life fashion collection: Longevity law: Refurbish - upcycling: Refurbish and resell: Repair: Repair and/or refurbish: Resell: Repair service: Repair law: Resell: Restyle and remodel: Share and rental: Upcycling:
Design for reduced environmental impact during manufacture and use (SLOWING THE FLOW through lower impact) **All product components and manufacturing technologies are chosen based on their low environmental impact during manufacture or the in-use phase of the product, in order to reduce energy and water use and eliminate material waste and pollution.**	**Renewable and recycled textiles and materials**	Bio-sourced synthetics: Fabric Library/chemical transparency: Reduced impact fashion collection: Microfibres – recycled polyester: Open loop – industrial ecology: Other non-mainstream natural fibres:[1] Reclaimed natural fibres: Recycled polyester: Recycled polyester from marine waste: Recycled synthetics: Recycled natural materials: Tencel/Lyocell: Transparency – tracking and labelling: Renewable and recycled materials mix: Renewable natural materials:
	Reduced impacts during cultivation	Organic cotton: Other non-mainstream natural fibres: Reclaimed natural fibres: Sustainable wool: Tencel/Lyocell:

1: This is a broad category that can include many different types of fabrics, for example: animal fibres (i.e wool, alpaca, cashmere,silk), plant-based fibres (i.e. kapok, flax and hemp, soy and cotton), and bio-based fibres (i.e. Tencel, Sorona, Q-Milk and SeaCell). There are many different ways to categorise the plethora of fabrics which would some extra research. This is also important for differentiation of the various recycled qualities.

	Low impact processing	Water/energy/chemical savings: Microplastic fibres:
	Low impact colouring and finishing (reduce energy and water use and eliminate pollution/ toxic chemicals)	Water/energy/chemical savings:
	Local manufacture (i.e. digital/ 3-D printing)	Local custom manufacture:
	Design efficiency/ material waste reduction	Design challenges/innovation: Design efficiency: Reduced impact fashion collection: Production efficiencies: Reduce fabric waste:
	Biodegradability/ composting	Microfibres: Biodegradable synthetics/polymers: Biodegradable natural materials:

Design for remanufacture and recycling (CLOSED LOOP) **Design for remanufacture and recycling plans for a product's life beyond its first use, in order to enable disassembly, remanufacture and recycling to create new products of the same or higher value. The ultimate aim for the future is to design out waste altogether.**	**Recyclable materials (recyclability)**	Closed loop fashion collection: Recycled polyester: Textile collection: Recycled/recyclable materials: Closed-loop research and assessment:
	Mono-material design	Mono-materials:
	Design for disassembly (garment manufacture and disassembly)	Disassembly: Disassembly technologies:

SYSTEMS AND MODELS THAT FACILITATE SLOW FLOW AND CLOSED LOOP – OVERALL CATEGORY	2ND CATEGORY	3RD CATEGORY
End-of-life collection systems and recycling technologies **Systems that facilitate both slowing the flow - the re-use, remarketing and upcycling of second hand clothes - and closing the loop - recovery of materials by disassembly and recycling, as well as innovations in recycling technologies.**	**Take-back systems**	Donation: Downcycling: Downstream tracking: EPR system: Downstream tracking:
	Recycling technologies	Chemical recycling:[2] Mechanical recycling - natural fibres: Mechanical recycling - synthetics: Separating/recycling fibre blends:
	Exchange systems	
	Mechanical recycling – sorting systems	
Alternative business models **Business models that seek to work within environmental boundaries and create positive societal impacts by design**	**Supporting local economies and supply chains,** (total manufacturing)	Fairtrade/ethical manufacturing: Learnings from tradition: Local economies: Local manufacturing: Short supply chain: Supply led production
	Innovations beyond current model (including strategic, manufacturing)	Ecological/regenerative: Investment in innovation: Manufacturing technology innovation: Strategic collaboration for innovation: Training for innovation:
	Fair business principles, (taking economic and societal aspects into account, not only local but global eg. fair trade)	Fairtrade/ ethical manufacturing: Family business: No debt business: Sustainable economics:
	Alternative marketing strategies (no advertising, limited marketing, leasing, crowdfunding)	Crowdfunding: Marketing for less consumption: Service business model: Sharing economy: Strategic collaboration for innovation: Sustainable economics:

2: See: http://ckh.wrap.org.uk/rawMaterialsAndFabrics/recycledPolyester?breadcrumb=Explore+by%3A+Process+Step for further details on different recycling technologies.

Annex 3: Table of examples

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	Benetton*	Italy	Design and strategy for long life	Physical durability:	*Fabric treatment:*	Plasma process to make wool more long lasting during use.	Benetton
	Burberry*	UK	Design and strategy for long life	Marketing for slowing fashion turnover	*Reducing/slowing seasons:*	Four shows reduced to two, mens & women's combined	Burberry
	C&A*	Germany/NL	Design for reduced environmental impact during manufacture and use	Biodegradability/ composting: Renewable and recycled textiles and materials:	*Biodegradable natural materials:*	New Cradle2Cradle Tshirt made out of organic cotton, safe chemicals process & biodegradable	C&A 1
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Design challenges/innovation:*	Annual C&A design challenge & House of Denim	C&A 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	World's leading user of organic cotton in 2015; goal 100% sustainable cotton by 2020	C&A 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Fabric library allows comprehensive database for tracking	C&A 4
			End-of-life collection systems and recycling technologies	Take-back systems:	*Downstream tracking:*	Reports tonnage for Europe & quantity recycled	C&A 5
			Alternative business models	Innovations beyond current model:	*Investment in innovation:*	Challenge to transform the fashion industry for social entrepreneurs	C&A 6
			Alternative business models	Innovations beyond current model:	*Manufacturing technology innovation:*	Create a hub focused on incubating and accelerating technologies that support the circular economy	C&A 7
			Alternative business models	Innovations beyond current model:	*Training for innovation:*	Cradle to cradle workshop for employees	C&A 8

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	Esprit*	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Renewable natural materials:*	Sustainable materials include BCI and organic cotton, recycled materials and Canopy-certified cellulose	Esprit 1
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Site assessments performed by Reset Carbon at 4 facilities Pakistan	Esprit 2
	Fast Retailing/ Uniqlo*	Japan	End-of-life collection systems and recycling technologies	Take-back systems:	*Donation:*	Collection of second-hand clothing at UNIQLO and GU stores in 16 countries and regions worldwide. About 90% of all collected clothing is donated to refugee camps and others in need, while the remaining 10% is converted into fuel	Fast Retailing
	G-Star*	NL	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Design challenges/innovation:*	Fashion Positive Initiative - a platform to transcend industry challenges	G-Star 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Microplastic fibres - polyester:*	Research and assessment of microfibres from synthetics with Plastic Soup Foundation & Mermaid, on which fibres shed the most	G-Star 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	G-Star is ranked 5th in the Top Ten Organic Cotton Users by Growth BUT use 30% 'sustainable' fibres in collections which also includes Better Cotton	G-Star 3
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Other non-mainstream natural fibres:*	Fabric made from nettles, organic cotton and recycled cotton "." G-Star states that it aims to "gradually increase the use of sustainable materials (i.e. organic cotton, recycled cotton, Tencel) in our products. no goals for organic cotton etc.	G-Star 4

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	G-Star*	NL	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	RAW Recycled blends post-consumer denim with organic cotton	G-Star 5
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester from marine waste: Open loop – industrial ecology:*	RAW for the Oceans collection	G-Star 6
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Recycled polyester	G-Star 7
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Tencel/Lyocell:*	Mostly uses "organic cotton, recycled cotton, recycled polyester and Tencel®, active partner of the Textile Exchange G-Star is ranked 3rd in the top ten Lyocell Users by volume	G-Star 8
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Dyeing and finishing processes, eg. ozone bleaching, laser treatments, natural tanning of leather, with less social/ environmental impact	G-Star 9
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Research and assessment:*	Part of circle economy's project to close the loop on textiles	G-Star 10
	H&M*	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Care, repair and longevity tips:*	Tips on caring for clothes, extending their life, swapping and repairing.	H&M 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Microplastic fibres - polyester:*	Research and assessment of microfibres from synthetics with Mistra Future Fashion & two other brands	H&M 2

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	H&M*	Sweden	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	One of the biggest buyers of organic cotton. The goal for cotton is that it is to be 100% sustainably sourced by 2020.	H&M 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	Working to increase %age of recycled fibres - currently, one garment up to 20% recycled fibres (recycled cotton or wool) goal is to use 100% recycled or other sustainably sourced by 2030	H&M 4
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester from marine waste: Open loop – industrial ecology:*	New H&M Conscious Exclusive collection using BIONIC	H&M 5
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	One of the world's biggest users of recycled polyester, goal is to use 100% recycled or other sustainably sourced by 2030	H&M 6
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Other recycled material (blended or pure) ; H&M Foundation has partnered with The Hong Kong Research Institute of Textiles and Apparel to develop technologies to recycle clothes made from textile blends into new clothes	H&M 7
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduced impact fashion collection:*	Weekday's Remains - A capsule collection made from leftover materials	H&M 8
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Separating/recycling fibre blends:*	Design for reducing/eliminating need for virgin plus research on recycling mixed fibres	H&M 9
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Bring-it-on campaign to increase amounts taken back	H&M 10

