TEXTILE CHALLENGE 3

Material and Chemistry

TEXTILE & FASHION 2030

SUSTAINABILITY BY SWEDEN
THE NATIONAL PLATFORM

TEXTILE CHALLENGE 3

Agenda

09:00 – 09:30	**Registration and coffee**	
09:30 – 09:45	**Welcome statement**	*Lisa Schwarz Bour, RISE IVF*
09:45 – 10:00	**Introduction to Tex4IM**	*Enrico Venturini, Tex4IM*
10:00 – 10.25	**Background on materials and chemicals and their environmental impacts**	*Sandra Roos, RISE IVF*
10:25 – 10:55	**Auxiliaries and functional chemicals in the wet textile processes**	*Ellinor Niit, Swedish School of Textiles*
10:55 – 11:05	***Short break***	
11:05 – 11:30	**How free can we be? Phasing out PFCs**	*Felix Aejmelaeus-Lindström, Fjällräven*
11:30 – 12:00	**Measuring the Total Impact of a Garment**	*Lisa Rosengren, Fristads*
12:00 – 12:45	***Lunch***	
12:45 - 15:00	**Textile Challenge 3, Workshop**	*Lisa Schwarz Bour, RISE IVF*
14:30 – 14:50	*Summary*	
14:50 – 15:00	*Walk to matchmaking facilities*	
15:00 -18:00	**Tex4IM Matchmaking**	
18:00 -19:00	**Wrap Up Mingel**	
19:00	**End of the day**	

About the Textile Challenges

Each Textile Challenge builds upon a seminar and a workshop based on one of the following 7 themes connected to the textile value chain:

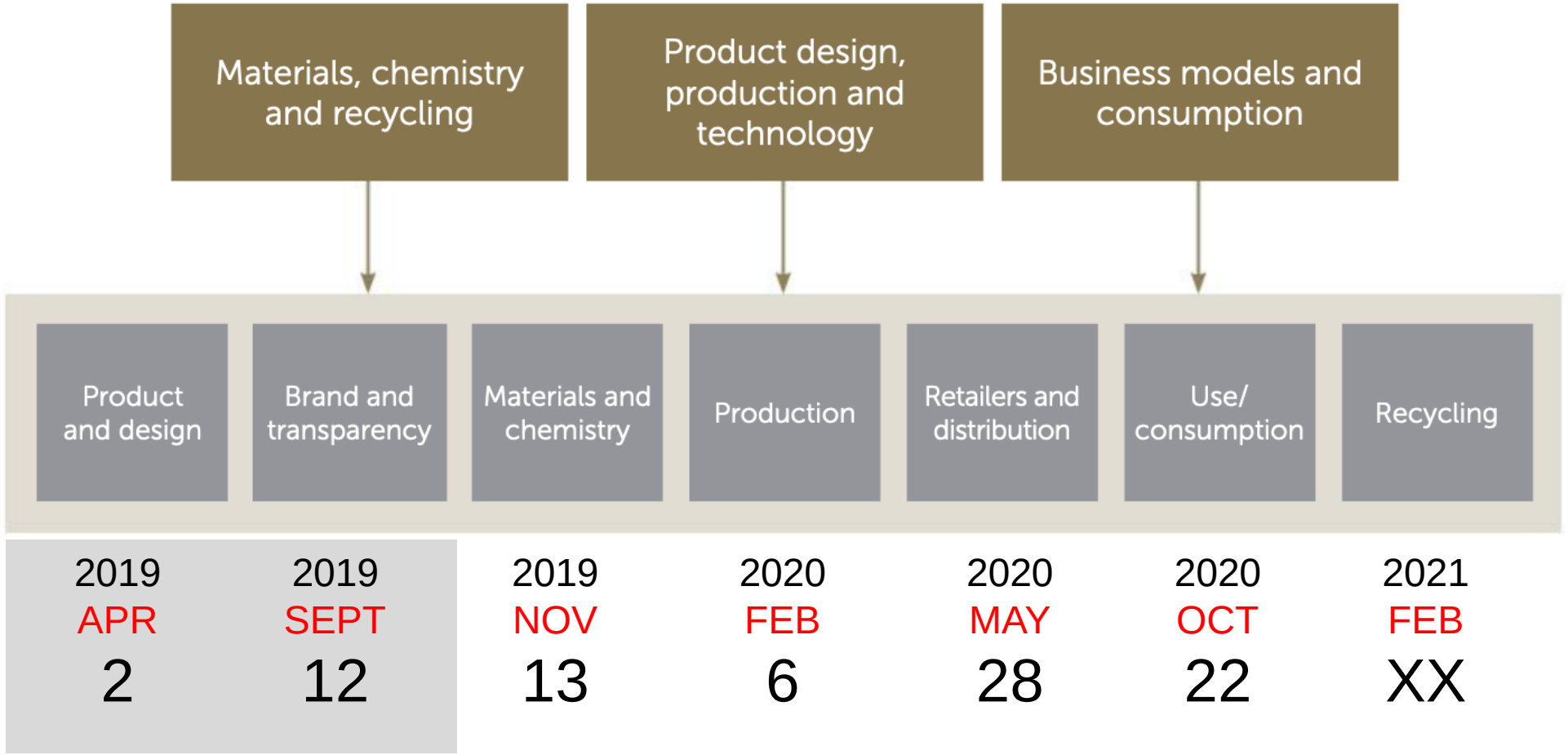
- Product & Design
- Brand & Transparency
- **Material & Chemistry**
- Production
- Sales & Distribution
- Use & Consumption
- Recycling

The seminar & workshop aims to challenge you to dig deeper within these areas, finding possibilities to improve, exchange experiences with others & expanding networks

Our wish is to support companies in advancing – by possibility of initiating company specific projects

Textile Challenge

TEXTILE & FASHION 2030



TEXTILE & FASHION 2030

Sweden unites for a sustainable textile and fashion future

TEXTILE & FASHION 2030

SUSTAINABILITY
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The National Platform for Sustainable Fashion and Textiles

It is **URGENT** that the fashion and textile industry becomes environmentally sustainable and eventually develops a climate-neutral and non-toxic cycle in line with what the planet can sustain.

Textile & Fashion 2030 is a neutral arena and enables new, sustainable solutions and business opportunities for the textile and fashion industry. We unite industry players and create a dynamic, strong **COMMUNITY** to reduce environmental impact at both national and international levels.

We offer skills development, activities, and tools that measure the progress of your sustainability work to achieve desirable results and to meet the consumer of the future. Through our work, Sweden is **ACTING** now and we are acting together.

The mission

The Swedish government has given the University of Borås the task of establishing and leading Textile & Fashion 2030 - The National Platform for Sustainable Fashion and Textiles.

The five-year assignment is led by Smart Textiles, part of Science Park Borås at the University of Borås, in collaboration with the Swedish School of Textiles, the Swedish Fashion Council, the RISE Research Institutes of Sweden, the Swedish Trade Federation, and TEKO, the Swedish trade and employers' association for companies working in the textile and fashion industry.

Textile & Fashion 2030 is the platform that puts Sweden at the forefront when it comes to the development of the textile and fashion sector in moving towards sustainability and a circular economy. In this way, the platform also works to achieve the national environmental goals and Agenda 2030 goals that affect textiles and fashion.

Textile & Fashion 2030 aims to:

- Promote collaboration, cooperation, and efforts towards an environmentally sustainable value chain in the textile sector.
- Make research and development results available for environmentally sustainable development and provide a bridge between research and practice.
- Promote sustainable business models and combine environmental benefits with business benefits.
- Strengthen the work of SMEs to achieve circular flow and environmentally sustainable development.
- Minimize negative environmental effects from production.

