ANFA Nonwovens Conference 2019

Nonwovens is the one of keys of Circular Economy Transformation in Textile sectors

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2019.11.08

紡織產業綜合研究所
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Speaker

Chief of Sustainability and Certification section, Department of Testing and Certification

- **Education**
  - Master of Design, Department of Product Design, Ming Chuan University
  - Msc, Institute of Organic and Polymeric Materials, National Taipei University of Technology
- **Experience**
  - 2011~2013 Provide auditing service for the Environmental Verification Program of the Brands
  - 2014~2015 Join the Renewable Energy Advisory Group of Cradle to Cradle Innovation Institute
  - 2013 Provide consulting and training service for Cradle to Cradle product certification to textile sector in Taiwan

How many people in the world?

https://www.worldometers.info/world-population/

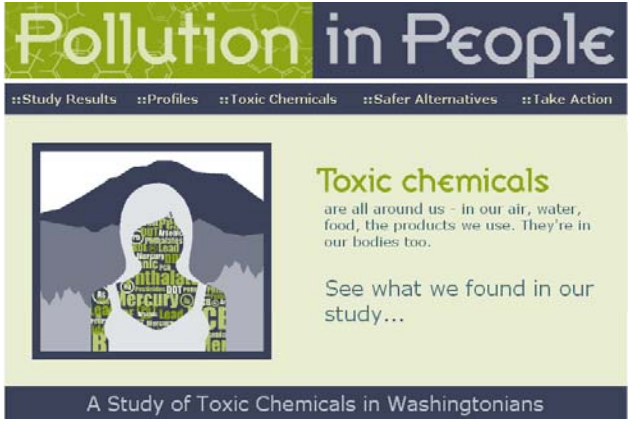
7.7 billion (2019.10)