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	Inditex*	Spain	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Working in eco-design for durability & recycling but no publicly shared example.	Inditex 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton; Tencel/Lyocell; Reclaimed natural fibres/materials; Reduced impact Fashion Collection*	Organic cotton, recycled wool and Tencel used in Join Life fashion collection, implements Inditex Right to Wear system (goal is for all products)	Inditex 2
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Research and assessment:*	Collaboration to explore recycling possibilities	Inditex 3
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back/non-profit:*	Take-back containers in stores. Collected clothes to be donated to charities incl. Red Cross, Caritas, Oxfam, CEPF in China. Currently in eight countries with plan to roll out to 12 during 2017, Repair, Reuse and Upcycling as priorities; benefits to partners	Inditex 4
	Levis*	USA	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	LEVI'S® JEANS WERE BUILT TO WEAR AND WEAR IN, PATCH, REPAIR AND PASS DOWN	Levis 1
			Design and strategy for long life	Physical durability:	*Long-life fashion collection:*	Wellthread collection designed for durability, sustainability etc.	Levis 2
			Design and strategy for long life	Physical durability:	*Long-life fashion collection:*	Commuter collection for cyclists designed for durability etc.	Levis 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester: Open loop - industrial ecology:*	Waste<Less™ collection of products are 20 percent post-consumer waste- specifically, recycled plastic bottles	Levis 4

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	Levis*	USA	Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Techniques to reduce water usage — down to 96 percent for some styles.	Levis 5
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	Single fibre waterless fabric with closed loop recycling in mind	Levis 6
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Mechanical recycling - natural fibres:*	Turning cotton garment waste into pulp: start-up Evrnu™ has collaborated with Levis to produce *the world's first prototype jeans made from regenerate*d post-consumer cotton waste	Levis 7
			End-of-life collection systems and recycling technologies	Take-back systems:	*Downcycling:*	Take-back service at stores	Levis 8
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Separating fibre blends:*	R&D efforts to separate poly-cotton blends	Levis 9
	M&S*	UK	Design and strategy for long life	Physical durability:	*Colour and fit retention: Fabric and component durability:*	Stay New launched 2012 uses various technologies (Novozymes) that can keep products looking "newer for longer"	M&S 1
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back/non-profit: Downstream tracking:*	Take-back collaboration with Oxfam on distribution & re-use of clothes	M&S 2
			Alternative business models	Innovations beyond current model:	*Strategic collaboration for innovation*	M&S is one of 89 signatories to Sustainable Clothing Action Plan	M&S 3
	Mango*	Spain	Design and strategy for long life	Physical durability:	*Long-life fashion collection:*	Promotes basic collections to encourage long - term use of clothing and durability	Mango 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Explores the use of alternative sustainable materials (i.e. organic cotton, recycled fibers etc.)	Mango 2

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global fashion	Mango*	Spain	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics: Reclaimed natural fibres/materials:*	Explores the use of alternative sustainable materials (i.e. organic cotton, recycled fibers etc.)	Mango 3
			End-of-life collection systems and recycling technologies	Take-back systems:	*Sorting systems:*	Take-back pilot with KOOPERA for sorting into categories; Mango Sustainability Report 2015, p. 55;	Mango 4
	Miroglio*	Italy	Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Miroglio's digital printing technology saves water compared to traditional tech	Miroglio 1
			Alternative business models	Supporting local economies and supply chains:	*Local manufacturing:*	100% Italian production, tailored to the customer	Miroglio 2
	Primark*	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Donation:*	Europe - donating unsold merchandise to the Newlife Foundation	Primark 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Donation:*	US Primark donates unsold merchandise to the charity K.I.D.S/Fashion Delivers.	Primark 2
	Stella McCartney	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Care, repair and longevity tips:*	Clevercare labels provide explicit care instructions to get the most out of clothing through proper care eg. not washing clothes too often, lower temperatures, reducing tumble drying & ironing less.	S.McC 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Other non-mainstream natural fibres:*	Spring 2017 collection all ready-to-wear viscose comes from sustainably managed and certified forests in Sweden.	S.McC 2
	Topshop	UK	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduced impact fashion collection:*	Reclaim range is a capsule collection made from existing stock of jersey, cotton and denim off-cuts.	Topshop

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global sportswear	adidas*	Germany	Design for reduced environmental impact during manufacture and use	Biodegradability/ composting:	*Biodegradable natural materials:*	Prototype shoe made of Biosteel® fiber, a nature-based and completely biodegradable high-performance fibre	adidas 1
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Production efficiencies:*	Production efficiencies - injected plastic plates for football boots 99% now recycled back to production, & rubber and EVA reground and reused in shoes	adidas 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester from marine waste: Open loop – industrial ecology:*	UltraBOOST Uncaged Parley running shoe with Primeknit upper made from a mix of Ocean PlasticTM	adidas 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics: Open loop – industrial ecology:*	Recycled polyester, rubber, sustainable materials etc. from within production, regrinding and reusing EVA and rubber in shoes, recycling from post consumer waste (eg. PS boxes)	adidas 4
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Low waste initiative, maximum pattern efficiency, aiming to reduce material waste	adidas 5
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Drydye, nodye, low waste and formotion technology; automated manufacturing etc.	adidas 6
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	A three year project for a fully recyclable sports shoe: the three-year project aims at identifying and developing recyclable, partly waste-based, textile fiber reinforced composites. These materials enable the fast production of easily customizable sporting goods. Extra information http://www.adidas-group.com/en/media/news-archive/press-releases/2015/messis-boots-today-recycled-yours-tomorrow/	adidas 7

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Global sportswear	adidas*	Germany	End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Pre consumer now spreading to post consumer which will be beyond countries where take-back systems exist	adidas 8
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Brazil - take-back for sports shoes	adidas 9
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Pilot seasonal take-back programmes	adidas 10
	NIKE*	USA	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	The world's top user of recycled polyester in the apparel industry, Nike Sustainability Report 2015, p.29, p.39	NIKE 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Nike Grind – a palette of premium recycled materials – is used in 71% of NIKE footwear and apparel products; NIKE grind is made of manufacturing scrap and old shoes, waste streams – including rubber, foam and textile scrap – are transformed into new, premium materials.	NIKE 2
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Flyknit technology	NIKE 3
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	In FY15 alone, 54 million pounds of factory scrap was transformed into premium materials	NIKE 4
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Surpassing goals for reducing water use, including Colordry technology, Nike Sustainability Report 2015, p. 25	NIKE 5

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Global sportswear	NIKE*	Germany	End-of-life collection systems and recycling technologies	Take-back systems:	*Downstream tracking:*	"Reuse a shoe" programme reporting amounts collected, Nike Sustainability Report 2015, p.39	NIKE 6
	Puma*	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	Recycled Suede, the PUMA Re-Suede, as the first sustainable shoe in the company's history	Puma 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Thermoplastic polyurethane (TPU) with significantly increased recycled content for use in football boots - see also https://www.basf.com/en/company/news-and-media/news-releases/2016/06/p-16-234.html	Puma 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Polyester clothes (usually) created from recycled plastic bottles (see http://about.puma.com/en/sustainability/products/sustainable-materials - previous links no longer available)	Puma 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reduced impact fashion collection:*	Collection primarily made in Africa	Puma 4
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Large scale 3 year project to increase resource efficiency in Asia manufacturing	Puma 5
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials: Textile collection:*	"In Cycle" collection, recyclable/degradable, not commercially successful but useful example, also see https://www.youtube.com/watch?v=j9zfkYHtuMc	Puma 6
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Bring me back" take-back system with I:CO, appears to be no longer operational	Puma 7

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Global sportswear	Reebok	USA	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Production efficiencies:*	Liquid Factory manufacturing lab, which will house additive manufacturing units to create or modify shoes on demand, without needing extensive time to develop moulds and samples first	Reebok
Other	NRG/ 10xbeta	UK	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	Prototype 'shoe without a footprint', made primarily from gaseous effluent (CO2), which is emitted from power plants, see also http://www.10xbeta.com/co2-project	NRG
Other – collaboration	Circle Market	Europe	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Renewable and recycled materials mix:*	Circle Market with members of its Circle Textiles program by facilitating the exchange of post-industrial, pre-consumer or post-consumer recyclable textiles	Circle E. 1
			End-of-life collection systems and recycling technologies	Exchange systems:	*Exchange system:*	Marketplace- facilitates trade of recyclable materials between parties, Circle Economy	Circle E. 2
	Fibershed	USA	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Sustainable wool: Other non-mainstream natural fibres:*	Climate beneficial wool - farmers commit to practices which increase drawn down of carbon to the soil, research into local farming of hemp and uses	Fibershed 1
			Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	Culitvation and processing of natural indigo dye, used for "grow your own jeans"	Fibershed 2
			Alternative business models	Innovations beyond current model:	*Ecological/regenerative:*	Regional and regenerative fiber systems on behalf of independent working producers, providing connection and ownership of 'soil-to-soil' textile processes - diverse textile cultures are designed to build soil carbonstocks on the working landscapes & enhance the strength of regional economies.	Fibershed 3
			Alternative business models	Supporting local economies and supply chains:	*Local economies: local manufacturing:*	Eg. Grow your jeans: connects the wearer to the local field where the clothes were grown, building a system that can last, connects farmers with designers, manufacturers and wearers, rebuilding regional manufacturing	Fibershed 4