Our Offer

By taking part in the platform's activities and becoming part of our network of textile and fashion companies, you can, free of charge, take part in our knowledge and experience through, for example:

- Self-assessment
- Project support
- Seminars and workshops
- Training
- Tools and resources

We are also happy to share good examples and inspiring projects that we find in relation to our areas of knowledge.

Please contact us for more information:

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Knowledge Areas Coordinator
Lena-Marie Jensen
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Activities that challenge and develop

Textile & Fashion 2030 initiates activities at the national and international level to help achieve the goals of Agenda 2030. Four public and recurring activities are central to the platform.

Each activity focuses on different challenges and opportunities in the textile and fashion sector and leads to insights on why and how a sustainable industry should be developed.

Textile Challenge
Project challenges for companies in a specific area of knowledge that start with an inspiring seminar and lead to projects to achieve Agenda 2030.

Exposé
A design-driven exhibition concept that promotes inspiration and generates knowledge exchange for further experimentation.

Big Do
Activity for visionaries who are invited to the Swedish School of Textiles' infrastructure to create prototypes and find inspiration for new sustainable products and services on the market.

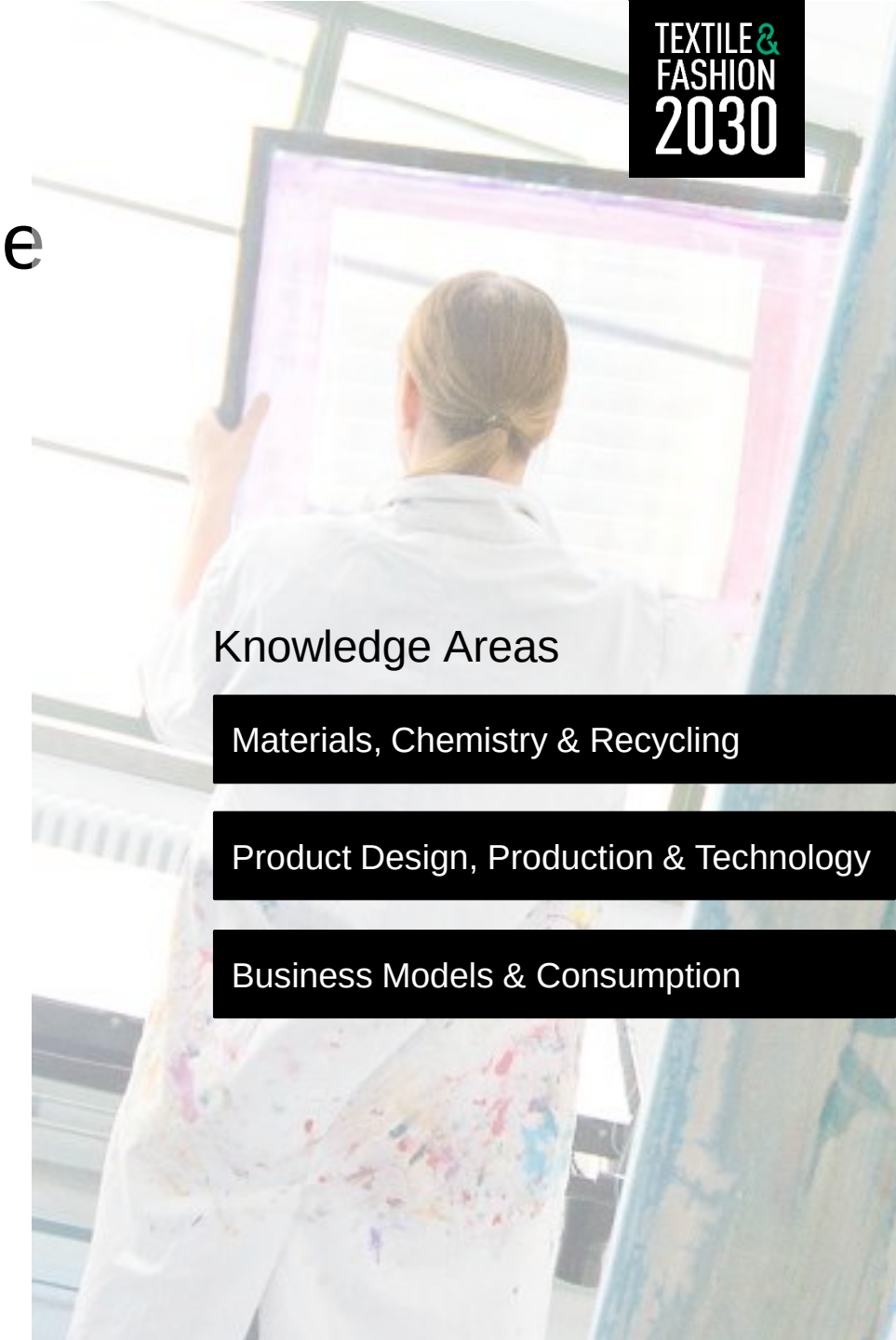
International Conference
An international conference on global issues in the textile and fashion industry.

Collected knowledge and continuous monitoring of developments worldwide

The knowledge areas are an important part of Textile and Fashion 2030, which through the participants' good knowledge of research developments contribute to the platform's role as catalyst, facilitator, and accelerator for the sustainable development of the textile and fashion sector and its value chains.

Textile & Fashion 2030 works in three areas of knowledge to contribute to the competence development and training of the platform's stakeholders. These areas are chosen to cover the textile value chain and all actors should be able to find a good fit.

The purpose of the knowledge areas is to create a neutral meeting place where experts in textiles, fashion, and sustainability can work together on sustainability issues, external monitoring, policy, education and project generation.



Participants in the Knowledge Groups

	Materials, Chemistry & Recycling	Product Design, Production & Technology	Business Models & Consumption
Group leader	Lisa Schwarz Bour RISE	Niina Hernández, Swedish School of Textiles	Jonas Larsson, Swedish School of Textiles
Design perspective	Hanna Landin, Swedish School of Textiles	Anna Lidström, Swedish School of Textiles	Annika Berner, Beckmans
System perspective	Rudrajeet Pal, School of Textiles	Sandra Roos, RISE	Björn Spak, RISE
Experts	Ulf Haraldsson, SIS Christina Jönsson, RISE Maria Ström, Wargön Innovation Mikael Skrifvars, Swedish School of Textiles Ellen Einebrant, The Swedish Recycling Industries' Association Emma Westerholm, KEMI	Adrian Zethraeus, Science Park Borås Weronika Rehnby, TEKO Joel Svedlund, Peak Innovation Oskar Juhlin, Stockholms Universitet Mats Johansson, Science Park Borås Yvonne Augustsson, Naturvårdsverket	Alina Klaseva, SIWI Claudia Rademaker, Stockholms Universitet Eva Holmgren, The Swedish Consumer Agency Maria Sandow, Swedish Trade Federation Rebecca Uggla, The Swedish Environmental Protection Agency Emma Samsioe, Lunds Universitet

Coordinator Lena-Marie Jensen, Smart Textiles

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Core Partners

Hosted by:

smart textiles
BY SCIENCE PARK BORÅS

THE SWEDISH SCHOOL OF TEXTILES
UNIVERSITY OF BORÅS

Core Partners:

SWEDISH FASHION COUNCIL

RI.SE
Research Institutes of Sweden

TEKO | SVERIGES TEXTIL- & MODEFÖRETAG

SVENSK HANDEL

TEXTILE & FASHION 2030

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www.textileandfashion2030.se

EXPOSE

A design-driven public exhibition concept within Textile & Fashion 2030 with the aim to increase awareness amongst textile and fashion companies, as well as consumers, about the issues associated with the textile and fashion industry.

