It has been an intriguing year for the fashion industry and for the Mistra Future Fashion research program. Sustainable fashion is on the agenda as never before.

Sustainable behavior and intentions form an integrated part of this transformation.

Changing an industry ecosystem requires patience and persistence. By breaking things down into bite-sized chunks, the system progresses steadily but surely, thanks to innovations and on ongoing awareness of new practices. Mistra Future Fashion researchers, representatives of multiple organizations that work with many others around the globe, are a vision of a future sustainable fashion industry. In parallel, we see such a big movement towards sustainable behaviors by stakeholders worldwide. This is about how we utilize new knowledge; we don’t just sit on critical barriers for recycling. In addition, two doctoral theses supported by the program were successfully defended.

What we call, value to others, deals with how we bridge the gap from research to practice. One way 2016 involved using open calls for new projects that focused more on implementation. Another was to leverage the outputs of bigger international networks. Thus, in 2016 Mistra Future Fashion joined the Sustainable Apparel Coalition (SAC) and contributed to the development of the Higg Index. The third way concerns being industry oriented and finding solutions to industry needs. We kicked off with fashion brand Filippa K in-house research projects, with our PhD team seeking theprogram’s design strategies. A fourth example is how we help new knowledge; we held a stakeholder workshop together with the Swedish Environmental Protection Agency in October, facilitating a joint discussion between policymakers and others to address identified barriers for recycling.

Increasing awareness around sustainable fashion were done throughout 2016 with engagements in multiple events and conferences. Our efforts led to a broad media penetration in 2016 both internationally and domestically, including several TV and radio appearances. During this year, we also developed new events and added new research tracks such as microplastics in ocean, nylon and elastane fiber mix separation to native two. New partners also joined the program. First was the important research partner International Institute for Industrial Environmental Economics (IIIEE), as policy experts, followed by several equally relevant value-chain stakeholders.

The quality scientific outputs 2016 were a mix of deliverables, exploration of existing literature, and conferences. The final success conference, first batch of paper textiles for our prototype development, chemical recycling, report on circular economy An itinerating. In addition, two doctoral theses supported by the program were successfully defended.

During 2016 we kept our focus on generating relevant new information and putting our effort into influencing the global agenda. We are utterly convinced that the research we lead and the joint efforts of our partners will result in advances.

As the second year in phase 2 of the research program, 2016 was an intensive one. During this period, we did not just maintain the momentum, we added five new research tasks – such as productive time we also identified new areas for further advancement. Accordingly, Mistra Future Fashion was actively involved during 2016 in designing a national arena concept for sustainable fashion, initiated by the Royal Swedish Academy of Sciences, and the Business of Fashion) tells us, “across the State of Fashion Report for 2016 (McKinsey and the Business of Fashion) tells us, Forest all market segments, product categories, and geographical sphere, large-scale shifts in consumer behavior and shaping business strategies to produce deeply felt change. And that is what we have been working on since day one. We have been engaged for an industry that is ranked as the seventh biggest in economic terms globally. There’s no doubt that the industry faces uncertainty; it is undergoing change. According to the industry’s global leaders, 2016 has been one of the hardest years for the industry to be ever experienced. At the State of Fashion Report for 2016 (McKinsey and the Business of Fashion) tells us, “across the State of Fashion Report for 2016 (McKinsey and the Business of Fashion) tells us, Forest all market segments, product categories, and geographical sphere, large-scale shifts in consumer behavior and shaping business strategies to produce deeply felt change. And that is what we have been working on since day one. We have been engaged for an industry that is ranked as the seventh biggest in economic terms globally. There’s no doubt that the industry faces uncertainty; it is undergoing change. According to the industry’s global leaders, 2016 has been one of the hardest years for the industry to be ever experienced.
research for sustainable fashion

A research program with a vision of enabling systemic change leading to a sustainable fashion industry and society.

sustainable fashion

The program focuses on environmental and climate effects caused by global fashion industry processes and interlinked communities and the changes required for future sustainable operations. The research applies the principles of circular economy and is structured around four themes: Design, Supply Chain, User and Recycling.

unique system perspective

The program takes a holistic system approach for the fashion value chain, from fiber to recycling, and how it needs to change in order to become more circular. The research is trans-disciplinary, allowing more comprehensive and relevant analyses and insights. Newly generated knowledge is always verified in a holistic context, ensuring sustainability also from a system perspective.

platform for sustainable fashion

The program and the primary funding organization is Mistra, the Swedish Foundation for Strategic Environmental Research, which provides an SEK 80 million grant. An additional SEK 30 million is co-financed by in-kind contributions from industry partners. The program is now in its second phase of the total program period of 8 years, 2011-2019.

consortium based

Program research rests on engagement with its consortium of relevant actors: research institutions, universities, government agencies, non-governmental organizations (NGOs) and companies within the entire textile value chain, from forestry, pulping and textile manufacturing to fashion retail and recycling. The partners set the research scope, participate in the research with intelligence, resources and materials, and agitate for implementation.

results leading to global competitiveness

Expected results are scientific knowledge and novel solutions for the fashion industry and its stakeholders that enable positive change in the fashion sector in terms of its environmental performance and its global competitiveness.

why

The global fashion industry faces multiple challenges when meeting modern requirements for sustainability, traceability and transparency. Today’s fashion industry causes severe environmental impacts from production, consumption and the generation of large volumes of textile waste. Majority of today’s fiber production is unsustainable, either as conventional cotton that requires high amounts of pesticides and water in places where water is scarce or synthetic fibers such as polyester which is made of fossil resources, taken from the planet’s natural pools. Despite the massive focus on finding new sources of fiber, the issue is also about the high volumes required, and the fact that only get worse with the continued growth of the global population. An annual volume of 950 million metric tons is estimated by 2020 (Eichinger 2012), and very few natural sustainable alternatives can meet these needs. But a focus on fiber is not enough, since as much as 70 percent of a garment’s environmental impact lies in the total production phase, such as fiber, weaving, dyeing, finishing, sewing, surface treatments, etc., due to its energy, water and chemical usage. Thus sustainable fibers in end production processes provide no guarantee for sustainable products. Further there is an imbalance in efforts needed for production vs. usage. In general there is a high-environmental impact required for a short user phase. Furthermore, modern consumption habits generate massive textile overload in the market and ultimately also problems with waste. This is result of the linear economy model, where “take, make, waste” represents a broken design right from start.

