

# 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 CO<sub>2</sub> emission from textile industry
- 70 – 100 million trees are cut to make cellulose fabrics each year
- 700 gallons of water require to produce 1 T-shirt

# 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

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

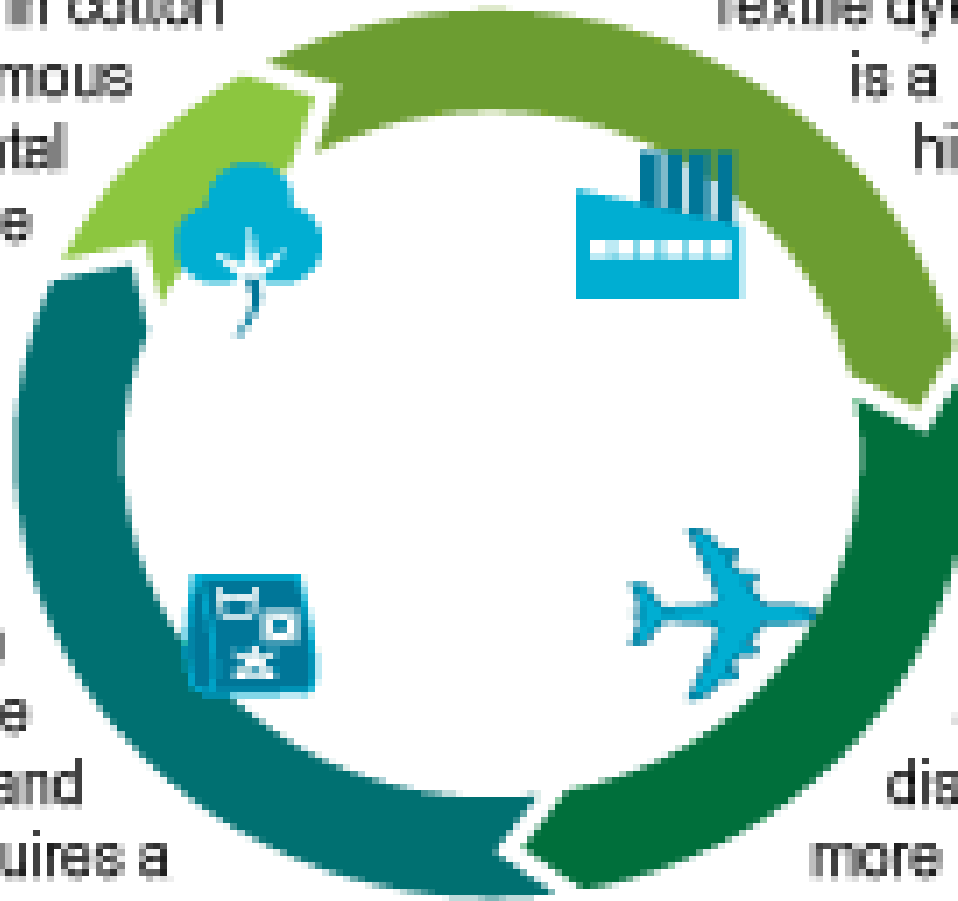
Textile dyeing and finishing is a particularly high-volume, high-impact source of water pollution and CO<sub>2</sub>.

### 3. Goods Movement

Shipping long distance by air emits more than 40 times the CO<sub>2</sub> 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)**

