THE NEW FASHION INITIATIVE

TEXTILES

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THE TEXTILE PROBLEM

Each year, **92 million tons of textile waste** is created globally by the fashion industry, and this issue is only worsening. Textile waste is projected to increase by 60% between 2015 and 2030. Accordingly, textile waste is a pressing issue that must be addressed. Furthermore, the **creation of textiles contributes to environmental degradation** through water use, energy use, and air/water pollution. In fact, the **clothing industry is the second largest polluter in the world**, contributing to 10% of global greenhouse gas emissions and 20% of global wastewater. In this paper, the environmental impact of popular materials is evaluated as well as more sustainable alternatives. Finally, we look into innovative companies that are working to revolutionize the fashion industry by minimizing textile waste.

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HIGG INDEX

The Higg Index is an indicator-based assessment tool developed by **The Sustainable Apparel Coalition** to help apparel and footwear companies measure their social and environmental sustainability performance. Essentially, it creates a standard industry approach to measuring and evaluating sustainability impacts and it helps brands standardize how they can improve their production practices across the supply chain.

Assessments

Environmental assessments
Animal welfare, biodiversity, deforestation, etc

Social assessments
Forced labor, wages and benefits, etc.

WHAT DOES IT MEASURE?

BRAND & RETAIL

Helps global brands and retailers assess the sustainability of **product life cycles**, environmental performance of their **operations**, and the social impacts across the **value chain**

Includes the **Higg Brand, Retail, and Management Sustainability Index** (Higg BRM)

PRODUCT

Helps brands, retailers, manufacturers, and academics understand the **environmental impacts** of apparel, footwear, and textiles

Includes the **Higg Materials Sustainability Index** (Higg MSI) and **Higg Product Module** (Higg PM)

FACILITY

Helps brands, retailers, manufacturers, and academics understand the **environmental impacts** of apparel, footwear, and textiles

Includes the **Higg Materials Sustainability Index** (Higg MSI) and **Higg Product Module** (Higg PM)

UNSUSTAINABLE TEXTILES

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SYNTHETIC FIBER

Polyester, Nylon, Acrylic, Etc.

Synthetics are the **most used fiber** in the clothing industry, comprising **63%** of the world's fiber production. **63,000 million tons** of synthetic fiber are produced each year from **petroleum**, a nonrenewable fossil fuel. Raw materials are also dependent on **petrochemical industries** and **fossil fuel extraction** for production, making synthetics **highly energy intensive** and **non biodegradable**. Microfibers are released into waterways every time a synthetic garment is washed, **damaging marine life** and vital ecosystems.

COTTON

Conventional

A naturally **biodegradable** fiber, cotton accounts for nearly **half** of the textiles used in the global clothing industry. Its environmentally demanding production requires massive amounts of water:

10-20,000 gallons of water per jeans

3,000 gallons of water per t-shirt

High levels of **pesticides** and **toxic chemicals** are used: Cotton is accountable for **⅙ of all pesticides** used globally. Chemicals also reside **within the fabric** and are released throughout the lifetime of the garments.

Recycled

Recycled cotton is **more sustainable** than organic and conventional cotton, as it uses **post industrial** and **post consumer** cotton waste. Reducing **water** and **energy** consumption, recycled cotton also keeps textiles **out of the landfills**.

Organic

Organic cotton is produced **without harmful pesticides** and chemicals and is **GOTS (Global Organic Textile Standard) certified**. Nonetheless, organic cotton requires **massive amounts of water** for production.

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UNSUSTAINABLE TEXTILES

LEATHER & SYNTHETIC LEATHER

Leather

Leather is produced from **animal hide**. Raising livestock is associated with massive amounts of **deforestation, water-use, air pollution, and greenhouse gas emissions**. The tanning process used to turn the animal hide into a usable material is the most **toxic** phase of leather production. There are two types of tanning: chromium and vegetable. While vegetable tanning is much more sustainable, chromium tanning is more widely used. Chromium can cause skin reactions, digestive problems, kidney or liver damage, cancer, and reproductive problems. In addition, the **wastewater from tanning pollutes waterways** and causes marine eutrophication.

One of the most enviornmentally-damaging materials

1 kg of leather = 1700L of water + 33kg chemicals

Synthetic Leather

Increasing in popularity synthetic leather, the **vegan alternative** to animal leather, is typically made from Polyvinyl Chloride or Polyurethane mixed with a base material of cotton, polyester, or nylon. Although synthetic leather is estimated to be up to 33% less environmentally harmful than normal leather, it is still created from **plastics manufactured from fossil fuels**. Additionally, the phthalates added to PVC leather are toxic and **banned in several countries**. Since synthetic leathers use plastics, the material takes **years to biodegrade** and contributes to **micro-plastic pollution** throughout its lifetime.

WOOL

Animal Fiber

Wool is one of the most **reusable** and **sustainable** textile fibers due to its long **service life, biodegradability, and suitability for recycling**. Risks involved in the production of wool solicit a search for less hazardous alternatives. Firstly, in certain countries, cleaning options are limited to coal-fired boilers which escalate **greenhouse gas emissions**. China, a significant perpetrator of this issue, generates 18% of the world's wool, second only to Australia in nationwide wool production. Furthermore, no matter the location of the factory in which wool is produced, the extensive cleaning process generates effluents (i.e., dirt and animal sweat salts) which are **highly contaminant to local water sources**. This issue is exacerbated by the lengthy supply chain process associated in wool production: concomitant poor supply chain communication renders wool prone to the accumulation of unregulated pollutants as it is passed through the hands of many unrelated owners.