how

We need textile fibers that are sustainable, but comparable in quality and price to existing, non-sustainable fibers. A circular model will involve more advanced design processes incorporating sustainability impact procedures right from the design phase – procedures that are based on intended usage and duration of use, which ensure optimum usage via reuse and which enable separation and the regeneration of new fibers at the point of disposal.

vision: enabling a systemic change of fashion industry and society

We hope to see a future with recycled fibers from textile waste, new sustainable production techniques and new consumption habits leading towards new services such as leasing, in-design and borrowing, which will encourage flourishing new business in re-use, collecting, sorting and recycling. This will mean available alternatives and enable more sustainable actions.

- this is mistra future fashion -
We develop knowledge and new processes in recycling methods and the impact of post-consumer textiles in order to provide guidance on necessary steps to enable sustainable textile recycling.

We make recommendations on how to encourage sustainable consumer behavior and to increase user engagement in sustainable consumption. Specifically, we develop recommendations for increasing services for extending the life of garments, reuse, and second-hand consumption.

We identify the necessary actions in textile and garment supply chains to enable circular economy guidelines for governance on how to transition to and sustain a circular textile supply chain.

We explore and evaluate the environmental potential of the design and user potential of short-life vs long-life garments, and the full spectrum in between, to find the most suitable choices for a circular textile economy for different types of garments and uses. Expected outputs will be recommendations, guidelines and tools for how to design for resource circularity.

We identify and develop new processes in recycling methods and the impact of post-consumer textiles in order to provide guidance on necessary steps to enable sustainable textile recycling.
The Mistra Future Fashion program is a consortium whose partners stand behind the program vision and actively contribute to achieving the program vision and goals. The program covers a broad range of expertise and explores the many facets and aspects of progressive leaders within their respective research fields. The research is organized around four themes and involves researcher partners from Sweden, Denmark and the United Kingdom.

The industry partners involved are a mix of relevant stakeholders from across the value chain such as producers, designers, retailers, waste managers and NGOs.

The consortium has two levels of industry partnership: Stakeholder partners, and Advisory Stakeholder partners. Stakeholder partners include in-depth involvement in research tasks with inputs such as expertise, information-sharing, resources, equipment and materials. Advisory Stakeholder partners actively follow research progress and provide input on shaping the agenda, but do not engage in individual research tasks.

The consortium - partners who share the program vision and actively contribute to the program goal.

<table>
<thead>
<tr>
<th>Research Partners</th>
<th>Involved in Theme</th>
<th>Researchers</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalmers University of Technology</td>
<td>Design</td>
<td>Greg Peters, Anna Palme, Bahareh Zarnani</td>
<td>LCA, Chemistry, Fiber prototypes</td>
</tr>
<tr>
<td>Copenhagen Business School</td>
<td>Design</td>
<td>Wenche Oweds, Eskil R. O. Petersen, Kirsti Rothan Andersen, Sarah Netter</td>
<td>Consumer behaviour, Business models, Local production</td>
</tr>
<tr>
<td>Stockholm School of Economics</td>
<td>Supply</td>
<td>Susanne Sweet, Tina Sendhefer</td>
<td>Market, Supply chain strategy, Business models</td>
</tr>
<tr>
<td>University of the Arts London</td>
<td>Design</td>
<td>Kasia Golunowsry, Rebecca Earley, Kay Polkiewicz</td>
<td>Strategic design, Prototypes, Guidelines</td>
</tr>
<tr>
<td>IVL, Swedish Environmental Research Institute</td>
<td>User</td>
<td>Maria Elander, Hanna Ljungkvist</td>
<td>Recycling policies, Recommendations</td>
</tr>
<tr>
<td>Inventia</td>
<td>User</td>
<td>Hjördis O Tallberg, Lotte Jargensen, Sir Lindberg</td>
<td>Nonwoven biodegradable materials, Process analysis, Consumer perception</td>
</tr>
<tr>
<td>SP Technical Research Institute of Sweden</td>
<td>Design</td>
<td>Hanna de la Matte, Gunter Sandin Albertsson, Helene Wedin, Finn Englund, Åsa Orkland</td>
<td>LCA, Cellulose, Chemistry, Recycling feasibility, Auto sorting</td>
</tr>
<tr>
<td>The Swedish School of Textiles</td>
<td>Design</td>
<td>Elinor Nilsson</td>
<td>Textile technology, Textile engineering, Policies</td>
</tr>
<tr>
<td>Planmiljö</td>
<td>User</td>
<td>David Wiman, Anja Charlotte Gylling</td>
<td>Policies</td>
</tr>
<tr>
<td>The International Institute for Industrial Environmental Economics</td>
<td>Supply</td>
<td>Nanna Tojo, Åsa Thidell</td>
<td>Chemical engineering, Textile fibre recycling</td>
</tr>
<tr>
<td>re:newell</td>
<td>Recycling</td>
<td>Christopher Lindgren, Henrik Holst</td>
<td>Policies</td>
</tr>
<tr>
<td>Swerea IVF</td>
<td>Design</td>
<td>Sandra Ross, Desiré Rex, Hans Leonard Nordlom, Zengwen Guo, Anna Rose Kristofardottir, Camilla Nilsson</td>
<td>LCA, Cellulose, Fiber prototypes</td>
</tr>
</tbody>
</table>

- our partners -
Circular speeds: towards a new understanding of designing for fashion textile rhythms

Focusing on “speed of cycle”, the aim is to better understand the challenges cycle speed may bring to design and to prepare for the subsequent action research phase, which includes development of design research prototypes. The aim is to develop the discourse from fast and slow pure and simple, to a level where multiple, proportionate speeds can be both understood, tested via LCA and ultimately engineered to improve the circular efficiency of a product.

