



The holistic design process tested in the research project Circular Design Speeds results in products sold by the project's collaboration partner, Filippa K. The coat shown in the photo is made of recycled wool.

## FASHION REVOLUTION

Fashion is one of the most polluting industries in the world. The Swedish fashion industry is in a development phase in which a transition to more sustainable and circular business models is as natural as it is necessary. It's an exciting time, when research, innovation and cross-disciplinary collaborations can inspire the industry globally.

### Changing the foundation

The behind-the-scenes workings of the global fashion and textile industry are not pretty. Stories about exploitation, unethical labour conditions, inefficient resource consumption and emissions of toxic chemicals and carbon dioxide are much too common.

To achieve a sustainable fashion economy, the industry needs to re-examine all parts of the value chain and change the foundation of the system.

### Bending the linear model

One of the major problems is that the fashion industry is dominated by a linear business model that entails a huge waste of resources, and that is

unsustainable from economic, human and environmental perspectives.

As the industry transitions to a circular economy, every link in the value chain will be connected, and the product's added value will be preserved for as long as possible, while the amount of waste is reduced.

In Sweden, emphasis is placed on the need for new technology, innovation and cooperation between the business sector, academia and the public sector.

### A new role for 'fast fashion'

The trend of fast production of trendy clothing for low prices, 'fast fashion', follows a linear business model and is traditionally about fast sales and rapidly shifting trends.

Fast fashion is problematic, but rather than putting a stop to the phenomenon, the Swedish cross-disciplinary research programme Mistra Future Fashion proposes that fast fashion could become even faster.

Their research underscores the importance of materials that are adapted for different garment lifespans: using biodegradable and compostable materials such as textile fibres from forests will make fast fashion more sustainable. Fast fashion's antithesis, 'slow fashion', should be designed to be used for as long as possible. The manufacturing process and raw material use should match the intended lifespan, to ensure optimal environmental benefits. ►

## SWEDISH INITIATIVES

### A NEW TYPE OF FAST FASHION

The cross-disciplinary research project *Mistra Future Fashion* initiated the project *Circular Design Speeds*, which focuses specifically on the speed of fashion. Working jointly with the *Filippa K* brand, the project is developing 100 per cent circular fashion garments, and the most important insights are shared with the industry.

### INCREASED LIFESPAN

*Nudie Jeans* considers sustainability as a part of its offering – for example by mending its customers’ jeans, and reselling jeans that customers no longer use.

### THE FIGHT AGAINST MICROPLASTICS

In collaboration with Swedish brands *H&M*, *Filippa K* and *Boob Design*, and researchers from *Swerea IVF*, *Mistra Future Fashion* analysed the relationship between polyester fabrics and microplastics. They concluded that fabric cutting should be done using ultrasound, and that microparticles in fabrics should be removed in the production phase. A new project aims to overhaul fabric design and identify solutions for trapping fibres in washing machines before they reach treatment plants.

### LESS WATER

In collaboration with the Spanish denim consulting company *Jeanologica*, *Lindex* has launched a collection of jeans that only require two litres of water per pair to give them a ‘worn-out’ look – instead of the usual 50–70 litres. The new technology uses air and laser, and *Lindex* aims to scale up the new production method to encompass its entire denim range. *Sweden Textile Water Initiative (STWI)* is an initiative based on an increasing number of Swedish fashion and textile brands that provide suppliers with instructions on how to minimise their use of water.

