Circularity in the textile sector

Promotion of Sustainability in the Textile and Garment Industry in Asia-FABRIC

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

FABRIC Asia

Circularity in the textile sector

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- Conceptual consideration on a circular textile industry
- Transitioning towards a circular textile industry
- Recycling technology
- Challenges and barriers - Solutions and best practices

Circularity in the Textile sector

Circular textiles economy

A circular textiles economy describes an industrial system which produces **neither waste nor pollution** by redesigning fibres to circulate at a high quality within the production and consumption system for as long as possible and/or feeding them back into the bio- or technosphere to restore natural capital or providing secondary resources at the end of use

Source: Circular Economy in the Textile Sector, GIZ 2019

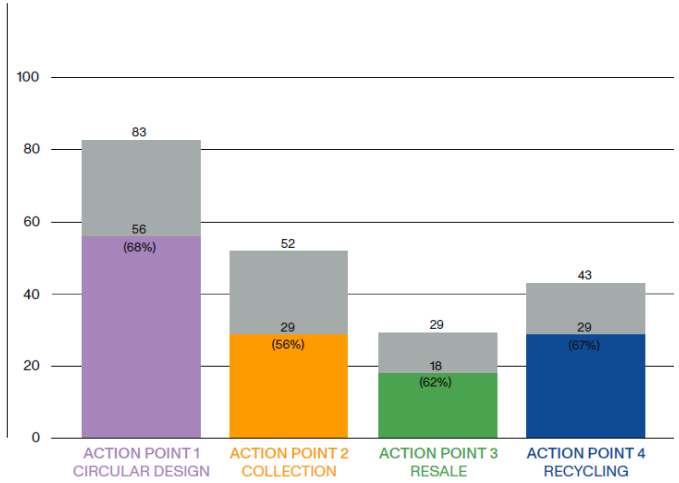
Commitment from Fashion Industry to Improve Circularity

At Copenhagen Fashion Summit 2017, fashion industry signed the 2020 Circular Fashion System Commitment as a concrete way to turn words into action and to accelerate the industry's transition to a circular fashion system.

86 SIGNATORIES

207 TARGETS SET

132 TARGETS REACHED



To set a direction for this transition, Global Fashion Agenda **outlined** 4 **immediate action points**:

1) Implementing design strategies for cyclability
2) Increasing the volume of used garments and footwear collected
3) Increasing the volume of used garments and footwear resold
4) Increasing the share of garments & footwear made from recycled post-consumer textile.

Commitment from Fashion Industry to Improve Circularity

https://www.globalfashionagenda.com/2020-commitment/

CIRCULARITY OPTIONS AT THE FACTORY LEVEL

a) Examples of Reducing Manufacturing Waste

- *apply innovativ CAD cutting devices,*
- *Avoid overproduction and deadstocks,*
- *Re-cutting and sewn to lower sized products and the local market,*
- *Apply eco-design principles to optimise resource use, consider recyclability in the design process,*

CIRCULARITY OPTIONS AT THE FACTORY LEVEL

b) Collection, Separation and Recycling

- *At site sorting, by colour, type of fiber, size of cuttings,*
- *Fluffing on factory level*
- *Develop a joint fluffing initiative within Industrial estates*
- *Downcycling of non-reusable fraction into industrial rags, upholstery filling and insulation*

CIRCULARITY OPTIONS AT THE FACTORY LEVEL

c) Upcycling

- *Develop initiatives with SME‘s and start ups to use large and medium sized cuttings for the production of new products*
- *Reuse recycled mono fibre fractions for respinning together with virgin fibres (so far yarn production is part of the factories value chain – degree of vertical integration)*

Recycling polyester and cotton (e.g. HKRITA “Green machine”)

- A textile-to-textile recycling process was developed by H&M at the Hong Kong Research Institute of Textiles and Apparel (HKRITA).
- The process is comparatively well developed and currently applied in a pre-industrialised plant opened in Hong Kong in September 2018.
- Based on chemical and hydrothermal treatment under pressure this approach recycle polyester blends into new fabric and yarns and also recycle cotton (H&M Foundation 2018).
- Cotton is processed to cellulose powders and is not used for new garments in a closed loop but functional products like super-absorbency materials.
- A biodegradable chemical is used and the facility is called “Green machine” and is licensed by HKRITA
- The energy consumption is high due to the needed heat and pressure and commercial competitiveness need to be further assessed.

https://hmfoundation.com/project/recycling-the-green-machine/

Chemical recycling processes for textiles

Definition (according to draft ISO/CD 5157): A process using chemical dissolution or chemical reactions which is employed in polymer or monomer recycling.

