

Bioinnovation ENTIS WP6

Textile recycling

Mechanical and dissolving

Emma Östmark

180823

General conclusions (draft)

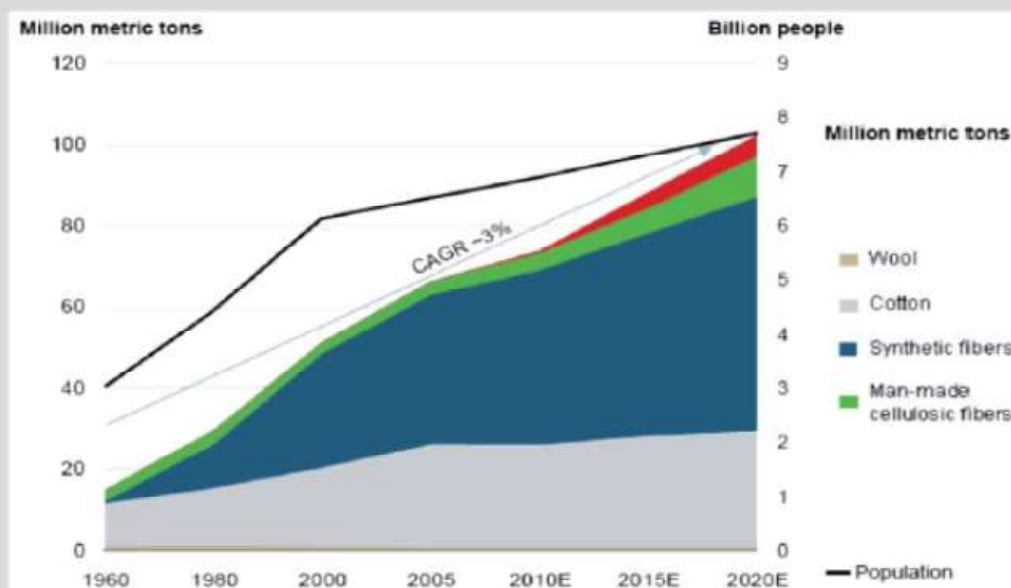


- Potential for chemical and mechanical recycling of waste fibres in Sweden!
- Market needs exist
- Environmental aspects can be promising
 - Different issues for different recycling technologies
- Value chain is not complete and needs to be worked on
 - Collection and sorting of waste textiles need more development
 - Value chain within project not complete (spinning, knitting and weaving missing)

WP6: Textile Recycling – Mechanical and dissolving

Background

Increased global demand of fibers creates a market for mechanical and dissolving cellulosic fibers