The article brings forward how ideas and theories to reduce the damage connected to production use and disposal of fashion must be translated into garments with features, which allow them to serve the wide range of needs and purposes required. The result shows, among other things, how the circle of speed may either be acquired by clothes becoming ‘quality agents’, with their value, linked to our memories, increasing as we age. On the other hand, garments may be designed to be durable and connected with e.g. a system for repair and renewal where it can be replaced or redesigned in whole or in part. In the case of mass production,

Researchers Goldsworthy and Earley examine a positive form of ‘planned obsolescence’ as the material is recovered for re-manufacture after a short time in use. Continuing forward with the research, the theme short, mid and slow will be tested during 2017, ultimately leading to a set of guidelines for circular fashion design to be published in 2018.

The following are taken from the Design Theme when exploring circularity in new ways based on the insights gained so far:

**Insight 1: Circular can be fast or slow**
The ten approaches to designing for circularity from the first phase of the Mistra Future fashion program – most of the approaches concerned extending the use phase of the product (in both physical and emotional durability strategies), while three of the prototypes had little or no reference to product longevity. Instead, they were concerned with easing the flow of materials around the lifecycle, creating garments designed for a particular material-recovery technique or even intervening with the material at the actual point of recovery itself.

**Insight 2: Context is everything**
Another important factor is the ‘context’ of the garment and appropriate choices based on specific archetypes. Not all garments are the same and what makes sense for a basic white T-shirt may not make equal sense in the design of a coat, a piece of underwear or a hospital gown. The life cycle assessment shows that impacts across all stages of the lifecycle are very different for different product archetypes and there simply isn’t a solution that would suit all of them equally.

**Insight 3: Circular speeds interrelate with ALL areas of a product’s lifecycle**
The duration and speed of a product is relevant in all of its lifecycle stages, not just production and use. The seemingly opposing ideas of extending the lifecycle contra reducing it are more connected through the nature of the cycle. Often, it might simply push impacts from one part of the cycle to another, e.g. if the materials needed to create a durable product are more impactful in production or if the laundry requirements of a longer-lasting product are more impactful. If the materials are ultimately not closed-loop (or recoverable at a high level) then the difference between a long-life product and a short-life one may not be that dramatic in real terms.

**Insight 4: There are trade-offs between durability and recyclability**
There are often trade-offs between designing for durability and recyclability which make it difficult to choose one over the other. Some items require functionality which automatically increases impacts in other parts of the lifecycle, be it energy in material production to produce a hardwearing fabric or fiber mixes to achieve a low-launder solution or even use of chemicals for ultimate advantage.
On 23 and 24 November, the Circular Transitions Conference took place in London at the Tate Britain, and was organized by Kate Goldsworthy and Rebecca Earley from UAL. It was the first global event to bring together academic and industry research, with designing fashion textiles for the circular economy. The conference and exhibition was curated around the three areas Materials, Models, and Mindsets, which emerged from the textile toolbox developed previously in phase 1 of Mistra Future Fashion. They aim to encompass all aspects of design and celebrate the material, relational and personal challenges which need to be solved in order to achieve circular goals.

Materials
Design to create change through new industrial and economically viable systems which respond to material, technology, and scientific developments. Papers and exhibits in this theme looked at challenges and benefits of new modes of production, opportunities for cleaner processes in the textile materials value chain, and the potential for digital processes to enable a circular economy.

Models
Design to evolve new Systemic Models through manufacturing, services, networks and communities. New business models and tools, cradle-to-cradle thinking and projects which explore speeds and appropriate design are all vital to this approach. Collaboration is essential to drive the circular model and this is in itself a challenge. What are the tensions between our traditional modes of competition and collaboration? Can we create more social equity within the circular supply chain? What opportunities are there for designers to bridge understanding of scientific tools such as environmental assessment?

Mindsets
Design to change behavior towards shaping new habits, attitudes, beliefs, frameworks, and experiences with ideas for facilitating collaboration across disciplines, pioneering and enabling the changing role of the designer in a circular economy. How design can contribute towards well-being that develops circular cultures. How both designers and end users need to be conscious of their decision-making and how design can support this.

Conference facts: 5 keynote speakers, 33 papers and 40 exhibitors, 150 guests from 12 countries (Finland, USA, UK, Sweden, New Zealand, Denmark, Israel, Germany, Belgium, Netherlands, Hong Kong, Canada), with an audience split of academia 65% and industry 35%.

Key note speakers were Cyndi Rhoades (Worn Again), Sophie Thomas (Thomas Matthew), Ed van Hinte (Lightness Studio/DSR22), and Orsola de Castro (Fashion Revolution).

The papers for the conference are published in the Circular Transitions Proceedings, and a selection of papers will be developed further and published in a specialist journal by Taylor & Francis.

In order to change behaviour we need to understand what material systems lead to ‘good’

Changing Behaviour Designing to change mindsets and culture, rethink approaches and minimize ‘wise behaviour’, institutional change and ‘imbibedness’. Encouraging inner knowledge, reflecting, affiliation, empathy.

New Business Models Designing for new business models and social systems (Fashion libraries, collaborative consumption, ethical production, local examinations).
Material sample: paper non-woven materials - like cashmere

Hjalmar Granberg at Innventia has developed and presented material samples and technical records pinpointing paper non-woven material. This includes an extra layer of material understanding for design scenarios for the garment prototypes and the first concepts and textile sampling for short-life garments.

The challenge was to produce a paper base material suitable for clothing which feels like cashmere.

