

Shredding textiles in Sweden

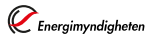
SUB-PROJECT CIRCULAR TEXTILE INNOVATIONS

Initierat av:



BioInnovation

Med stöd från:



Strategiska
innovations-
program



The project has been implemented with the support of: BioInnovation

Project manager: IVL Swedish Environmental Research Institute

Project participants: Wargön Innovation, RISE, The Loop Factory

Reference group: Albany International, Björkåfrihet, Elis, Houdini, Human Bridge, ICA, Swedish Red Cross, Samhall, Sporda, Stadium, Sysav, Trikåby

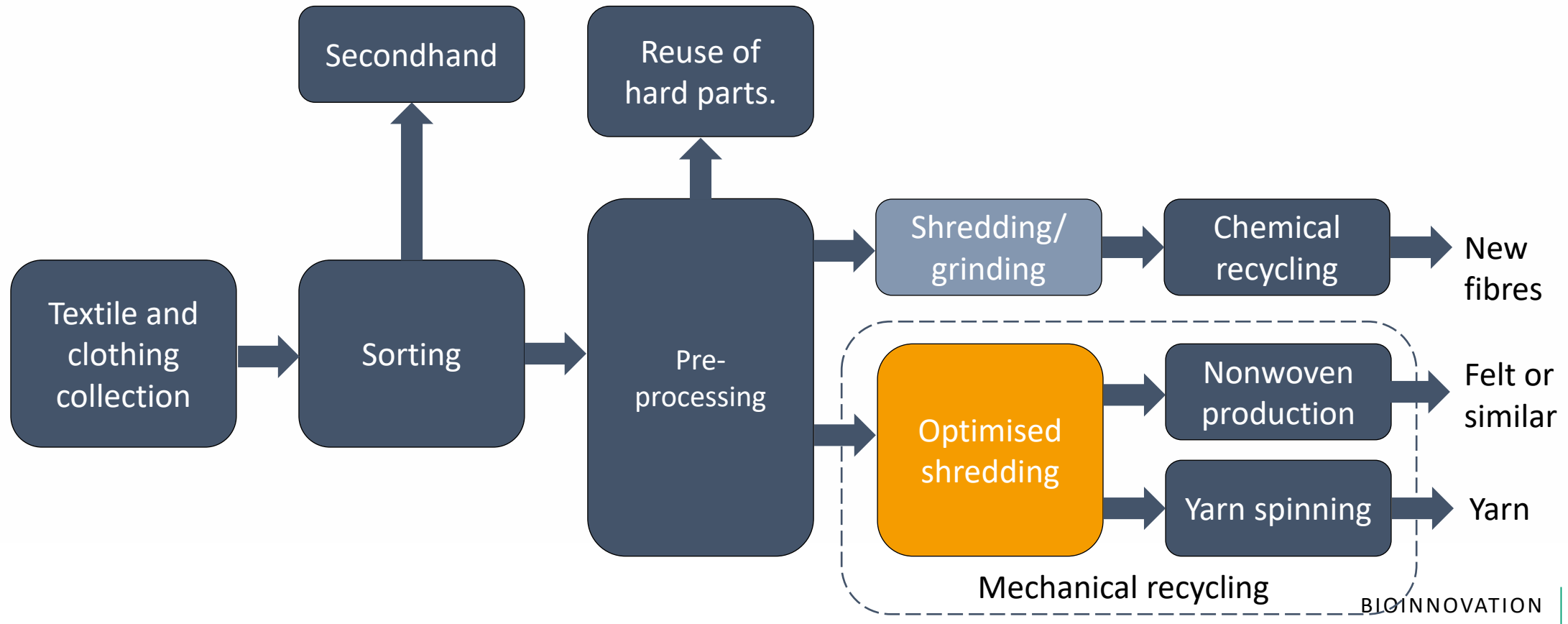
Contact:

Johan Strandberg,
IVL Swedish Environmental
Research Institute

johan.strandberg@ivl.se

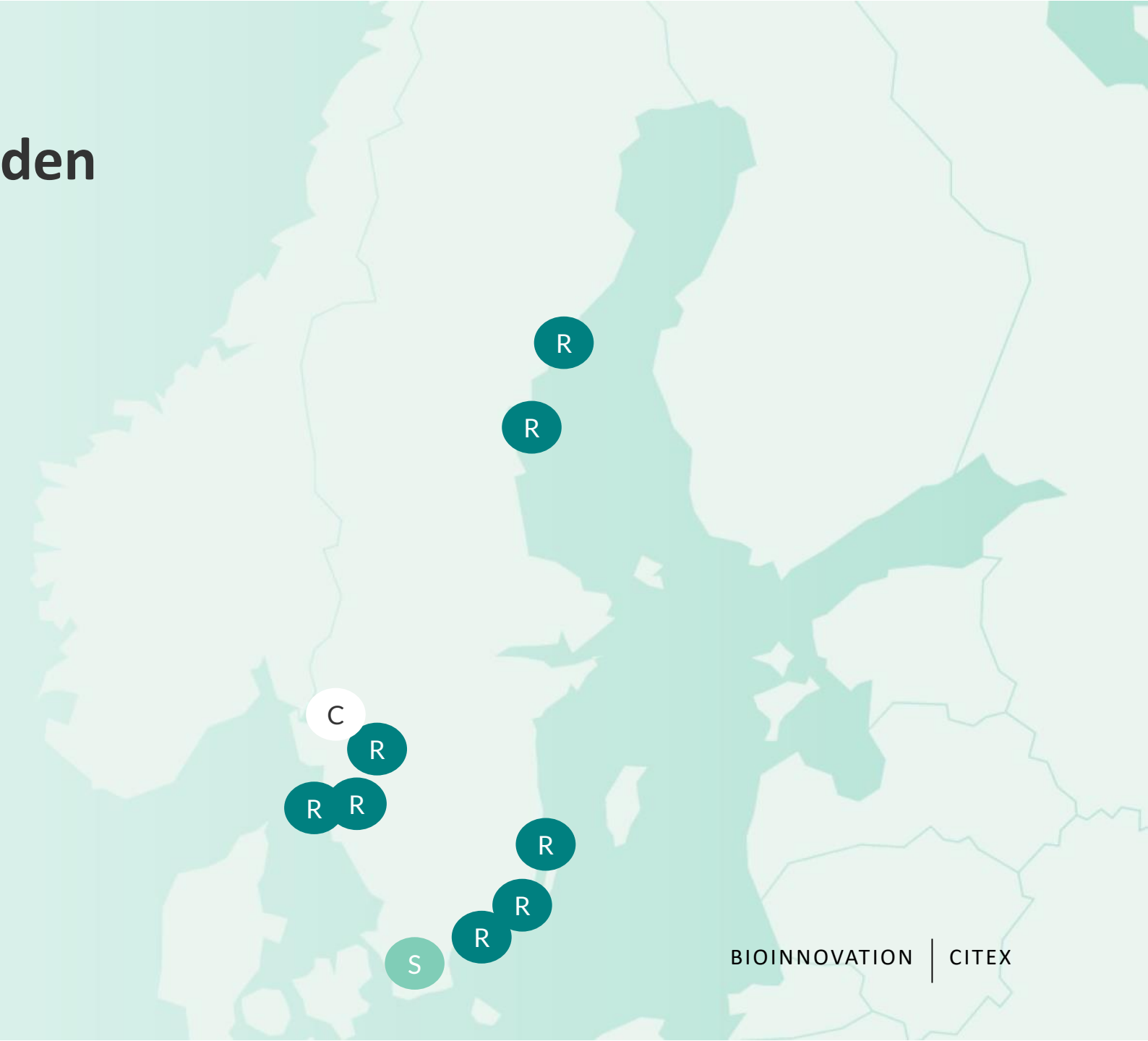