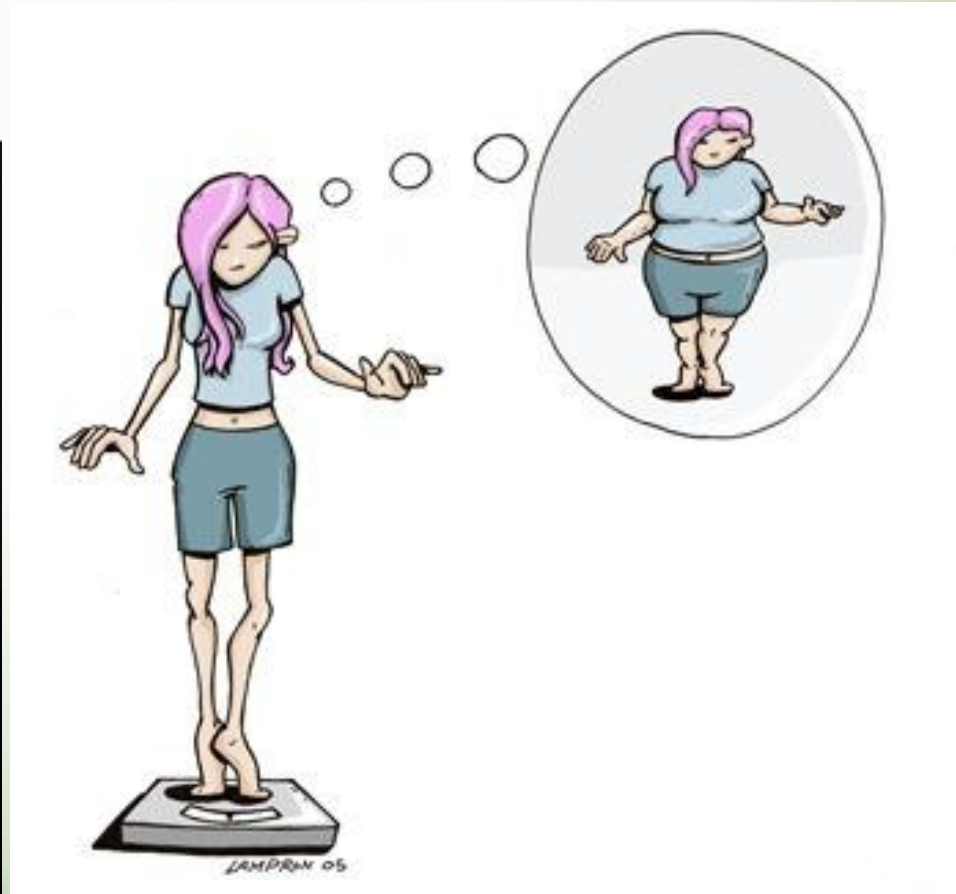


# Negative Influence

## 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

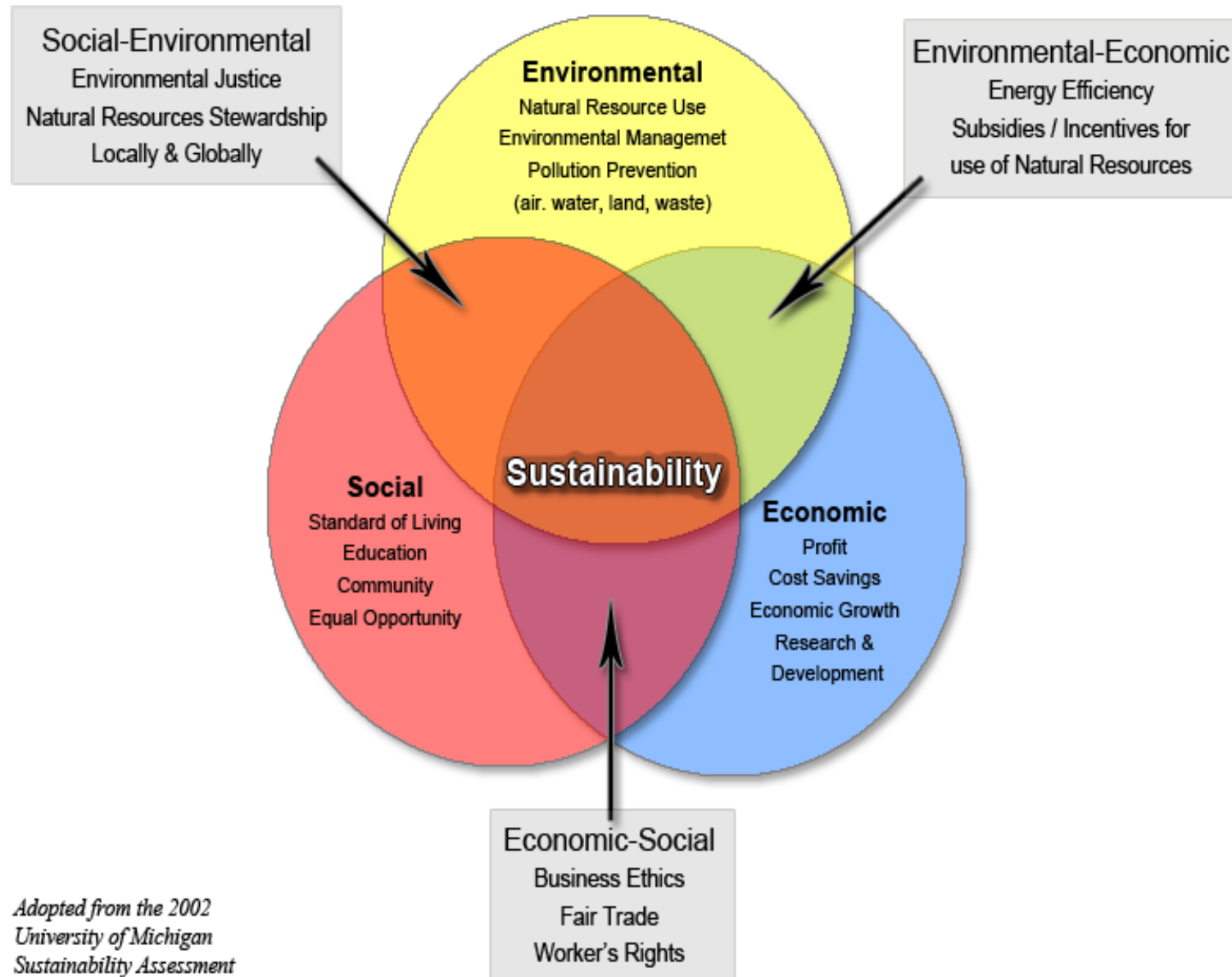
The background of the slide features abstract, organic green shapes on the right side, transitioning from a light green to a darker, more saturated green. The shapes have a textured, painterly appearance. The text is centered on the left side of the slide.