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Other - collaboration	SITRA	Finland	Alternative business models	Alternative marketing strategies:	*Strategic collaboration for innovation: Service business model:*	A Finnish fund commissioned to promote economic growth, partnered with Circle Economy to research innovative service-based business models in the fashion and textile industry, created case studies - analysis of best practises - to develop roadmap to guide the business model transformation process	SITRA
Other – consortium	RESYNTEX	EU	End-of-life collection systems and recycling technologies	Recycling technologies:	*Chemical recycling:*	New feedstocks of chemicals and textiles from textile waste	Resyntex
	Wear 2	UK	Design for remanufacture and recycling	Design for disassembly:	*Dissassembly:*	Microwave technique for removing labels & branding, dismantling clothes	Wear2
Other – foundation	Re:Mix	Sweden	End-of-life collection systems and recycling technologies	Recycling technologies:	*Separating/recycling fibre blends:*	Developing techniques for separation of nylon and elastane blends	Re:Mix
Other - NGO	WRAP - love your clothes	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Care, repair and longevity tips: Restyle and remodel: Refurbish – upcycling:*	Love Your Clothes campaign with tips, advice and videos to inspire consumers on buying clothes, caring for & repairing clothes, refashioning & upcycling clothes and what to do with unwanted clothes	WRAP
Other – global south	Ghana - bespoke clothes	Ghana	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Tailoring, refashioning western clothes and repair is a major industry in Ghana, where local tailors can be found on every street.	Ghana 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel:*	Tailoring, refashioning western clothes and repair is a major industry in Ghana, where local tailors can be found on every street.	Ghana 2
			Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing: Learnings from tradition:*	Tailoring, refashioning western clothes and repair is a major industry in Ghana, where local tailors can be found on every street.	Ghana 3

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Other – global south	India - Ready to Sew	India	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Traditional market of local tailoring for the general masses – ie. a skilled person or group of persons catering to local orders, with minimal exposure to fashion trends, technology and product-specific knowledge	India RTS 1
			Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing: Learnings from tradition:*	Traditional market of local tailoring for the general masses – ie. a skilled person or group of persons catering to local orders, with minimal exposure to fashion trends, technology and product-specific knowledge	India RTS 2
Other - pilot	BUANA	Mozambique /Portugal	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Lisbon/Mozambique pilot project, research aiming to apply, at an academic level, the identity, tradition and fashion-able challenges of African capulana textile into XXI century fashion and, in parallel, to contribute in a practical way to the improvement of a more equal society through sustainable fashion design	BUANA 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel: Long-life fashion collection:*	Lisbon/Mozambique pilot project, research aiming to apply, at an academic level, the identity, tradition and fashion-able challenges of African capulana textile into XXI century fashion and, in parallel, to contribute in a practical way to the improvement of a more equal society through sustainable fashion design	BUANA 2
			Alternative business models	Supporting local economies and supply chains:	*Learnings from tradition:*	African tailors are considered agents for the operational creativity of local fashion with this African textile (or sui generis), and therefore agents to develop mechanism between tradition and modernity	BUANA 3
Other - platform	Lovely Taiwan Cultural Foundation	Taiwan	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	To keep the native culture alive in Taiwan, supporting small fair-trade business and holding regular offline upcycling workshops	L. Taiwan 3
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	To keep the native culture alive in Taiwan, supporting small fair-trade business and holding regular offline upcycling workshops	L. Taiwan 2

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Other - platform	Lovely Taiwan Cultural Foundation	Taiwan	Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	To keep the native culture alive in Taiwan, supporting small fair-trade business and holding regular offline upcycling workshops	L. Taiwan 3
	Buymeonce	UK	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Clothes and footwear designed to last (& other products) are featured on the Buy Me Once website	Buymeonce
Other - PRO	Eco-TLC	France	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Longevity law:*	Mandatory law collecting fee for take-back and research funds, Eco-TLC is the PRO managing it, fee is rebated according to longevity test (wear/resistance tests), yet this individual approach is still in the experimental phase	Eco-TLC 1
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Closed loop R&D:*	Mandatory law collecting fee for take-back and research funds, Eco-TLC is the PRO managing it, fee is rebated according to longevity test (wear/resistance tests), yet this individual approach is still in the experimental phase	Eco-TLC 2
			End-of-life collection systems and recycling technologies	Take-back systems:	*EPR system:*	Mandatory law collecting fee for take-back and research funds, Eco-TLC is the PRO managing it, fee is rebated according to longevity test (wear/resistance tests), yet this individual approach is still in the experimental phase	Eco-TLC 3
Other - State	Sweden	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair law:*	Law for tax rebate on repair (Skatteverket (2016), Nya momsregler från 1 januari 2017 (New VAT rules from 1 January 2017), 2016-12-28 (in Swedish))	Sweden
Outdoor	Bergans	Norway	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service:*	Provides info & offers alteration and repair services and a returns scheme, ensures all products will be re-used	Bergans
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Bio-sourced synthetics:*	30 % plant-based polyester (also recyclable), saves energy, reducescarbon dioxide emissions and conserves fossil oil resources	Bergans 2

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Outdoor	Bergans	Norway	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials: Biodegradability/ composting:	*Bio-sourced synthetics:*	Eidfjord Jacket, which uses ecodear®, a partially plant-based polyester, in 30% of jacket, polymer also recyclable	Bergans 3
	Berghaus	UK	Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings: Water/energy/chemical savings during use:*	Colourkind technology adds pigments "directly to to the nylon or polyester chips before they are spun into yarn, reducing CO2 emissions, chemical use by 60% each, water 90%". Provides longer-lasting colour.	Berghaus
	Columbia	USA	Design and strategy for long life	Physical durability:	*Fabric and component durability: Multi-functionality:*	Material and product quality testing standards - products are made to last. In addition "Functionality and classic design ensure that the customer can feel confident wearing our products in multiple conditions and social settings.	Columbia 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Outdry Extreme ECO jacket (PFC-free) Spring 2017 has several environmental features, including 100% recycled fabric - recycled polyester	Columbia 2
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	85% marker coverage, high standard and helps to reduce fabric wastage in the material cutting phase; simplified trims, eg patented Light Rail zipper eliminated the need for the sewing tape & complete removal of that particular material	Columbia 3
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings: Water/energy/chemical savings during use:*	Garment fabric is not dyed, reducing water, energy, and chemicals - saves approximately 13.5 gallons (51L) per jacket. (80% savings) jacket can be wiped clean it reduces the need for washing	Columbia 4
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	"Rethreads" in partnership with I:CO	Columbia 5
	Dannah	UK	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Quality products that last a long time and with proper care won't need to be replaced for many years	Dannah 1

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Outdoor	Dannah	UK	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Membranes made by Porelle from recycled materials using renewable (solar) energy	Dannah 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Sustainable wool:*	Accredited merino wool from southern hemisphere	Dannah 3
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Water saving technology - dye-house's low liquor dyeing machines use 40% less water than conventional dyeing processes.	Dannnah 4
	Fjällräven	Sweden	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Long-lasting, hard-wearing, pure and functional... this begins during the design phase	Fjällräven 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Use of organic cotton for all T-shirts and as much as possible for other ranges	Fjällräven 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Short term goal is that all the polyester used in its products will be both recycled and recyclable	Fjällräven 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Tencel/Lyocell:*	Compare materials to choose those with best sustainability profiles, look at renewability and if materials are degradable or recyclable	Fjällräven 4
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	SpinDye technology 75% less water; 67% less chemicals; 39% less energy; 20% lower carbon footprint	Fjällräven 5

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Outdoor	Fjällräven	Sweden	Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	Recycling project Eco Circle™ for polyester	Fjällräven 6
	GoHiking	Taiwan	End-of-life collection systems and recycling technologies	Take-back systems:	*Downcycling:*	Recycling bins in stores	GoHiking
	Haglöfs	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Care, repair and longevity tips: Share and rental:*	General details and care instructions for each garment to maximise it's lifetime	Haglöfs 1
			Design and strategy for long life	Emotional durability/ longevity:	*Classic styling:*	Produces iconic clothing that does not go out of style - no need to replace it before end of its lifespan. Details such as zips are made to be easily replaceable.	Haglöfs 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Resell:*	"Haglöfs Second Hand" enables people to sell their old garments	Haglöfs 3
			Design for reduced environmental impact during manufacture and use	Low impact processing:	*Microplastic fibres:*	Strategy to reduce the release of microfibres both through the choice of high quality synthetic materials in durable constructions and through manufacturing methods (filtration)	Haglöfs 4
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Take Care label - for clothing this means either 100% organic cotton or recycled material, also Bluesign certified, currently 76% of clothes	Haglöfs 5
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	50% of the material in a garment or piece of equipment is recycled, it is labelled as "Haglöfs Recycled"	Haglöfs 6
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Take Care label - for clothing this means either 100% organic cotton or recycled material, also Bluesign certified, currently 76% of clothes	Haglöfs 7