+46 (0)10 788 65 98

Textiles recycling is a multi-step process

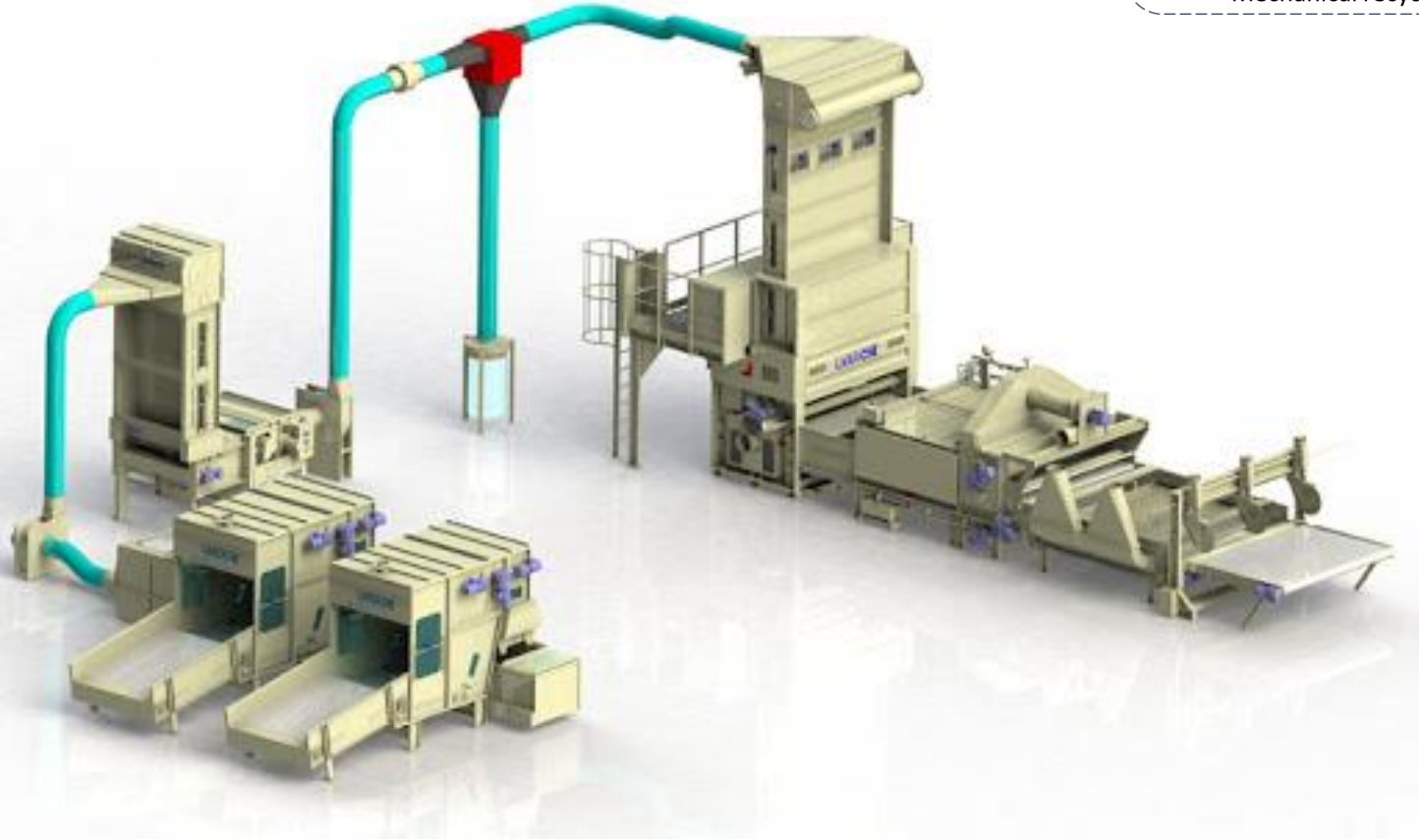
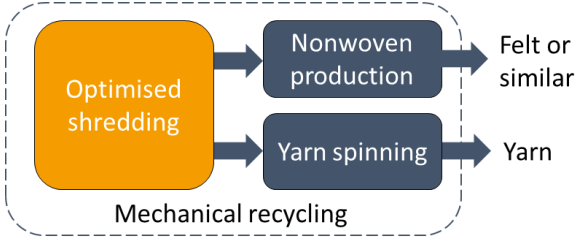