There are two major possibilities for chemical recycling:

- Monomer recycling: system for breaking down polymeric textile materials into their constituent monomers and rebuilding polymeric fibres for new uses.
- Polymer recycling: system for disassembling used fibres, extracting polymers and re-spinning them for new uses.

Three major technologies can be identified in this respect:

- Monomer recycling of Nylon/PA6 or polyester/PET via (partial) degradation into oligomers or monomers,
- Polymer recycling of cotton via a pulping process,
- Technologies focusing on the recovery of both cellulose and PET from polycotton blends.

European Commission (2021) Study on the technical, regulatory, economic & environmental effectiveness of textile fibres recycling.

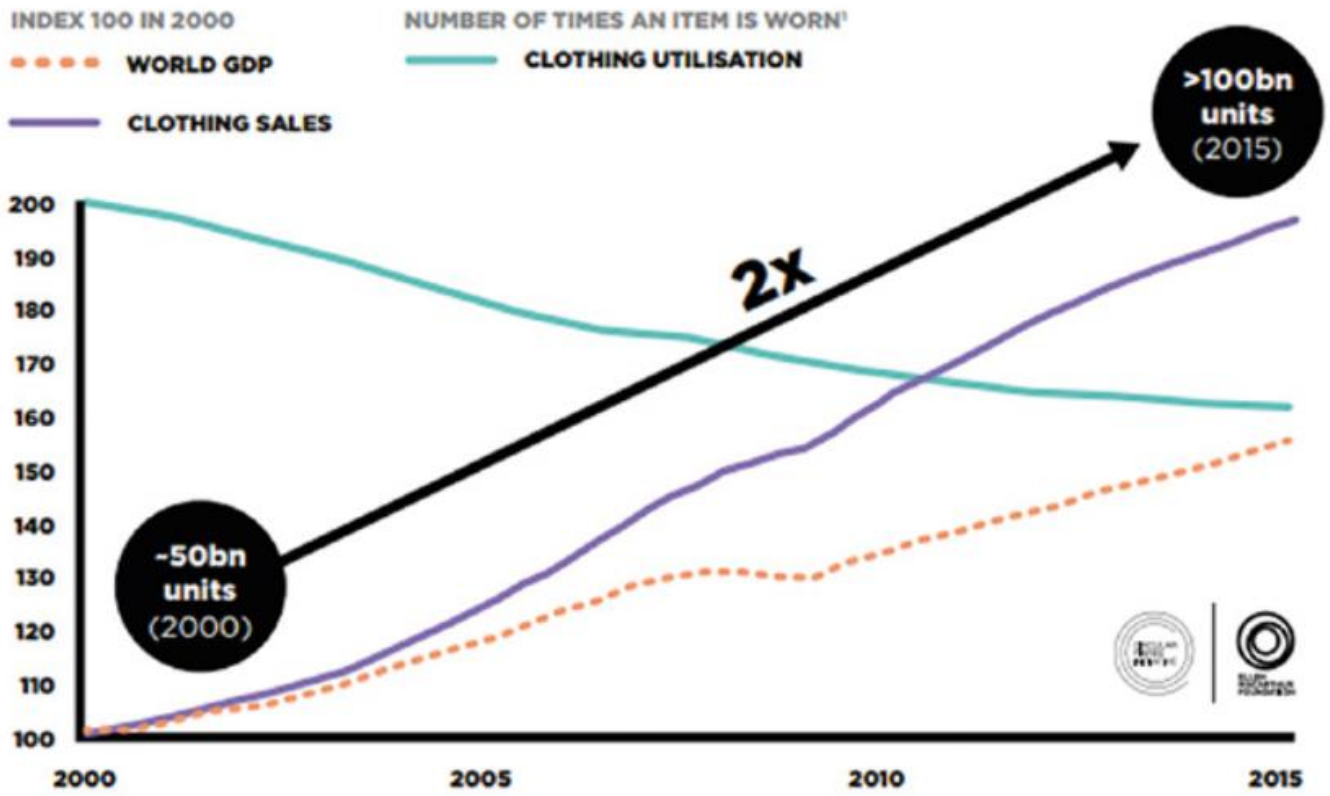
Conclusions and recommendations

- While reuse and repurposing of textiles is useful, textiles containing hazardous chemicals such as synthetic carpets or tents should only be reused in low exposure scenarios if at all.
- Carpets, tents, curtains or uniforms which contain persistent organic pollutants (POPs; PFOS, PFOA, PBDEs, HBCD) **are not allowed to be recycled** if levels are above “low POP content”.
- Also other legacy hazardous chemicals in textiles should be controlled and phased out.
- **Mechanicalrecycling**of textile **canlikelynotseparatehazardouschemicals**. Therefore the control of input-textiles containing haz. chemicals is important to promote mechanical recycling.
- **Mechanical recycling should be guided by monitoring of pollutants** in the recycling process (exposure of workers) and in the products (exposure risk of consumers).
- Several chemical recycling processes have been developed in full scale for PA6, PET & cotton.
- These processes have inherent depollution steps which likely remove (a share of) hazardous additives. Research studies are needed to assess the removal efficiency and waste be treated.
- **Overall the assessment of hazardous chemicals in textile recycling is at its infancy and need to be accelerated by the industry and the research community.**

Quiz: How much do you think we through out globally?

globally, the annual cost to consumers of throwing out clothing that they could continue to wear is estimated at **$460 billion**

UNEP circularity platform - Textiles



1 Average number of times a garment is worn before it ceases to be used

Source: Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005–2015); World Bank, *World development indicators – GD* (2017)