Middle class consumers

DELI, 2019.11.06

Picture from:
https://www.facebook.com/taiwan.aerial.imaging?hc_location=stream

Post consumers

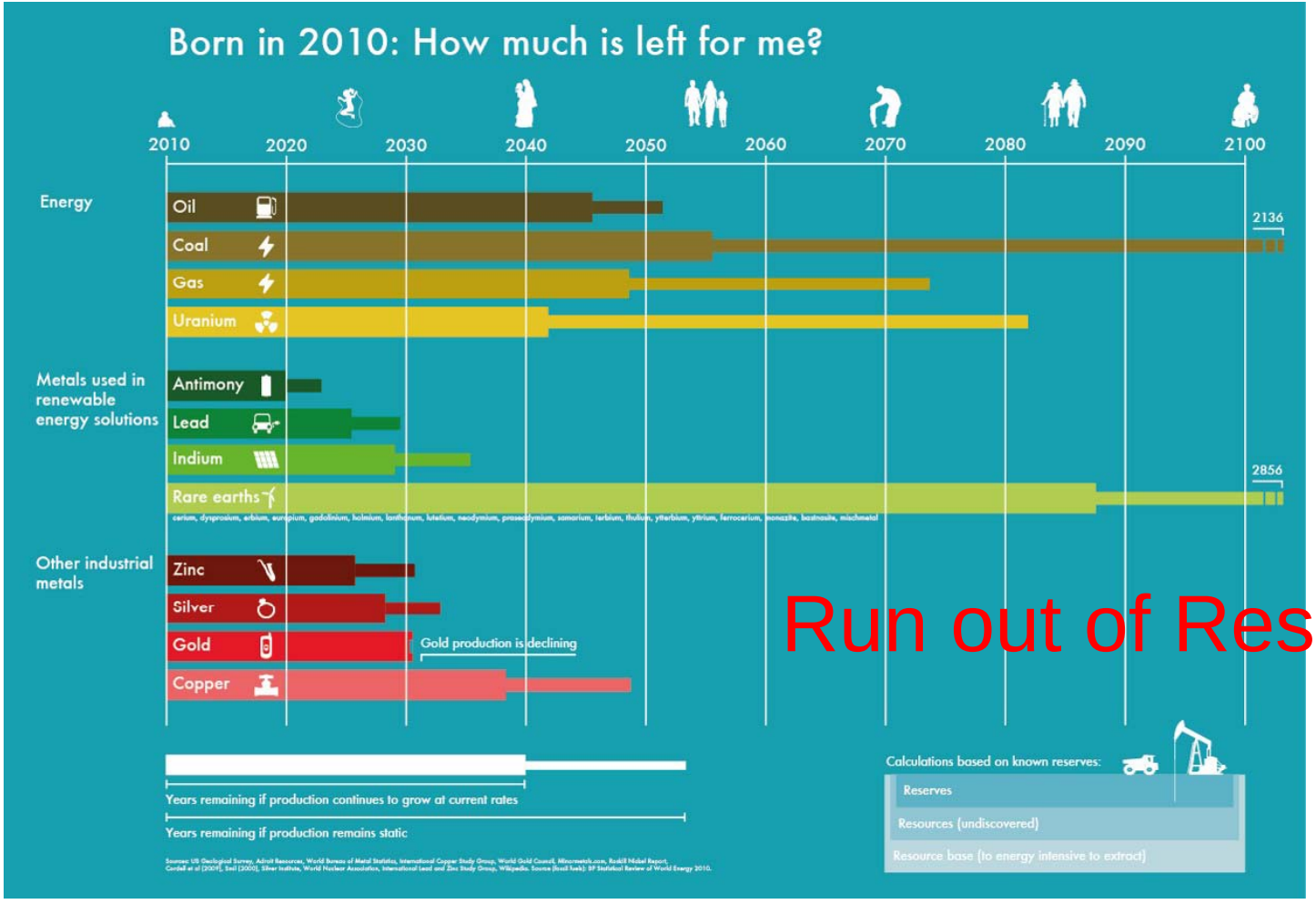


Toxic Pollution Found In Washingtonians

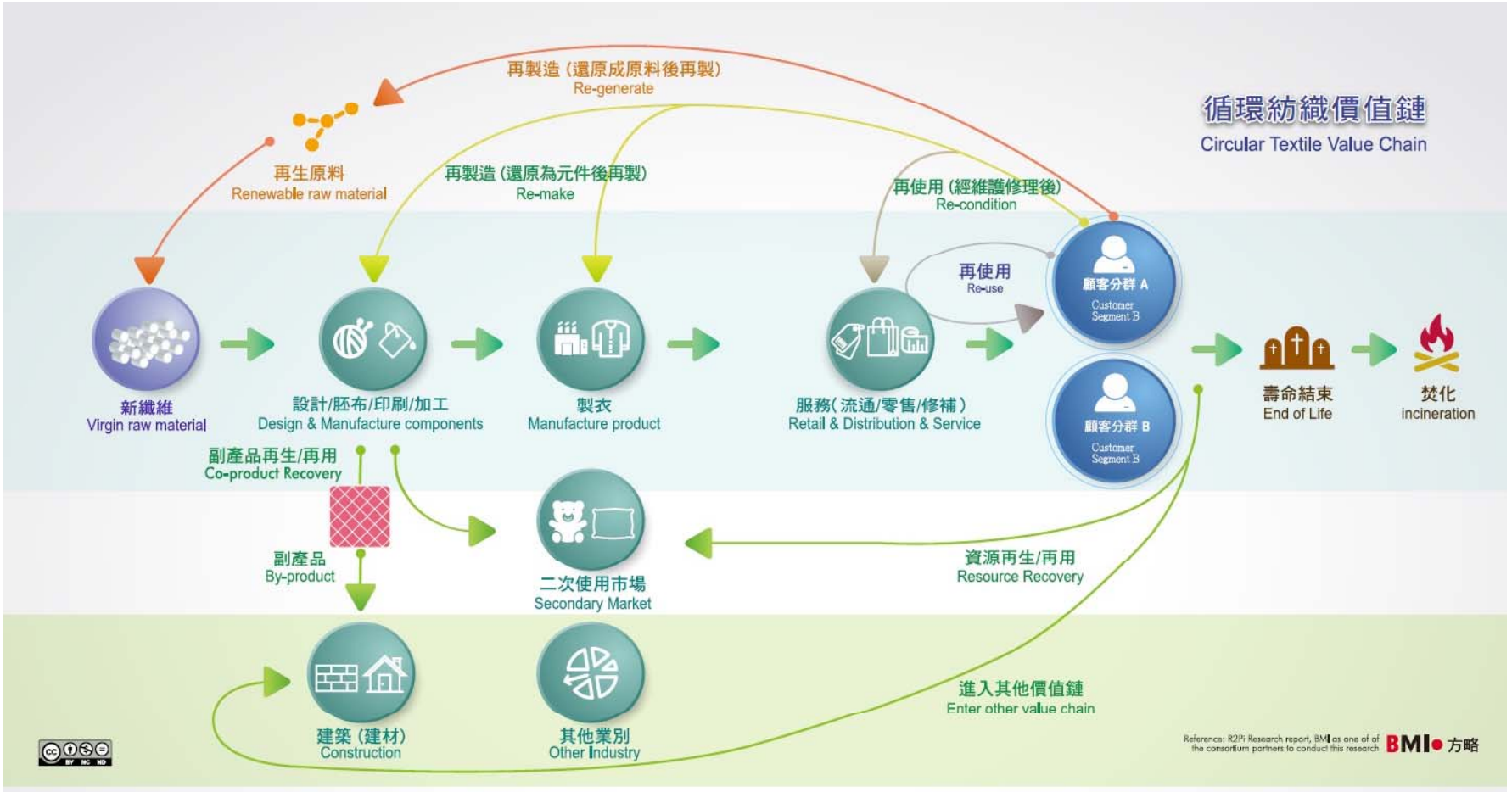
Toxic Chemicals	Pam Tazioli	Bill Finkbeiner	Karen Bowman	Ann Holmes Redding	Lisa Brown	Laurie Valeriano	Patricia Dawson	Denis Hayes	Allyson Schrier	Deb Abrahamson
PFCs ("Teflon chemicals")	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PBDEs (toxic flame retardants)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phthalates (plasticizers and fragrance carriers)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pesticides		✓		✓	✓		✓		✓	✓
DDT (banned pesticide)	✓		✓	✓	✓		✓	✓	✓	✓
PCBs (banned industrial coolant)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mercury	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead			✓							
Arsenic	✓		✓		✓		✓	✓		