Textile recycling in Sweden

- S** Automatic sorting
- R** Recycling (chemical)
- M** Recycling (mechanical)
- C** Chemical industry



Capacity for shredding textiles is lacking



Business Case

Can textile shredding in Sweden be economically profitable?

Yes, it can.

Conclusions – Business case



You can make a profit from a small plant if you:

- Can charge SEK 9,400/tonne and process 1,100 tonnes/year or,
- Sell 640 tonnes at a price of SEK 15,000.



You can make a profit from a large plant, working two shifts if you:

- Charge SEK 3,200/tonne and process 16,000 tonnes.
- Alternatively, 1,100 tonnes at a price of SEK 4,500.

Estimated price of fibre (established through interviews)

Quality profile – input flow	Good quality		Medium quality		Low quality	Spillage	
Fibre length	Long fibres > 30 mm		Medium-length fibres 10–30 mm		Short fibres 6–10 mm	Dust < 5 mm	
Case scenario	Industrial waste sorted by colour, e.g. 100% cotton, 1 type of fibre		Post-consumer mono-material sorted by colour, 1 to 2 types of fibre		Sorted mixed fast-fashion, 3 to 4 types of fibre	Waste material of fibre	
Outflow	Fibre-to-fibre	Nonwoven	Fibre-to-fibre (fibres < 15 mm do not contribute to the strength of the yarn)	Nonwoven	Nonwoven	Dust	Metal (buttons, zips)
Estimated revenue [SEK/kg]	10–25	15–20	10–25	10–15	5–10	0.5*	5*