The current Exposé shows results from Big Do, an activity within Textile & Fashion 2030 held in August 2019, where designers and visionaries were invited to Science Park Borås and the Swedish School of Textiles to create inspiring concepts based on the United Nation's Sustainable Development Goals.

The Exposé will be presented on different locations both national and international and the content will vary. Examples of content are: results from the Big Do activity, results from Textile Challenges, and results from national as well as international sustainability projects.

TEX4IM

Textile Clusters for Industrial Modernisation - Tex4IM

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Co-funded by the COSME programme
of the European Union

TEX4IM Call

- Call for EOI: May 2016 – March 2017
- European Strategic Cluster Partnerships for smart specialisation investments COS-CLUSTPARTNS-2017-03-02

Co-funded by the COSME programme of the European Union

TEX4IM and Regiotex

RegioTex
SMART REGIONAL INVESTMENT IN TEXTILE INNOVATION

TEX IM

ESCP.S
TEX4IM
Partnership

Call for EOI: May 2016 – March 2017

- ❑ 15 EOI received
- ❑ 8 regions included
- ❑ Other stakeholder regions (at least 4)

T E X / I M

TEX4IM consortium

OTIR2020 - TUSCANY FASHION CLUSTER (NEXT TECHNOLOGY TECNOTESSILE S.R.L.)

ASTRICO NORD-EST

ATEVAL - ASOCIACION DE EMPRESARIOS TEXTILES DE LA REGION VALENCIANA

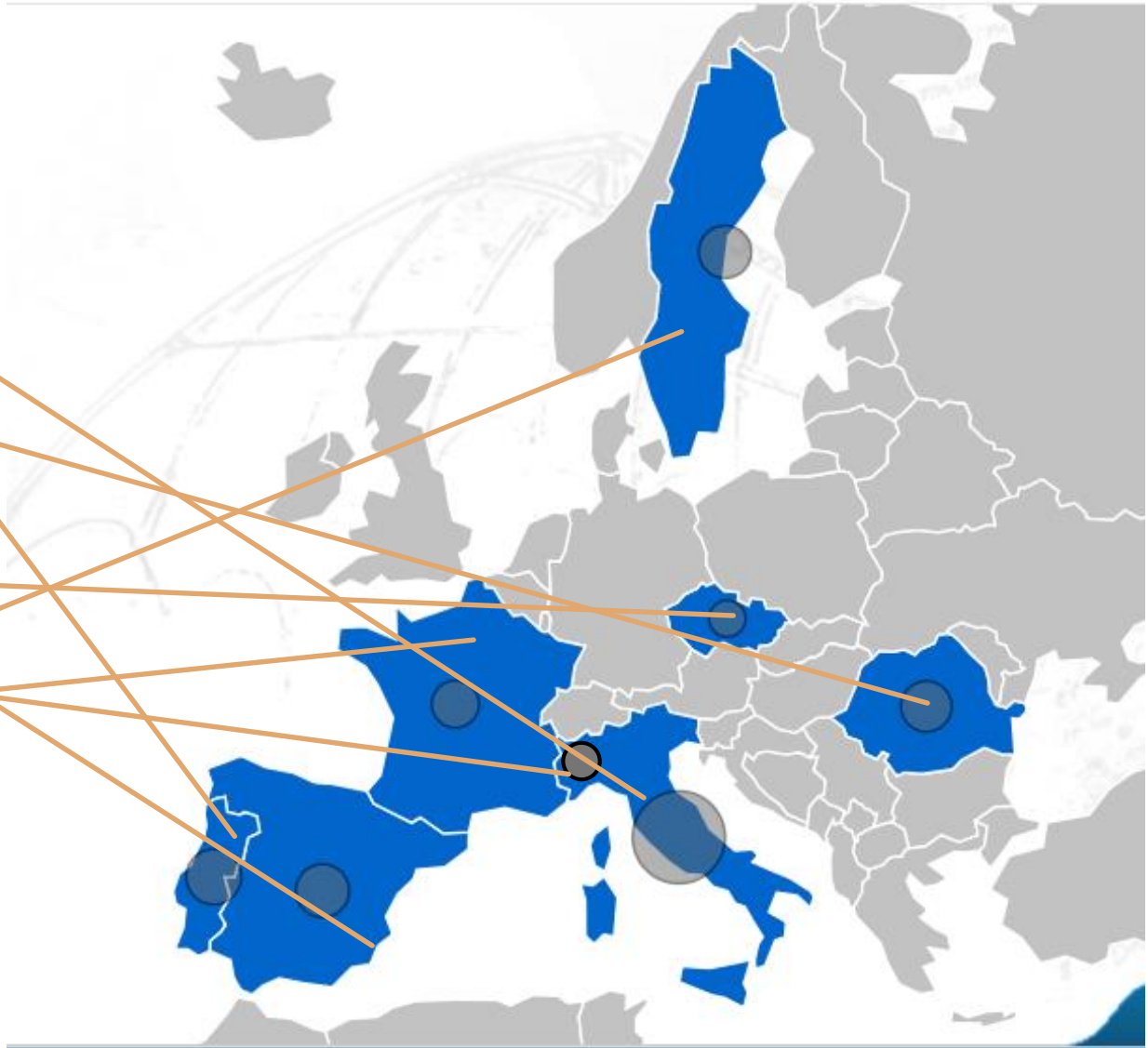
CITEVE - CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL

CLUTEX - KLASTR TECHNICKE TEXTILIE

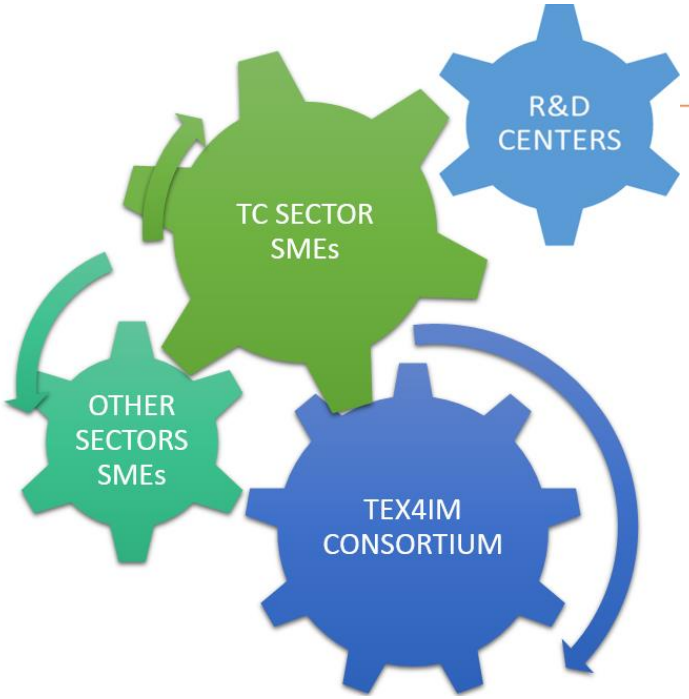
PO.IN.TEX (CITTA STUDI SPA)

SMART TEXTILES (HOEGSKOLAN I BORAS)

UP-TEX



T E X I M



TEX4IM objectives

- Set up a sustainable **incubator and accelerator** system for the generation of joint investment projects in TC and other related or cross-linkable sectors;
- To develop a joint **strategy for industrial modernisation** of TC sector of Europe;
- To accelerate the uptake of innovation and increase of production by TC SMEs, thanks to a more focused and effective **R&D matching** and a more efficient design of **new business models and value chains**