Personal Impacts- Molecular Level

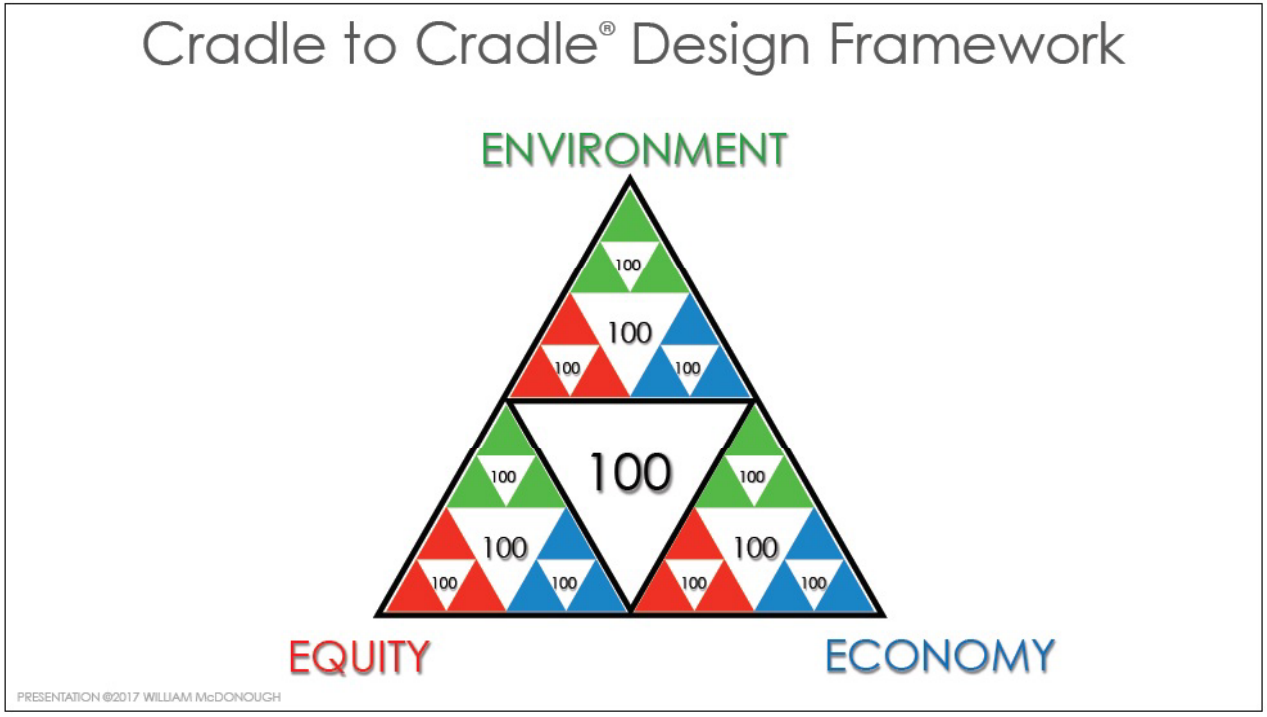
Source: www.pollutioninpeople.org



Run out of Resource


循環紡織價值鏈
Circular Textile Value Chain
再製造 (還原成原料後再製)
Re-generate
再生原料
Renewable raw material
再製造 (還原為元件後再製)
Re-make
再使用 (經維護修理後)
Re-condition
再使用
Re-use
新纖維
Virgin raw material
設計/胚布/印刷/加工
Design & Manufacture components
製衣
Manufacture product
服務(流通/零售/修補)
Retail & Distribution & Service
顧客分群 A
Customer Segment B
顧客分群 B
Customer Segment B
壽命結束
End of Life
焚化
incineration
副產品再生/再用
Co-product Recovery
副產品
By-product
二次使用市場
Secondary Market
資源再生/再用
Resource Recovery
建築 (建材)
Construction
其他業別
Other Industry
進入其他價值鏈
Enter other value chain
Reference: R2Pi Research report, BMI as one of of the consortium partners to conduct this research
BMI 方略

Sustainability



Cradle to Cradle philosophy

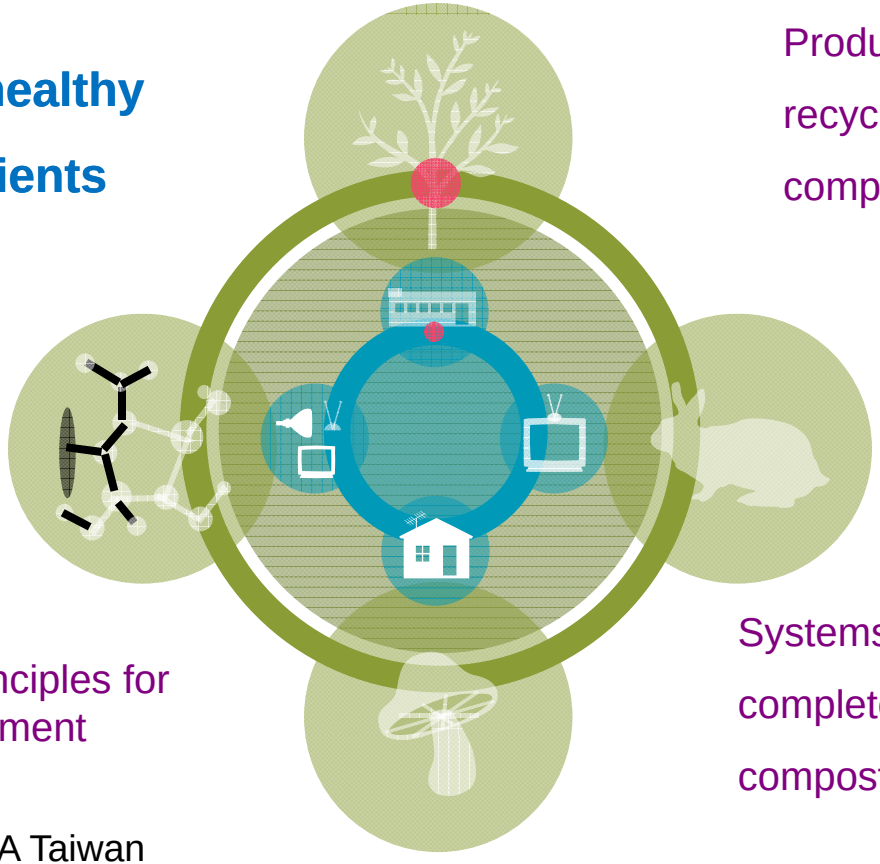
- ***"Waste equals food"***
  - Eliminate the concept of waste
  - Materials safe for human health & the environment
  - Safely cycled, perpetually (i.e., recyclable materials, Design for Disassembly & value recovery system)
- ***"Use current solar income"***
  - New energy economy built upon a renewably- powered world
- ***"Celebrate diversity"***
  - Place based design – not one-size-fits-all solutions
  - Human rights, including future generations
  - Ecological rights (i.e., non-human species)