Type of company or organisation	Company or organisation	Country HQ	Design concept or strategy - heading 1	Design concept or strategy - heading 2	Design concept or strategy - heading 3	Brief description	Link
Outdoor	Houdini	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental: Resell: Care, repair and longevity tips:*	Designing for product longevity and versatility, helping customers to care for and repair their products and providing a rental service and selling second-hand products, see also https://www.houdinisportswear.com/en/sustainability	Houdini 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Microplastic fibres - polyester:*	*"Houdini products generally release very little microplastics due to the quality of our fabrics and construction methods. This has been proved multiple times by analyzing garments when new versus after years of heavy wear and multiple washes – the weight difference is usually very small. This contrasts vastly from "fast-fashion"- synthetics that shale of fibers at a much faster pace."*	Houdini 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Sustainable wool: Other non-mainstream natural fibres:*	The design process considers the product's entire lifecycle, including choosing low impact materials and technologies; when natural fibres are used these are not blended with synthetics. Natural fibres are Merino wool, also blended with silk and Tencel. (& animal welfare policy)	Houdini 3
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	Corner jacket made with recycled polyester, tapes, thread etc. also polyster with recycling in mind (Teijin is supplier/recycler): *"to ensure that our garments are biodegradable and recyclable, we never mix natural fibers with synthetics"*	Houdini 4
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	Corner jacket made with recycled polyester, tapes, thread etc. also polyster with recycling in mind (Teijin is supplier/recycler); each layer is made out of pure polyester, the entire 3-layer fabric is recyclable. Most 3-layer fabrics on the market are made from a mix of different fibers and chemicals, making them impossible to recycle. Note also PFC free. Also note *"More than 65% of Houdini's products have been converted into a circular lifecycle and 99,5% are made in Europe"*.	Houdini 5
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Closed loop recycling system in place since 2006. *"In total our recycling process saves huge amounts of energy and reduces CO2 emissions dramatically... "*.	Houdini 6

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Outdoor	Jack Wolfskin	Germany	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service:*	A professional impregnation (PFC free waterproofing) & repair service to restore products, including patching up small holes to make them waterproof again	Jack W. 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton: Sustainable wool*	Has used organic cotton for 100% of its products since 2013; also merino wool (non mulesed) and has strict animal welfare standards for this & other products	Jack W. 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Recycled polyester, with care regarding chemicals, use exclusively bluesign®-certified recycled materials	Jack W. 3
	Mammut	Germany	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Organic cotton from Remei AG for large share of climbing collection, cotton has traceability, produced India & Tanzania under humane working conditions	Mammut 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Recycled polyester in products marked with WE CARE recycled logo, quantities not reported	Mammut 2
			End-of-life collection systems and recycling technologies	Take-back systems:	*Downstream tracking:*	Take-back in stores, partner I:CO	Mammut 3
	Norrona	Norway	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	100% of the cotton currently used by Norrøna is organic cotton	Norrona 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester: Open loop - industrial ecology:*	Uses recycled PET from bottles in its polyester (recycled and recyclable) which is described as 'upcycling', goal is 100% by 2020	Norrona 2

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Outdoor	Paramo*	UK	Design and strategy for long life	Physical durability:	*Fabric and component durability: Classic styling:*	Fabrics and components are high quality; designs are classic and timeless, translating function into style, designed not to become obsolete	Paramo 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell: Durability guarantee:*	Customers can buy restored garments in great condition, with 12 month warranty	Paramo 2
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	Design avoids mixed materials, (100% polyester) membranes, seams etc.	Paramo 3
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Chemical recycling:*	Recycling maintains value & quality	Paramo 4
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Take-back system to stores	Paramo 5
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Over 80% of Páramo's annual production occurs at Miquelina, Colombia; foundation for women at risk of prostitution and drugs	Paramo 6
	Patagonia	USA	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Care, repair and longevity tips:*	Collaboration with IFIXIT, Patagonia empowers the consumer to repair items themselves. Consumers can download easy-to-follow repair instructions & repair guides	Patagonia 1
			Design and strategy for long life	Physical durability:	*Fabric treatment:*	"Polygiene® technology - naturally occurring antimicrobial provides effective and permanent odor control by stopping the growth of bacteria in the fabric	Patagonia 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	Worn wear "Common Threads" the first of its kind; an online-marketplace for used Patagonia products on eBay; store credit for used (but still usable) clothing - refurbished garment will be sold on Patagonia's website	Patagonia 3
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service:*	Repair services for damaged goods, an online-marketplace for used Patagonia products to be sold for re-use in collaboration with eBay.	Patagonia 4

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Outdoor	Patagonia	USA	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Microplastic fibres - polyester:*	Research and assessment of microfibres from synthetics	Patagonia 5
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton: Other non-mainstream natural fibres:*	Sources a number of natural materials which it claims are produced sustainably, including 100% organic cotton, hemp, tencel, yulex (natural rubber) undyed cashmere and wool	Patagonia 6
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	Reclaimed wool and reclaimed cotton;	Patagonia 7
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Recycled polyester insulation introduced in 2016 - PrimaLoft® Gold Insulation Eco – which has 55% recycled polyester content	Patagonia 8
			End-of-life collection systems and recycling technologies	Take-back systems:	*Downstream tracking:*	Take back programme for items not possible to repair	Patagonia 9
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Much of Patagonia's supply chain is certified as Fair Trade, first apparel company to bring the program to factories in Mexico, Central America and US	Patagonia 10
			Alternative business models	Alternative marketing strategies:	*Marketing for less consumption:*	"Don´t buy this jacket" campaign, to encourage people to consider the effects of consumerism on the environment and purchase only what they need	Patagonia 11
	Picture	France	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	Multi-material, non-wearable products (from its take-back system) are recycled into limited edition products	Picture 1

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Outdoor	Picture	France	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Organic & recycled products for snowboarding, skiing, skateboarding and surfing	Picture 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Created the 100% recyclable Welcome jacket; organic & recycled (50%) products for snowboarding, skiing, skateboarding and surfing also listed in 1.3 for recyclable jacket	Picture 3
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	Created the 100% recyclable Welcome jacket; organic & recycled products for snowboarding, skiing, skateboarding and surfing	Picture 4
			End-of-life collection systems and recycling technologies	Mechanical recycling - sorting system	*Sorting systems:*	Both design and system for return & sorting, considering mono-materials to be separated out for recycling	Picture 5
	Pyua	Germany	End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Collection boxes for closed loop recycling partnership Textil Recycling K. & A. Wenkhaus	Pyua
	Rotauf*	Switzerland	Design and strategy for long life	Physical durability:	*Durability guarantee:*	Commitment to quality with a 2-year warranty	Rotauf 1
			Alternative business models	Fair business principles:	*Sustainable economics: No debt business:*	Business model crowdfunded, no investors, allows sourcing of sustainable Detoxed material, goal to cover costs and re-invest	Rotauf 2
			Alternative business models	Alternative marketing strategies:	*Crowdfunding:*	Business model crowdfunded, no investors, allows sourcing of sustainable Detoxed material, goal to cover costs and re-invest	Rotauf 3
	Salewa	Switzerland	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Consolidating product range to use less resources & focus on highest quality and durability, claims rate decreased by 60% due to increased quality and durability of products	Salewa 1
			Design and strategy for long life	Emotional durability/ longevity:	*Classic styling:*	A clear design and color strategy that enables us to maintain products in the range for multiple seasons	Salewa 2
			Design and strategy for long life	Marketing for slowing fashion turnover	*Reducing/slowing seasons:*	Upcoming collections more than 50% of the styles will stay over several seasons	Salewa 3

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Outdoor	Salewa	Switzerland	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	Local upcycling cooperation's for old shop inventory and marketing materials and the reuse of leftover materials	Salewa 4
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service:*	Maintains its own sewing rooms, cooperates with partners and provides spare parts to repair and return the garments	Salewa 5
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics: Reclaimed natural fibres/materials:*	Recycled downs in our sleeping bags; reuses leftover material as well as carefully selecting materials, including natural fibers and recycled textiles	Salewa 6
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Minimizes excess fabric waste & ensure that we create patterns which use the fabrics efficiently	Salewa 7
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Sustainable wool: Other non-mainstream natural fibres:*	*"In addition to local wool, we also look to develop materials using other natural and locally grown fibers such as hemp and linen."*	Salewa 8
	The North Face	USA	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester: Open loop - industrial ecology:*	Recycled polyester from used bottles in its polyester fabric and is concentrating its "efforts on high volume products and materials such as the iconic Denali Jacket	TNF 1
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Denali jacket (see recycled materials above) is made using an alternative dyeing technique which saves 75% of water and 25% of energy, plus off-cuts from pattern cutting are reused; in addition, a programme with suppliers led to water usage reductions	TNF 2
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	"Clothes the loop" take-back system, sophisticated sorting but includes downcycling	TNF 3

