Circular Design conditions:
Evidences from Re:textile project

Dr. Rudrajeet Pal
Associate Professor, PhD
Swedish School of Textiles, University of Borås
Scientific lead: Re:textile

THE SWEDISH SCHOOL OF TEXTILES
UNIVERSITY OF BORÅS

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RE:TEXTILE – Objectives

Develop new garments to last long through design-led innovations, and thus create new business areas and services that extend the life of the garment and create economic growth.

Develop new design principles, business models, and production systems that enable circular flows in the textile industry.

re:textile

VÄSTRA GÖTALANDSREGIONEN

Boråsregionen
Sjuhärads kommunalförbund

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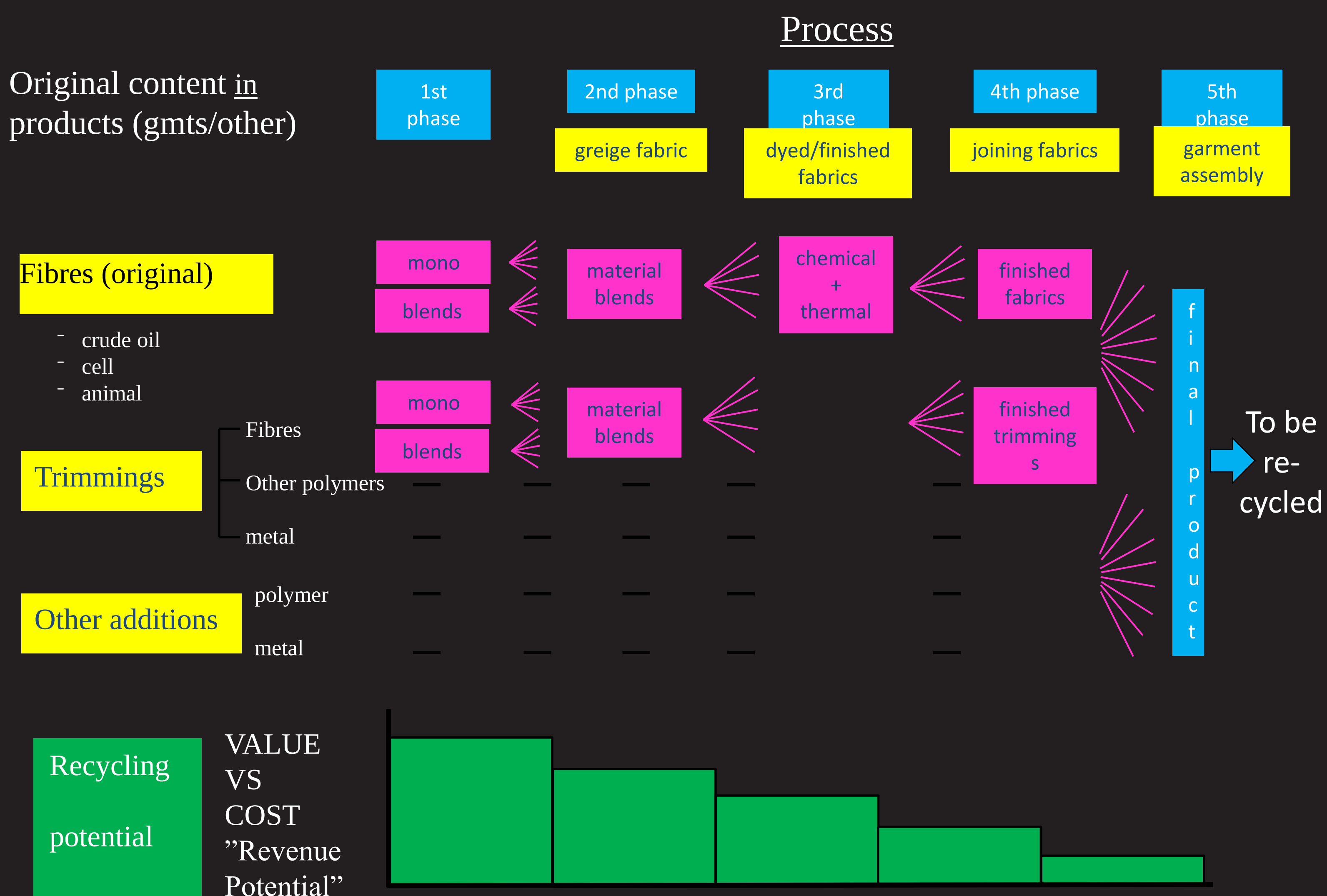
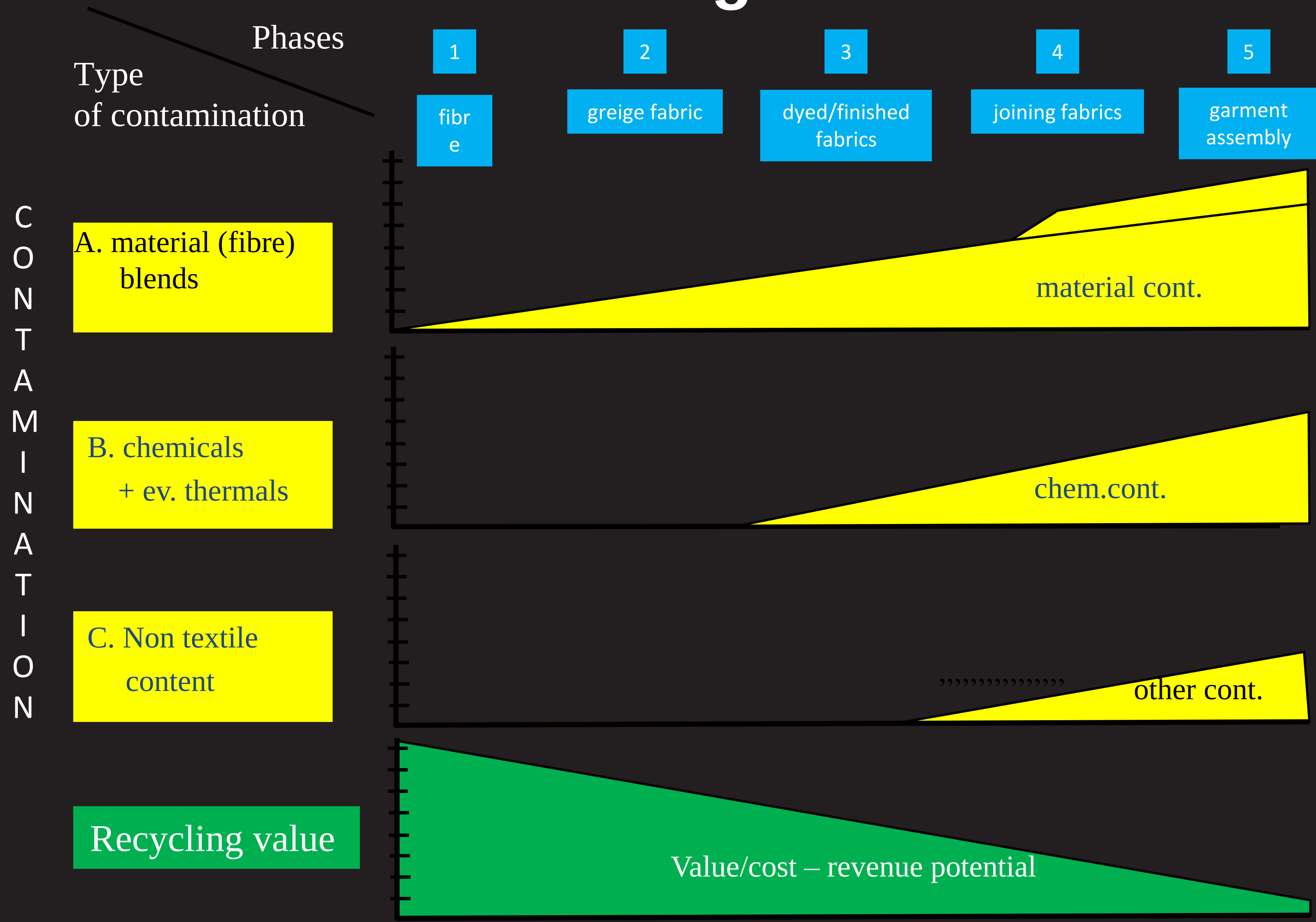
SCIENCE PARK BORÅS