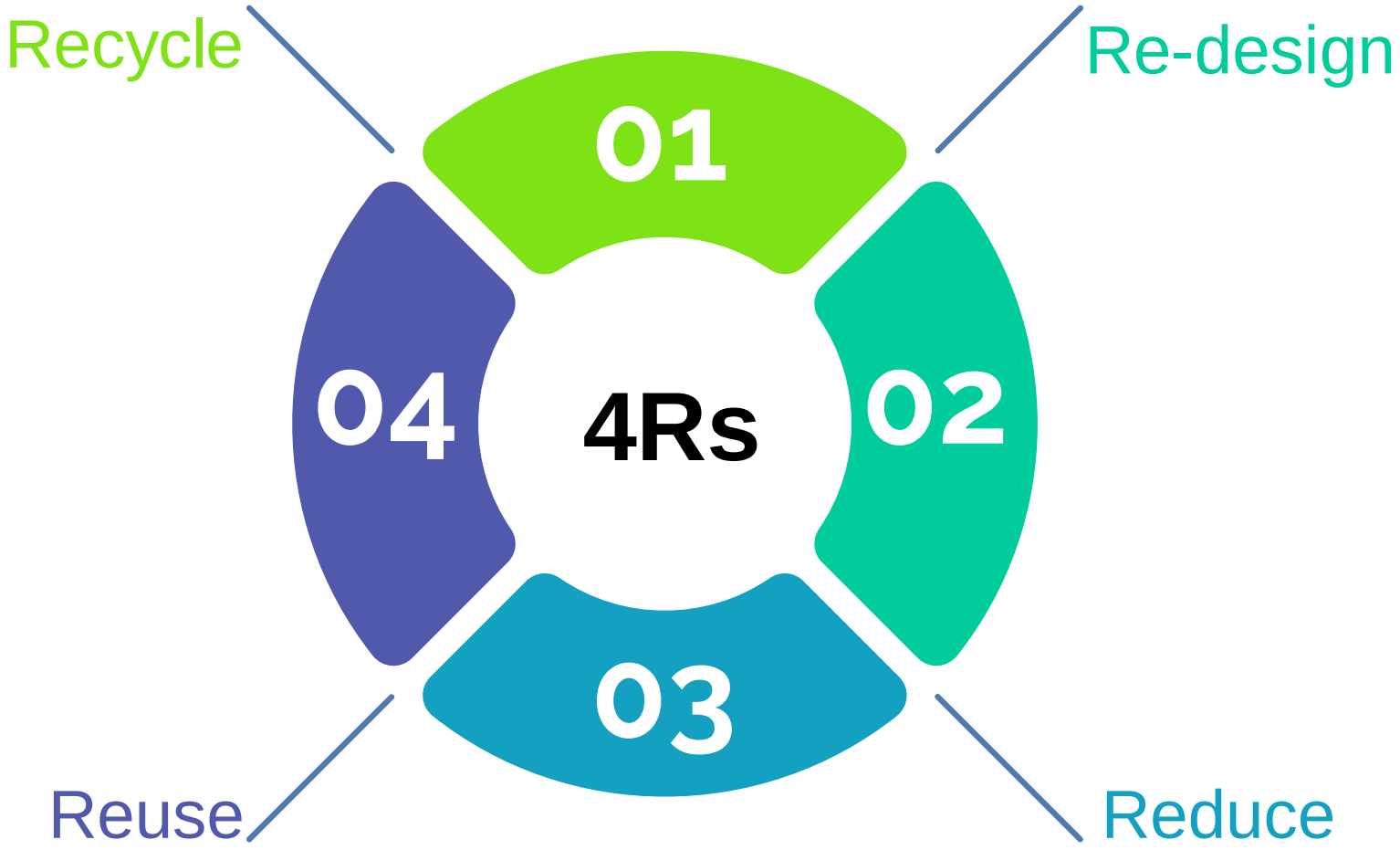
Circular Economy as a paradigm shift

Linear	Circular
Raw materials & waste	Raw materials only
Competition	Collaboration
Individuals	Ecosystem
Do less bad	Do good and Positive
Added value	Shared value
Standardised Production	Local & adapted production
Downcycling	Upcycling

Figure 2: Framework for circular business models in the textile industry (Circle Economy 2015)

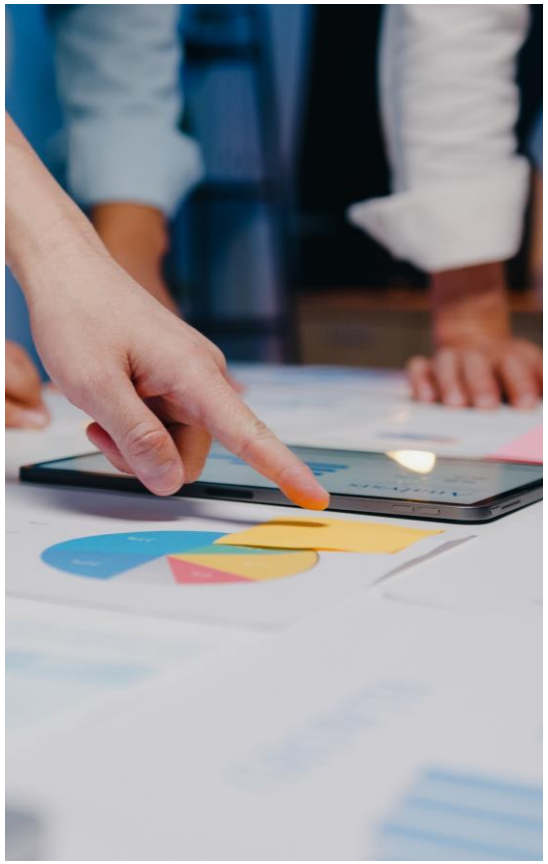
Circular	Servitization	Sufficiency
Create Value From Waste The concept of waste is eliminated By turning waste streams into useful and valuable input for other processes	**Functionality over Ownership** Provide services that satisfy users' need without having to own physical products.	**Encourage Effective Resource Use** Solutions that actively seek to reduce consumption and production
Closed Loop Models	**Repair & Warranty**	**Demand Management**
Reuse	**Renting & Leasing**	**Co-Creation**
Recycle	**Pay for Result**	**Use Excess Capacity**