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Outdoor	The North Face	USA	Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing:*	The Backyard Project collection aims to significantly increase the quantity of products made through new relationships and collaborations within the American textile industry, Europe next, See also Fibershed for more details	TNF 4
	Tierra	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	Upcycling programme; products are the Back Bag (note - using old Goretex clothing), the Duster Jacket and Couch Potato Pants	Tierra 1
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Microplastic fibres:*	Sustainable alternatives to synthetic fleece - advanced 3D knitting developed a 2-layer material combining a wool layer on the outside and a hydrophobic Primaloft yarn on the inside	Tierra 2
			Design for reduced environmental impact during manufacture and use	Biodegradability/ composting:	*Microplastic fibres:*	The Deterra® Hood Anorak, a 100 % bio-based padded jacket, which is made from castor beans, Tencel, wool, corn, cotton and corozo nuts	Tierra 3
	Timberland	USA	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Timberland collaborated with crowd-sourcing platform Betabrand to create a new collection called Craftletic™. Designers created 3 unisex footwear styles, customers voted for their favourite styles	Timberl. 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics: Open loop – industrial ecology:*	Thread post-consumer recycled plastic fabric is part of two new Timberland products in Spring 2017.	Timberl. 2
			Design for remanufacture and recycling	Design for disassembly:	*Dissassembly:*	Boot collection designed and engineered with disassembly in mind, recyclable materials, recycled tyres (designed and engineered with disassembly in mind, as approximately 70 to 90 percent of the materials could be reused or recycled, including the detachable metal hardware. The soles were made with Green Rubber, which contained 42 percent devulcanized recycled rubber tyres)	Timberl. 3

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Outdoor	Timberland	USA	Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	Boot collection designed and engineered with disassembly in mind, recyclable materials, recycled tyres	Timberl. 4
	Tretorn	Sweden	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics: Open loop – industrial ecology:*	'Eco essentials', a rainwear collection produced from recycled PET-bottles and coated with a waterproof PU-coating, goal 50% will be eco essentials by 2020	Tretorn
	Vaude*	Germany	Design and strategy for long life	Physical durability:	*Criteria:*	Criteria for materials selection and for repairability and durability of products	Vaude 1
			Design and strategy for long life	Physical durability:	*Durability guarantee: Repair:*	Two-year warranty, can be extended to 5, designed to last & with repair in mind	Vaude 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	VAUDE supports customers re-selling of used clothes via a second use shop on eBay	Vaude 3
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service: Care, repair and longevity tips:*	Partnership with iFixit for DIY repair of its products, plus option of using Vaude's own repair service	Vaude 4
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Vaude's new service iRentit (May 2017) allows customers to rent quality outdoor gear at the VAUDE Store Ravensburg and VAUDE Store Konstanz as well as at the VAUDE factory outlet at the company headquarters in Obereisenbach near Tettnang.	Vaude 5
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	*"To manufacture products that use fewer resources, you first need to reduce the complexity of the product"*	Vaude 6
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back/non-profit:*	Take-back collaboration with Fairwertung (100 non-profit orgs) and Gift your Gear UK	Vaude 7

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Outdoor	Vaude^	Germany	End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back/non-profit:*	VAUDE Ecolog Recycling Network from 1994 - failed project	Vaude 8
			Alternative business models	Fair business principles:	*Sustainable economics*	Mid-sized family-owned business without external shareholders with high investment return requirements, sustainability does not preclude successful business and are not aligned with pure profit maximization	Vaude 9
Retailer - multiple	Aldi*	Germany	Design and strategy for long life	Physical durability:	*Criteria:*	Developing criteria on the definition of longevity and recommendations for improvements, using eg. Oeko Test	Aldi 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Donation:*	No take-back programme, remaining stocks of clothes donated	Aldi 2
	COOP*	Switzerland	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Fair trade production of clothes made from organic cotton with own-label brand Naturaline for 20 years, whole process is considered	COOP 1
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Processing of Naturaline textiles is protective of health and the environment, hazardous chemicals are banned in all stages of production	COOP 2
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Collection at selected stores for clothes & shoes	COOP 3
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	World leader in fair trade organic cotton	COOP 4
	George at ASDA	UK	Design and strategy for long life	Physical durability:	*Durability guarantee: Colour, fabric and fit retention: Durable components:*	100 day Satisfaction Guarantee', Lasting Colour technology on school knitwear to keep these items looking newer for longer, as well as adjustable waistbands	George

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Retailer - multiple	Kaufland*	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling: Recycled polyester:*	Target for materials (GOTS, recycled products, Made in Green products) & communication to customers	Kaufland
	Lidl*	Germany	Design and strategy for long life	Physical durability:	*Criteria:*	Closed loop requirements which include; longevity, high quality, fit for re-use and recycling,	Lidl 1
			Design for reduced environmental impact during manufacture and use	Biodegradability/ composting:	*Biodegradable natural materials:*	Design phase 'ingredients' are defined and ensured to be safe; designed for biological circle	Lidl 2
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Requirement to significantly reduce resource usage and waste	Lidl 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Communicate with customers on more sustainable materials, using textile labels such as Fairtrade; plans to increase	Lidl 4
			Design for remanufacture and recycling	Design for disassembly:	*Dissassembly:*	Disassembly, pilot T shirts 2018	Lidl 5
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	Mono-materials, pilot T shirts 2018	Lidl 6
	REWE*	Germany	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	Provides tips on how to extend lifetime of products, (non-textile) upcycling tutorials available	REWE 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Strategy to increase its use of organic cotton from 56% in 2015 to 70% in 2017;	REWE 2

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Retailer - multiple	REWE*	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	Socks made with recycled cotton	REWE 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester: Reclaimed natural fibres/materials:*	Sheets made with recycled polyester	REWE 4
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Start of take-back system, probably limited to Germany, further info required	REWE 5
	Tchibo*	Germany	Design and strategy for long life	Physical durability:	*Durability guarantee:*	Guarantee (scope and duration) beyond legal requirements is granted for many products, especially technical products	Tchibo 1
			Design for reduced environmental impact during manufacture and use	Biodegradability/ composting:	*Biodegradable natural materials:*	Pilot product GOTS certified biodegradable t-shirt	Tchibo 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	A leader in organic cotton use (Nr3 on global scale, >75% of total range)	Tchibo 3
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Testing of recycled fibres for sportswear: the learning is that high quality yarns are still challenge	Tchibo 4
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Closed loop R&D:*	Tchibo's strategy is to have ALL products 'basically fit for closed loop' by 2020, 800 products checked for material content and grouped	Tchibo 5
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Closed loop R&D:*	Research on closed loop potential; 100 product groups were checked for closed loop potential, product group specific approaches for a closed loop have been identified	Tchibo 6

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Retailer - multiple	Tchibo*	Tchibo*	Design for remanufacture and recycling	Design for disassembly:	*Dissassembly:*	Refine/define product specifications	Tchibo 7
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Strategic analysis & implementation of take-back	Tchibo 8
			Alternative business models	Alternative marketing strategies:	*Sharing economy:*	Investigating new modes of ownership strategies (sharing economy)	Tchibo 9
Smaller fashion	1083	France	Design and strategy for long life	Emotional durability/ longevity:	*Classic styling:*	Focussed on jeans and baskets (sneakers) as it is timeless slower fashion.	1083 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton: Other non-mainstream natural fibres:*	Organic cotton denim, organic linen for laces,	1083 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Reclaimed natural fibres/materials:*	Recycled rubber/viscose (in shoes)	1083 3
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Laser washout for jeans, provided by Spanish company Jeanologia, thorough standards	1083 4
			Alternative business models	Alternative marketing strategies:	*Crowdfunding:*	Created by crowd-funding (110k€ in 2013). Since then, 21 jobs created in France (incl. 15 in Romans), iconic of Made-in-Fr revival, 20000 Facebook followers success story	1083 5
			Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing:*	Across France with main implantation in Romans, rooted into integrated production/distribution to reduce intermediates	1083 6
	3X1	USA	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Choice between custom and bespoke jeans. Custom-made products are made to order; bespoke service customers work directly with designer/pattern maker to create luxury jeans	3x1

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Smaller fashion	April's Goodies	Taiwan	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	Collect and repair, reburbishing garbage/waste furniture. Second-hand clothes/vintage can be found in their shop as well	Aprils G
	Bleed	Germany	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton: Tencel/Lyocell*	Sustainable & vegan materials (GOTS certified): organic cotton, cork, hemp, linen, Tencel – all natural materials 100% organic	Bleed 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Bleed uses 100% recycled polyester supplied by Sympatex.	Bleed 2
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduced impact fashion collection:*	2016 collection of "upcycled" products made from manufacturing remnants (100% of products is waste) from organic cotton, Tencel & recycled polyester.	Bleed 3
			End-of-life collection systems and recycling technologies	Take-back systems:	*Take-back systems:*	Take-back for recycling (personal communication)	Bleed 4
			Alternative business models	Fair business principles:	*No debt business: local economies:*	No debt, 100% self-sufficient and with sustainable growth; supporting our local region by creating jobs and working in co-operation with local companies	Bleed 5
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	"Fairly produced" regular and unannounced inspections, as part of GOTS – certification. This guarantees a regulated work schedule and a fair wage	Bleed 6
	DFC – Design for Circularity	Germany	Design and strategy for long life	Physical durability:	*Fabric and component durability:*	New platform for brands to share examples of "extended closed loop " projects; digital tool for brands to store and track information about the sourcing of materials & customers to choose durable, long life products	DFC 1
			Design for reduced environmental impact during manufacture/use	Biodegradability/ composting:	*Biodegradable synthetics/polymers:*	Research collaboration with fiber/fabric suppliers on biodegradable recycled synthetic fibres	DFC 2