Ref: EPEA Taiwan

Nested, Interdependent Metabolisms (Ecosystem)

Safe, healthy ingredients

Product design for recyclability / compostability

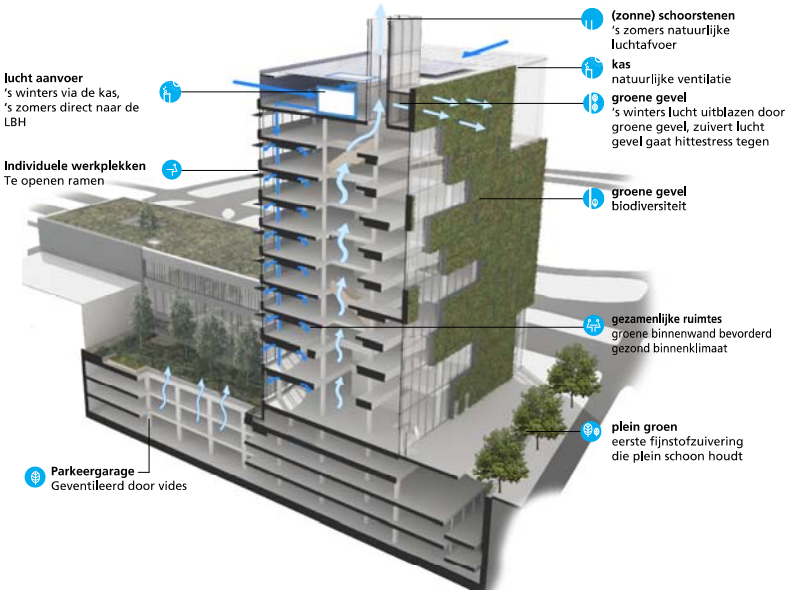


Reorient design principles for continuous improvement

Systems for complete recycling / composting

Ref: EPEA Taiwan

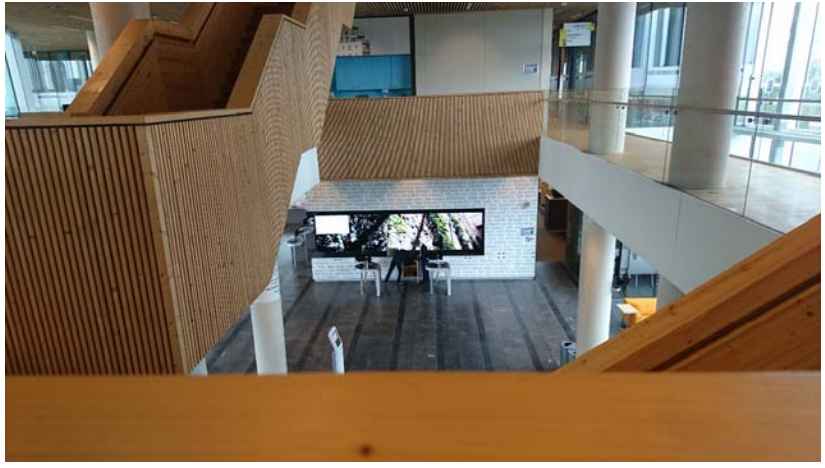
Air purifying building in VENLO



- An innovative process
- Air purifying building
- Materials health
- Zero energy
- Continuous water loop