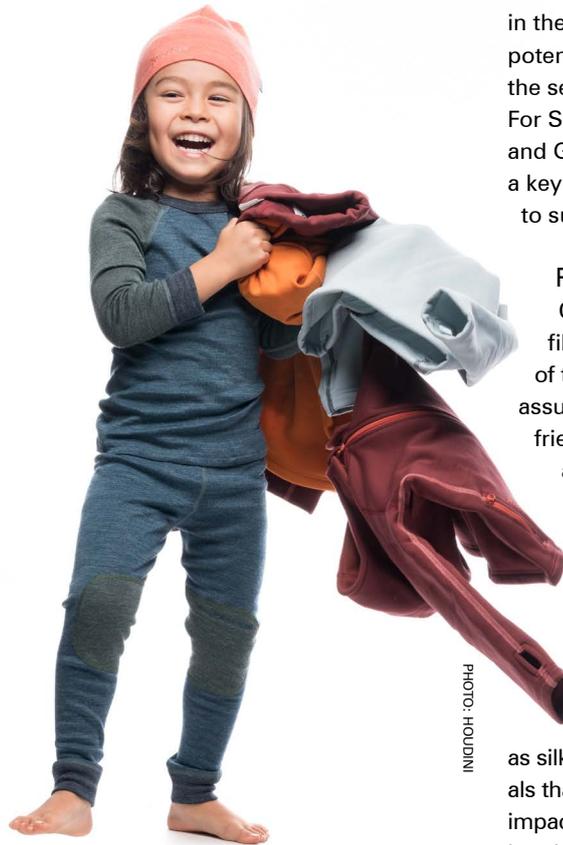


PHOTO: HOUDINI

Sustainability for future generations is an integral part of business at Houdini.

#### ► Less impact with longer use

A garment’s useful life makes a great difference in its total environmental impact. If a garment were to be used three times longer, its climate impact would shrink by a full 65 per cent. Choosing second-hand knocks off a full 70 per cent of its climate impact.

Since up to 80 per cent of a garment’s total environmental impact is determined

in the design phase, there is already a potential to make a great difference in the selection of material and suppliers. For Swedish brands such as *Filippa K* and *Gudrun Sjödén*, product life is a key concept in their whole approach to sustainability.

#### Fibres

Clothes are made from natural fibres, synthetic fibres or a blend of the two. Natural fibres are often assumed to be more environmentally friendly since they are renewable and biodegradable, but the reality is somewhat more complicated. The manufacture of natural fibres may require huge amounts of water, chemicals and energy.

According to the *Higg Materials Sustainability Index (MSI)*, leather and natural fibres such as silk, cotton and wool are the materials that have the greatest environmental impact in the short term – on the other hand, they are often more durable.

Synthetic fibres, on the other hand, are usually extracted from fossil oils. To complement to the use of fossil fibres, active efforts are under way to develop and produce better alternatives – such as the cellulose-based material *Lyocell*.

#### Cotton

Cotton farming is one of the world’s most chemical-intensive forms of agriculture, one that also consumes enormous amounts of water and land area. ►

## THE CIRCULAR MODEL

A garment’s life cycle starts with raw material and textile production, followed by design, production, transport and distribution. Next in line is the consumer phase, which hopefully leads to re-use and, ultimately, material recovery. To achieve a circular economy, changes must occur during all phases. New funding methods, market models and political decisions are also needed.



PHOTO: TERRA

The *Deterra®* collection is 100 per cent biobased.

## SWEDISH INITIATIVES

### CERTIFICATION

Many Swedish brands, such as Linex, Velour, Uniforms for the Dedicated, Mini Rodini and Boob Design, sell GOTS-certified garments. The New Wave Group sells garments that are both Svanen-labelled and GOTS-certified. H&M has set a target that by 2020 all cotton must come from what the brand defines as sustainable sources: organic, recycled, or from the Better Cotton Initiative.

### ALTERNATIVE FIBRES

The Tierra brand has developed a jacket completely free of fossil sources. The Deterra® is made of 100 per cent biobased material from sources such as beans, corn and nuts. One of the challenges was to find solutions for zippers, for which they could not find any biobased solution, and therefore chose buttons instead.

### LOCALLY CULTIVATED TEXTILES

The innovation project ‘Establishing locally cultivated textile in Sweden’ (ENTIS) aims to re-establish and strengthen the Swedish textile industry by finding out how sustainable, biobased textile production can be facilitated by textile fibres from forests or recycled textiles.



PHOTO: MARKUS MARCETIC

Made from 11 PET bottles.

### NEW DYEING PROCESS

Swedish We aRe SpinDye dyes synthetic textile fibres before they are woven into fabric. By means of ‘spin-dyeing’, water use can be reduced by 75 per cent and chemical use by 90 per cent. Moreover, the energy consumption and the environmental footprints in the form of carbon-dioxide emissions are significantly lower.



PHOTO: ANNA SIGGE/SMART TEXTILES

This knitted dress, made of 100 per cent paper from Swedish forests, is produced by Smart Textiles at the University of Borås, in collaboration with a number of Swedish companies within the project Design for Recycling. The project is part of the Swedish strategic innovation programme BioInnovation.