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Smaller fashion	DFC – Design for Circularity	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	A digital tool for brands to store and track information about the sourcing of materials; inputs of resources and their cycle visible to customers	DFC 3
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	No mixed fibres - clothes designed for recyclability	DFC 4
	Earth.er	Hong Kong	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell: Refurbish - upcycle*	Upcycle different materials into different products, eg.different parts of jeans upcycled into bags, sell vintage stuff	Earth.er 1
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Eco-friendly and fair trade products, such as naturally dyed clothes, shoes, bags, scarfs etc	Earth.er 2
	Ecowearcn	China	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	Online platform to sell organic textiles bought from Ecowearcn to reuse them	Ecowear 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	All clothing and textiles sold by Ecowearcn are either certified to Chinese organic standard or to GOTS.	Ecowear 2
	Electroloom	USA	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Inspired by 3D printing and the maker culture, the Electroloom team set out to build a technology that could enable consumers to design and manufacture clothes from scratch. never implemented	E Loom 1
			Design for reduced environmental impact during manufacture and use	Local manufacture (i.e. digital/ 3-D printing)	*Local custom manufacture:*	Inspired by 3D printing and the maker culture, the Electroloom team set out to build a technology that could enable consumers to design and manufacture clothes from scratch. never implemented	E Loom 2
	EUMO (Eugenia Morpurgo)	Italy	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair:*	Originator of RIY (repair it yourself), footwear came equipped with patches and a sewing kit, to encourage the user to repair their shoes	EUMO

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Smaller fashion	Flint & Tinder	USA	Design and strategy for long life	Physical durability:	*Fabric and component durability: Colour and fit retention:*	Flint & Tinder 1. Premium, high-volume manufacturer of men's underwear, following campaign, launched the 10-year hoodie, which was designed with product durability and longevity in mind.	Flint & T 1
			Alternative business models	Supporting local economies and supply chains:	*Local manufacturing:*	10 y hoody is 100% American made	Flint & T 2
	Freitag	Switzerland	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Customise messenger bags online, through their 'design a bag' feature.(finished 2011)	Freitag 1
			Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Freitag bags made to be tough	Freitag 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Upcycling:*	Customers choose the exact piece of printed material from a selection of recycled and brightly printed tarpaulin, inner tubes etc., to customise into a bag	Freitag 3
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation: Biodegradability/composting	*Other non-mainstream natural fibres:*	developed their own biodegradable textile - F-ABRIC is made from hemp, flax and Modal, all of which are European-grown resource	Freitag 4
	Gwynnie Bee	USA	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Gwynnie Bee is an online subscription services for womens clothing size 10 – 32, based in New York. There is free shipping and unlimited exchanges, with the option to buy at less than the retail price	Gwynnie B
	Holly McQuillan	New Zealand	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel: Long-life Fashion collection:*	Designer with a focus on Zero Waste Fashion Design; kindest cut collection offers remodelling service for the wearer as tastes and seasons change	Holly McQ 1
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Collection 'Kindest Cut' pattern technique of hyperbolic tessellation, to eliminate waste from garment production & offers remodelling service for the wearer as tastes and seasons change	Holly McQ 2

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Smaller fashion	Junky Styling	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel:*	Originator of restyle/remodel; offered "wardrobe surgery" remodelled or redesigned unwanted or worn-out items of clothing	Junky S.
	Keep & Share	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Knitwear label 'Keep & Share' launched 2004, idea of crafting sustainable knitwear based on philosophy that garments should be kept longer or shared with others	Keep & S.
	Kleiderei	Germany	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Fashion library in Hamburg	Kleiderei
	La Révolution Textile	France	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Other non-mainstream natural fibres:*	Use locally sourced linen. vegan material: substituted wool with linen since winter 2016/2017 collection	La Revolu. 1
			Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	Mentions favouring non-dyed wool in previous collections, using better quality wool uses no dye - contributes to slowing, more expensive etc.	La Revolul 2
			Alternative business models	Supporting local economies and supply chains:	*Short supply chain:*	Under 2 collections, one "made in France" + one "made in Portugal", Oekotex certified	La Revolu. 3
	Last but not Least	Hong Kong	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling: Restyle and remodel: Co-creation/customisation:*	Provides different tailor-made upcycling clothes services, such as a custom-made upcycling design service and holding upcycling workshops.	Last but. 1
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Designed, sourced, produced and sold certified organic t-shirts and one-pieces in Hong Kong. However, low returns so ended	Last but. 2

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Smaller fashion	Le Tote	USA	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	A monthly clothing and accessory subscription service, which offers a range of packages to suit different needs	Le Tote 1
			Alternative business models	Alternative marketing strategies:	*Service business model: Sharing economy:*	A monthly clothing and accessory subscription service, which offers a range of packages to suit different needs	Le Tote 2
	LENA - The Fashion Library	NL	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Fashion Library in Amsterdam, members can access the library's full closet of vintage and designer clothes, lend out their own clothes	Lena 1
			Alternative business models	Alternative marketing strategies:	*Service business model: Sharing economy:*	Fashion Library in Amsterdam, members can access the library's full closet of vintage and designer clothes, lend out their own clothes	Lena 2
	L'Herbe Rouge	France	Design and strategy for long life	Emotional durability/ longevity:	*Multi-functionality: Co-creation/customisation:*	Eco-design: we work ergonomic fit and adapt to different heights (small, large, handicaps ...). Some clothes are convertible or reversible and therefore can be used for many purposes (2 products in 1): L'Herbe Rouge forced to close despite successful business, due to lack of investment	L'Herbe R. 1
			Design and strategy for long life	Marketing for slowing fashion turnover	*Reducing/slowing seasons:*	Timeless products with reinforced stitching and durable materials, sold in several seasons and that reduce material consumption and obsolescence: L'Herbe Rouge forced to close despite successful business, due to lack of investment	L'Herbe R. 2
			Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Unirrigated organic cotton from Francophone Africa, GOTS: L'Herbe Rouge forced to close despite successful business, due to lack of investment	L'Herbe R. 3
			Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	Eco-sourcing criteria: GOTS, biodegradable materials, non-toxic, energy saving, water saving, waste saving, water recycling: L'Herbe Rouge forced to close despite successful business, due to lack of investment	L'Herbe R. 4

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Smaller fashion	L'Herbe Rouge	France	Alternative business models	Supporting local economies and supply chains:	*Fairtrade/ethical manufacturing: Short supply chain:*	Favours a short chain (France and EU) for its supplies for better traceability, quality and innovation. fair trade + deliver to clients by solidarity workshops (ESS): L'Herbe Rouge forced to close despite successful business, due to lack of investment	L'Herbe R. 5
	Lindex	Sweden	Design and strategy for long life	Marketing for slowing fashion turnover	*Long-life fashion collection:*	A collection of exclusive upcycled products redesigned and remade in Borås, Sweden	Lindex 1
			Design and strategy for long life	Emotional durability/ longevity:	*Multi-functionality:*	With Re-design, "*one great garment can become several amazing pieces during its lifetime*".	Lindex 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	A collection of exclusive upcycled products redesigned and remade in Borås, Sweden	Lindex 3
	Mima-Te	Mozambique	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel:*	Clothes discarded by consumers in the Global North are upcycled and re-designed for re-export or sale from studio in Maputo or exhibitions	Mima Te
	Ministry of Supply	USA	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Seamless clothing is designed digitally in 3D to achieve multi-dimensional articulation and manufactured using innovative WHOLEGARMENT technology - seamless blazer has customizable shape mapped to the wearer's body.	Ministry 1
			Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Seamless clothing, 3D designed, environmental benefits of this method as producing minimal waste and carbon footprint	Ministry 2
	Mode Off	Japan	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish and resell:*	Clothing re-use brand of the materials re-use group Hard Off, not a textile business per se, but an entire business model for many different products, buy unwanted goods and resell	Mode Off
	MUD Jeans	NL	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental: Repair service:*	Commercially viable leasing service for jeans, they remain the owner of the raw materials, returned products are upcycled & sold as unique vintage jeans; if too worn out are recycled & blended with virgin cotton for new pairs of jeans	MUD 1