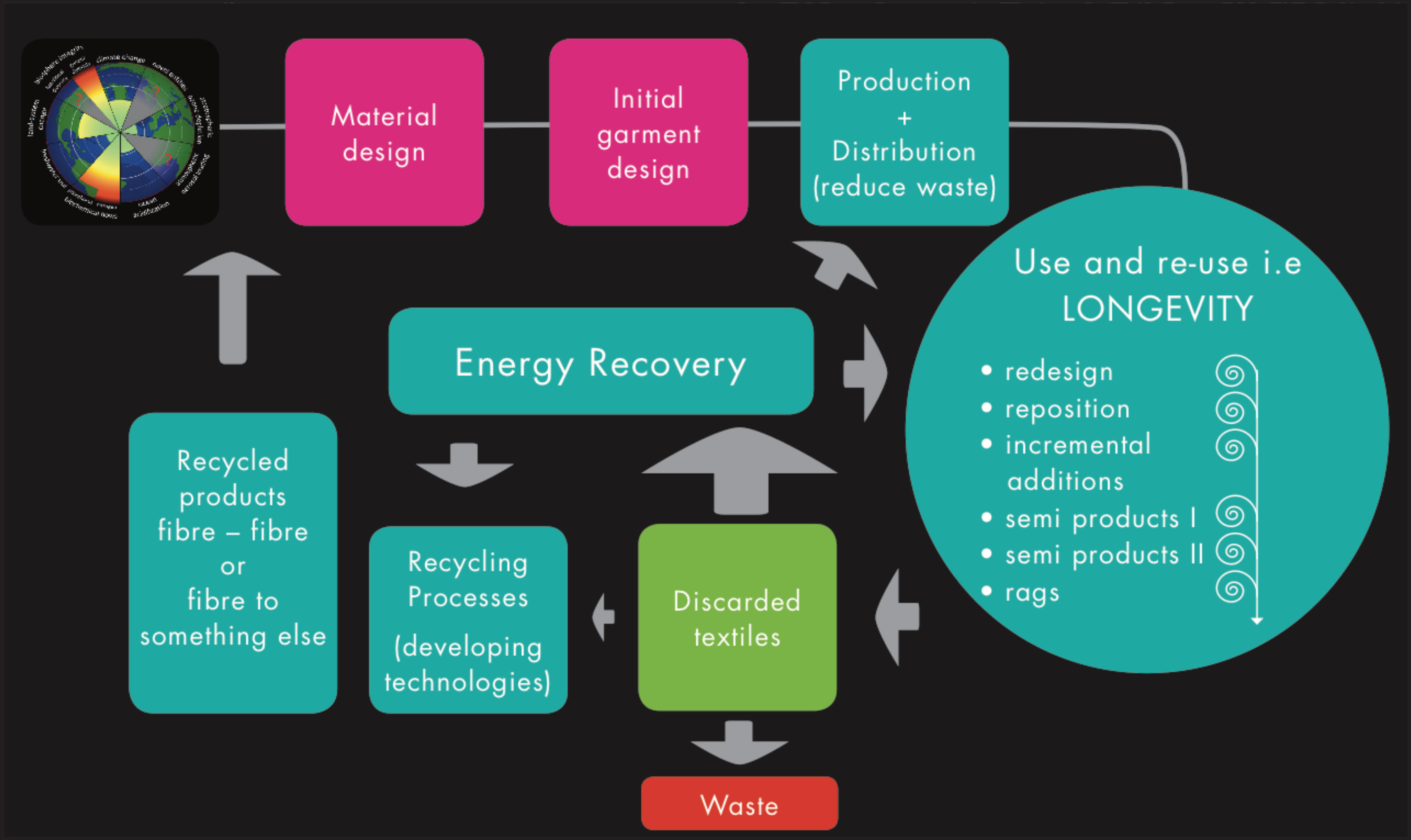
The contamination problem



Value loss along value chain



Power to synthesize a change through initial garment design



Design's power to synthesize a change

Initial garment design

- Design and construction has a huge impact on sustainability in terms of material & component choices, production processes, footprints
  - Conventional apparel design (followed in mainstream fashion industry) impacts 50-55% in terms of resource consumption and footprints
- With conventional design and construction, scope and scale for designing circularity is limited (due to technological limitations, lack of economic viability)
  - In the near future this is aqggrevated by higher fractions for blends.