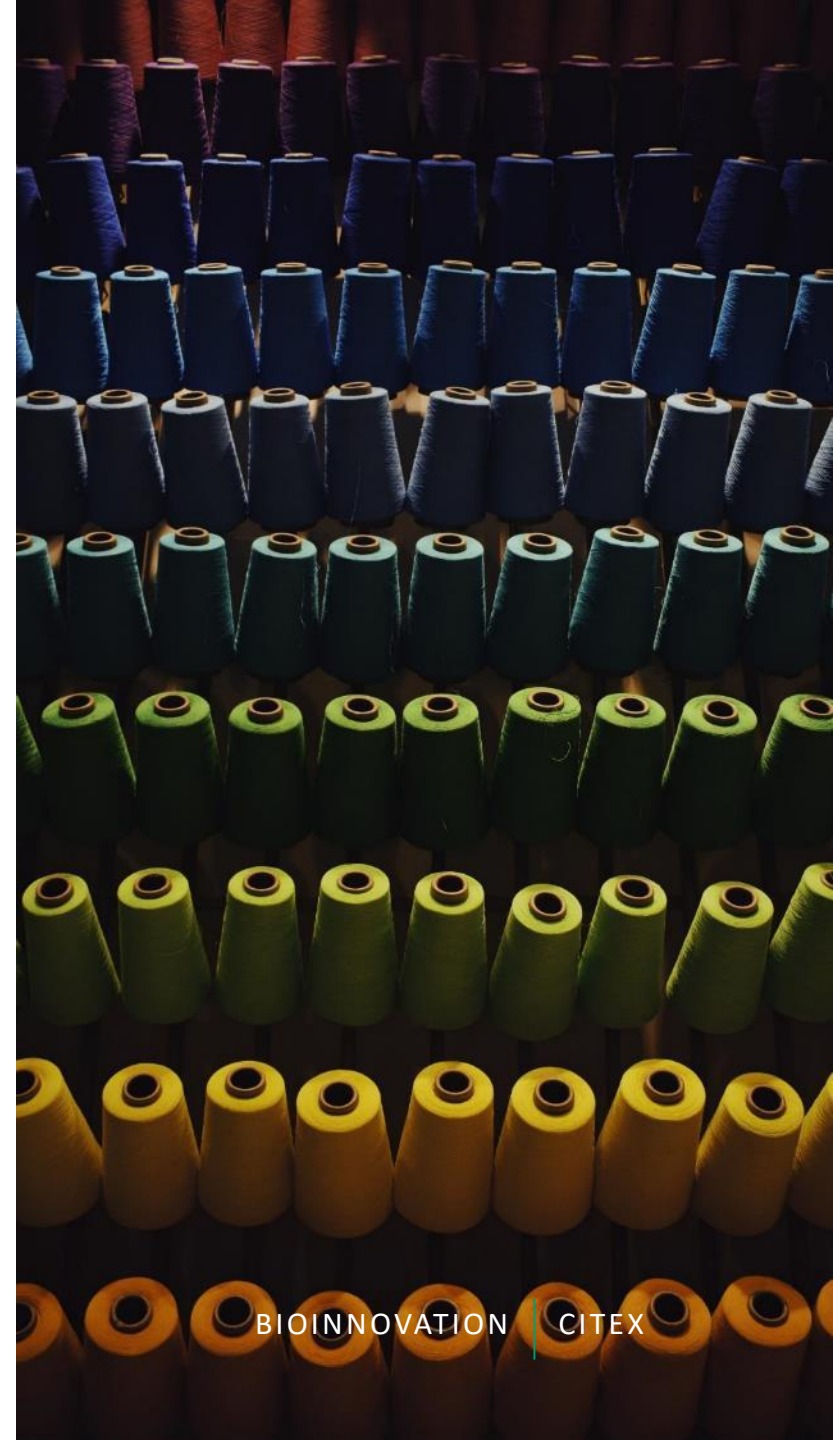
* This figure has not been verified

The price range may depend on a number of factors: type of fibre, demand, availability, desired profit margin, etc. Natural fibre is generally more expensive.

This information was gleaned from interviews with project partners, machine manufacturers/dealers and industry experts, as well as a report by McKinsley and previous project results at WI.

What does a shredding plant need?

- A material inflow of 800 kg/h.
- Investment capital starting at €2.5 million
- 3 to 5 operators for a small plant.
- Premises of at least 3,000 m² with a ceiling height of 10 m.
- Most likely a combination of guts and grit





But what
happens if?



Where do the difficulties lie?

- **Finding homogenous material flows.** The opposite means lost production time while changing over the machinery.
- **Optimising the output.** It requires know-how or advanced process control to maximise the fibre length and minimise downtime.
- **The broker role.** A considerable amount of work will probably be needed to identify materials for shredding that match the needs of customers. Or vice versa.
- **Guts and grit.** Even though this is an identified gap in the textile market, it needs bridging.

Life Cycle Assessment (LCA)

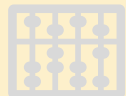
Conclusions – Life cycle assessment



The results of the study demonstrate that mechanically recycled fibres have a lower climate impact than primary fibre.