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Smaller fashion	MUD Jeans	NL	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Customers can buy new organic, vegan or vintage jeans, can lease those jeans and have them repaired, if needed, full transparency on their supply chain	MUD 2
			Design for remanufacture and recycling	Mono-material design:	*Mono-materials:*	Customers can buy new organic, vegan or vintage jeans, can lease those jeans and have them repaired, if needed. Full transparency on supply chain; doesn't communicate so much on the monomaterial although communicating 98% cotton for fabrics (and some accessories like buttons made of cotton as well)	MUD 3
	MUKA Kids	New Zealand	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Resell:*	Customers shop for accredited ethical and sustainable clothing and trade any unwanted pre-loved clothing through the online marketplace	MUKA Kids
	Nudie Jeans	Sweden	Design and strategy for long life	Emotional durability/ longevity:	*Classic styling: craftmanship:*	Focusses on creating timeless and durable clothing and has made it an important aspect of its philosophy and brand identity which also incorporates the idea of celebrating craftsmanship	Nudie J. 1
			Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Focusses on creating timeless and durable clothing and has made it an important aspect of its philosophy and brand identity which also incorporates the idea of celebrating craftsmanship	Nudie J. 2
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair service:*	Sell jeans that come with a life-long service for free repair, which is done in their stores and offers repair kits to encourage their customers to start mending and repairing again	Nudie J.3
	People Tree	Japan	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	A good understanding of the ecological costs / waste issues in production	People T 1
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Explicitly a fair trade clothing business	People T 2

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Smaller fashion	Post-Couture Collective	NL	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Items are designed (and can be customised to the customers exact specifications), and available as open-source; customers can download digital files and take them to a local Fablab or Makerspace with their chosen fabric, to get the pattern cut, seams are replaced by a simple slotting system, so the need for sewing is removed.	Post CC 2
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Material used in this system is recycled polyester – which is also recyclable, open source (eg. green Sprite bottles)	Post CC 2
	Rebag	USA/China	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	Bags made from old clothes sent by customers, choice of designs	Rebag 1
			Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	Bags made from old clothes sent by customers, choice of designs	Rebag 2
	Reclothing Bank	China	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel:*	Reclothing is the remaking and redesign of second hand clothes, bank is a platform or store for the circulation and exchange for donated old materials	Reclothing
	Rentez-Vous	UK	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Customers list and rent designer clothes and accessories - the founders describe this as the "guilt-free unlimited wardrobe"	Rentez-vous
	Schmid-ttakahashi	Germany	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Restyle and remodel:*	Builds on understanding that any item of clothing, even if mass-produced, can be redesigned into new desirable pieces. Unwanted garments are collected from their owners, who can track the 'afterlife' of the items	Schmid.
	ShareWear	Sweden	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Sustainable way to be fashionable, by borrowing an item for a week, before passing it on to someone else - usersfind items through searching for the hashtag sharewear on Instagram	ShareWear

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Smaller fashion	Shed Me Clothes	UK	Design for remanufacture and recycling	Design for disassembly:	*Dissassembly:*	Alternative joining methods & non toxic PVA soluble stiching to join, for technology see: http://www.ctechinnovation.com/funded-projects/wear2-microwave-textile-disassembly/	Shed MC
	The Renewal Workshop	USA	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Repair and/or refurbish: Resell:*	Idea of diverting clothing and textiles from landfill to recover the embedded value and reducing waste. Collected textiles and clothing are transformed into what the company call 'Renewed Apparel', which is sold on their website	Renewal w.
	Thomas Cridland	UK	Design and strategy for long life	Physical durability:	*Durability guarantee:*	"30 year sweatshirt", specifically manufactured to last that long and with a 30 year warranty (& other products)	Cridland
	Timo Rissanen	USA	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduce fabric waste:*	Fashion Creation without Fabric Waste creation' in 2004, prototype hoody	Timo R
	Twine	Taiwan	Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Hold eco fashion fair focusing on fair trade clothing business	Twine
	UseDem	China	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Refurbish - upcycling:*	UseDem is a project which recycles old jeans into new products. These could be bags, furniture or even objects for interior design	UseDem
	Veja	France	Design for reduced environmental impact during manufacture and use	Reduced impacts during cultivation:	*Organic cotton:*	Uses certified organic cotton	Veja 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Renewable and recycled materials mix:*	Uses certified organic cotton, natural rubber from wild rubber trees in Amazon forest, recycled bottles	Veja 2
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Working with Indigenous Amazon communities (rubber), also, objective to control the leather production chain (recognizing impossible fair trade for this material) from cattle breeding conditions to environmental concerns on leather processing	Veja 3

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Smaller fashion	Veja	France	Alternative business models	Supporting local economies and supply chains:	*Fairtrade/ethical manufacturing: Short supply chain: Supply-led production*	Keeps no stock (production is adjusted according to organic resource availability), products are made to order at least 6months in advance, there is zero advertising (saving resources for investments)	Veja 4
			Alternative business models	Alternative marketing strategies:	*Marketing for less consumption:*	Keeps no stock (production is adjusted according to organic resource availability), products are made to order at least 6months in advance, there is zero advertising (saving resources for investments)	Veja 5
	Zady	USA	Design and strategy for long life	Emotional durability/ longevity:	*Classic styling: craftmanship:*	Mission for quality clothing, against the current system that replaces style with trends; Not a trend but a New Standard	Zady 1
			Design and strategy for long life	Physical durability:	*Fabric and component durability:*	Mission for quality clothing, against the current system that replaces style with trends; Not a trend but a New Standard	Zady 2
			Design and strategy for long life	Emotional durability/ longevity:	*Long-life fashion collection:*	Zady currently has two collections of sustainable and quality clothing, the Zady collection and the Inspired by Emma Watson collection	Zady 3
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Zady works "to create a product that tackles each issue of our supply chain", including local sourcing & manufacturing, craftsmanship	Zady 4
			Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing:*	Zady works "to create a product that tackles each issue of our supply chain", including local sourcing & manufacturing, craftsmanship	Zady 5
Smaller fashion – collabora-tion	Ethical Fashion Initiative/ RISEmap	Europe/East Africa	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Online traceability platform highlighting the brands who support artisans in Kenya, Uganda, and Ethiopia through their supply chains.	EFI/RISE 1
			Alternative business models	Supporting local economies and supply chains:	*Fairtrade/ethical manufacturing: local economies:*	RISEmap highlights stories of unique crafts that sustain communities and supply unique products to globally recognized brands	EFI/RISE 2
Smaller fashion - platform	Centre Commercial	France	Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	A project to showcase in one location fashion brands which share the same commitment to values - primarily transparency	Centre Com

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Smaller fashion - platform	LangerChen	China	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Upcycling:*	Provides different tailor-made upcycling clothes services, such as a custom-made upcycling design service and holding upcycling workshops	Langerch 1
			Design for reduced environmental impact during manufacture/use	Reduced impacts during cultivation:	*Organic cotton: other non-mainstream natural fibres:*	Organic fibres	Langerch 2
Smaller fashion (sportswear)	Under Armour	USA	Design and strategy for long life	Emotional durability/ longevity:	*Co-creation/customisation:*	To facilitate the design of custom products, while reducing development time and material waste.	Under A 1
			Design for reduced environmental impact during manufacture/use	Local manufacture (i.e. digital/ 3-D printing)	*Local custom manufacture:*	Facilities include 3D design and body scanning, 3D printing and rapid prototyping, apparel and footwear prototyping and apparel and footwear pilot lines, to facilitate the design of custom products	Under A 2
			Alternative business models	Supporting local economies and supply chains:	*Local economies: Local manufacturing:*	This facility is part of Under Armour's 'local for local' concept, which sees products being designed for and manufactured in local markets globally	Under A 3
Supplier	Aquafil ECONYL®	Italy	Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Recycled Nylon 6 from regenerated post-consumer Polyamide 6 waste materials, such as fishing nets, clothing and carpets and pre-consumer waste	Aquafil 1
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	ECONYL® nylon can be recycled an infinite number of times, without losing any quality.	Aquafil 2
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Mechanical recycling - synthetics:*	Recycling technology for pre & post consumer nylon, can be recycled infinitely, plus take-back system with Speedo USA manufacturing waste for nylon in swimsuits	Aquafil 3
	Archroma	Switzerland	Design and strategy for long life	Physical durability:	*Fabric treatment:*	DWR finishes strengthen fabric agains tearing, abrasion, stains	Archroma 1
			Design for reduced environmental impact during manufacture/use	Low impact processing:	*Water/energy/chemical savings:*	Earth Colours; made from leaves and non-edible shells of nuts	Archoma 2

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Supplier	Crabyon® (Swicofil)	Switzerland	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	Crabyon® fibre- blend of viscose & chitosan sourced crabmeat manufacturing waste, structure similar to cellulose.	Crabyon
	DryCoo - DryDye	NL	Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	DryDye is a waterless dyeing process based on using supercritical carbon dioxide instead of water; requiring no water, utilising 50% less energy and 50% less chemicals, compared to conventional dyeing processes	DryCoo
	HeiQ	Switzerland	Design and strategy for long life	Physical durability:	*Fabric treatment:*	DWR finish increases endurance of treated clothing and shoes and has high abrasion resistance	Heiq
	Lauffen-mühle	Germany	Design and strategy for long life	Downstream strategies and marketing for extending life:	*Share and rental:*	Degradable polymer is also durable & suitable for leasing, scored here for share & rental	Lauffenm 1
			Design for reduced environmental impact during manufacture and use	Biodegradability/ composting:	*Biodegradable synthetics/polymers:*	Eco-friendly degradable polymer	Lauffenm 2
	Lenzing	Austria	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Refibra™ - made from reclaimed natural fibres; Lenzing has developed a new identification system. The system makes it possible to identify the Refibra™ fiber in the finished textile. This guarantees transparency in the overall processing chain.	Lenzing 1
			Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Tencel/Lyocell: Transparency – tracking and labelling: Reclaimed natural fibres/materials: Open loop – industrial ecology:*	Refibra™ - new fibre based on cotton scraps and wood, the first cellulose fiber featuring recycled material on a commercial scale	Lenzing 2