**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*



*Adopted 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**

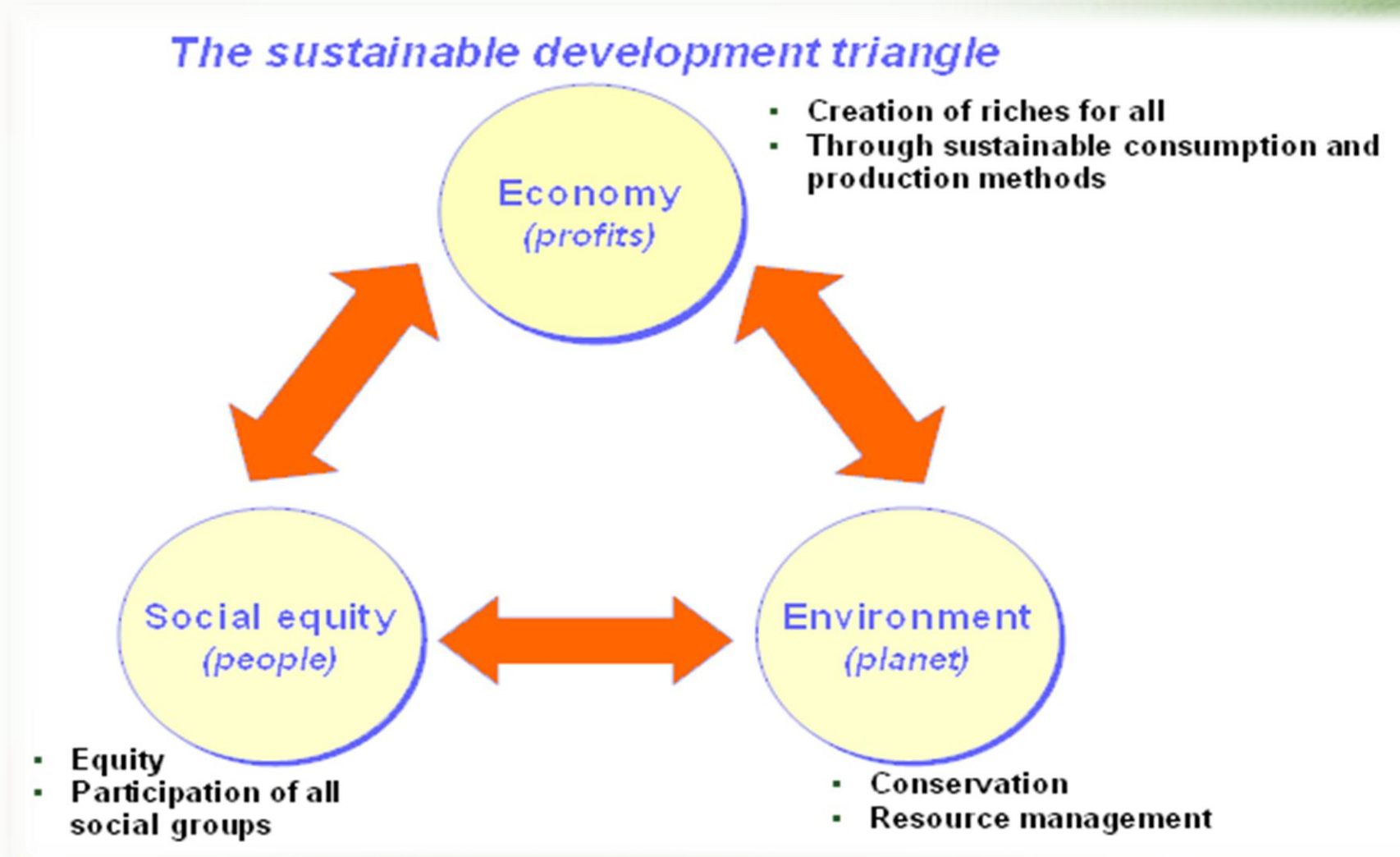
**The first challenge** focuses on the wide variety of ways to practice sustainability