Information from VENLO CITY HALL

VENLO CITY HALL

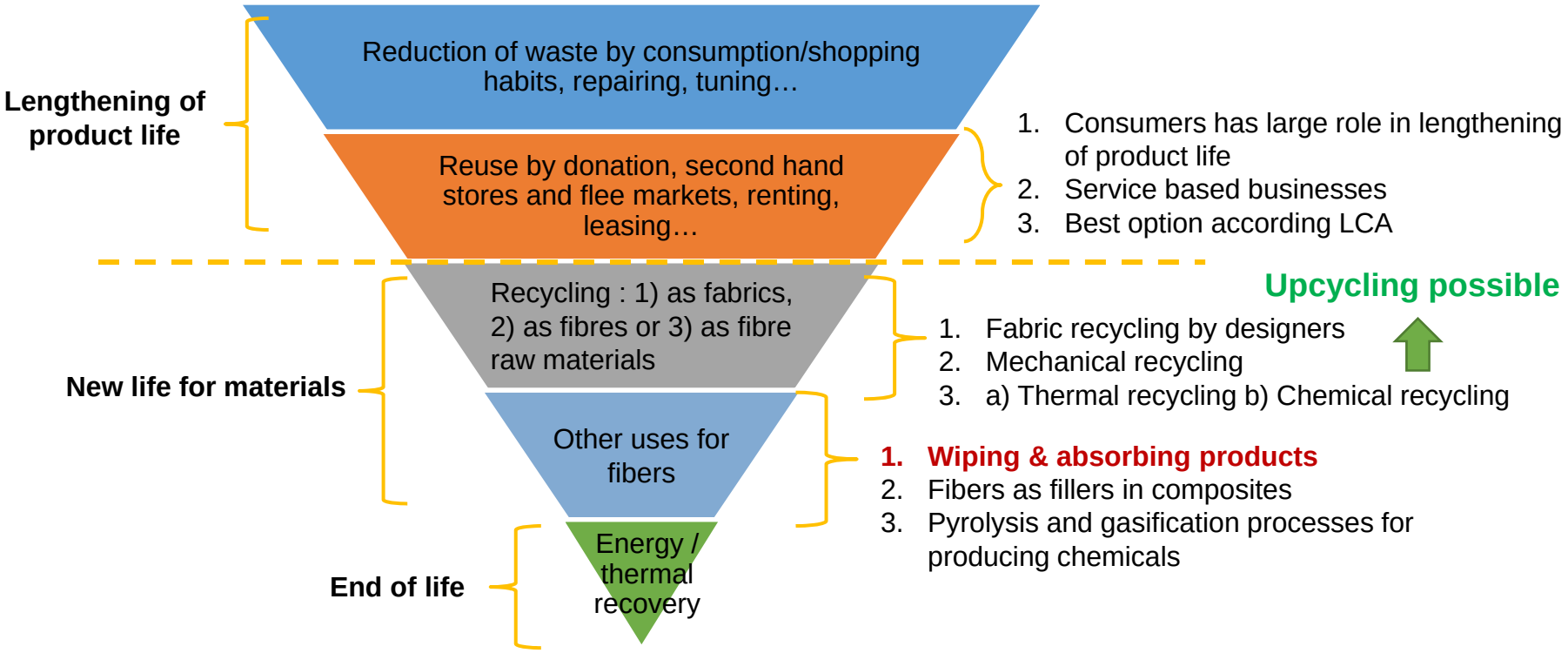


VENLO CITY HALL

VENLO CITY HALL

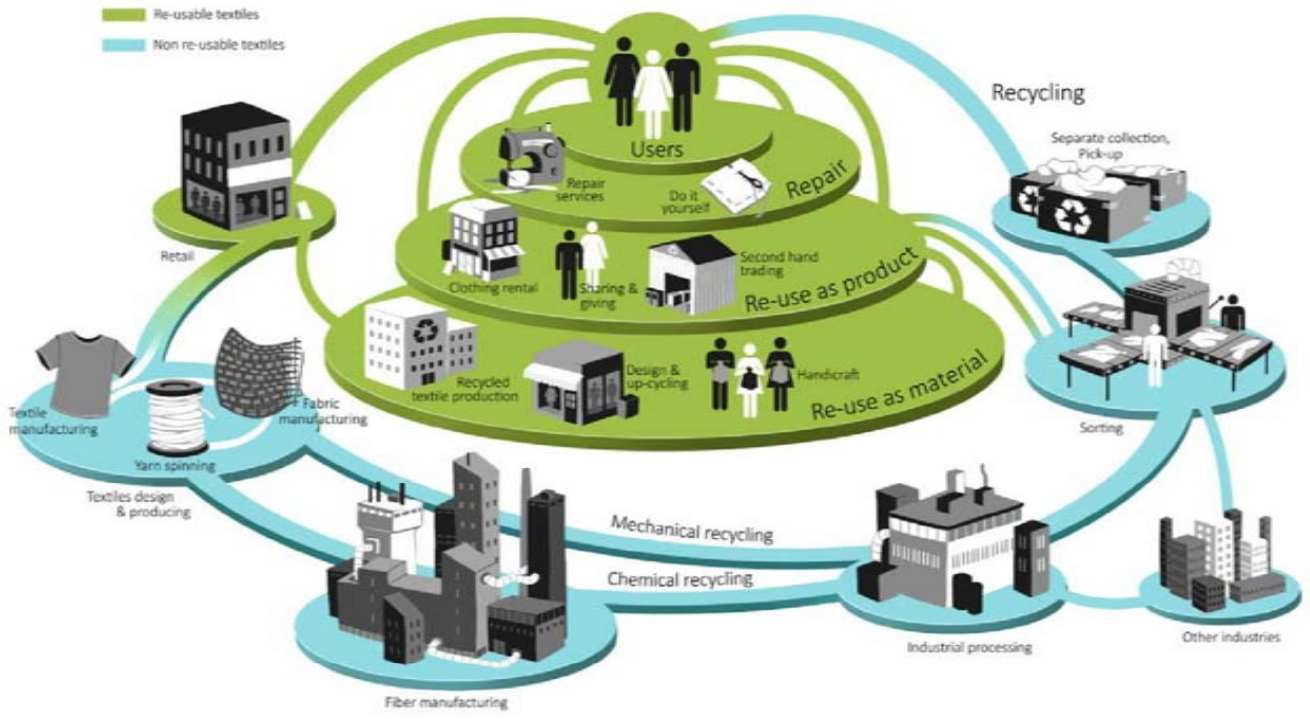
Park 2020

Adopted Waste and Textiles Hierarchy