4Rs

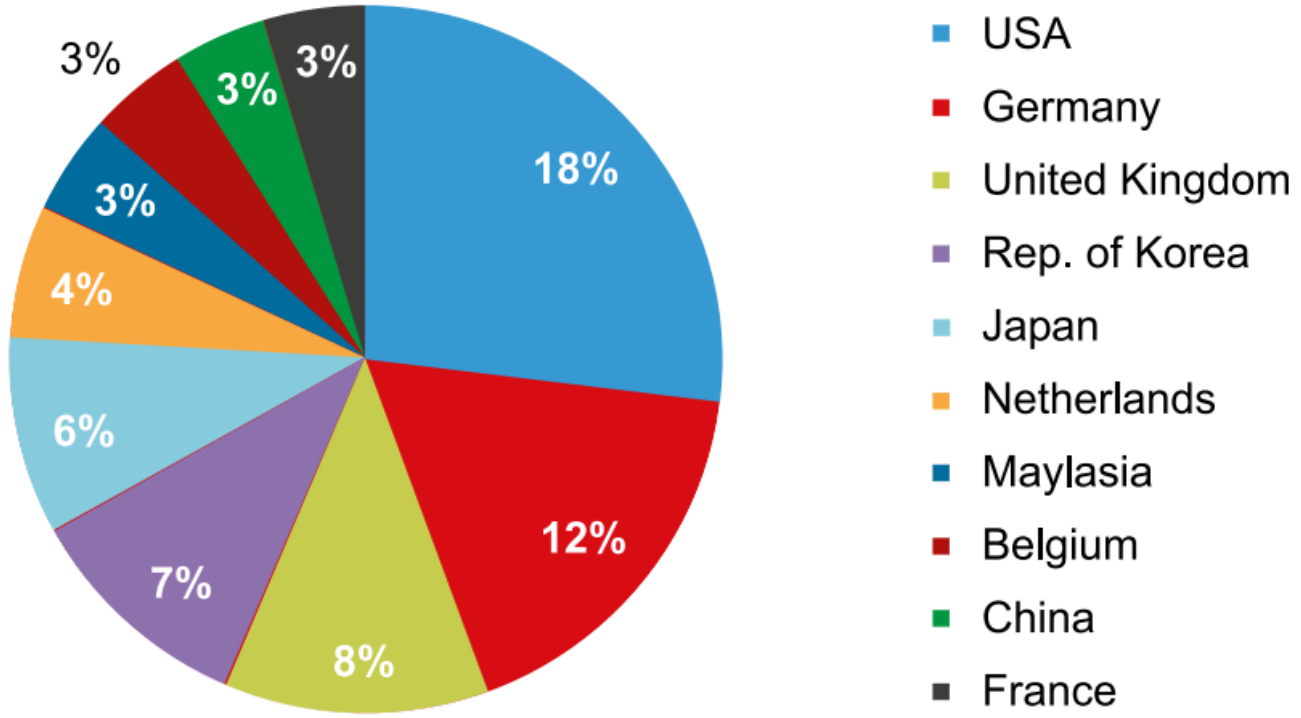


Seven strategies

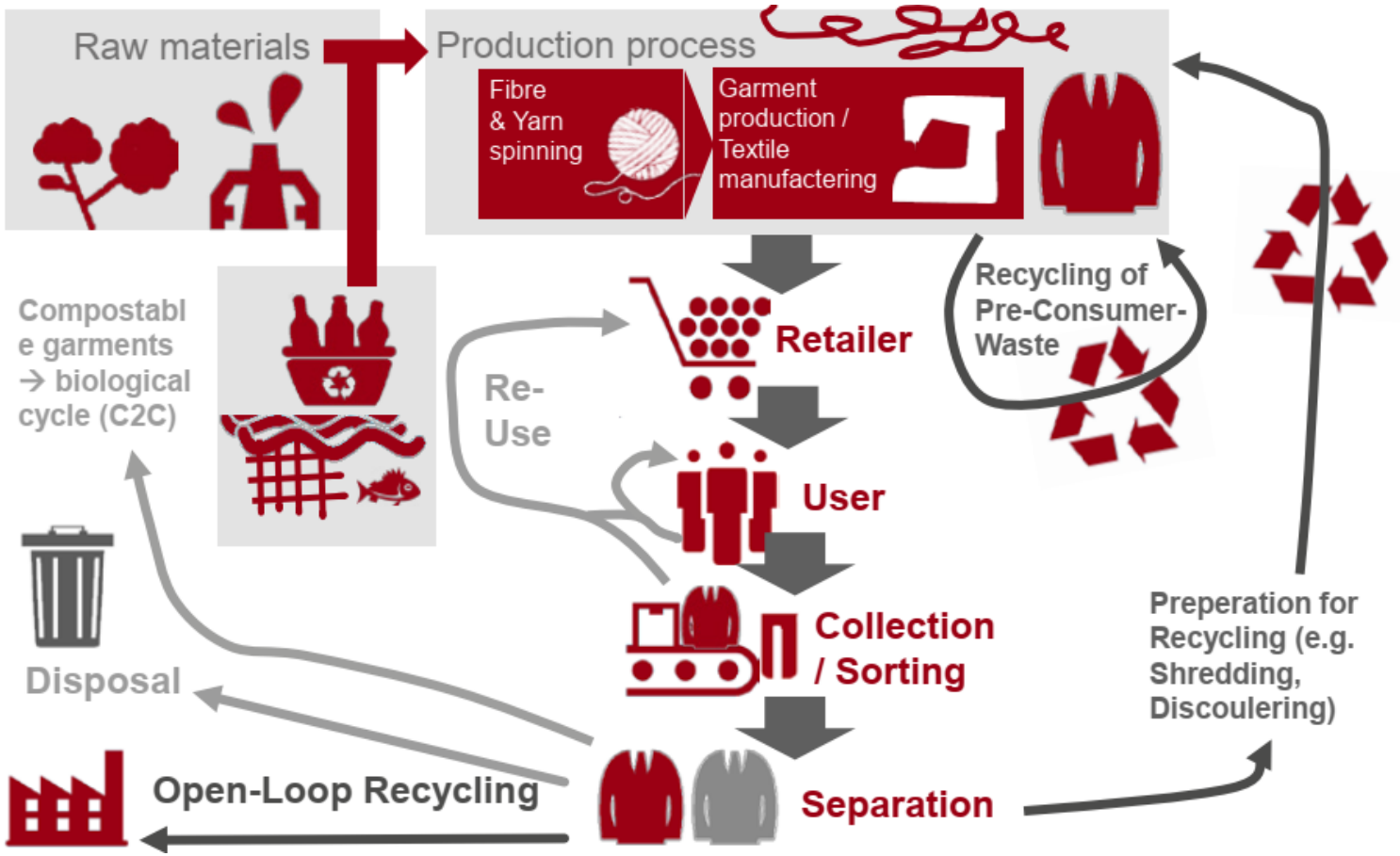
1. Redesign manufacturing processes and products to use less material and energy
2. Redesign manufacturing processes to produce less waste and pollution
3. Develop products that are easy to repair, reuse, remanufacture, compost, or recycle
4. Eliminate or reduce unnecessary packaging
5. Use fee-per-bag waste collection systems
6. Establish cradle-to grave responsibility
7. Restructure urban transportation systems



Top ten exporters of used textiles (share of total mass exported globally)