**Use of renewable materials and/or non-harmful materials**

**Low-impact processes**

**Reuse or recycling of waste materials**

# The second challenge: eco-friendly, green, environmental friendly (Hethorn & Ulasewicz, 2008)

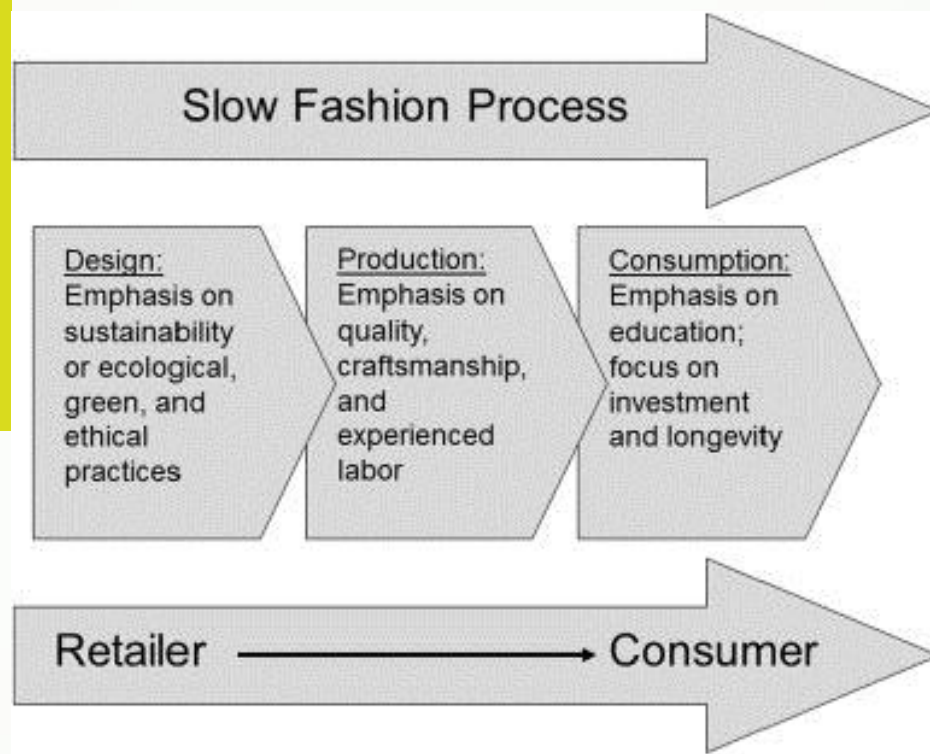




# The third challenge promote slow fashion

*Buy less,  
choose well,  
make it last.*

VIVIENNE WESTWOOD



# 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





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**

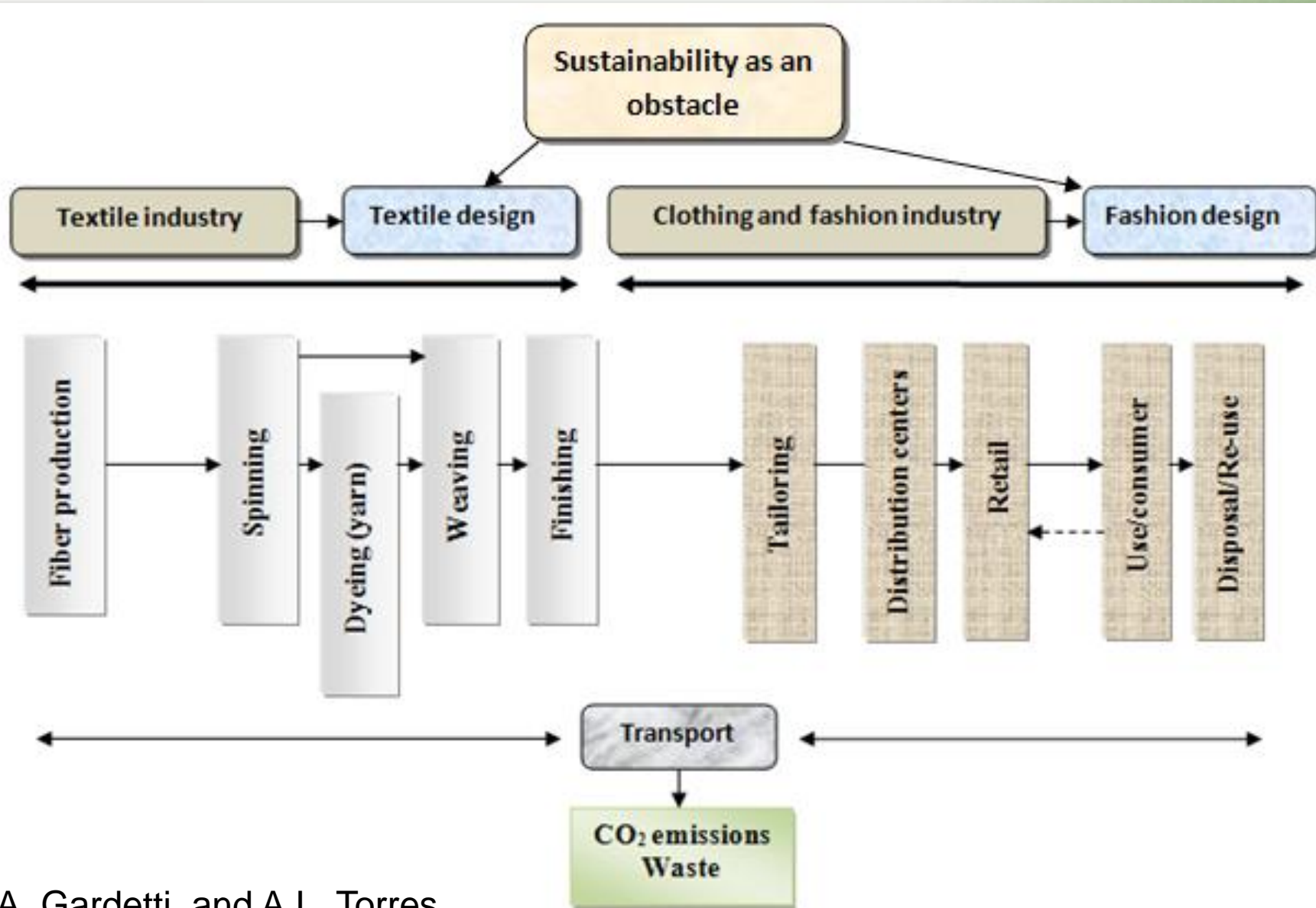
**Design is the creativity aspect of fashion**