How can the design process synthesize enhanced circularity?

Design for longevity

115 years - 1 miljon hour

Design for recyclability

Conditional Design Approach

Defn. Delivering and implementing selective and optimal choices of product design which when subjected results in either better recyclability or longevity in the value loops

**Design for recyclability –
Monomaterial, Modularity, techniques for disassembly etc.**

Design for longevity (Quality, timelessness, redesignability) – Modularity, incremental design

Often in Conflict

Systematic Conditional design classifications

DESIGN CLASSIFICATION

CODING SCHEME

C — **NO LIMITS (e.g. Blends)**

C – Non-mono in composition (Not easy to separate), e.g. polyester-cellulose blends

Ex.
C – (ab):
POLYESTER-CELLULOSE BLEND

B — **Manual separation possible by module removal**

B – Contains Non-mono components and needs manual separation by cutting, detaching etc. e.g. removal of labels, pockets, buttons, etc.

B – (A1a):
MONO-POLYESTER AFTER MANUAL SEPARATION

A — **100% Monomaterial**

A1 – 100% Mono
A2 – 100% Mono after Auto. separation

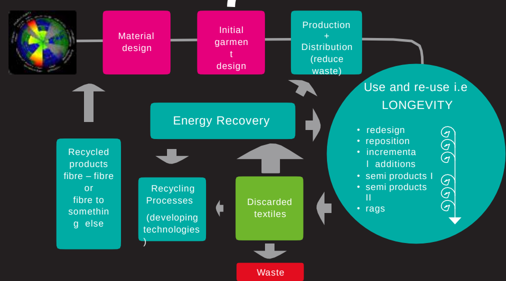
A1 - All material component incl. Trimmings, sewing threads, labels etc. are of the same basic material, e.g. polyester or cellulose

A2 – Contains Non-mono components but can be separated in the mechanical recycling processes (Automatically) after cutting but before shredding, e.g. removal of heavy components such as metal zippers, buttons, etc.

(A1a):
MONO-POLYESTER

(A2b):
MONO-CELLULOSE AFTER AUTO. SEPARATION
…

Design process can classify products from start



Classification of the product from the start

Conditional Design for Closing the loop

DESIGN CLASSIFICATION	RECYCLING SCENARIO
NO LIMITS (e.g Blends)	HIGH VALUE Downcycling/Reuse
Manual separation possible by module removal	
100% Monomaterial A1 - 100 Mono A2 - 100 Mono after Auto separation	Upcycling scenarios Polyester Cellulose Wool ...

Better yield - lower cost

Enables automatic sorting

Enables id coding. (RFID, DNA or similar techn.)