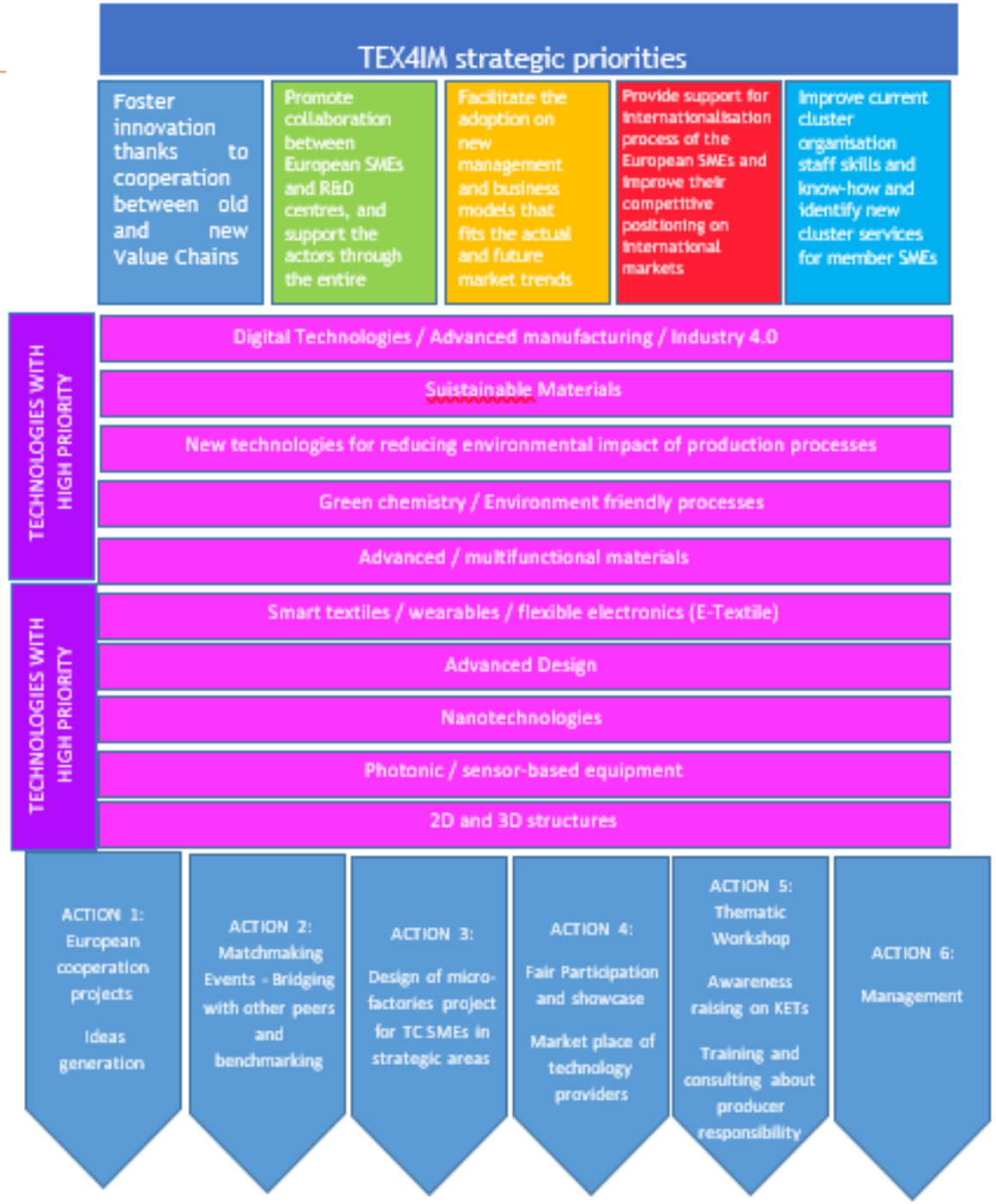
TEX4IM thematic priorities

Sustainability (resource-efficiency and circular economy)
Industry4.0 and new digital business models
Sector diversification (Technical & smart textiles)
Design- and creativity-based innovation

- Circular economy
- Industry 4.0 and advanced manufacturing
- Digital technologies, including digital platforms, e-marketing and thematic social communities;
- Advanced Textile Materials (ATM);
- Creativity as a new business model for TC value chains creation.

T E X I M

TEX4IM Strategy



T E X I M

TEX4IM Expected Outcomes

1 - EU TEXTILE 2030

Agreement/synergies with an external partnership for the long term sustainability

Min. 10 actions for the future defined

Long term cooperation agenda for the partnership

Joint strategy for TC industrial modernization and long-term cooperation

1 - This document

8

Achievement of the ESCP-S3 label for the TEX4IM consortium members

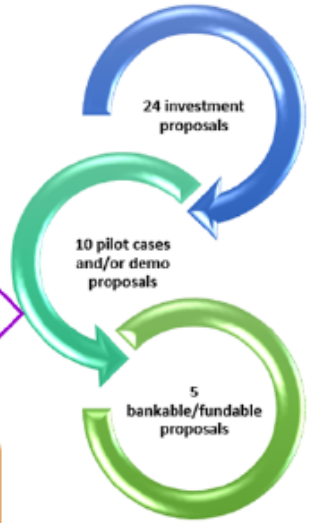
17

Common areas of interes identified for the collaborations set up

2

Interregional matchmaking events, including B2B and C2C sessions each

Portfolio of business opportunities



Awareness raising and dissemination campaign, learning and monitoring system for the project

250 stakeholders contacted

Permanent incubation and acceleration system for the generation of joint investment projects in TC sector. 3 investment projects per year, for a period of 5 years after the end date of the project.

Long-term outcome

Intelligence action, detailed map of opportunities for cluster firms of the 8 regions

1

Participation to at least one European Strategic Cluster Partnership different from TEX4IM