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



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**



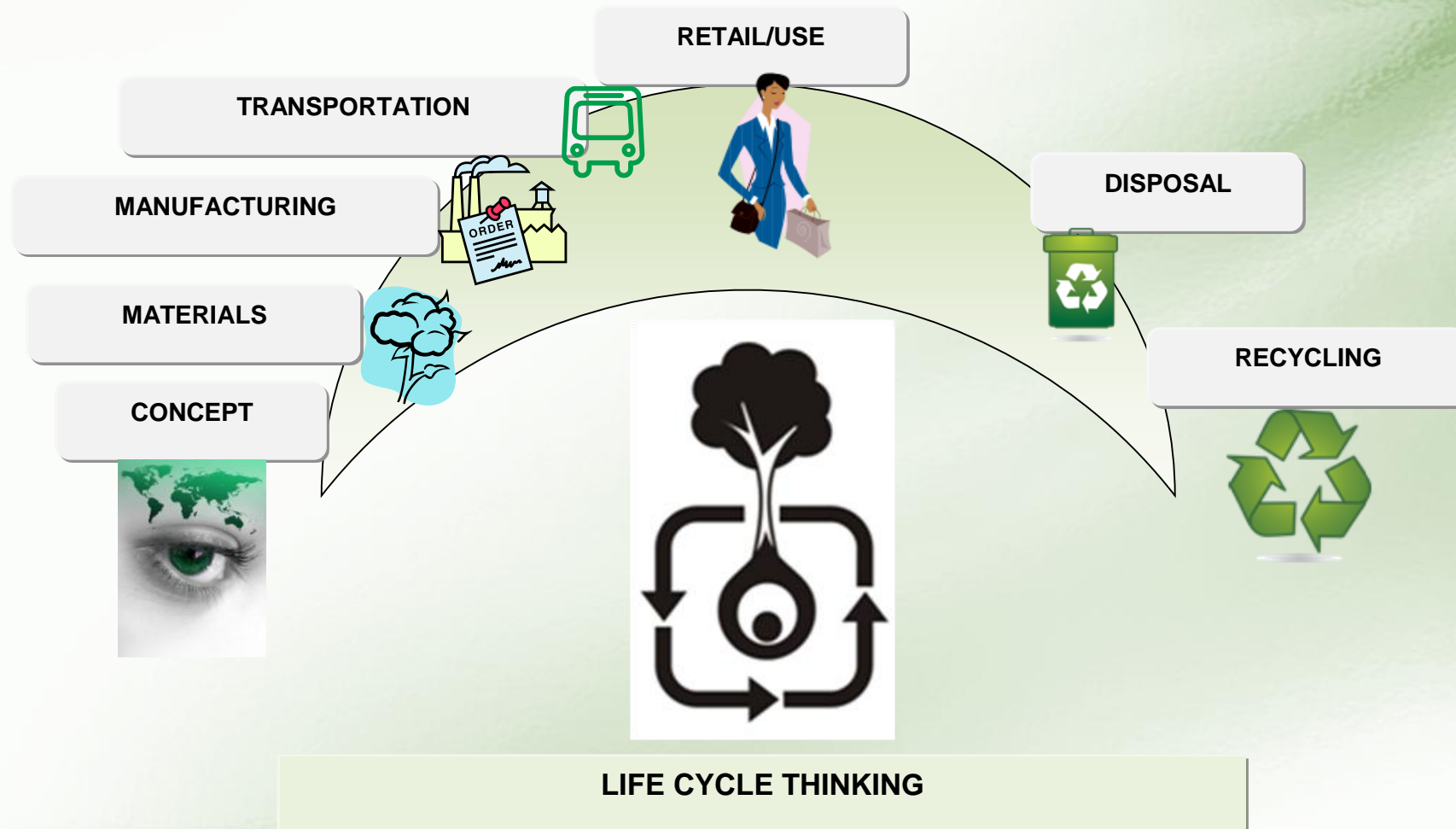
Innovation will play  
a key role in delivering solutions  
that are both  
sustainable and competitive

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

break 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**

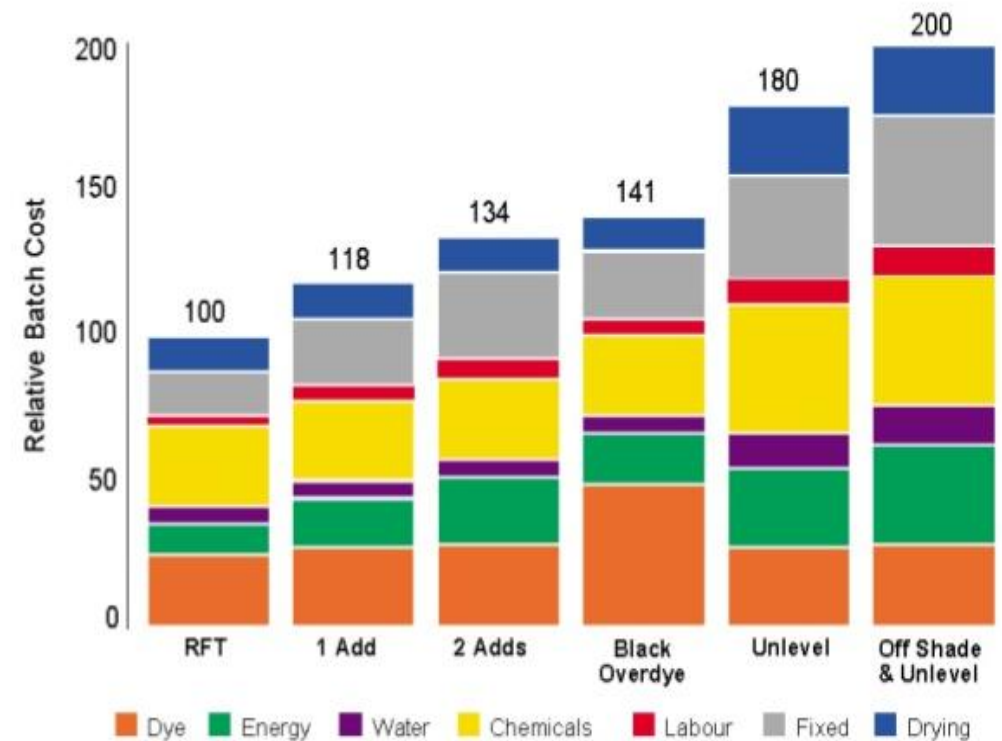


# Sustainable colour

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



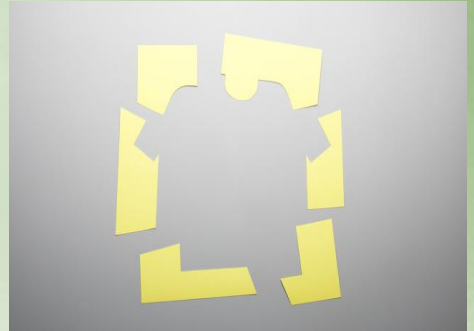
## **Recycling food waste into fibre**

Researchers have found that citrus can be turn into raw materials and afterwards, be spun into yarns.