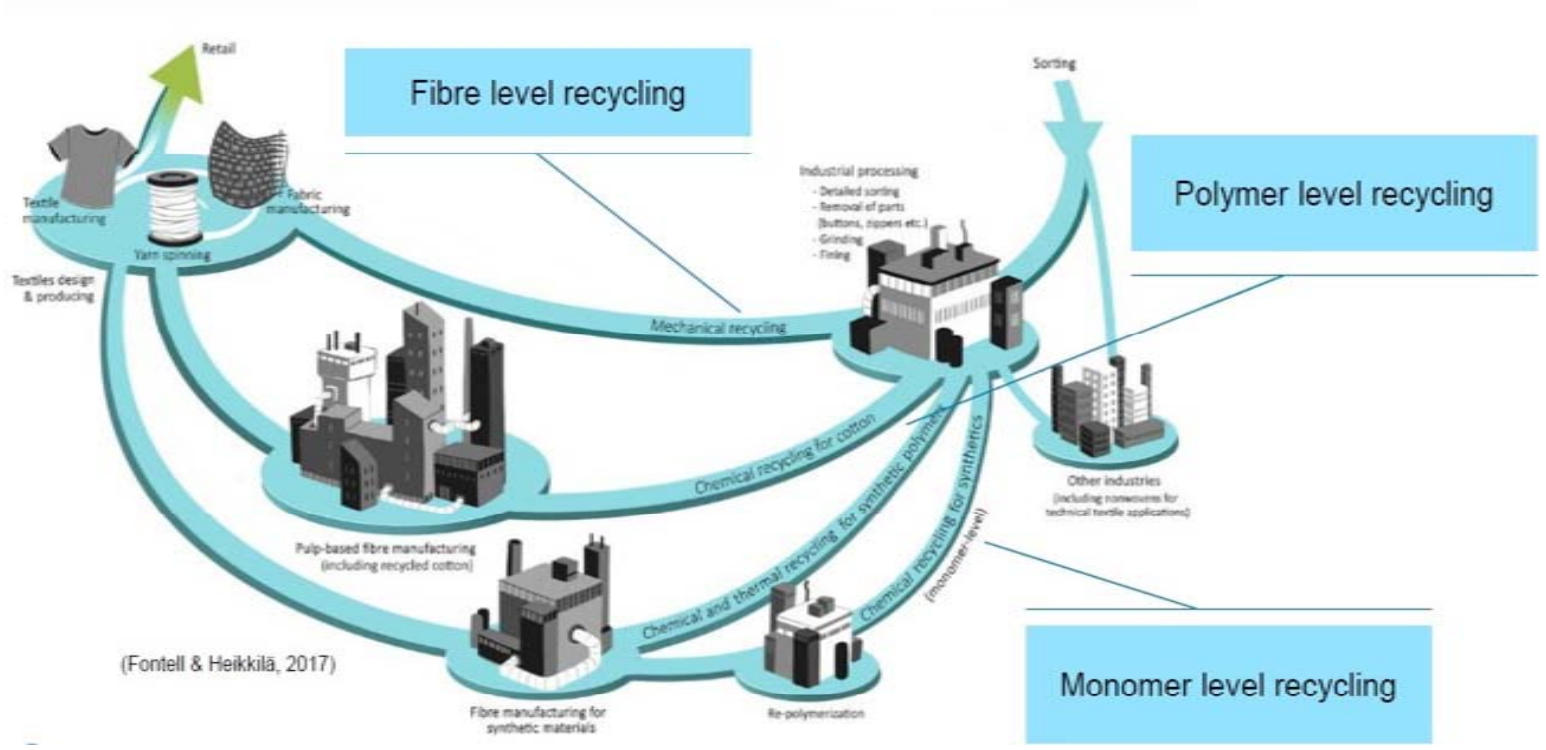
資料來源 ：VTT Heikkilä, TIFE2018, Taipei

Model of The Circular Ecosystem of Textiles



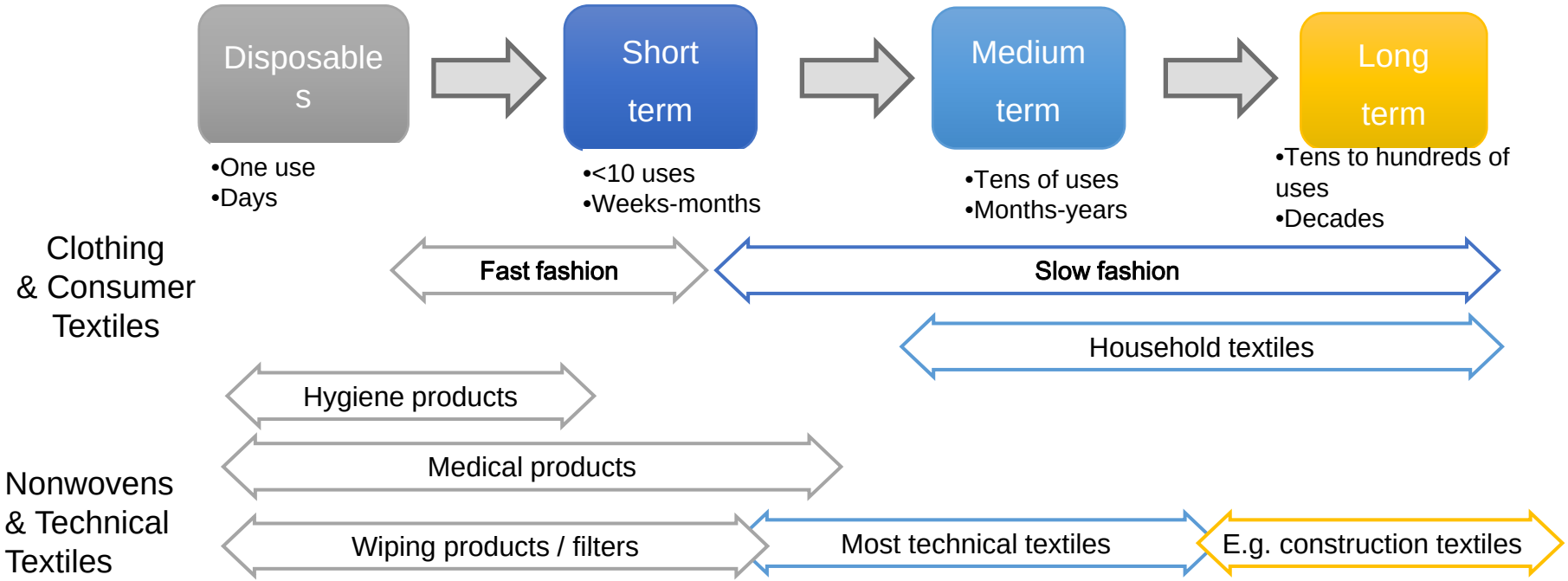
ref : VTT Heikkilä, TIFE2018, Taipeihttps://www.vtt.fi/inf/pdf/technology/2017/T313.pdf

