SUSTAINABLE FASHION: DESIGN RESEARCH INNOVATION

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The textile and fashion industry is one of the biggest and oldest industrial sectors in the world.
The textile and fashion industry has his place second to the oil industry, as the most polluting industry in the globe.
2016 Statistics about textile industries

- 150 billion clothes produced per year
- 2.5 billion pounds of deadstock clothes in land field
- 2.1 million tons of CO₂ emission from textile industry
- 70 – 100 million tress are cut to make cellulose fabrics each year
- 700 gallons of water require to produce 1 T-shirt

Source: Vouge  April 2016 Future of Fashion Sustainability
2016 Statistics about textile industries

• 93 percent of companies don’t know the origins of their raw fibre

• 61 percent of companies don’t know where their garment were produce

Source: Vogue  April 2016 Future of Fashion Sustainability
These numbers are threatening

The **challenge to the fashion industry** then is in understanding these threats and take **appropriate action** to safeguard its future.
The industry is composed of one of the longest and most complicated industrial chains involving agriculture, fibre production, wet processing, finishing treatment, textile and apparel manufacturing, retail and service sectors, second-hand markets, and waste management.
Textile and fashion industry encompasses a supply chain which is diverse in size, organization, location, complexity and structure.
Each component has a different mix of financial, social and environmental goals.

As such it is difficult to have an ecosystem which works in a single direction with a single goal.
Where are the Heaviest Impacts?
The four heaviest impact areas of the fashion/apparel industry:

1. Raw Materials
   Use of pesticides in cotton fields has an enormous negative environmental impact. Dust storms are caused by Cashmere goat over-grazing.

2. Manufacturing
   Textile dyeing and finishing is a particularly high-volume, high-impact source of water pollution and CO₂.

3. Goods Movement
   Shipping long distance by air emits more than 40 times the CO₂ in using a container ship.

4. Consumer Care
   Washing clothes in hot water has large environmental costs and dry cleaning requires a toxic, persistent solvent.
It’s probably worse than we thought
To keep up with the constant demand of new, inexpensive clothes
to cheap labour, chemical-based fabrics, unsafe working conditions
Hazardous chemicals in clothing
Alkylphenols
Phthalates
Brominated and chlorinated flame retardants
Azo dyes
Organotin compounds
Perfluorinated chemicals
Chlorobenzenes
Chlorinated solvents
Chlorophenols
Short-chain chlorinated paraffins
Heavy metals: cadmium, lead, mercury and chromium (VI)
Negative Influence
Materialistic/ Superficial
Fashion defines us?
Influence on others
Fast fashion

is characterised by

a quick response system or just-in-time manufacturing

that allows for

short production and distribution lead times

enabling a close match of

supply with uncertain demand
FAST FASHION

supports the retailing of

low-cost highly fashionable apparel products

mimic high fashion luxury runway collections
Developments within the supply chain have typically focused on technological production efficiencies and cost in order to maintain low-priced products.
Awareness by key stakeholders of the negative environmental and social impacts of the fashion industry has steadily increased during the last decade.
Governments, media, and activists are quite adept at targeting companies to become responsible and accountable for the social consequences of their activities.
The response has resulted in corporate social responsibility (CSR) and the principles of sustainability being increasingly implemented into the business strategies of the industry.
The challenge of CSR and sustainability strategies is to recognize the equal importance of financial sustainability as well as social and environmental sustainability.
Resource stressed world

Environmental Goals assume great significance

This premise is equally true for fashion
Environmental Principles:

**Water** – the *reduction* of water use and *wastage* across the textiles *supply chain*

**Waste** – *reduction of waste creation* throughout the textile supply chain

**Energy** – *reducing the carbon impact* across the supply chain

**Biodiversity** – the *preservation and promotion of* biodiversity, with an emphasis on *diversification in textile fibres*

move away from a global dependence on raw materials that utilize unsustainable agricultural practices or result in the depletion of finite natural resources
Appropriate actions: The textile and fashion processing

Minimize pollution
Optimize resources
Workers safety
Consumer safety and satisfaction
Sustainability is one of the key issues facing the fashion industry today.
Addressing sustainability issues in the fashion industry is extremely challenging due to the production–consumption relationship.
The Three Spheres of Sustainability

Environmental
- Natural Resource Use
- Environmental Management
- Pollution Prevention (air, water, land, waste)
- Energy Efficiency
- Subsidies / Incentives for use of Natural Resources

Social
- Environmental Justice
- Natural Resources Stewardship
- Locally & Globally
- Standard of Living
- Education
- Community
- Equal Opportunity

Economic
- Profit
- Cost Savings
- Economic Growth
- Research & Development
- Business Ethics
- Fair Trade
- Worker’s Rights

Adapted from the 2002 University of Michigan Sustainability Assessment
Sustainable Fashion

• Sustainable fashion needs a balance between financial, social and environmental sustainability

• How things could remain productive indefinitely without affecting the these 3 sectors
Sustainable fashion, also called eco fashion - to create a system which can be supported indefinitely in terms of environment and social responsibility

Sustainable fashion is part of the larger trend of sustainable design

Sustainable fashion appears not to be a short-term trend but one could last multiple seasons
The first challenge focuses on the wide variety of ways to practice sustainability:

Use of renewable materials and/or non-harmful materials
Low-impact processes
Reuse or recycling of waste materials
The third challenge promote slow fashion

Buy less, choose well, make it last.