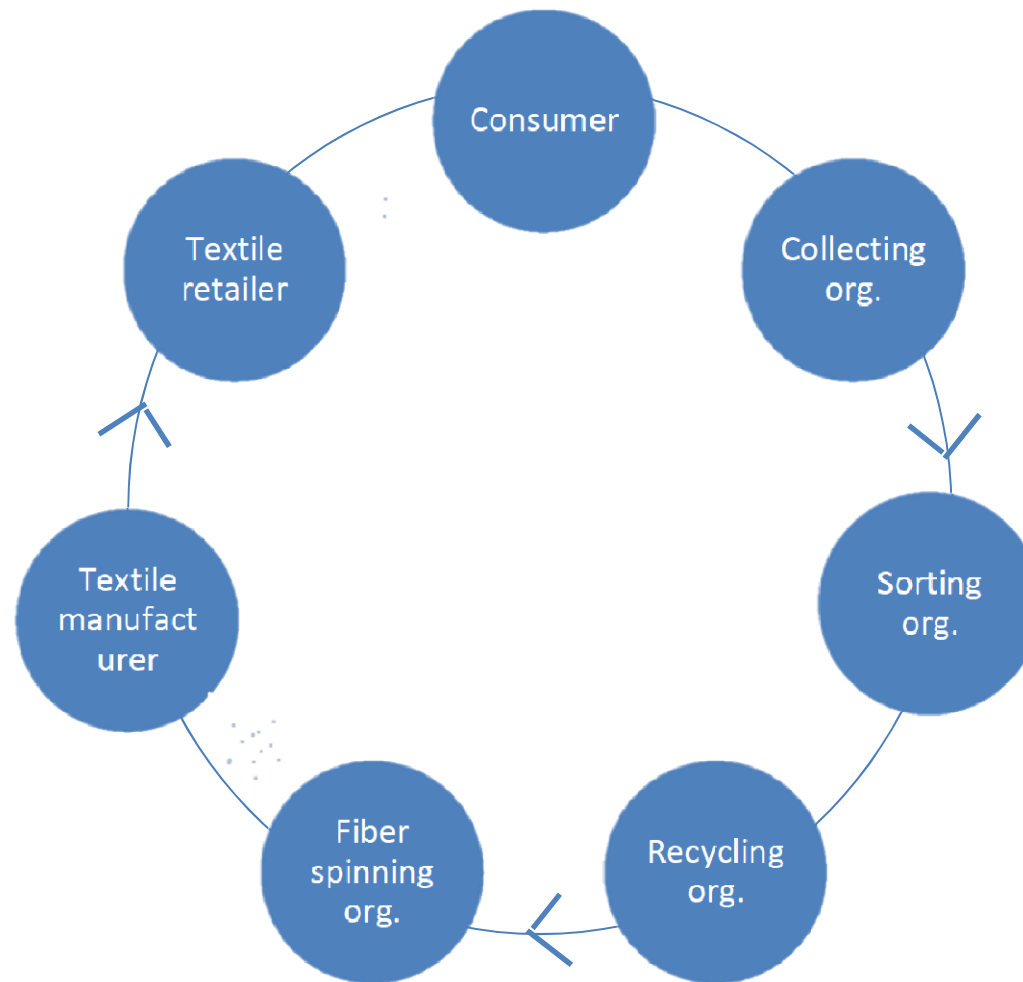


Eichinger, D., *A vision of the world of cellulosic fibers in 2020*. Lenzinger Berichte, 2012. 90: p. 1-7.

Objectives for WP6



The textile recycling value chain



WP6 Partners

martinson

 **STENA**
RECYCLING

ADITYA BIRLA

Domsjö

 **RödaKorset**


LUND

**RI
SE**

WARGÖN
INNOVATION

RAGN SELLS
En del av kretsloppet


HAGLÖFS

re:newcell

 **Vänersborgs kommun**


Textilia
PURE REALITY.

LINDEX

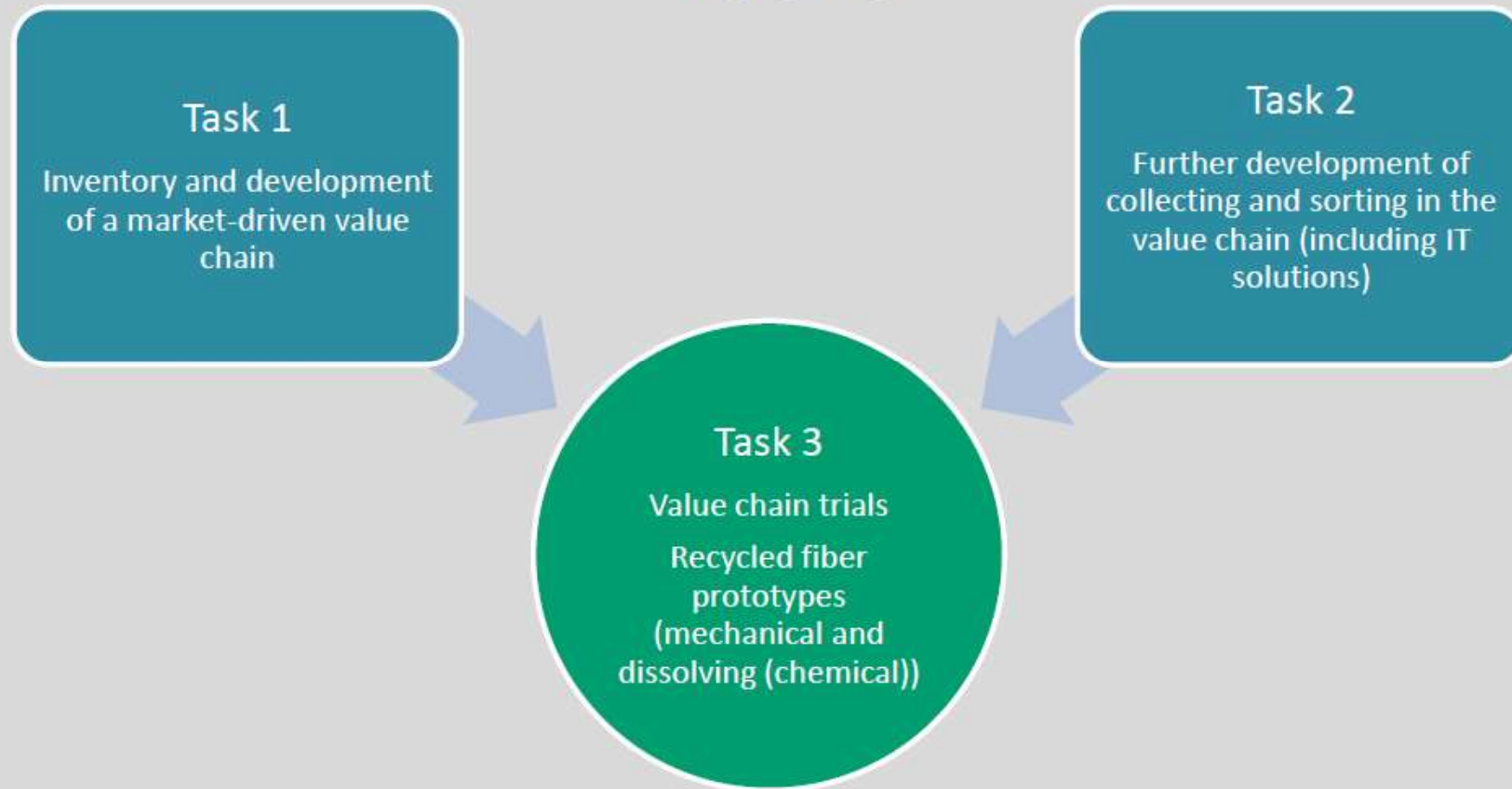
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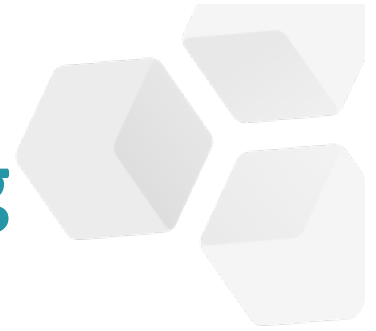
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WP6: Textile Recycling – Mechanical and Dissolving