Textile-to-Textile Recycling



ref : VTT Heikkilä, TIFE2018, Taipei

Life cycle of Textile

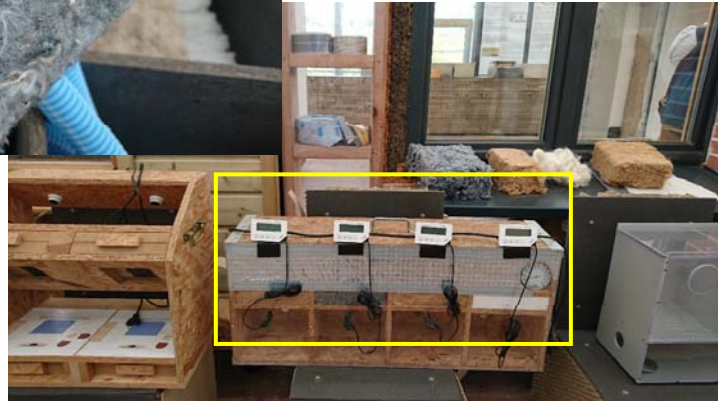


ref : VTT Technical Research Centre of Finland Ltd., Building New Business Ecosystem Around Textile Recycling, 2018

Upcycling or Downcycling ?

Thermal insulation material

(Theater of eco-construction in France)



Filtration Testing Center in TTRI

Filtration Testing Service

HVAC Filter

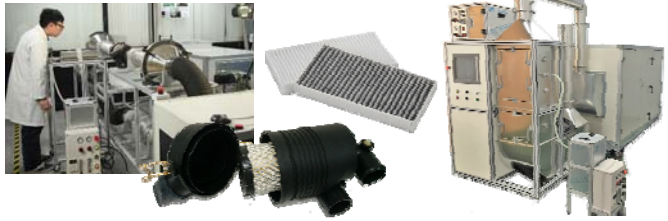
Oil Filter

Facemask

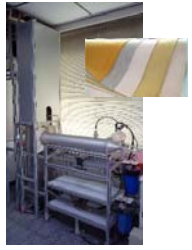
HEPA Media Test

HEPA Filter Leak Scan

Pore size



Cabin / Engine Intake Filter



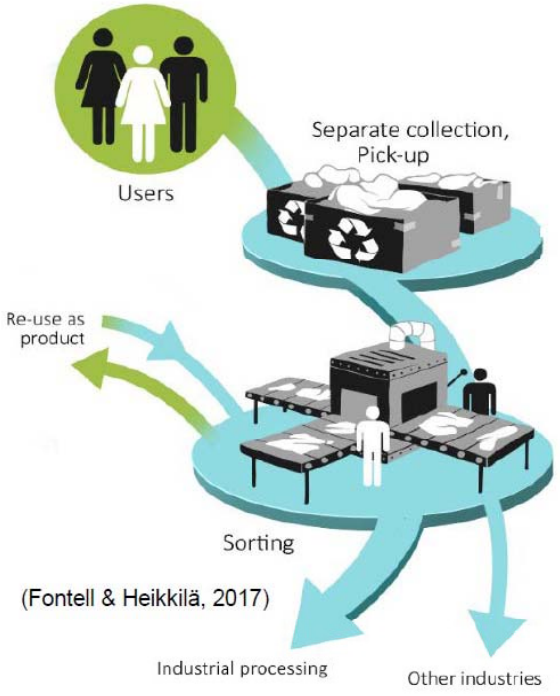
Cleanable filter media

air

water

Healt h

Textile Collecting and Sorting



- When re-use and when recycle?
- Collection systems available mainly for re-usable products
- Effectively collecting without mixing with others wastes essential for industrial recycling processes

- Recycling processing options vary depending on the fiber type
- Other factors homogeneity, cleanliness and wear and tear
- Sorting needs to be taken from manual to automated process
- **Traceability and identification system for textiles would be optimal solution**

ref : VTT Heikkilä, TIFE2018, Taipei

Development of fiber sorting instrument

Fabric content	result	symbol
70~100% polyester	**PET**	**V**
70~100% Cotton	**Cotton**	**O**
0~69% polyester	**Others**	**X**