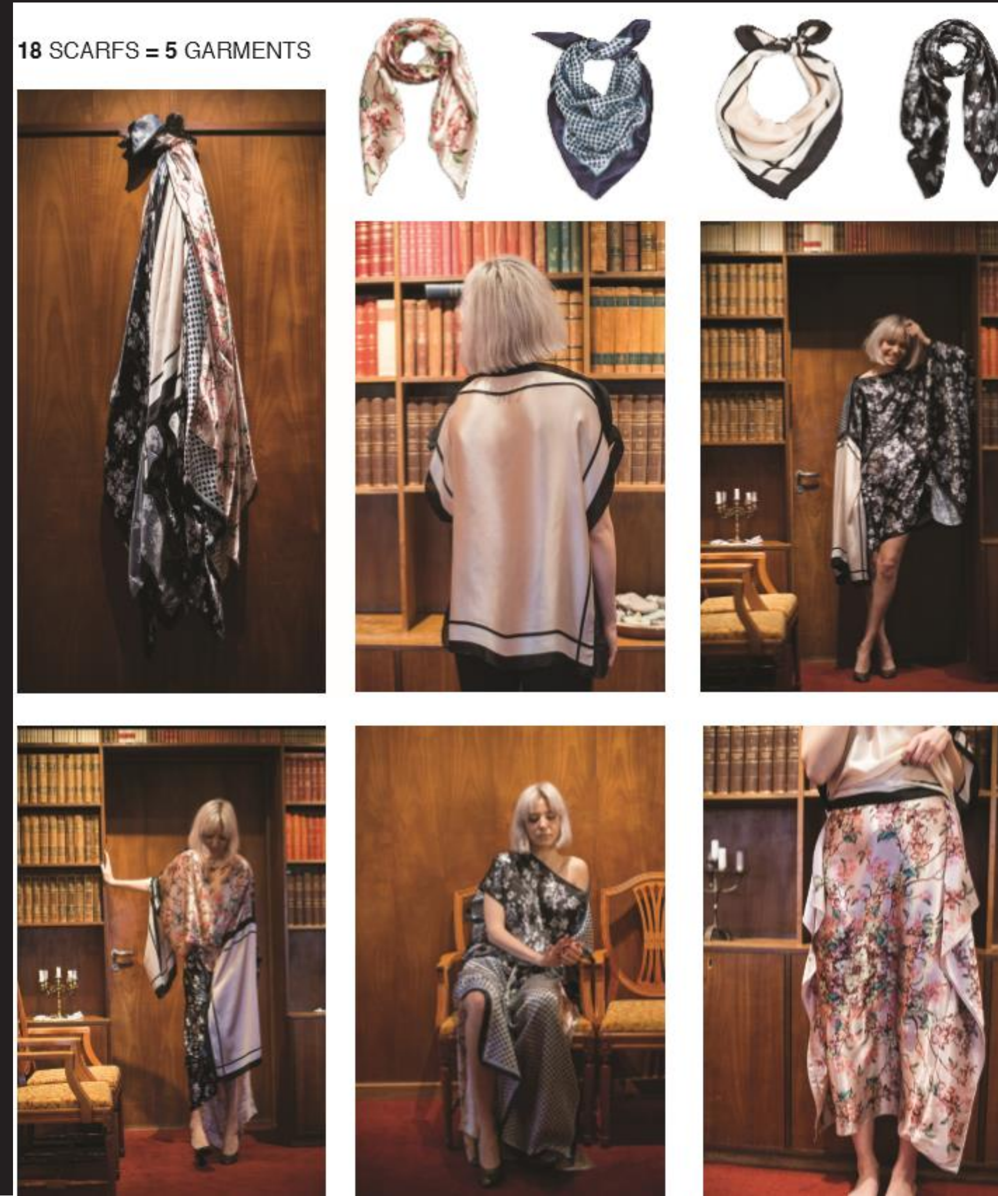
Experiment 1

x LINDEX

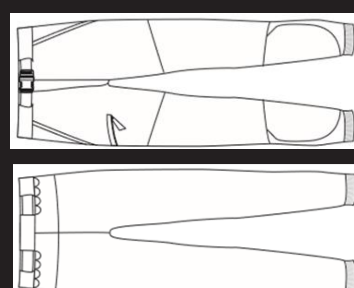
Modular design-led construction principle

B

Design: Anna Lidström



Experiment 2 X Klättermusen
Incremental design-led construction principle



C

Item	Information	Cost		Pricetag	Classification (With current recycling technologies)	Highest possible classification
		Material	*Labour*			
Shell fabric	Windstretch 180g/m2 - 70% Polyamid, 20 % Polyester, 10 % Elastan Bluesign approved, Reinforcement 100% Kevlar, Shoe cleaning area, 100 % Polyester	80 kr/m2	90 min 180 kr Total production cost 460 SEK	2300 SEK	C	C, as this is an example on modularity, the ambition is not to have as high classification as possible but to showcase modularity.
Sewing thread	Polyester	50 SEK/kg				
Zipper	Polyester & Metal	30 SEK				