The aim was to tune the development of textile-like paper samples to be fed into the Design Theme concept of Fast, and to deliver demonstrator materials that are later elaborated and transformed into prototypes.

The technical report includes the process of translating material design brief from designer researchers (at UAL) into a technical context for materials sampling (at Innventia). This will be used as the basis for the future upcoming development of garment prototypes during 2017-18.

Kate Goldsworthy, Rebecca Earley and Kay Politowicz at UAL have explored the framework of short-life fashion and long-life-fashion, including the spectrum in between. The aim is to consider how we best can design materials and products to fulfill their purpose in the most sustainable manner. This will be illustrated by the current chosen models for fashion consumption and how these can be measured and communicated to designers. By reviewing the opposite ends (fast as slow) of the fashion spectrum we aim to clarify the specific materials and design challenges faced by different segments of the industry.

Involved are Innventia, with material intelligence for making paper-textile garments, and Chalmers to ensure best decision making in the process. The LCA expert Greg Peters will provide full LCA on the garment prototypes (2018).

The work will be illustrated with concepts, material samples and prototype garments.

To cover requests on recycling options at the disposal phase – especially for the slow concept – the researchers Tatjana Karpenja at Innventia and Hanna de la Motte at SP, are involved by presenting key factors to review the recyclability of the paper textile. To ensure relevance of the concepts for business models, researcher Eksen R G Pedersen at Copenhagen Business School provides support with the identification of barriers and opportunities related to models. During 2016, the team connected with partner Filippa K and its design team, and as of 2017, the work will involve in-house operations at Filippa K testing design theories and developing garments.

“We know that the textile industry is the second most polluting industry in the world. We also know that our industry has long and complex value chains spread out all over the world. We also know that we need to practice systemic change in the way we do business if we want our future generations to keep thriving on this planet.

To succeed with that it is crucial to have a holistic perspective to understand how each profile fits in the puzzle. Everything is connected. We can look at our value chain as big eco-systems with many actors with different tasks.

So to create the necessary changes we need to collaborate and work towards the same goal. We need research to help us understand the best way and we need businesses to take this valuable research and start moving in the right direction. Together we can describe the future we want to see, the new destinations, that is absolutely necessary in order to get there.

All of that is what Mistra Future Fashion is helping us with.”

Elin Larsson, Sustainability Director, Filippa K
Academic Article: What interventions enable us to stay within the planetary boundaries?

What types of interventions, as well as actors, can potentially make the fashion sector sustainable?

Actor-oriented advices:

For the textile manufacturing industry, it is clear that a transition to renewable energy systems is needed to reach the proposed target for climate change. Also finding substitutes for conventional cotton fibers is important in order to decrease the water footprint, e.g. by using forest-based fibers, organic cotton or water-saving technologies. Further, the water scarcity is basin-specific, so generic water saving targets will not be as effective in dealing with water scarcity on local surfaces of areas that suffer from severe water scarcity.

For retailers, enabling and encouraging consumers to use low-impact transport can have a large impact. The consumers with collaborative consumption based business models is strongly dependent on how long the service life of the garments is extended and on the transport mode of the consumer, but if these issues are considered as a part of the total environmental intervention.

For consumers, the most effective intervention seems to be the avoidance of conventional cotton-based recycled cotton or “better cotton”. Further, the most effective intervention to guide the apparel consumption towards sustainability is the case of an industry sector towards a circular economy. The answer is that one intervention in isolation cannot make the difference. It has to be a combination of interventions in order to have an impact, and secondly, to achieve the sharing-economies effect, it has to be smart. This work and conclusion is a continuation from previous life cycle assessment on five garments scaled up to national consumption level (2015) and further applied for planetary boundaries as targets (2016). The team evaluated the impact reduction resulting from interventions such as energy efficiency, recycling etc.

In order to compare the overall climate impact of the garment sector, they need to be compared to other industries, such as the automotive industry, in order to see if the garment industry is a sustainable industry. The garment industry is a large and complex industry, and the environmental and social challenges are significant.


New data reveals garment sustainability

Sandra Ross at Sweero IVF has been studying almost 5 years of research in identifying which fibers and production techniques are sustainable using life cycle assessment (LCA). For the first time, this also includes chemicals and their impact. She will defend her PhD at the end of 2017, and during the year the program will continue with key partners to explore how to leverage this new data for best possible use within the fashion industry. The objective will be to create a database into useful tools for designers for relevant implementation in existing production processes, enabling decision makers to make more informed decisions.

Sustainable textile technology

· Work begins in 2016 on the development of sustainable textile technology with the purpose of acquiring an understanding of the feasibility of technologies in terms of scale-up, product quality, life-cycle-performance etc. Techniques: split spinning, plasma pre-treatment, increased cutting length of regenerated cellulose fibers, chemical recycling, dye, plasma pre-treatment, increased cutting length of regenerated cellulose fibers.

Production Location Impact & Differences

Erik Pedersen and Rikke Balslev Hansen at Copenhagen Business School have assessed the business model landscape of local production versus globalization in the fashion industry. The objective will be to convert the database into useful tools for designers for relevant implementation in existing production processes, enabling decision makers to make more informed decisions.

Design for Manufacturing (DFM)

Sandra Ross at Sweero IVF currently has led a task that looks at the concept Design for Manufacturing and what it means from the sustainability perspective. It will include experiences and success stories and will be presented during 2016.
Understanding consumers
Wencke Gwozdz at Copenhagen Business School worked on identifying the mechanisms behind the relationship between wellbeing and sustainable fashion. It is a quantitative field study in four countries (Sweden, Poland, Germany, USA). A survey was developed and conducted together with fashion company partners and the results will be presented mid-2017. The outcome will be used as the basis for developing policy and business recommendations on how to promote sustainable consumption. Furthermore, Wencke will utilize the data for a cross-country comparison of new business models from a consumer point of view. This includes understanding the geographic differences on new business models.