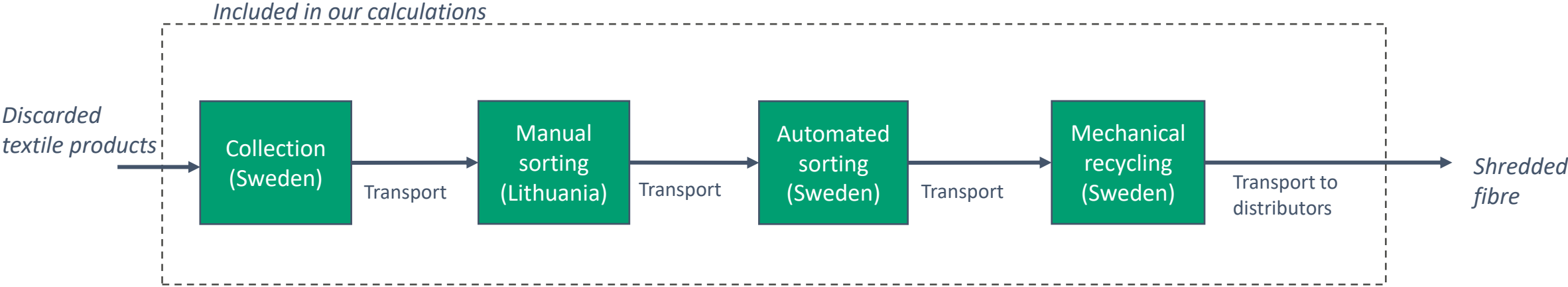


This holds true regardless of electricity mix, transport distance, fuel, the need for sorting or the construction of a new plant.

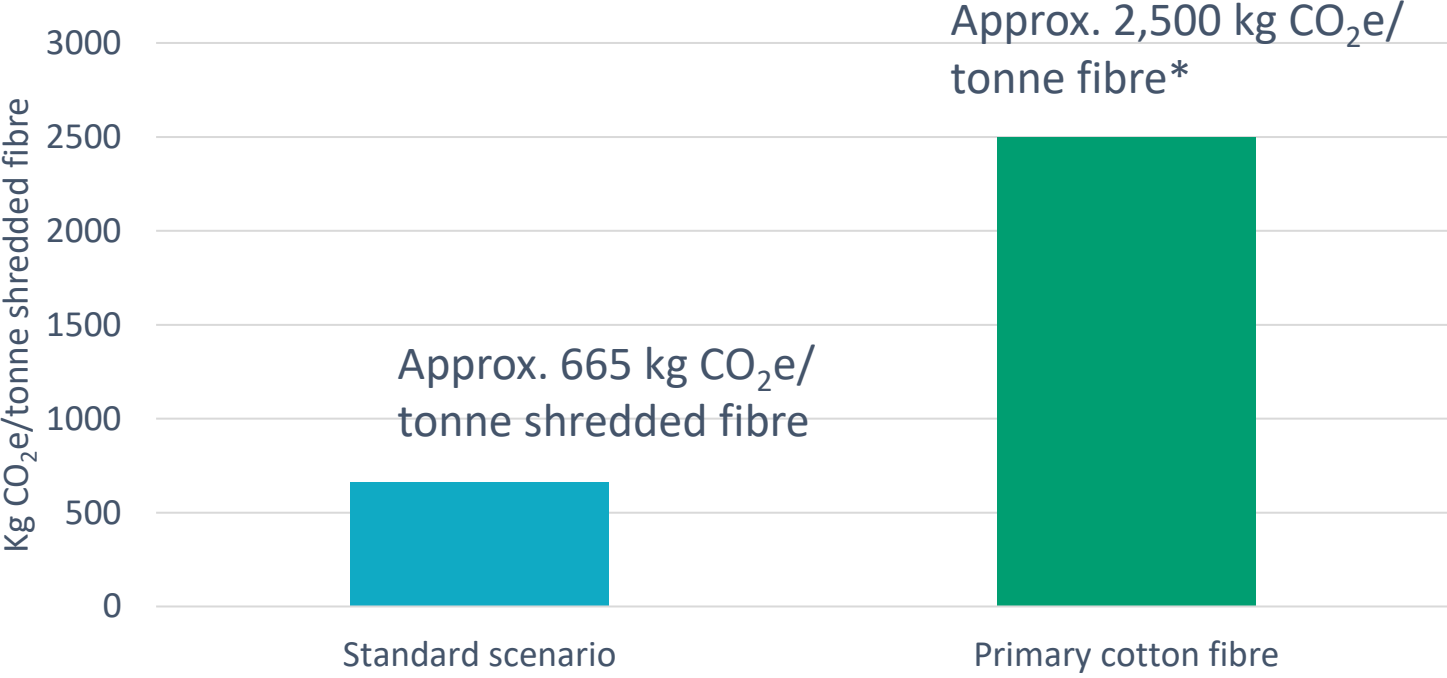


Above all, thanks to an electricity mix with a high percentage of renewables, a plant located in Sweden has enormous potential to contribute to reducing the climate impact of the textile sector.