— VIVIENNE WESTWOOD

Slow Fashion Process

Design: Emphasis on sustainability or ecological, green, and ethical practices
Production: Emphasis on quality, craftsmanship, and experienced labor
Consumption: Emphasis on education; focus on investment and longevity

Retailer ———— Consumer
SLOW FASHION PROMOTES

- Fair Labor
- Satisfying Human Needs
- Supporting Local Economies
- Robust Supply Chain Relationships
- Enhancing Communities
- Sustainable Design Methods
- Diverse Business Models
- Meaningful Fashion Experiences
- Clean & Efficient Production
- Cultural Diversity
- True Retail Prices
- Resourcefulness

Made with love.
The sustainable fashion philosophy involves the combined responsibility of designers, producers and consumers.

The designers are responsible because they decide which materials will be used and how they will be produced.

The producer’s responsibility lies in ensuring that the processes, materials and certifications are in line with this philosophy.

The customers or the consumers, because they decide where and how to spend their money and purchase new products.
Apart from the supply chain, fashion’s core ingredient is **DESIGN**

Design is the creativity aspect of fashion

With its aesthetics, design drives the fashion world and determines how it can eventually be delivered to the consumer.
Main obstacles in a textile, clothing and fashion industry

M.A. Gardetti, and A.L. Torres
Design and Style are an absolute in the world of fashion.
Design decides which resources are used,
how materials are procured,
which technology & manufacturing processes are utilised,
how the end product is shipped to reach its destination,
how it will be acquired by the consumer and eventually
how it will be consumed and disposed
or impact end-of-life management of the product
A sustainable design will seek to incorporate environmental principles:

**Lower energy and water consumption** through the entire lifecycle – from manufacture, to daily use and disposal;

**Minimize impact on climate change** by reducing greenhouse gas emissions or mitigating them through carbon neutralizing activities;

**Limit resource consumption** through waste-free manufacturing, a preference for renewable resources, and an emphasis on recycled materials;

**Reduce or eliminate waste** by minimizing consumption, reusing when possible, and recycling when necessary;

**Minimize impact on the local ecosystem** and look for ways to incorporate bio mimicry principles where possible;

**Give preference to non-toxic materials** and those that will contribute to the health and wellbeing of humanity;

**Emphasize quality and durability over price.**
By shifting the focus to the design process, products can be designed to influence consumer behaviour, induce sustainable consumption, and reduce impact from use.
Consumer behaviour can have a significant influence on the environmental and social impact of clothing.
Sustainability initiatives must move beyond the supply chain to other areas such as business and product innovation and consumer engagement.
Ethical companies must recognise this and focus on innovation to make sustainability on trend.

There is the potential to lead a revolution in the way the fashion industry is run.
Innovation in textiles is beginning to drive the sustainable fashion agenda forward and exciting things are happening.
Why innovation?

Innovation in **business models** and **supply chain systems** is imperative and necessary in moving towards a more **sustainable fashion future**
Innovation will play a key role in delivering solutions that are both sustainable and competitive.
Some innovative trends need a closer approach: slow textiles, future fabrics, re-inventing the supply chain, herbal dyeing and digital printing, creative use of non-fashion materials, vertically integrating production
LAUNCH 2020 calls for innovators:
Brought together 150 materials specialists, experts, designers, producers, entrepreneurs, and organizations from all over the world **to collaborate and come up** with innovative solutions to the sustainability of the new fabrics.
Whole life cycle of product: from its birth to its finished cycle, including design, raw material extraction, material and garment production, its use, and final disposal.
Recycling and up-cycling play a major role in the sustainability criteria of economic, environmental and social dimensions.

Finding another use for an existing garment, converting (waste) into reusable materials, breaking down or grinding of high-grade materials into their purest raw forms or substrates.
Upcycling includes the performance of value added activity to create a product of higher quality or value than the original.

Upcycling can be done using either pre-consumer or post-consumer waste or a combination of the two.

Upcycled apparel can help people in making responsible choices when purchasing their clothing by respecting the environment.
Research
Focus on improving supply-chain sustainability through the development of cleaner production technologies
The Clean Tee
It is known as the most sustainable T-shirt on the planet.
It has been invented by the company of Nomadix
Its particular properties - it has been totally made from recycled textile waste, without adding water or dye
Sustainable colour
Direct communication from designer to vendor/textile mill

Designer presents a colour fundament (QTX file)

Right First Time (RTF) dyeing the fabrics will improve and limit the wastage of water, energy, dyes and chemicals
Recycling food waste into fibre
Researchers have found that citrus can be turn into raw materials and afterwards, be spun into yarns.