Tasks



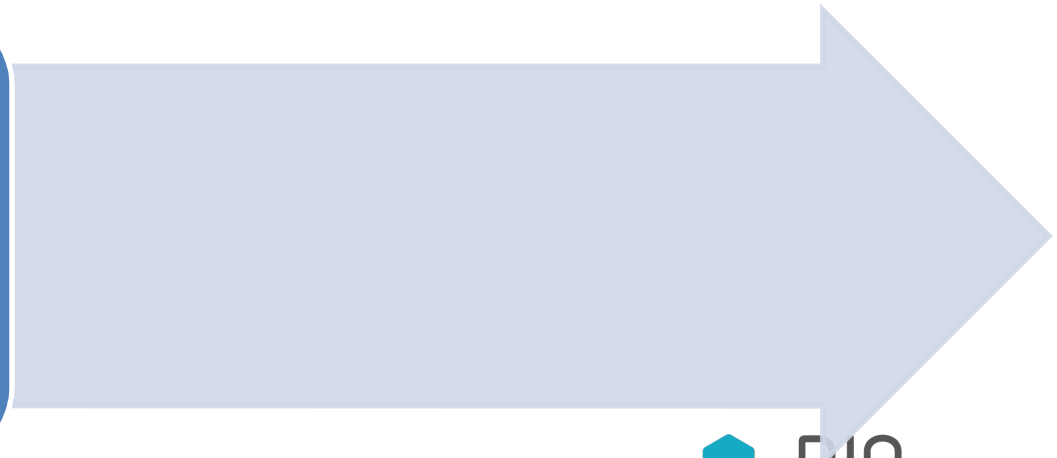
Mechanical and chemical recycling



Mechanical
recycling



Chemical
recycling



Task 1: Inventory and development of a market driven value chain



Aim: Develop textile recycle value chain/s based on end-user perspective

Milestone: Structuring a framework for WP6

Activities include:

WS with consortium to assess value chains and challenges

Partner specifications

Market analysis

Brief environmental assessment

Task 1 results: WS with consortium to assess value chains, challenges and partner specifications



- Gaps in value chain identified
- Volymes and qualities
- Limitations
- Specifiaction of what partners can contribute with in Task 3
- Input to environmental assessment

Task 1 results: Market analysis



Availability of raw material for recycling?