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Supplier	Lenzing	Austria	Design for reduced environmental impact during manufacture and use	Low impact processing: Low impact colouring and finishing	*Water/energy/chemical savings:*	Tencel - 99% recycling of solvent in process; EcoVera 50% water & emissions compared to viscose; Modal black & colour - 90% chemicals savings on dyes, less energy, water etc. Also see: https://www.youtube.com/watch?v=8PFz5AyFV2Q&feature=youtu.be	Lenzing 3
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Chemical recycling - natural fibres:*	Refibra™ - Tencel (viscose) manufacturing process used for recycling cotton - new fibre based on cotton scraps and wood, the first cellulose fiber featuring recycled material on a commercial scale	Lenzing 4
	Novozymes Bioblast	Denmark	Design and strategy for long life	Physical durability:	*Fabric treatment:*	Using enzymes to modify the surface of cotton fabrics, in order to provide anti-pilling, smoother fabric surfaces and colour retention features	Novozym. 1
			Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	Using enzymes to modify the surface of cotton fabrics, in order to provide anti-pilling, smoother fabric surfaces and colour retention features, enzymatic solutions are biodegradable, natural proteins which are only required in low dosages and do not contribute greatly to to effluent loads	Novozym. 2
	Orange Fiber	Italy	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	Creation of sustainable fabrics from citrus juice by-products	Orange F
	Organoclick	Sweden	Design and strategy for long life	Physical durability:	*Fabric treatment:*	DWR for durability and OC-biobinder™, a bio-based fiber-binding system to make nonwovens and textiles stronger and stiffer	Organoclick
	Pinatex(TM) - Ananas-anam	UK	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	Nonwoven textile made from waste pineapple leaf fibre, like leather	Pinatex
	Prato: Nuova F.lli Boretti s.r.l.*	Italy	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling: Reclaimed natural fibres/materials:*	Short and traceable recycling supply chain and production, from both post & pre-consumer, to regenerate wool and cashmere again and again, leader in pulled regenerated wool	Prato N 1

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Supplier	Prato: Nuova F.lli Boretti s.r.l.	Italy	Design for reduced environmental impact during manufacture and use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	System of colour processing, instead of colour grounds, which allows the fabric manufacturers to use the material without dyeing again	Prato N 2
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	Sorting by expert workers, plus with brands work worldwide on fair-trade and solidarity projects for some phases of recycling pre-consumer wool and cashmere	Prato N 3
			End-of-life collection systems and recycling technologies	Recycling technologies:	*Mechanical recycling - natural fibres:*	Sophisticated system of sorting and classifying wool scraps for maximum recycling	Prato N 4
	Qmilch GmbH	Germany	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	A biodegradable textile fibre made from milk no longer fit for consumption	Qmilch
	Recover Upcycled Textile System	Spain	End-of-life collection systems and recycling technologies	Recycling technologies:	*Mechanical recycling - synthetics: Mechanical recycling - natural fibres:*	Regenerates and recycles pre and post-consumer cotton waste material into upcycled yarns.	Recover
	Re-Muji	Japan	Design for reduced environmental impact during manufacture and use	Design efficiency/ material waste reduction:	*Reduced impact fashion collection:*	The clothing upcycling line of Muji - every season, Muji will send unsold stock from the warehouse to upcycle - will dye all clothes into 3 different blue colours	Re-Muji
	ROICA™ Eco Smart (AsahiKasei)	Japan	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	The only more sustainable, eco-stretch elastane that is GRS certified, with 50% pre-consumer waste	ROICA
	Rudolf	Germany	Design and strategy for long life	Physical durability:	*Fabric treatment:*	Waterproofing and abrasion resistance, also improves the sewability	Rudolf

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Supplier	S.Café® (Singtex Industries)	Taiwan	Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Open loop – industrial ecology:*	S.Café® fabric made from recycled coffee grinds and PET and offers anti-odour, fast-drying and UV-resistant properties	S Cafe
	Schoeller	Switzerland	Design and strategy for long life	Physical durability:	*Fabric treatment:*	Ecorepel® is a PFC free water and dirt repellent treatment; it is water repellent, mud repellent and abrasion resistant	Schoeller 1
			Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Renewable natural materials:*	Ecorepel® Bio imitates plants' natural protection - obtained entirely from renewable primary products	Schoeller 2
	SOKO	Kenya	Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	To prove that it is possible to run a self-sustaining manufacturing business whilst having social and environmental principles at its core - paying fair wages, providing needed social services, a pleasant place of work and a commitment to limit its environmental impact	SOKO
	Spin Dye	Sweden	Design for reduced environmental impact during manufacture/use	Low impact processing:	*Water/energy/chemical savings:*	Colour is integrated into the material from the start, eliminating the use of water or toxins	Spin Dye
	Sympatex	Germany	Design and strategy for long life	Physical durability:	*Fabric treatment:*	Membrane for waterproofing, Sympatex Press Release; "100% Sympathy Inside"	Sympatex 1
			Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Recycled polyester:*	100% recyclable membrane made from recycled materials (100% recycled polyether-ester polymer), Sympatex Press Release; "100% Sympathy Inside"	Sympatex 2
			Design for reduced environmental impact during manufacture/use	Low impact processing:	*Water/energy/chemical savings:*	Evaluatiaon of entire textile process from sustainable use of raw materials, consumed energy and water, to avoiding harmful climate gases and banning of chemical toxins: Sympatex Press Release; "100% Sympathy Inside"	Sympatex 3
			Design for remanufacture and recycling	Recyclable materials (recyclability):	*Recycled/recyclable materials:*	PFC-free recycled polyester membrane also recyclable, Sympatex press release "Sympatex to launch first 100% CO2-neutral membrane"	Sympatex 5
			End-of-life collection systems and recycling tech.	Take-back systems:	*Take-back systems:*	Collaborates with brands on take-back, Sympatex press release, "Sympatex to launch first 100% CO2-neutral membrane"	Sympatex 5

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Supplier	Teijin ECOCIRCLE ™	Japan	End-of-life collection systems and recycling technologies	Recycling technologies:	*Chemical recycling:*	Supplier of recycled polyester from chemical closed loop recycling	Teijin
	Thread	USA	Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Recycled synthetics:*	Post-consumer plastic bottles, sent to the U.S and re-manufactured- 100% post-consumer recycled yarn or fabric.	Thread
	VTT Research Centre Finland	Finland	End-of-life collection systems and recycling technologies	Recycling technologies:	*Chemical recycling - natural fibres:*	Turning cotton waste into new fibres using cellulose dissolution	VTT
Supplier – collaboration	Prato – Re.Verso™*	Italy	End-of-life collection systems and recycling technologies	Recycling technologies:	*Mechanical recycling - natural fibres:*	Involvement of brands in sophisticated system of sorting and classifying wool scraps for maximum recycling	Prato RV 1
			Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Reduced impact fashion collection:*	Re.Verso™ cashmere for the Gucci AW15/16 mens, womens and childrenswear collections.	Prato RV 2
			Design for reduced environmental impact during manufacture/use	Renewable and recycled textiles and materials:	*Transparency – tracking and labelling:*	Re.Verso™ is the brand for a new, fully transparent, certified and traceable Italian textile system intended for wool and cashmere, collaboration of several companies	Prato RV 3
			Design for reduced environmental impact during manufacture/use	Low impact colouring and finishing:	*Water/energy/chemical savings:*	The integrated supply chain can boast incredible savings in terms of energy (-76%), water (-89%) and CO2 emissions (-96%), certified	Prato RV 4
			Alternative business models	Supporting local economies and supply chains:	*Local manufacturing:*	Supply chain of excellence is based on the collaboration of 5 premium Italian textile producers	Prato RV 5
Supplier network	Ethical Apparel Africa	Ghana	Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	Partner factories - EAA factory standards include waste reduction initiatives, use of renewable energy, lean (efficient) production processes, versatile production capabilities and rigorous quality systems.	Ethical Ap 1
			Alternative business models	Fair business principles:	*Fairtrade/ethical manufacturing:*	We develop our partner factories to gradually implement living wages, key benefits, and worker empowerment	Ethical Ap 2

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Suppliers platform	Taiwan Eco Textile	Taiwan	Design for reduced environmental impact during manufacture and use	Renewable and recycled textiles and materials:	*Recycled polyester:*	Most examples are recycled polyester - platform for local textile entrepreneurs to stay synchronised with the latest industry insights and development	Tw Ecotex 1
			Design for reduced environmental impact during manufacture and use	Low impact processing:	*Water/energy/chemical savings:*	Platform for local textile entrepreneurs to stay sync with the latest industry insights and development	Tw Ecotex 2
* Denotes Detox Committed company							

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Authors:
Madeleine Cobbing
Yannick Vicaire

Contributors:
Alexandra Perschau
Anne Prahl
Karen Miller
Melissa Shinn
Paula Tejon Carbajal

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