> 70% polyester, accuracy : 98%

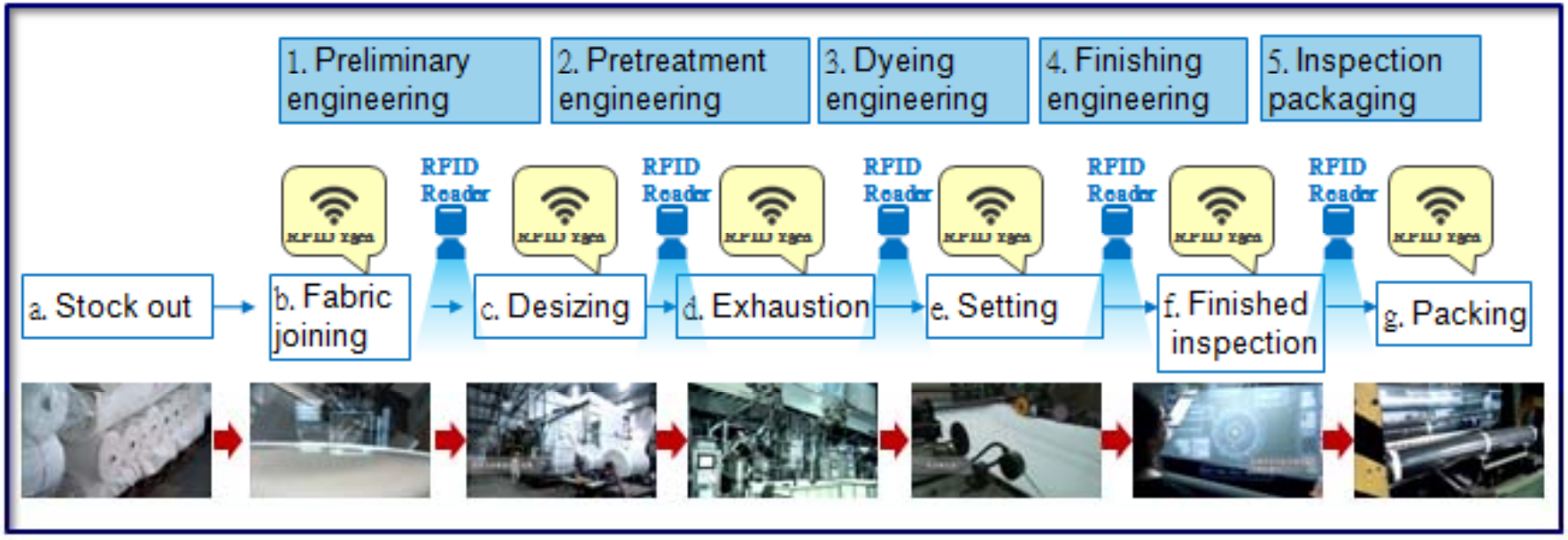
<70% polyester, accuracy : 85%

is still working

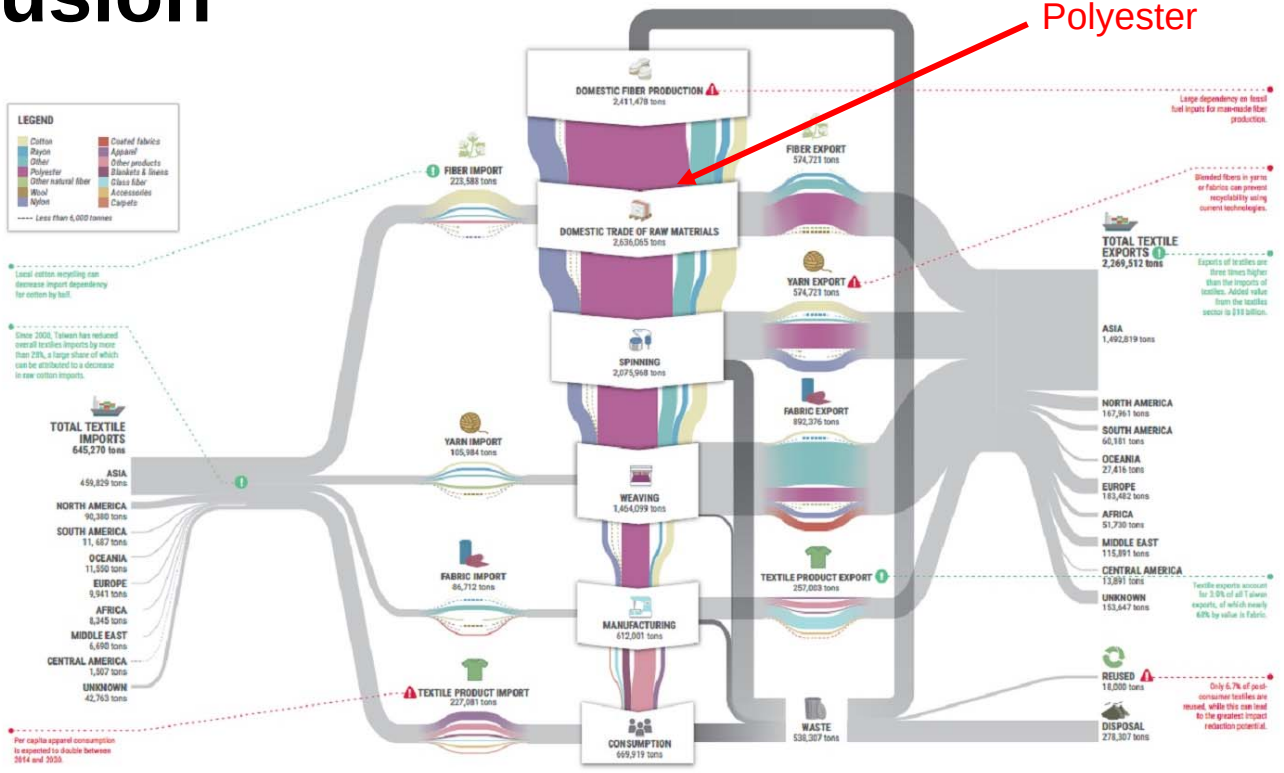
RFID Yarn Specification

RFID Yarn dimension	170±10mm x Ø2.0±0.5mm
Tag weight (approx.)	0.165±0.005 g
Frequency	UHF
Compliance	ISO/IEC 18000-6C EPC Class 1 Gen 2
Tag memory	Up to 128-EPC Bits
Read distance	≧ 2meters (straight line)
Operating temperature	-20~135°C
high temperature resistant	210°C, 1min
Typical washing cycle	AATCC 135≧30times
Anti-alkali	pH12, 6hrs
Anti-acid	pH4, 6hrs
Anti-roller pressure	3.5kg/cm^2
RoHS	pass

Dyeing and Finishing Process



Conclusion



12 RESPONSIBLE CONSUMPTION

"Think globally, act locally"

Ref: : Thomas Mason ; Erin Kennedy; Eva Gladek ."A Circular Vision for Taiwanese Textiles Sector" Metabolic .2018

Thank you !