Very good, many sources.

Future demand for existing and new fibre types?

It is expected to continue to grow at an even pace.
They need to be, in all aspects, equal to existing fibre types.

Task 1 results: Brief environmental assessment

Literature review:

- There are potential environmental benefits with future chemical as well as mechanical recycling in Sweden.
- Two factors which have considerable influence on the LCA results are:
 - The assumption about substituted fibre. This in turns depend on the type of product that is produced from the recycled fibres. Also, actual substitution depends on market mechanisms (e.g. price elasticity), and in reality the substitution effect is probably somewhere between 0 and 100%.
 - The geographical location of recycling and regeneration of fibres, as this influences the opportunities to use environmentally preferable suppliers of energy chemicals.
- The following appear to contribute the most to the environmental impact of the recycling processes:
 - For mechanical recycling: the transportation and the pulling of the textile waste (*rivning*, in Swedish).
 - For chemical recycling: the pretreatment (including de-dyeing), the dissolution and the spinning (transportation and pulling appear to be rather negligible).

References

Roos S, Sandin G, Zamani B, Peters G, 2015. Environmental assessment of Swedish fashion consumption: Five garments – sustainable futures. A Mistra Future Fashion report.
<http://mistrafuturefashion.com/life-cycle-assessment-gives-new-understanding-of-fashions-environmental-impact/>

Östlund Å, Wedin H, Bolin L, Berlin J, Jönsson C, Posner S, Smuk L, Eriksson M, Sandin G, 2015. Textilåtervinning: Tekniska möjligheter och utmaningar. Naturvårdsverket rapport 6685. <http://www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/ISBN/6600/978-91620-6685-7/>



Task 2: Further development of collecting and sorting in the value chain



Aim: In depth analysis of first part of value chain

Milestone: Deliver feedstock to mech/chem recycling according to end-user needs

Activities include:

WS with consortium to set common goals

Recommendation for collecting and sorting

Brief environmental assessment

Task 2 results: WS with consortium to set common goals



- Specification of future prototypes
- Specification of raw materials
- Further specification of what partners can contribute with in Task 3

Task 2 results: WS with consortium to set common goals



All agreed on to:

- Find large-scale solutions that are economically, logistically and environmentally feasible.
- Clear need for knowledge transfer and coordination
- That we need to understand needs and limitations of suppliers and customers.
- That we need increased understanding of required quality of material for recycling and reuse to enable efficient collection and sorting processes.

Task 2 results: Recommendations for collecting and sorting



- Existing collection, sorting and recycling systems not enough
- To establish new collecting and sorting facilities important for circular economy
- Collection solutions must be efficient, environmentally sound and have depositions for the collected materials
- Current collection actors have good potential for this

Task 2 results: Brief environmental assessment

LCA is being made right now by RISE. Results tomorrow...

Task 3 : Value chain trial (mechanical/chem)



Aim: Test recycling loop for mech/chem recycling of Swedish textile waste

Milestone: Production of mech/chem prototype and evaluation

Activities include:

Production of mechanical prototype (lab scale)

Production of chemical prototype (pilot scale)

Evaluation of results

Task 3 results: Production and evaluation of mechanical prototype



- Fristads AB /Martinson provided raw material. Not working right now.
- Thin yarn has been spun (40 Nm), white and dark. Mix (50%/50%) of virgin and postconsumer cotton/viscose.
- Lindex has evaluated a test piece
- Knitting and weaving capability not present in project

Task 3 results: Production and evaluation of chemical prototype

- Pilot plant under construction during the project
- Cotton provided by Textilia analysed for process, not working yet in pilot
- Other waste fibres of similar quality has been run at re:newcell
- Great potential to use the Swedish waste textile material



Re:newcell pulp

General conclusions (draft)

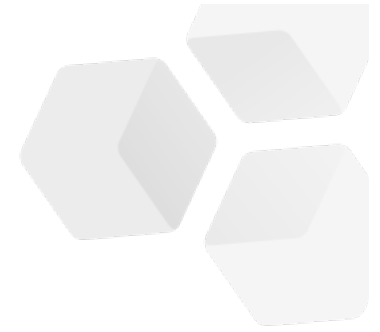


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Suggested future work (draft)



- Develop scenarios for collecting and sorting of waste textiles
 - Test more digital options
- Secure raw material quality
- Develop design for recycling
- ...



Thank you!