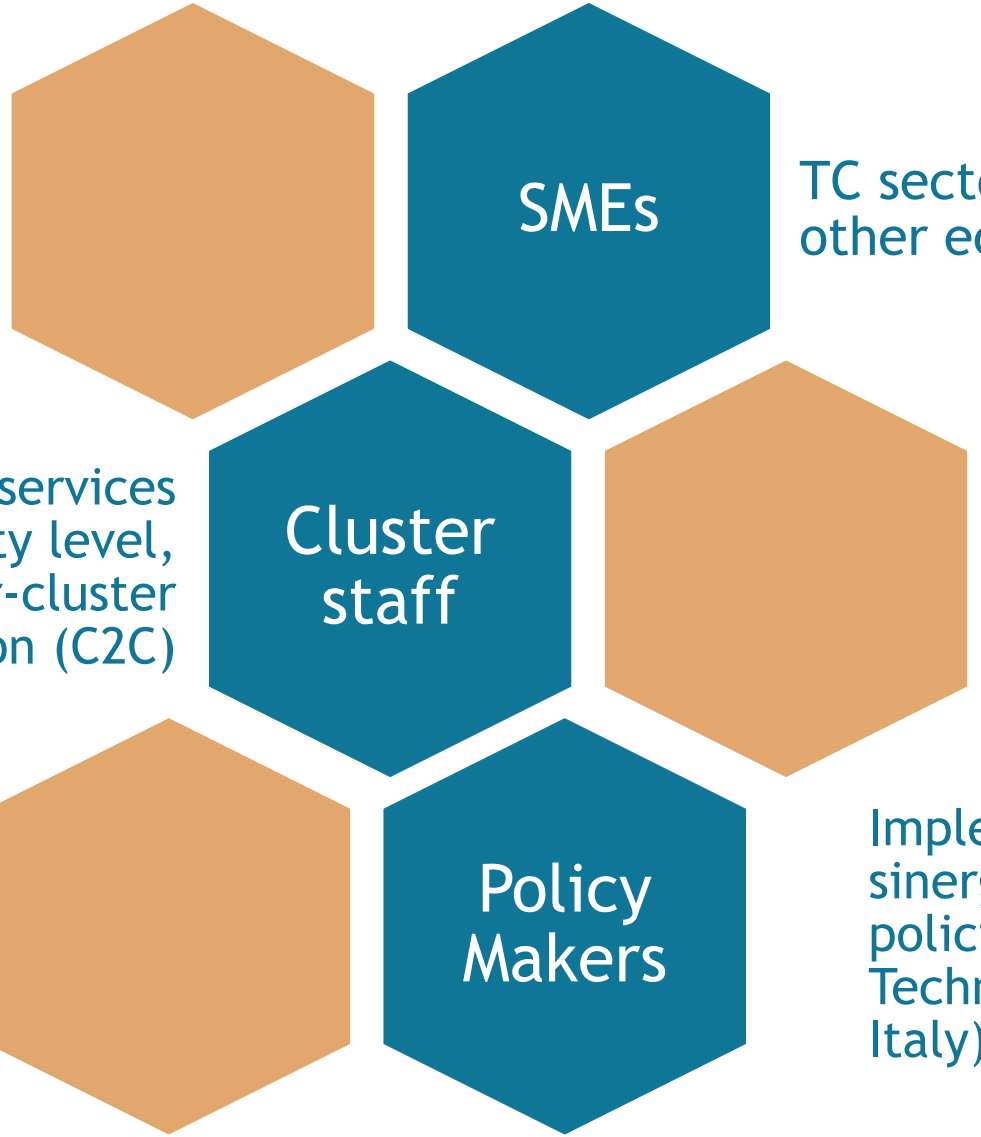
1

Business and growth support services, for the 5 fundable pilot cases

5 pilots assisted - production of 5 Business plans

T E X I M

TEX4IM Target groups



TC sector and other ecosystems

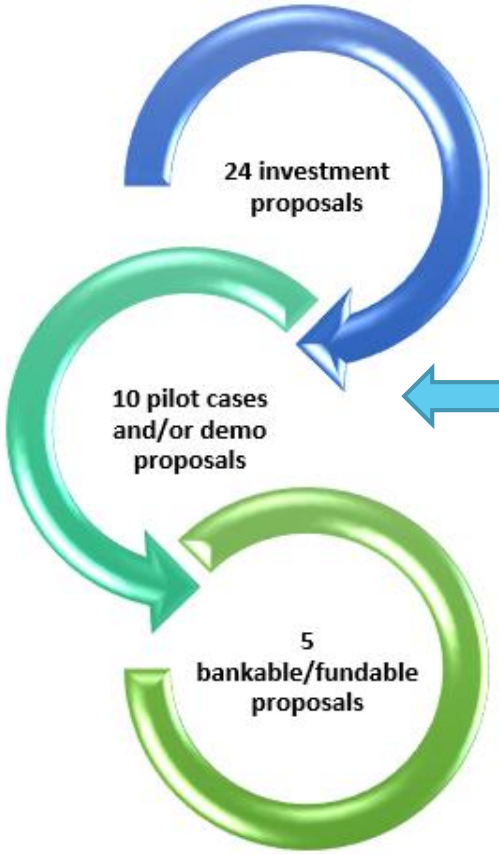
Raise services quality level, inter-cluster cooperation (C2C)

Implementation of S3, sinergies with national policies (i.e. National Technology Cluster in Italy)

T E X I M

TEX4IM Activities

- Map of cooperation opportunities
- Roadmap for partnerships



WP1 - Joint cluster partnership strategy

WP2 - Mobilising interregional business collaboration and consolidating clusters partnership

WP3 - Sustainable incubation and acceleration system; portfolio of projects/opportunities

WP4 - Technical support for the portfolio of demonstration and pilot projects

WP5 - Learning, monitoring and dissemination; exploitation for project outcomes and long-term partnership agenda

WP6 - Project management and risk management

- Map of TC KETs
- Map of non-TC key players

- Information to target goups
- Peer reviews in and out of T4I partnership
- Lomg term cooperation agenda
- Results exploitation at policy and end-users level

- Consortium agreeement
- Working protocol
- Steering Committee
- Meetings-peer reviews
- Communication, quality plan
- Risk management

T E X I M

MATCHMAKING EVENTS

November 13

9:00	Registration and Coffee
9:30	Seminar Textile Challenge 3 - Material, Chemistry & Recycling (including introduction to Tex4IM)
12:00	Lunch
12:45	Workshop Textile Challenge 3 - Material, Chemistry & Recycling
15:00	Tex4IM Matchmaking - FIRST ROUND (Foreign visitors meet Swedish actors)
18:00	Wrap up cocktail
19:00	End of the day

November 14

9:00	Tex4IM MM, SECOND ROUND (Foreign visitors meet each other and scaling up organisations)
11: 00	Break
11:15	Networking activity - OPTIONAL
13:00	Lunch
14:00	End of the day

Meet new business partners, enjoy the seminar and workshop about sustainable material, chemistry and recycling.

T E X I M

SEND YOUR PROJECT IDEA!

https://tex4im.eu/tex4im-call-for-project-ideas-in-the-form-of-expression-of-interest-eoi/