Textile recycling at a glance



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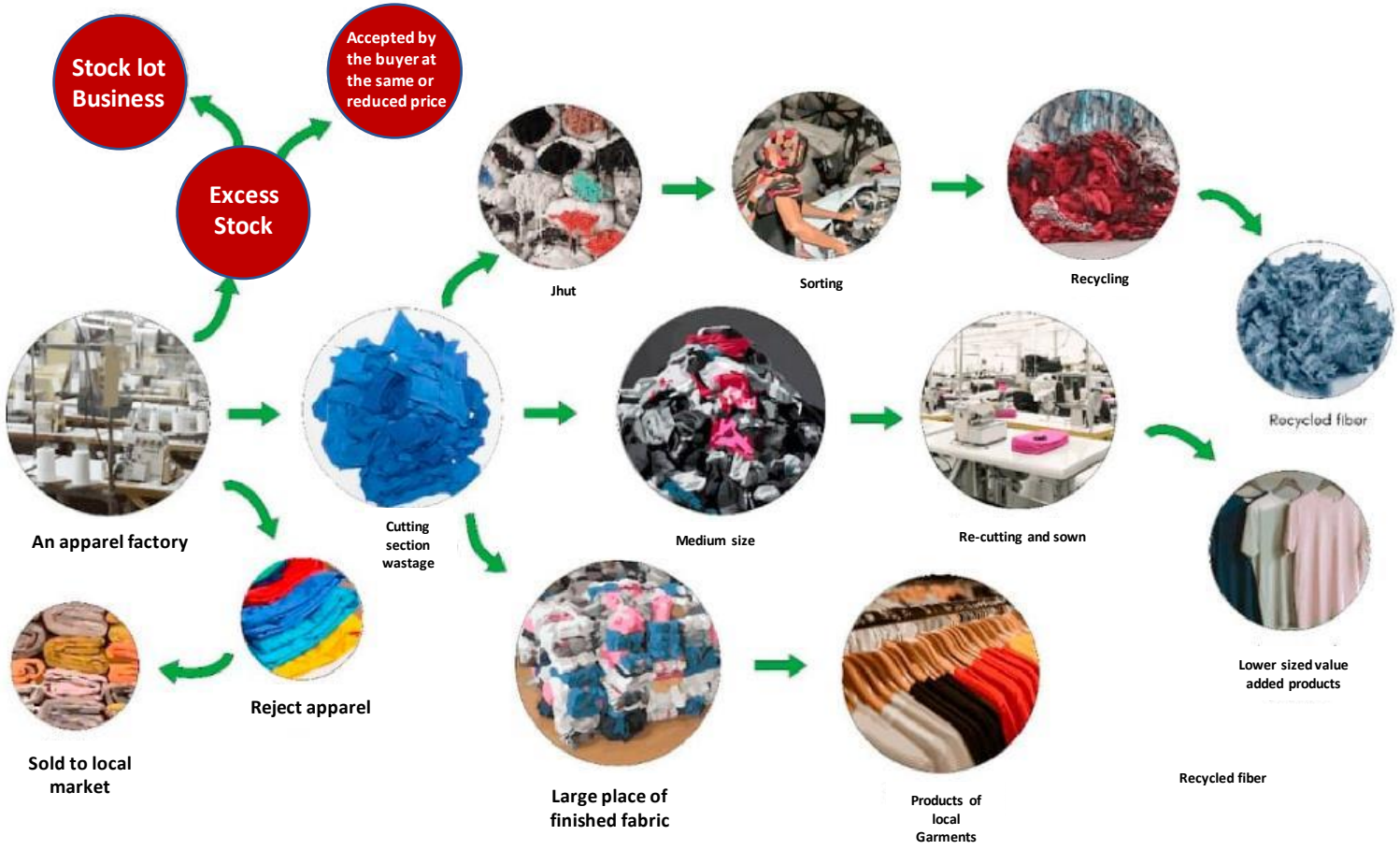
Solutions and best practices