Policies – helping consumers identify sustainable choices and alternatives
David Watson at PlanMiljø has led a task that aims to present policies with the potential to promote business models and social initiatives that extend the active life of textile products. He will list their potential and risks, how they complement/conflict with one another and with existing policy. He will continue assessing the impacts of these policies and provide recommendations for policy measures. The outcome will be published spring 2017.

Business models for ReUse, Upcycling and Sharing
— which factors play a role in the success or failure of initiatives and business models that promote reuse, collective use and the prolonged life of garments? This was explored and assessed by Maria Elander at IVL in 2016 where she was involved with multiple external stakeholders within this business area, both in Sweden and abroad. The work has led to recommendations that will be published during spring 2017. At the same time, Esben Pedersen at Copenhagen Business School has been analyzing user perception of collaborative fashion consumption and repair services. He has included reflections on whether and how upcycling can move from the margins to the mainstream of the fashion industry.

Sarah Netter at Copenhagen Business School successfully defended her doctoral thesis in Organization and Management in 2016; “Exploring the Sharing Economy.” She was supervised by Associate Professor Wencke Gwozdz and Professor Esben Rahbek Gjerdrum Pedersen at Copenhagen Business School. The thesis is dedicated to provide a more nuanced understanding of the micro- and macro-level tensions that characterize the sharing economy. Sarah concludes that the fate of the sharing economy primarily depends on two factors. Firstly, on the ability of stakeholders to resolve tensions and arrive at a more nuanced and less normative discourse - one that will largely inform the ways in which sharing initiatives can be supported and regulated. Secondly, on the ability of policy-makers and sharing initiatives to shift consumer mindsets from ownership to access in order to increase the adoption of these new consumption practices, while simultaneously reducing overall consumption levels and contributing to sustainable development.

Link to thesis: http://openarchive.cbs.dk/bitstream/handle/10398/9397/Sarah_Netter.pdf?sequence=1

During 2016, multiple stakeholders were involved in identifying critical aspects for increased fiber-to-fiber recycling.

All interviewed stressed that the current situation does not offer opportunities to handle used textiles in an economical and resource-efficient manner. The work was led by Maria Elander and Hanna Ljungkvist at IVL and the interviewed stakeholders were from fashion companies, textile sorters and textile recyclers. It was concluded that the challenge linked to increasing the fiber-to-fiber recycling of textiles cannot be met by a single stakeholder group or deal with as a single issue in the textile value chain, nor should it be reduced to a waste problem. The effectiveness of textile recycling must be used as terms of textile products entering and exiting the recycling and relevant to the value chain. Interestingly, different stakeholder groups rank critical aspects differently, which indicates that each stakeholder group sees the responsibility (or ability) to overcome the main obstacles in other parts of the textile value chain differently. In general, the stakeholders rank critical aspects connected to their own core business highly. Some sorters market-related aspects the highest, recyclers rank aspects regarding material input and fashion companies rank technology-related aspects the highest.

A holistic perspective is required when designing for fiber-to-fiber textile recycling. Trade-offs between design for durability and recyclability are important aspects that enhance durability and long life garments. This is done by designing for the life of the garments, the more worn the garments are, the more synthetic fibers are able to regenerate fiber quality degradation. This trade-off is related to limited supply of high qualities of input material to recycling. The challenge is greater for post-consumer material than for production waste.

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Among the interviewed companies were: Booz Group, Filippa K, H&M, Nyshan Bridge, Re:newal, Medina, Rekapofashion. The interviewed critical aspects are of use for future research work on the selection of policy measures promoting both reuse and fiber-to-fiber recycling of textiles.

The report presents the 43 critical aspects for increased recycling identified, among which are:

- use of mixed textile fibers in textile products
- presence of non-textile materials in textile products
- quality of textile fibers for recycling
- lack of economic viability of textile sorting and recycling
- market prices for recycled textile fibers
- trade barriers for textile waste
- availability of textile recycling technology
- lack of information regarding content in textiles for recycling
- lack of guidance on ownership of used textiles/textile waste

"In September 2016 the Environmental Protection Agency of Sweden submitted a proposal to the Swedish Government on the measures and instruments for a more sustainable management of textiles, aimed at the entire value chain from production and consumption to waste disposal.

In the Environmental Protection Agency’s report, we refer to a variety of results and publications developed within the research program Mistra Future Fashion. Research results combined with constructive communication with concerned scientists have been valuable in efforts to design proposals."
PolyCotton

Anna Palme at Chalmers has continued her work on the PolyCotton project, i.e. separation of polyester/cotton fiber blends, with depolymerisation of polyester from the use of phase transfer catalysts. Investigations on pre-treatment and dissolution methods of cotton fibers have been performed to find the best process. Also, to ensure the optimum recycling process, the work involved identifying the most suitable process conditions for the cotton materials.

Partners involved are Chalmers, SP, the Swedish School of Textiles, Textilia, Södra, MoRe and Recyctec Holding AB.

The results will be published in Anna’s PhD thesis at the beginning of 2017 and the research will continue with further exploration of the two fiber stocks, designing recycling processes and developing prototypes of regenerated textiles from polyester/cotton fiber blend during 2017.

Dye Aspects – Impact on Fibers, De-dying and Environment

Helena Wedin at SP has studied the impact of dye on physical properties of regenerated cellulose fibers and possible required actions if dyes affect the fibers in the process. Partners involved were Swerea, the Swedish School of Textiles, Mofle, re:newcell, Korallen, Senotex. The findings will be published during 2017.

New Sorting Technology and tagging of Textile Materials

A summary has been conducted of the most promising sorting technologies under development and an interview-based study of the potential and opportunities around tagging for information sharing and automatic sorting. The work was led by Finn Englund at SP and involved multiple stakeholders. The report will be published in the beginning of 2017.