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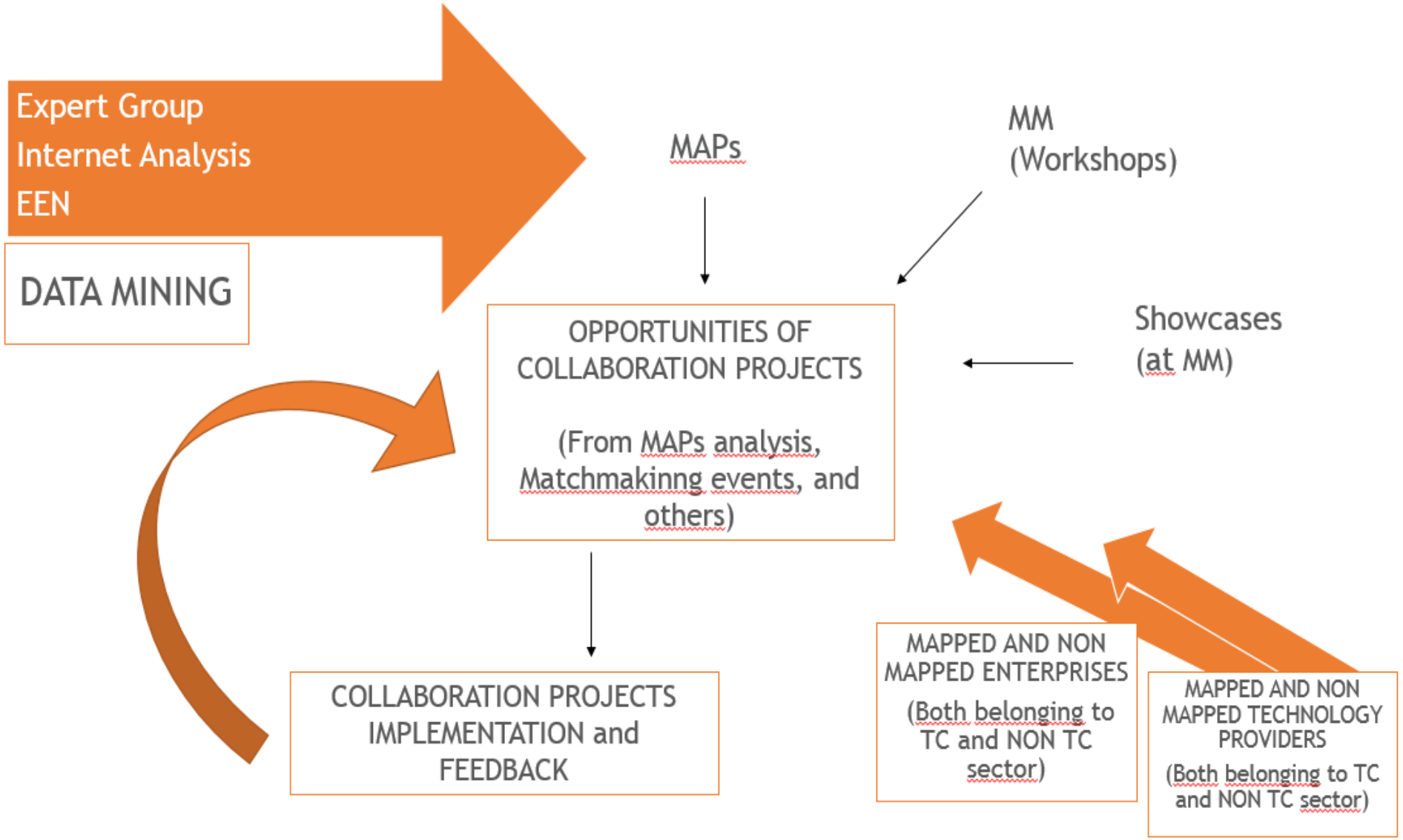
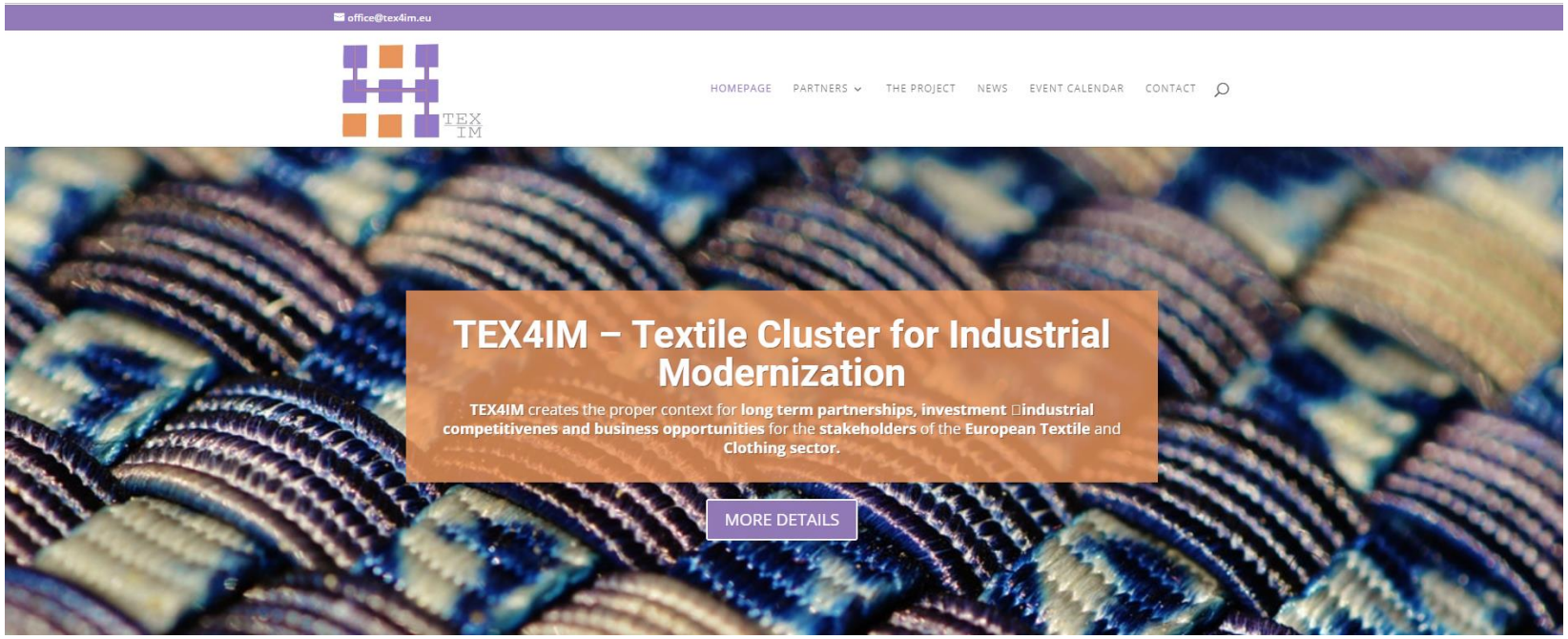
TEX4IM INTELLIGENCE SERVICE