Algae-Based fabrics
Algae is a fast glowing plants that does not require irrigation as they grow besides rivers, lakes and oceans.

Reuse wasted fabrics on textile ground
Waste fabrics in the cutting section to produce another garment
Organic Bamboo fibre
100 percent biodegradable fibre that glows fast and without the aid of chemical agent

Eco Spun
Recycle plastic bottles which has been converted into polyester fibre

Organic Cotton fibre
Grown without artificial herbicides or pesticides
Fabric from Fermented Wine: A group of scientists at the University of Western Australia has produced fabric by letting microbes to work on wine. The scientists’ culture bacteria is called Acetobacter.

Growing garments from microbes: UK-based BioCoutue has developed a method for creating a lab-grown biomaterial that can be shaped or even grown into clothing. Fashion designer Suzanna Lee grows the material from cellulose bacteria, in vats of what amounts to sugary green tea.
Bio-mimicry as design strategy
Biologically inspired design

biomimetic principles

- low energy manufacture
- functionality through design
- multifunctional/adaptive structures
There are a number of organisations which work with fashion designers, organisations and businesses to facilitate, support, or monitor sustainable practices and standards.

Standards & labelling
Affiliation with ethical standards bodies & labelling initiatives
Fair trade labelling
Organic standards
Eco-labelling
Multi-label boutiques with ethical buying policies
Detox fashion
Greenpeace International
Detox Fashion Campaign for a toxic free production
Started in 2011 with 70 fashion companies
Assessment criteria
Transparency disclosure of information about suppliers and hazardous chemicals they discharge,
Per and Poly-fluorinated chemicals elimination substituted with safer alternatives,
Detox 2020 plan
what proactive and preliminary system exists to ensure target is met
Beru kids repurposes deadstock fabrics to make its own collections of clothes
Kooshoo's sustainable shawl
Offers a wide range of wearing starting from a dress to a scarf
The dyeing process of the fabrics are handmade and in a solar powered dye house
PO-ZU collections - They have found alternatives to traditional shoe-crafting

Once bought, it can be customise into whatever you need on a particular day

From old fishing nets that were banned by the European Union
The next-generation designers will be critical to helping create an apparel industry that’s not only cutting edge, but that also minimizes negative social and environmental impacts.
Research

- Emotional Attachment
- Organic Fabric
- Sustainable Approach.
- Down cycling
- Upcycling
  * Cradle to Cradle
- Attitude and Behaviour gap
- Sustainable Colour

PRODUCT

Sustainable Fashion

Design

- Design Process
- Selection of Raw Material
- Choose Manufacturing process
- Delivery Process Shipping
- Zero Cost (low cost)
- Labour

Innovation

Eco Labelling
- Innovative Fabric
- Innovative process
  Air Dye, Digital printing

Recycled Product

Emphasizes Environmental Social

Po-Zu
- Beru Kids Fashion
- Algae Fiber
Sustainable Fashion

- Economy
- Environment
- Social

Sustainability

Reduce, Reuse, & Recycle

Technology
- INK (Digital Printing)

Innovation
- Hand dyeing
- Bio-filtering water
- Digital Printing
- Airdye
- 3D knitting
- Online shopping
- New standards

Materials
- Bamboo
- Hemp
- Recycled glass
- Organic cotton

Recycled, Synthetic
- Plastic bags & beer bottles are been melted & transformed to fibre.
Sustainable Fashion

(eco fashion - better for people, planet and last longer)

Production
- reduce waste
- eco-friendly processes

Distribution
- New concepts, process to reduce pollution, impact on the environment
  - 5 Steps Toward Sustainability

Retail

Use Phase

Cradle-to-Cradle

Consumer Responsibility

Recycle
- Downcycle
- Upcycle

Textile
- Production: reduce pollution
- Eco design
- Smart design

Organic Fibres
- Biodegradable
- e.g. bamboo, organic silk, recycled wool

RESEARCH
- Make use of renewable resources
- Protect environment
- Develop sustainability at all stages in the fashion industry

Cradle

Fibre
One of the fashion’s new trends for the 21st century is the Eco Couture where fashion should be as good for population as well as for the planet. Transforming into the “Eco-Friendly Fashion” is a must have for the future.
Conclusion

The future challenge to the fashion industry is to understand the threats and take appropriate action to safeguard its future, protect the environment and improve the lives of its customers, workers and suppliers around the world.
Becoming Green could be the hottest trend in the world
Designers, innovators, researchers, manufacturers as well as consumers are all accountable to develop a Sustainable Fashion Industry and enforce that the industry complies with the Principles of Social, Economic and Ecological Sustainability.
Fashion has the power to not only redefine our own industry, but become a role model for others to reinvent their practices.

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