- The aim should be no less than to transition to cotton that is organic and certified in accordance with both environmental and social requirements, such as GOTS (Global Organic Textile Standard) – and to develop equivalent alternatives to cotton.

### Water and chemicals

Production, cultivation and post-treatment of fibres require large quantities of water and chemicals. It takes 2–4 kilograms of chemicals and 10,000–30,000 litres of water to produce one kilogram of textile.

The waste water from the textile industry has devastating consequences for both people and the environment. Many responsible companies require that suppliers whose operations include wet processes such as dyeing or washing must purify their water in sewage systems.

### Microplastics

Polyester is currently the most common raw material for textiles on a global level. Just like other synthetic fibres, the oil-based material releases microplastics, which constitute a huge environmental challenge.

All synthetic clothing gives off microplastics when washed, and the plastic fibres continue out via water treatment plant filters, which catch only larger particles, into nature and water.

In our marine environments, the oil-based microplastic particles attract pollutants that are normally not water-soluble, which are then transferred to water animals and plants – and eventually into our bodies via the food we eat.

### Energy and transport

The high energy consumption of the fashion industry is present in every phase of a garment’s lifecycle. Its CO<sub>2</sub> emissions are expected to increase by over 60 per cent by 2030.

Even the user phase consumes energy in various forms, with 22 per cent of a garment’s total climate impact being caused by consumers’ shopping travels.

### Textile recycling

Globally, we consume about 62 million tonnes of clothing per year, and only 20 per cent is re-used or recycled. The fact that the textile industry has no functioning waste management entails an ongoing risk of major resource shortages and environmental problems.

Recycling of textiles is usually divided into mechanical and chemical recycling. In mechanical recycling, only textiles of a single material have been recovered so far, while mixed materials have presented a major challenge.

Regarding chemical recycling of cotton, most of the activity takes place ►

### COOPERATION

Similar to Mistra Future Fashion, Re:textile also deals with research and innovation with the aim of creating a circular textile industry. In March 2017 the Re:design pilot project, in collaboration with Lindex, launched a collection of upcycled products.

Industry networks focusing on sustainability also ensure that the knowledge level and the collective pressure on the value chain have an empowering effect.

The Chemicals Group is an ever-growing industry network that provides the conditions for achieving the national goals around nontoxic and resource-efficient environmental cycles for textiles.



PHOTO: LINDEX

More than half of the garments from Swedish mid-sized brand Lindex are made from sustainable materials, and 91 per cent of their cotton is either organic, recycled or lives up to the Better Cotton Standard.

### GREATER INSIGHT

As one of the original members of the Sustainable Apparel Coalition, H&M participates in promoting the issue of transparency in the fashion industry. With the help of Mistra Future Fashion, the Sustainable Apparel Coalition developed the Higg Index – a holistic self-evaluation tool by which to measure social and environmental impact throughout the value chain.

► on a laboratory scale. Polyester recycling, meanwhile, is full-scale in Asia and expected to go global in the coming years.

**Cooperation and transparency**  
Transparency is a key driving force for change in the fashion industry. Access to information about different

industry actors' sustainability work is important to enable us to understand what the most critical areas of our value chain are.

While many individual brands have made progress in the area, there needs to be a greater collective effort on both an inter-country and cross-industry level. ■

### FOCUS ON RECYCLING

The research project Blend Re:wind has developed a process for chemical recycling of fibre blends consisting of polyester and cotton. Another project, Re:Mix, aims to develop the technical methods required to separate nylon and elastane out of fibre blends. Re:newcell has developed a method for transforming used cotton and viscose into new, biodegradable pulp that can be made into new garments.

## FACTS AND FIGURES

- Swedes buy an average of 13 kg of textiles per person and year, and of that 8 kg are thrown in the garbage – of which 60% could be recycled.
- 15–30% of the plastic pollutants in the oceans consist of microplastics and 35% of that comes from laundering synthetic textiles.
- If a garment were to be used three times longer, its climate impact would be reduced by 65%.
- 2,400 chemical substances are used in textile production, and of these 368 are considered hazardous to our health.
- Choosing second-hand knocks off a full 70% of a garment's climate impact.
- The water consumption of the fashion industry is expected to grow by 50% by 2030.
- It takes 10,000–30,000 litres of water and 2–4 kg of chemicals to produce 1 kg of treated cotton.
- 22% of a garment's total climate impact is caused by consumers' travel.



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