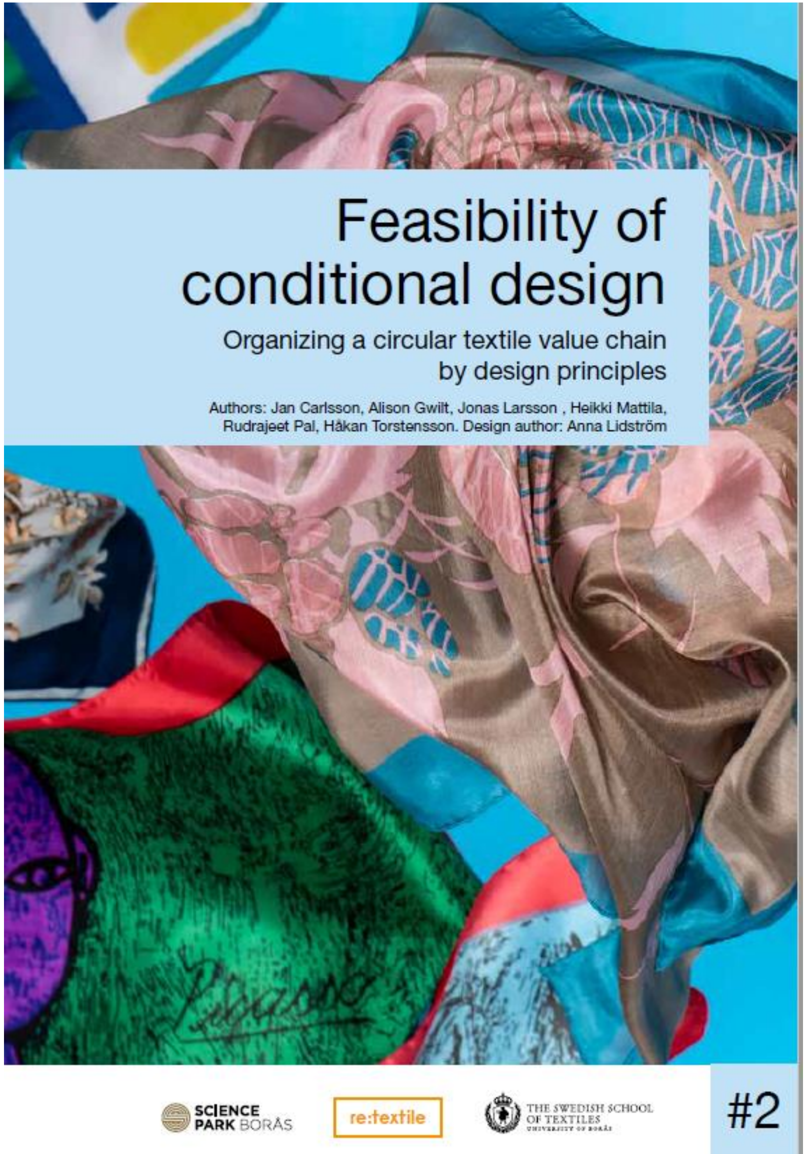
Experiment 3 X Mono-material

Item	Classification	Highest possible classification
1. Houdini C9 jacket (Green jacket)	A2. Polartec® Alpha Insulation, 100% polyester. Teijin C9 ripstop, 100% recycled polyester. Zipper: Polyester ribbons with metal closer.	A1. Zipper closing mechanism needs to be made of metal
2. Houdini Wooler Hoodie (Black sweater)	B. 100% mulesing-free merino wool, Wooler GridMerino 17.5 microns. Zipper: Polyester ribbons with metal closer. Pocket liners: Polyester	A2. Zipper closing mechanism needs to be made of metal. Zipper: Wear2 assembly technology
3. Houdini Commute Pant (Blue trousers)	A2. 100% polyester, Bluesign certified, 282 g/m^2	A1.

A

Three principles

DESIGN STRATEGIES	CIRCULAR STRATEGIES IN VALUE CHAINS	
	DESIGN FOR LONGEVITY	DESIGN FOR RECYCLABILITY
A 100%* Mono-material	The entire garment is made of a mono-fibre material (e.g cotton) and trimmings, which can be separated in the mechani- cal recycling process	Adresses recycling requirements (fibre to fibre)
B Modular	The garment is made up by using modules, which are easily separated in a re-process. Each module is mono-material	Adresses both redesign (longevity) and recycling requirements. Requires separation of modules
C Incremental	The design is made so that it can be incrementally updated during the life of the garment	Combination of longevity and A or B is optimal



Link:
https://issuu.com/hogskolaniboras/docs/rapport_conditional_design