SUSTAINABLE ALTERNATIVES

RECYCLED FIBERS

What is it?

Recycled polyester is a man-made fabric derived from synthetic fibers. However, instead of new materials like petroleum, recycled polyester is made from existing plastic.

Recycled nylon is typically made from fabric waste found in factories.

Recycled cotton and wool are generated by converting existing cotton and wool fabrics to reusable fibers.

How is it produced?

Existing plastic items are **broken down into tiny chips** which are converted into yarn. When **single-use plastic items** are reused, GHG emissions can be dramatically reduced.

Fabric is shredded and reconstructed into **“pellets”** with multiple reformative uses

Cotton and wool fabrics are **leached of dye** or sorted **by color, shredded** and then **spun** back into yarn.

Environmental Effects

Both **recycled polyester** and **recycled nylon** have the same positive impacts on the environment. The fabrication of recycled synthetics serves to **divert waste from landfills**, and requires **fewer nonrenewable resources** (i.e., water and non-renewable oil fuel) to produce than traditional synthetics.

Because cotton harvesting requires intensive usage of water, pesticides, and insecticides, **recycling cotton** enables the **conservation of these resources**. **Wool recycling** also preserves considerable amounts of these resources, **reducing air, water, and soil pollution**.

PLANT&ANIMAL BASED FIBERS

Linen

A **natural fiber** from the flax plant, linen uses **considerably fewer resources** than cotton or polyester (i.e., water, energy, pesticides, insecticides, fertilizers) It can grow in poor soil and can **rehabilitate polluted soil**, while flax plants also **absorb carbon at high rates**, reducing atmospheric greenhouse gas levels.

Hemp

Hemp is derived from the hemp plant and requires **considerably fewer resources** in production than cotton or polyester (e.g. water, energy, pesticides, insecticides, fertilizers) Hemp can grow in the same soil for years without **exhausting** it.

Silk

Spun from silkworms and **biodegradable**, conventional silk requires chemicals in its production process, making organic silk a more sustainable option.

Lyocell

Derived from eucalyptus from PEFC (Program for the Endorsement of Forest Certification) certified forests, Lyocell is **100% biodegradable** and requires **considerably fewer resources** than cotton or polyester (i.e., water, energy, pesticides, insecticides, fertilizers)

SUSTAINABLE ALTERNATIVES

SEMI-SYNTHETICS

What is it?

Semi-synthetic fibers are made from **natural and raw materials** which are **partially hybridized** with chemical substances.

Rayon, the most widely produced semi-synthetic, is made from cellulose (derived from wood pulp) and treated with mineral acids.

Other examples include Lyocell, Tinsel, orange fiber, pineapple fiber, and Refibra.

How is it produced?

From the plant…Cellulose, a structural substance abundant in plants, is extracted and treated with carbon disulfide to induce depolymerization. The resulting substance is called viscose.

...to fabrication The viscose is then treated with sulfuric acid, causing rayon filaments to develop. The fibers are then stretched and washed.

Environmental Effects

Depending on the type of plant from which cellulose is derived, semi-synthetic fabrics can be produced entirely without the use of **pesticides, fertilizers, or irrigation**, resulting in **lower rates of air, water, and soil pollution**.

Semi-synthetics are **100% biodegradable**, reducing methane and other GHG emissions.

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INNOVATING COMPANIES

BOLT THREADS

BoltThreads is a material solutions company that is working to create more sustainable textiles. One of their materials, Mylo, is a leather alternative made from mycelium, the network of filaments that makes up mushrooms. Not only does this alternative save water and reduce carbon dioxide emissions from not using cattle, Mylo production is free of Chromium and dimethylformamide (DMFa) and not petroleum-based like other synthetic leathers. Consumers will be able to find Mylo in adidas, Kering, lululemon, and Stella McCartney products in 2021. Another innovative BoltThreads material is Microsilk, a textile created by replicating spider vibes. Microsilk's main input is sugar from plants and is protein-based, giving it the potential to biodegrade.

ANANAS ANAM

Ananas Anam is the company that developed Piñatex, a natural textile made from waste pineapple leaf fiber. These fibers are dried naturally and mixed with corn based polylactic acid (PLA) to form a mesh base that is finished to create various types of fabric. Piñatex has been used by Hugo Boss, H&M, the Hilton Hotel Bankside, and over 1000 other brands. Ananas Anam is a socially responsible company that works to create a circular economy and supports rural farming communities in the Philippines by creating additional income streams for pineapple farmers.

ALGIKNIT INC.

AlgiKnit is a biomaterials company innovating to create textiles from renewable organisms. More specifically, they are developing a biodegradable yarn created from kelp, a macroalgae or seaweed. Kelp is extremely sustainable because it replenishes quickly and since it is grown in the ocean, it does not require pesticides or fertilizers or irrigation. In addition, growing kelp helps sequester carbon, filter water, and support the economics of local communities. Though the material is still in development, AlgiKnit has the potential to greatly reduce pollution from the textile industry