## **Algae-Based fabrics**

Algae is a fast growing 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 grows 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





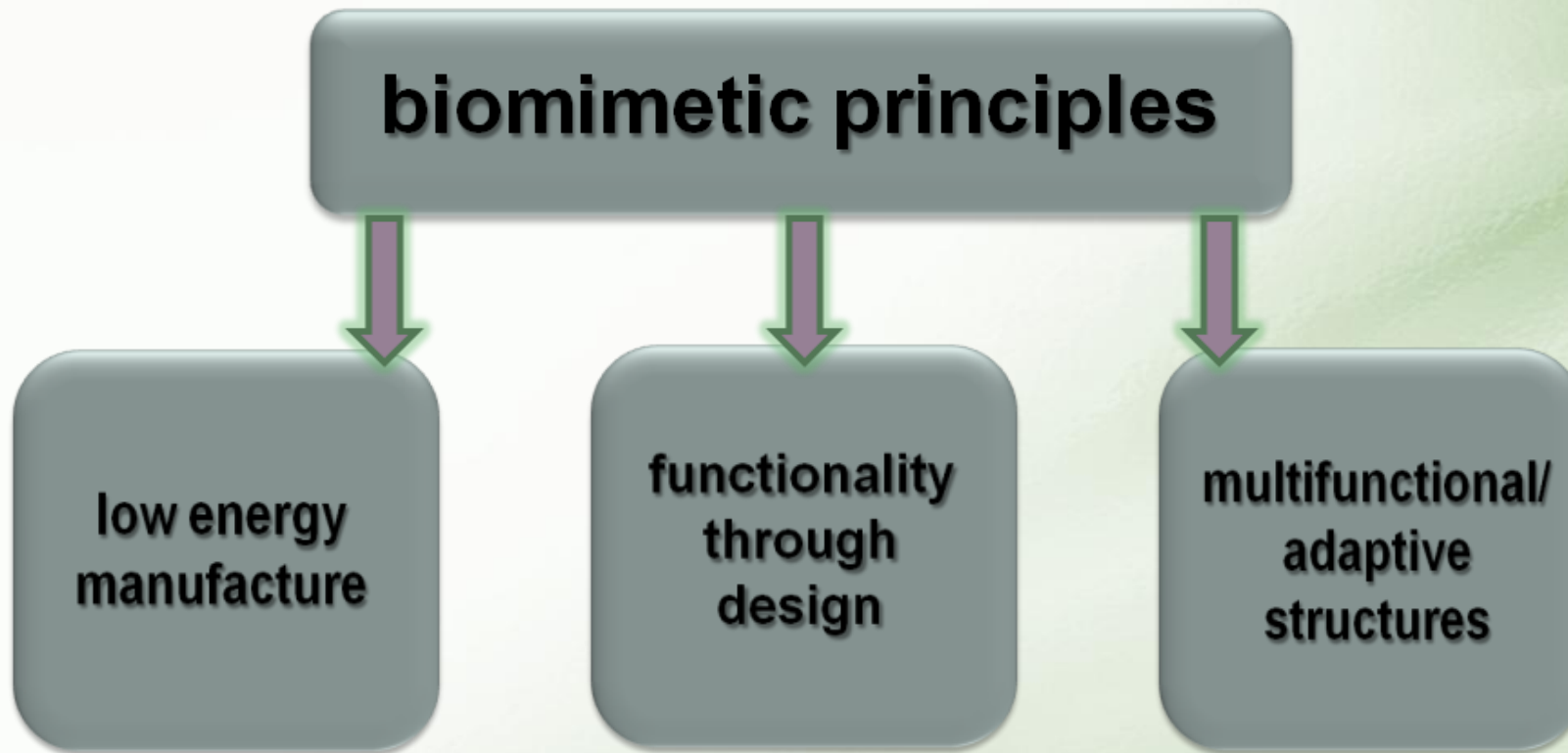
**Fabric from Fermented Wine:** A group of scientists at the University of Western Australia has produced fabric by letting microbes to work on wine. The scientists' culture bacteria is called Acetobacter