Promoters of Fiber-to-Fiber Recycling

Maria Elander at IVL has continued her work on how to overcome the critical barriers to textiles reported in 2016, and will present a study on how to advance on fiber-to-fiber recycling in early 2017. During October 2016, she organized a workshop together with the Swedish Environmental Protection Agency. The work included suggested areas for policy measures and will form the basis for further work which is ongoing. The aim is to improve the assessment of the suggested policies. The aim is to generate a better understanding of which policy instrument will provide the best possible increase in recycling. Target audience for the work includes politicians, government bodies like environmental protection agencies, authorities for chemicals, recyclers, retailers, and collectors.

Henrik Norlin, boardmember re:newcell

“We want to work towards an increased proportion of used textiles that can be recycled in a reasonable way. One focus area is the deinking of different types of textiles, which we are able to test within Mistra Future Fashion.”

Our vision is to create robust processes which, in turn, will enable a circular textile industry. This vision is shared by Mistra Future Fashion, and we appreciate the program’s holistic approach, with various focus areas that is vital in order to be able to create a sustainable textile industry. Where all parts of the cycle are included.”

Henrik Norlin, boardmember re:newcell
expanding with four additional projects 2016

The program’s strategic reserve fund of € 400,000 (2015-2019) for generated four new projects during the year.

FITS
Mistra Future Fashion supports the SF/ES automatic sorting project by contributing to the funding required in the FITS project. Project leader is Nils Sunnerhagen at Swerea IVF. Texting is crucial for enabling change, and anticipatory provides great practice-based findings for the recycling process linked to the automatic sorting of used textiles.

Microplastics in the ocean
Project outcomes are to understand microfiber fabric shedding and shedding from polyester fibers. It contributes with empirical knowledge and a theoretical framework for how to design products and processes to minimize microplastics shedding that could pollute the oceans with microplastics. Sandra Roos at Swerea IVF leads the work which involves industry partners such as Boohoo, H&M, Houdini Sportswear etc.

Circular Speeds
A project together with industry partner Filippa K where the design research team goes in-house and explores new products in commercial production and conducts as part of Filippa K’s next Fashioninnovation project. It enables other partners and designers to learn, parallel workshop sessions with finders and makers will be shared and explored. Project leaders are Kate Goldsworthy and Rebecca Earley at UAL.

Re:Mix
Aims to develop technical methods necessary for separating nylon and elastane in fiber blends in used textiles, as is textels. The goal is to support these efforts enabling innovation of new materials from garments comprised of many different materials. The project leader is Ann Öfverlund at SF and the project involves industry partners such as Swedish Stockings, Boohoo, H&M, Houdini Sportswear, iCo, TEKES, Bank, KTH (Royal Institute of Technology)/SolidFuels, Swerea IVF, SF, and University for Bodenlachs BOKU.

Moving research forward
Enabling new knowledge to be leveraged and utilized is a key focus of the Mistra Future Fashion research program. We call it Value to Others. It’s about making sure the research conducted within the program also gets implemented, whenever and wherever relevant. I.e. driving change towards more sustainable operations with the aid of new knowledge and results in hand leading to the systemic change that we seek. Thus, as soon as we have nice research results we continue our dialogue with consortia partners and stakeholders.

Engaging in international networks
Engaging in international networks aims to enable further use of the Mistra Future Fashion results. In May 2016, Mistra Future Fashion joined the industry network Sustainable Apparel Coalition (SAC) and contributed to its set-up of the Higg Index and played an active role in its Transparency Group. In December 2016, the program also joined forces with the European Circular Action Plan (ECAP), and together with the Danish Fashion Institute co-hosted their workshop on digitalization and Design for Longevity.

value to others

We call it Value to Others and it is about making sure the research outputs also gets implemented when and where relevant.

Engaging in sister projects
The more the merrier – enabling systemic change is not done by one actor in isolation or in one part of the textile and fashion industry on its own. It requires lots of efforts, by lots of people and organizations. Our researchers are involved in many other research projects such as the Swedish strategic innovation project Blåinnovation and its “Recycled textiles initiative,” the EU Horizon recycling project Tosh2Cash, the EU project Nocial and the sorting project SPTex etc.

Leveraging everyone’s efforts to enable change
Mistra Future Fashion has been involved in an initiative concerning resource efficiency in sustainable fashion initiatives and research in Sweden. It was launched by VTA, the Royal Swedish Academy of Engineering Sciences, 2015, who selected Sustainable textiles from four potential growth areas for Sweden. The reference group included representatives from research, the fashion industry, re-use and recycling etc. The core working group was from Mistra Future Fashion, Smart Textiles and Swerea IVF/BioInnovation, who jointly worked on a proposal for a national sustainable fashion initiative. One of the group’s proposed key responsibilities was to identify actions for enabling faster progress towards sustainable textiles. The working group had advisory members from Filippa K, H&M and Swedish Fashion Council. The proposal will be further explored during 2017.

With intent to complement with additional ideas and partners, the program announced an open call during fall 2016 with 40 000 € to new ideas with key focus areas:

- digitalization, implementation, scale-up services
- sustainable innovation, development, new business models
- others
events - Rebecca Earley from UAL in eight minute video at the Hybrid Talks event in Stockholm arranged together with Miks and the Swedish Fashion council (SFC) (Feb). A panel debate in the vlog episode "Ultra-fast fashion can be both democratic and sustainable" by "Fashionomics" by the weekly Webinars Affair with the SFC, Earley (UAL), RASP, and Midsommarkrysset (Feb). The "Understanding clothes" event in Eskilstuna by Södertörn University, Eskilstuna Fabrikskollegium and Stockholmjuniortextil with panel debate with the Mistra Future Fashion (MFF) program director Sigrid Barnekow, the Swedish Environmental Protection agency, H&M, Conscious Consumption and Fortrade (Apr). Kate Goldsworthy from UAL presented Design for Circularity at H&M’s 100 Circular Lab event in London (Apr). In connection with the Copenhagen Fashion Summit, the Swedish Embassy in Copenhagen arranged on event where H&M, Filipa K and Houdini presented Swedish examples of sustainable fashion and research (May). At Nordic Fashion Days by Nordic embassies in Tangere and the Exhibition of Swedish Fashion Design together with Tone Tobissön, the editor of Nice.org, Barnekow held lecture and a workshop for local designers and companies (May). Researcher on Strategic Design, Claas Vanriekelt at UAL shared at TEDxHealthy how consumers can engage with ethical fashion and how sustainability asks us as humans to consider really deep questions about our personal relationship to nature and the ethics of our actions (May). Goldsworthy was interviewed by Pro-Activists at the Rethink Fashion event in London (June). During Stockholm Fashion Week Barnekow talked at a sustainability seminar together with Elin Fredenberg, CEO of the SFC in Stockholm Fashion District (Aug). At NK Talks - conscious consumers, a talk on sustainability and fashion where Barnekow together with Elin Larsson, sustainability manager Filipa K, in Stockholm talked about today’s sustainability challenges and how to act in order to be sustainable as a consumer (Sep). Both Earley (UAL) and Barnekow were speakers at the "Facing the Fashion Paradigm Shift - The Relevance of Sustainability" seminar in Berlin in connection with the Swedish official state visit to Germany, organized by the Swedish Institute, the Swedish Embassy in Berlin, the German Sustainability Foundation Hesnert Stiftung and fashion school Esmod Berlin (Oct). Goldsworthy (UAL) spoke at the event "Beyond Green: Towards a zero waste industry" in Amsterdam regarding the practical challenges and opportunities surrounding the topic of zero waste, arranged by Circle Economy and the Amsterdam Fashion Institute (Oct). At the Global Fashion Conference 2016 in Stockholm Goldsworthy’s paper on Circular Fashion, Making clothes (Materials) last longer were shared (Oct). "Fashion’s new clothes - a smart fashion industry", in the Swedish Economic Growth conference in Stockholm, along with other key Swedish sustainability spokespeople from the fashion industry, Barnekow discussed the circular industry in the future, arranged by the Swedish Agency for Economic and Regional Growth (Oct). Support in local engagement on sustainable fashion and the link to the Nordic region was provided during the event Fashionable Biconomy in Baltic Sea region in Stockholm, arranged by the EU Strategy Forum for the Baltic Sea Region, and explored how the Baltic Sea region can take a leading role in developing sustainable textile industry, with Dagfinn Høybråten, Secretary General of the Nordic Council of Ministers and Sven-Erik Bucht, the Minister for Rural Affairs, Sweden, with discussion panel with representatives from Swavee, H&M, Houdini Sportswear and H&M (Nov). Driving the agenda on an international level, a group from Sweden arranged an UN event at the climate meeting COP22 in Morocco. Together with key spokespeople from Smart Textiles, KTH, Filipa K, Tretorn and Dedicated Institute, MFF held a joint panel and audience discussion that sought to decide on action points for change. The event was initiated and moderated by The Bridge (Nov).

dissemination examples - For dissemination and learning purposes, two one-hour webinars were launched - the "environmental impact of clothes" where researchers Gustavo Saadis Albertsson at IF and Sabina Ross at Swavee AB presented the 2017 UCL study of five garments that was scaled up to the national level to give figures on the environmental impact of Swedish fashion consumption. In What do the planetary boundaries mean for fashion? Saadis Albertsson outlines the procedure, assumptions and arguments made concerning the planetary boundaries as well as how it can benefit the fashion industry. Based on the article “Using the planetary boundaries framework for setting impact-reduction targets in the LCA contexts” from 2018.

mistra future fashion events - Annual meeting & workshops - 95 persons & 41 partners on September 7, researchers and industry partners gathered for the annual program meeting and workshops. The Supply Theme workshop, led by Sandra Ross, worked with communication requirements on sustainable circular options and environmental performance, starting from the LCA of the Swedish clothing consumption. Theme leader of Recycling, Hanna de la Motte, let her workshop go under the magnifying glass, reaching down to the molecular level for the understanding of circularity for textiles. In workshop 3 - Fab Labs for the textile and fashion industry, the User theme group explored the potential of sustainable innovation through local textile and fashion production, facilitaded workshops and cross-disciplinary partnerships.

Together with the Embassy of Sweden in London, Mistra Future Fashion and UAL arranged the event “Design for Circular Economy with Filipa K and H&M” in November. With the design exhibition and panel debates, it kicked off the following two-day Circular Transitions conference targeting UK media and key stakeholders within design & fashion. The discussion was moderated by Rebecca Earley at UAL around circular fashion, the relevance of understanding Speed of materials vs products, and what is required for industry to adapt to a circular design process. H.E. Ambassador Torbjörn Sohlström hosted the event at the Swedish Residence in London and the panel consisted of Kate Goldsworthy at UAL, Elin Larsson, sustainability director at Filipa K, Catarina Midby sustainability manager UK at H&M and program director Sigrid Barnekow.
contributions 2016

doctoral theses


book chapters

conference contributions


conference presentations


events, workshops, lectures


webinar presentations
Sandin G, Ross S, LCA på svensk modekonsumtion. Webinar within the Metro Future Fashion research program. May 17, 2016. Available at: https://www.youtube.com/watch?v=9Qy-hN2YqI-4


academic publications


reports

earley r, 2016 the textile toolbox [presentation], sustainability and textiles: reinforcement and innovation. summer institute, fashion institute of technology, ft, 8 - 11 june - fit 2016.


earley r, 2016 mindful manufacturing, talk & panel, hub kx, london, 14 june.

earley r, 2016 h&m circular lab launch event, talk, london, 14 april.