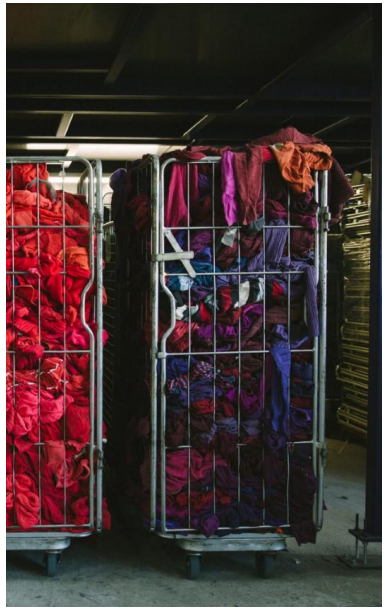


Recycling technologies

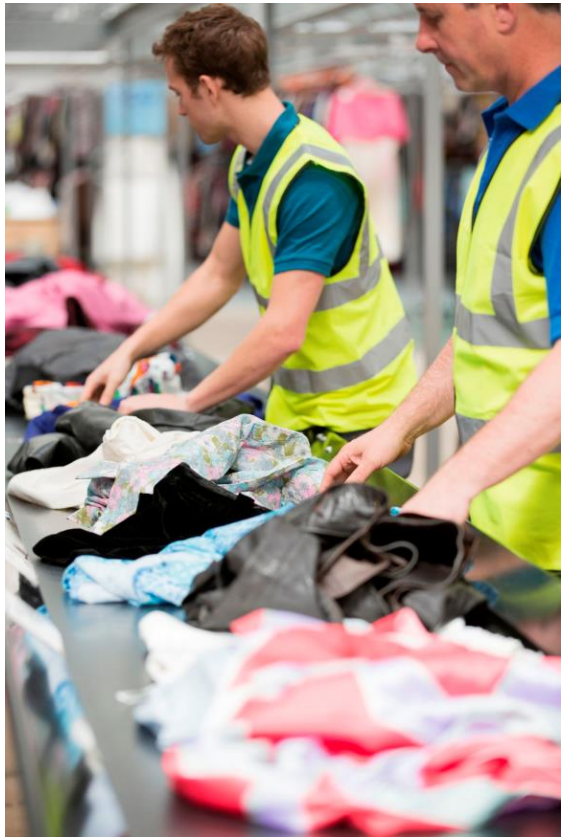
Chemical recycling/ Mechanical recycling

Innovative closed-loop recycling technologies

- Infinited Fiber (Relooping Fashion Initiative)
- re:newcell pulp
- Refibra (Lenzing)
- Innovative chemical polymer recycling (Worn Again/HKRITA/Evrnu)



Sorting technologies



- Fibersort
- SIPTex
- Textiles4Textiles

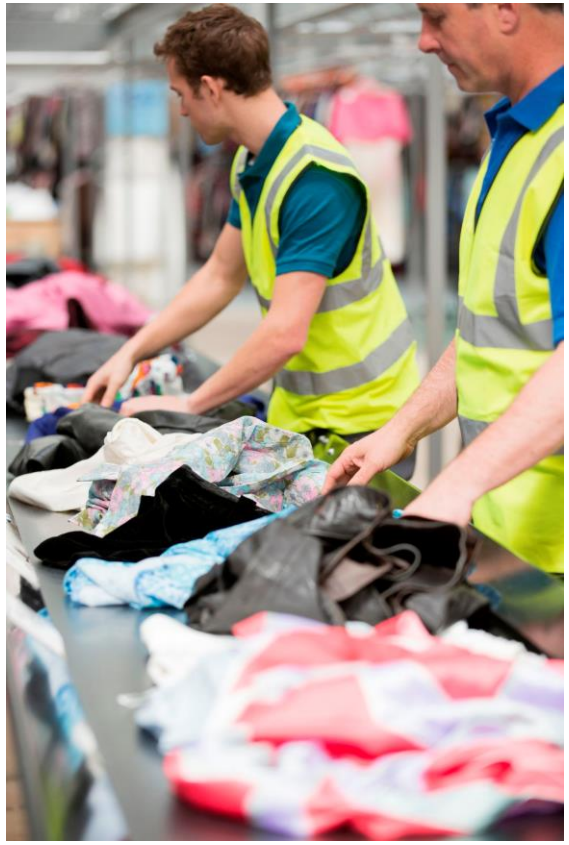
Challenges and barriers

- Low-grade quality of collected textiles, insufficient data on amount of collected textiles and lack of standards for collection and processing
- Lack of consumer awareness and insufficient education on circularity across schools for textile (design)
- Limited information exchange, low market penetration of innovative start-ups and path dependencies for established businesses in competitive market environments

Challenges and barriers

- Externalisation of costs, underdeveloped infrastructure for separate collection and recycling, textile exports and lack of funding
- Absence of extended producer responsibility (EPR), inconsistent policies, lack of global governance mechanism for textile supply chains and regulatory barriers

Solutions and best practices



- Integration of learning modules on circular economy into curricula for secondary and higher education
- Incremental innovation and disruptive business models which encourage circular production and consumption patterns
- International collaboration and the role of multi-stakeholder initiatives
- Enabling regulations, soft policies as well as research and development for circular economy principles in the textile sector
- Strategies to overcome challenges in recycling technologies

Questions for you

1. How circular economy is different from other concepts?
2. What are the 4Rs concept here?
3. How Vietnam can Championing to some extent on Circular economy on textile material context?

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