**Growing garments from microbes:** UK-based BioCouture 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





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

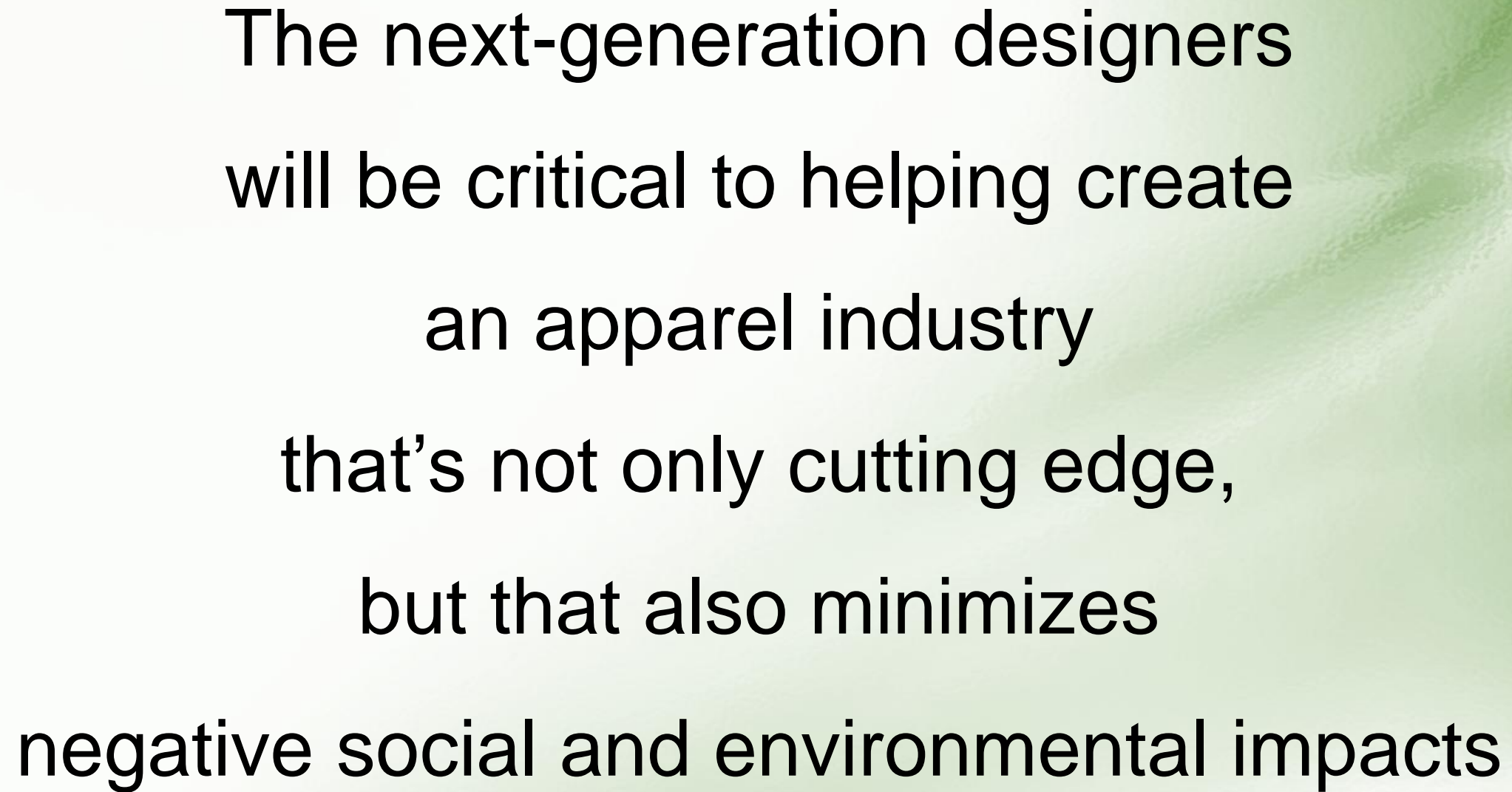


Once bought, it can be customise into whatever you need on a particular day



From old fishing nets that were banned by the European Union



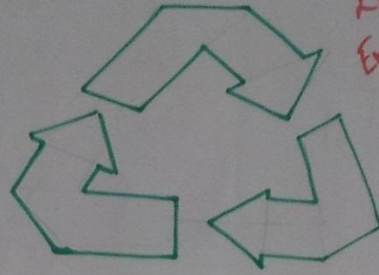
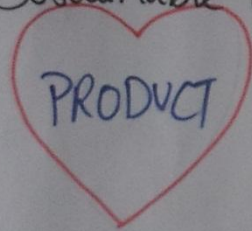
A large, abstract green graphic on the right side of the slide, resembling a stylized leaf or a splash of paint, with varying shades of green and a textured, watercolor-like appearance.

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



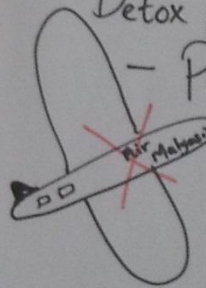
Encompasses  
Environmental  
Economic  
Social

## Innovation

- Recycled Product
- Eco - Labelling
- Innovative fabric
- Innovative process
  - Air Dye, Digital printing, 3D



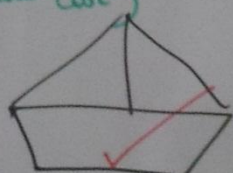
- Eco Spun
- Detox fashion campaign
- Po-Zu
- Beru kids Fashion
- Algae fiber