valeth c, 2016 tedx sydney salon https://tedxsydney.com/event/tedxsydney-salon-september-2016/

circlular transitions international conference (2016) mistra future fashion /ual co-sponsored event. tate britain and chelsea college of arts, london, united kingdom, 23-24 november.

designing fashion & textiles for the circular economy panel & showcase (2016) metro future fashion, in collaboration with ual and the embassy of sweden, 23 november.

fast and slow fashion industry workshop sustainable and textiles: reinvention and innovation by earley r (2016) summer institute, fashion institute of technology, ft, 8 - 11 june.


metro future fashion annual program meeting (2016) skofabriken, stockholm, sweden, 7 september.

recycling lecture by de la motte. textiles under the magnifying glass -reaching down to the molecular level for understanding of circularity (2016) metro future fashion annual meeting, skofabriken, stockholm, sweden, 7 september.

webinar presentations
sandin g, ross s, lca på svensk modekonsumtion. webinar within the metro future fashion research program. may 17, 2016. available at: https://www.youtube.com/watch?v=9qy-hn2yq1-4

sandin g, planetary boundaries for target setting. webinar within the metro future fashion research program. june 1, 2016.
selection of media exposure 2016

February

Business Wire, €1,000,000 to be Allocated between Global Change Award Winners in Public Online Vote
Aktuell Hållbarhet, Den svenska modetrenden ligger i handbiten
NRX, Förbrukningsröntgen, Barndus – naturlig anti-bakteriell?
NRK, Slikter & monke bambus som antibakteriell
Habit, 1 miljon euro för att sluta kretslopp för textiltier
Veckans Affärer, Habits veckans affär
SVD, Nordijski dani

March

Le Soir, Les déchets nous habillent
Svenska Institutet, Handelstrender
Finnveden Nu, Mode måste bli mer miljövänligt

April

Habit, Habit miter Sigrid Barnekow
Huffington Post, Flourishing Fashion Working together to complete the circle
Mistra Future Fashion in Örebro Guiden
Svenska Institutet, Framtidens hållbara kläddesign

May

Nordic Fashion Association, Nordic Days in Sarajevo: Three days in Sarajevo: The most successful event in the world
Radio Sarajevo, Za primjer/Nordijski dani u Sarajevu: Tri dana dragucnjih iskustava sa svijeta (for example/Nordic Days in Sarajevo: Three days of valuable experience from the north)
Nordic Design News, Filippa K on the CSR track

June

Style Urbano, Mistra Future Fashion ofrece 60 mil euros para propuestas innovadoras de moda circular
Höglundet Nu, "Det handlar om att ersätta nyproduktionen"

July

Landets Fria, Kläder ska bli mer hållbara
Recyclingsnet.se, Studie genomförd av fiber-till-fiber övervinnning av textiler
Ecostyle.com, Mistra Future Fashion partners with ecoweb institute

August

SR ketnet, Framtidens hållbara kläddesign
SVD, Gömma sköld är högsta mode
SVT news, Framtidens mode: Kompetenterbar
SVT, Rapport, Mode måste bli mer miljövänligt
Söp, ny innovativ produkt och hållbarhet på Söp-fashion-konferens
Finnveden Nu, Det handlar om att ersätta nyproduktionen

September

Habit, Årsövergripning nysaker på tagaten
Ecostyle.com, Project aims to separate nylon and elastan fiber
Ökologiska nyheterna, Hållbara textilier
Huffington Post, End of Life vs. End of Use: Circular Economy, getting more from the clothes that we wear
Örebro Gustaf, Mistra Future Fashion erhåller 60 000 euro
Sö Perfect Guide, Kalendurum
Produkt Aktuellt, Mistra Future Fashion erhåller 60 000 euro till diler för hållbart mode
Habit, Nytt anslag till forskningen om hållbarhet

October

Recycling & Miljöteknik, Forskningsprojekt kring separering av olika textilfibrer
Söderna, Säkta gärna tager vidare
Söderna, Störmodet, Stor H&M satsning kan bli ny miljöprodukt
Svenska Institutet, Hållbar mode uppknörs samma vid statsbesök i Tyskland
Recyclingsnet.se, Artikel Forskningsprojekt kring separeringen av olika textilfibrer

November

Huffington Post, London College of Art’s sustainability initiatives fixed up by Professor Sandy Black
Ecostyle.com, Mistra launches micro fibre research project
Monocle, Eco chic

December

sustainable brands.com, Trending: New Research Looking to Turn Fabric Into Fuel, Keep Microfibers Out of Water
just style, H&M joins polyester ocean research project
RecSource, Investigation Into Queen-Microfibres Launched
Ecostyle.com, Mistra launches micro fibre research project
Welt, Sogar die Bluse von Primark halt länger als eine saison
Ecostyle.com, London conference debates textile design and circular economy
## Financial Report

<table>
<thead>
<tr>
<th>Updated Program costs 2016, Phase 2</th>
<th>Total Budget kSEK</th>
<th>SRV supported tasks kSEK</th>
<th>Total Mistra kSEK</th>
<th>Reported Costs 2015 kSEK</th>
<th>Reported Costs 2016 kSEK</th>
<th>Total % used budget kSEK</th>
<th>Inkind contribution from partners *</th>
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*) Only reported until June 2016
The current system for fashion is broken. Given the environmental impact and challenges linked to production and usage, a new model is required.

Mistra Future Fashion is a research program that focuses on how to turn today’s fashion industry and consumer habits toward sustainable fashion and behavior. Guided by the principles of the circular economy model, the program operates cross disciplinary and involves 45+ partners from the fashion ecosystem. Its unique system perspective combines new methods for design, production, use and recycling with relevant aspects such as new business models, policies, consumer science, life-cycle-assessments, system analysis, chemistry, engineering etc.

MISTRA is the initiator and primary funder covering the years 2011-2019. It is hosted by RISE Research Institutes of Sweden in collaboration with 12 research partners.