T E X I M

Thanks for your attention!
Stay tuned on
www.tex4im.eu



TEX IM

Co-funded by the COSME programme of the European Union

TEX IM

MATERIALS AND CHEMICALS IN TEXTILES AND THEIR ENVIRONMENTAL IMPACTS

2019-11-13

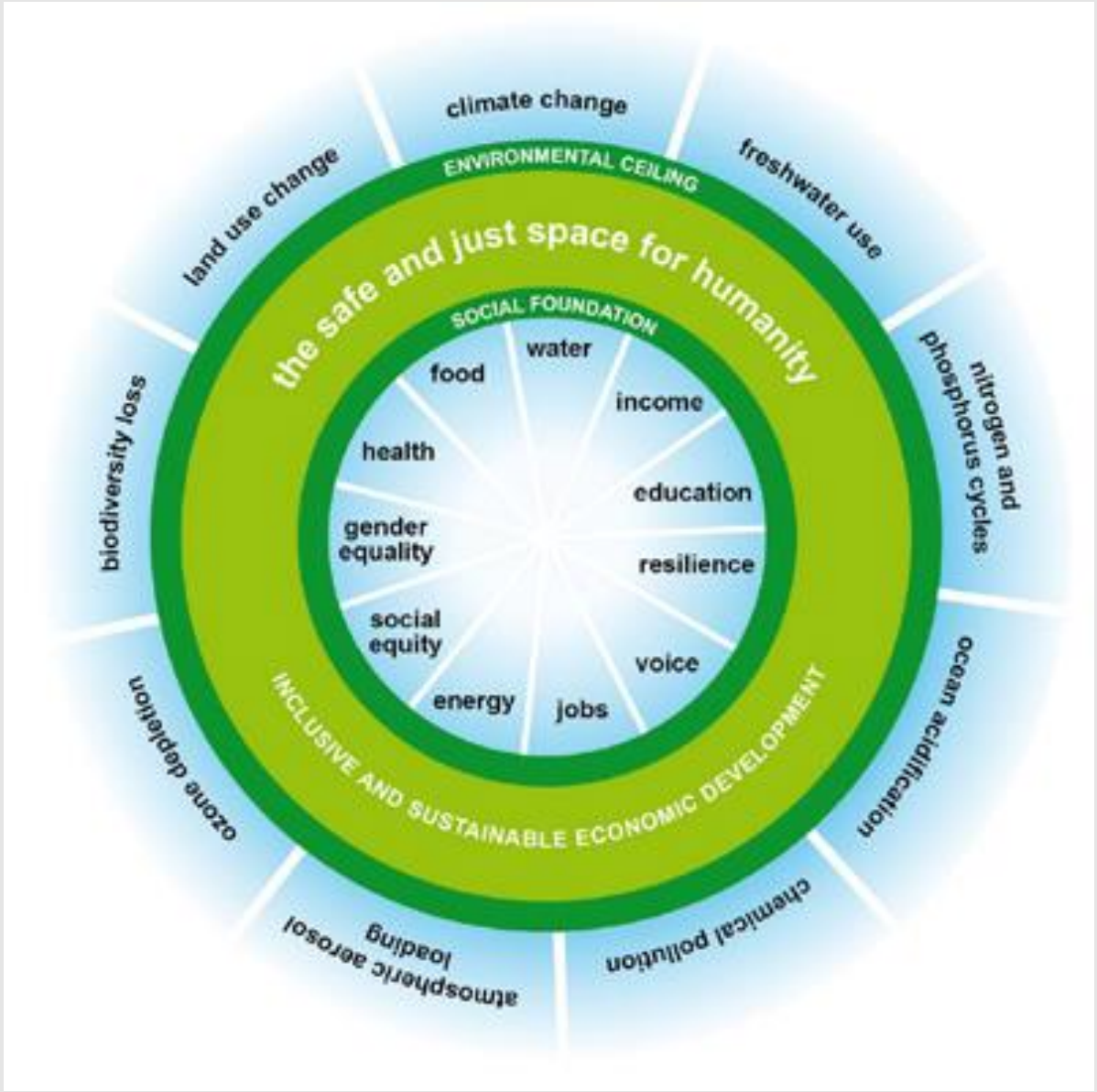
Dr. Sandra Roos, RISE IVF

Participates in Produktdesign, Produktion & Teknik

Research Institutes of Sweden

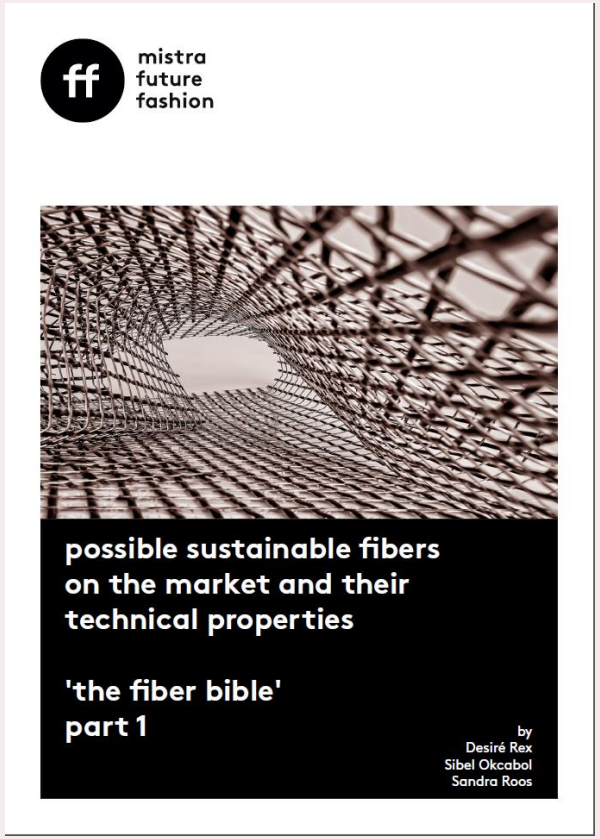
Material och Produktion

Can we live within the Doughnut?

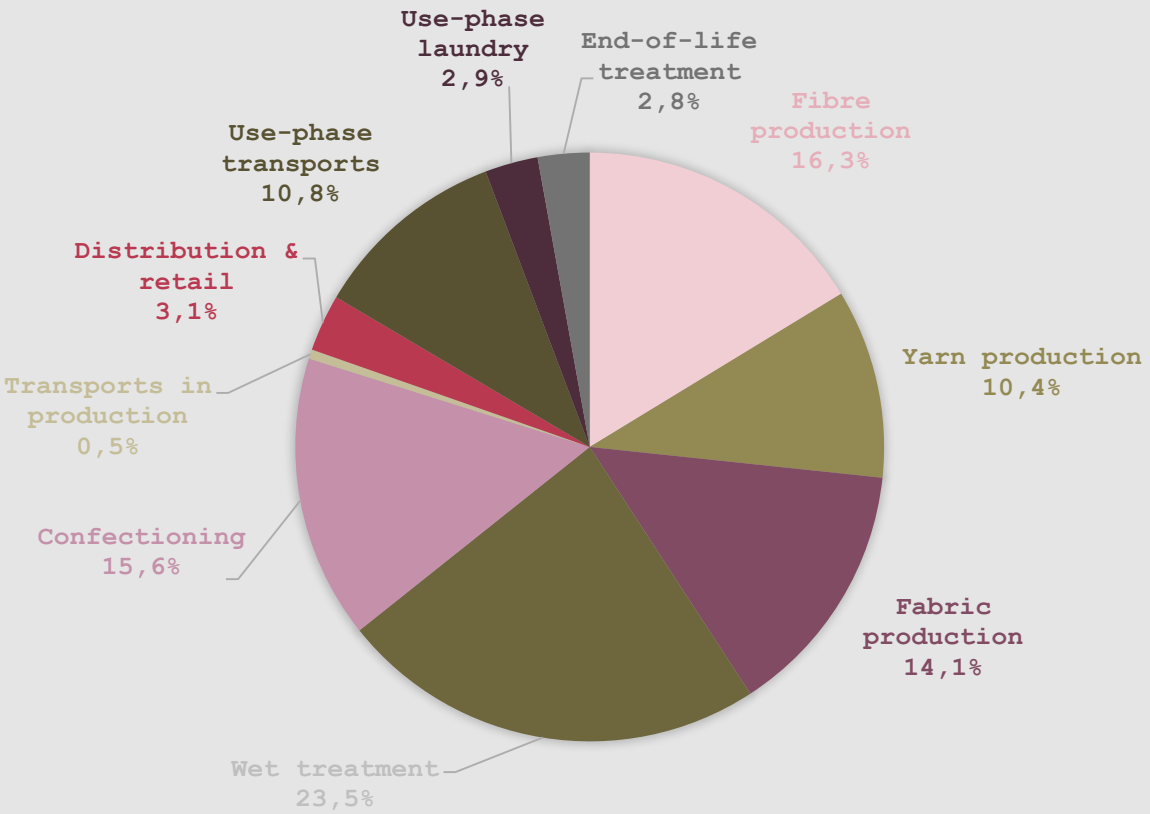


Raworth, K. (2012). A Safe and Just Space For Humanity: Can we live within the Doughnut? *Nature*, *461*, 1–26. doi:10.5822/978-1-61091-458-1