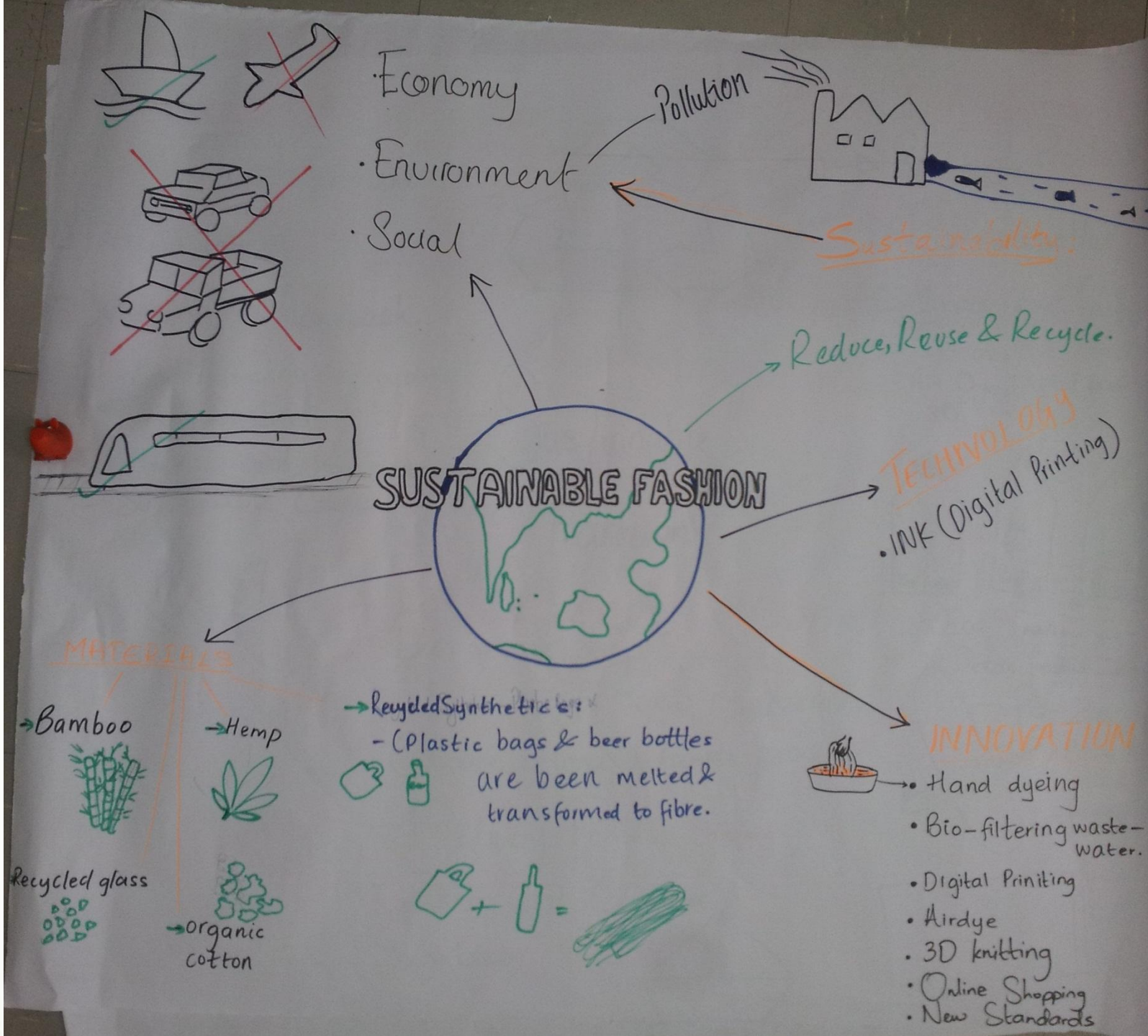
## Sustainable Fashion

### Design

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







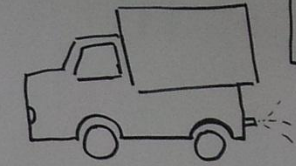




Textile Production  
reduce pollution

Design  
eco design  
Smart design

Production  
reduce waste  
eco friendly processes



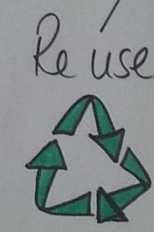
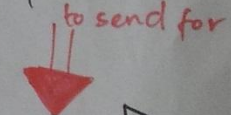
Distribution

INNOVATION  
New concepts, process to reduce pollution, impact on the environment.  
Steps toward Sustainability

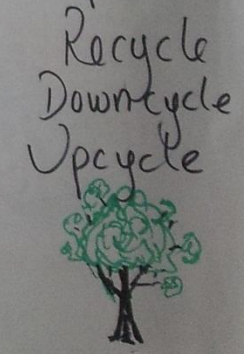
Retail

Use Phase

Grave



Re use



Recycle Downcycle Upcycle

Consumer Responsibility

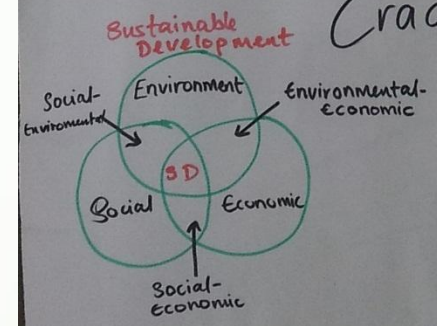


Bad infrastructure

# RESEARCH

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

Organic fibres  
Biodegradable  
e.g. bamboo, organic silk, recycled wool



Cradle-to-Cradle

Sustainable fashion  
(Eco fashion - better for people, planet and last longer.)

One of the fashion's new trends for the 21<sup>st</sup> 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**



**Thank  
you  
for  
your  
attention**

Fashion has the power  
TO NOT ONLY REDEFINE  
*our own industry,*  
BUT BECOME A ROLE MODEL  
*for others*  
TO REINVENT THEIR PRACTICES.

- Timothy Ho, CCA student

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