The system boundaries of our calculations

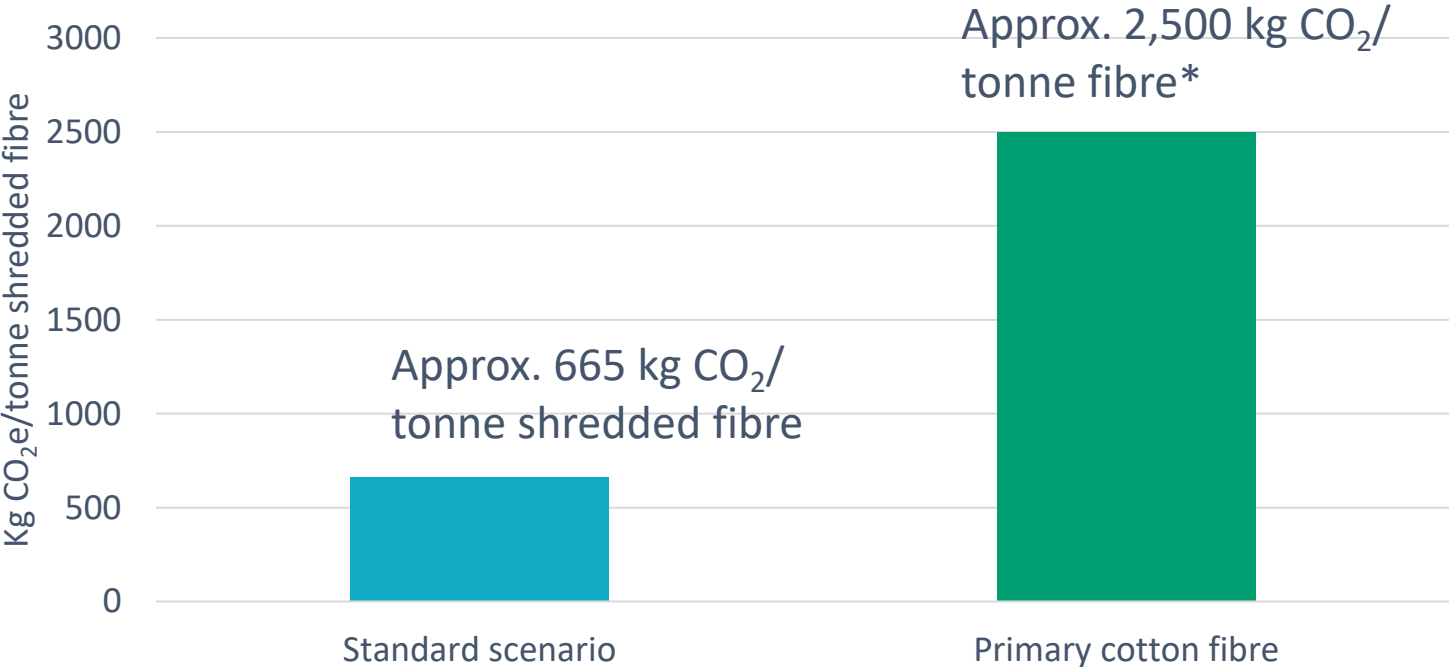


Climate impact



*On average for primary cotton fibre

Climate impact



*On average for primary cotton fibre

Assumptions:

- Collection takes place in Sweden
- Manual sorting takes place in Lithuania
- Automated sorting takes place in southern Sweden
- Fuel used for road transport is 6% RME
- Existing premises in southern Sweden are used for mechanical recycling.

**To conclude – a mechanical
recycling in Sweden has a
great potential**

Thank you!