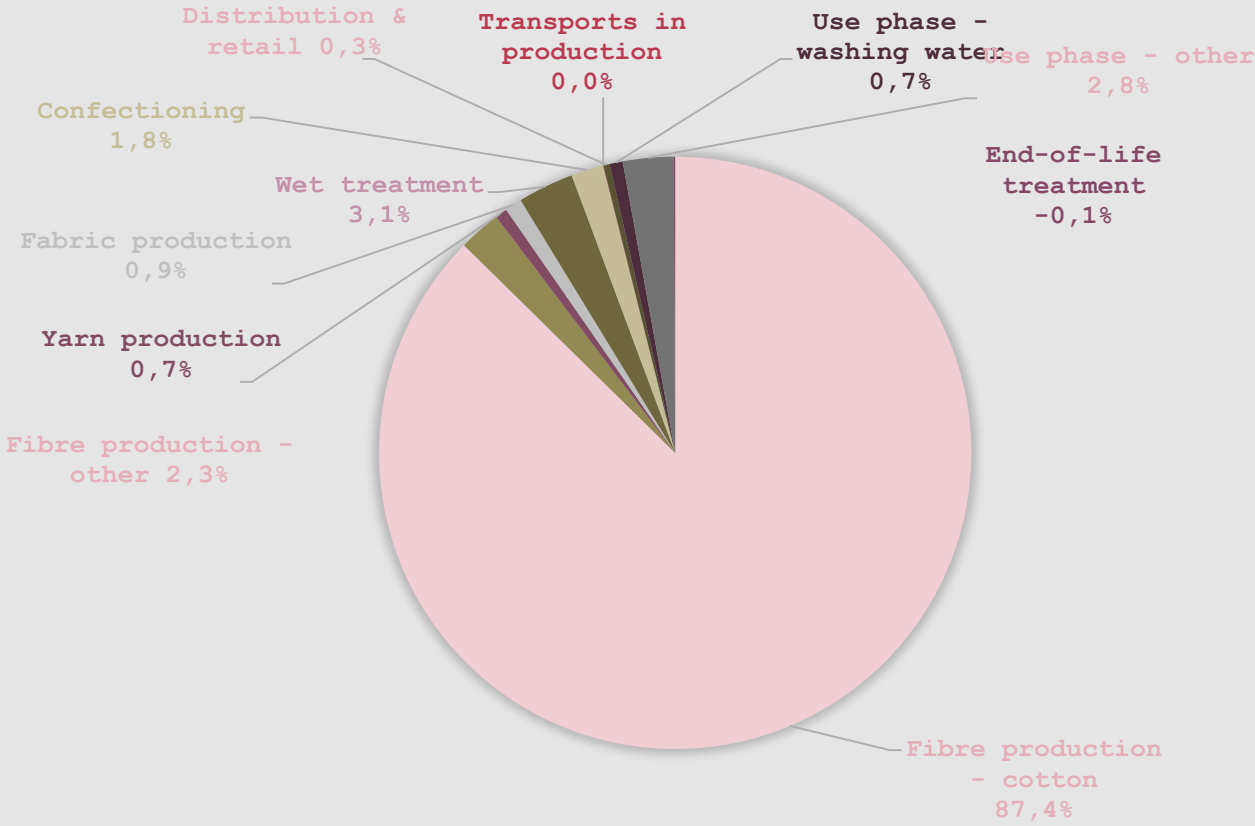
http://mistrafuturefashion.com/download-publications-on-sustainable-fashion/



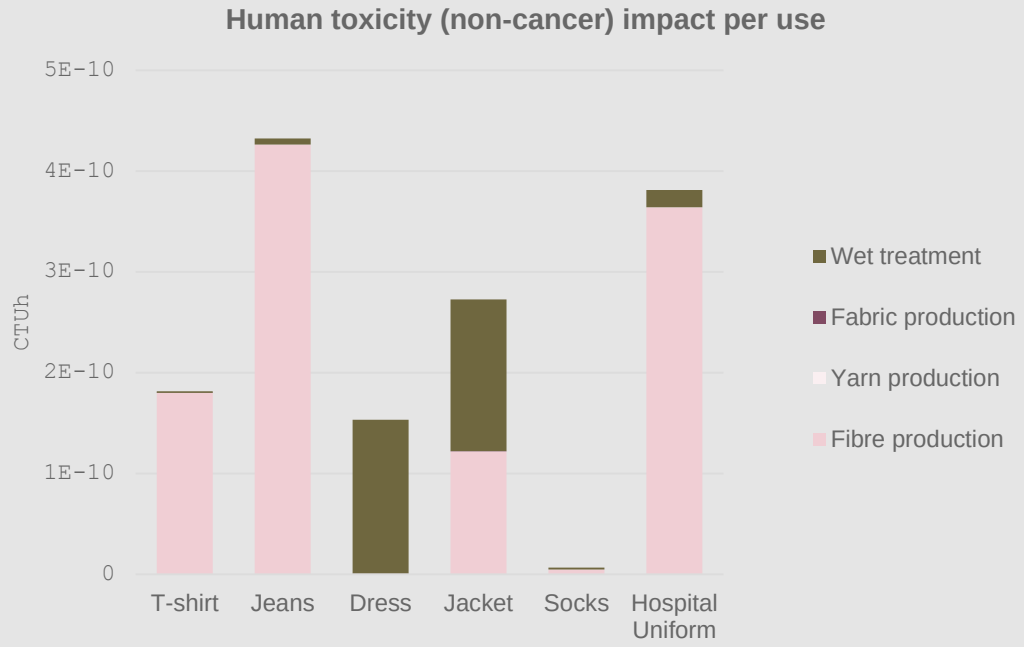
Climate impact

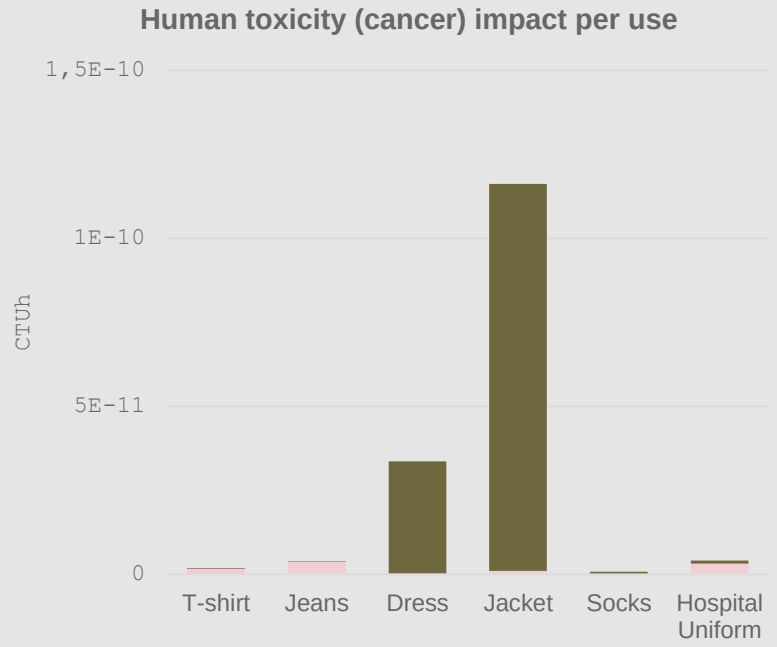


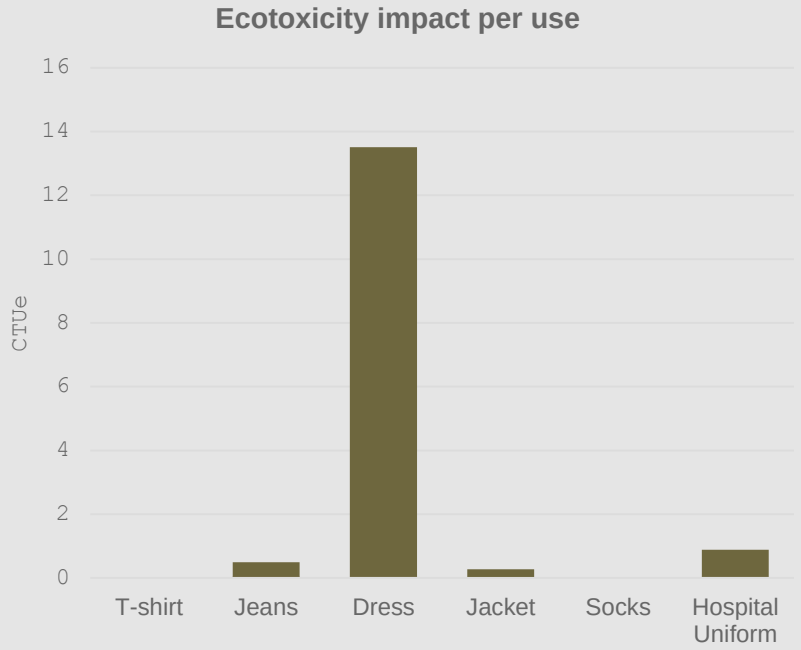
Water scarcity impact



Sandin et al. (2019a)

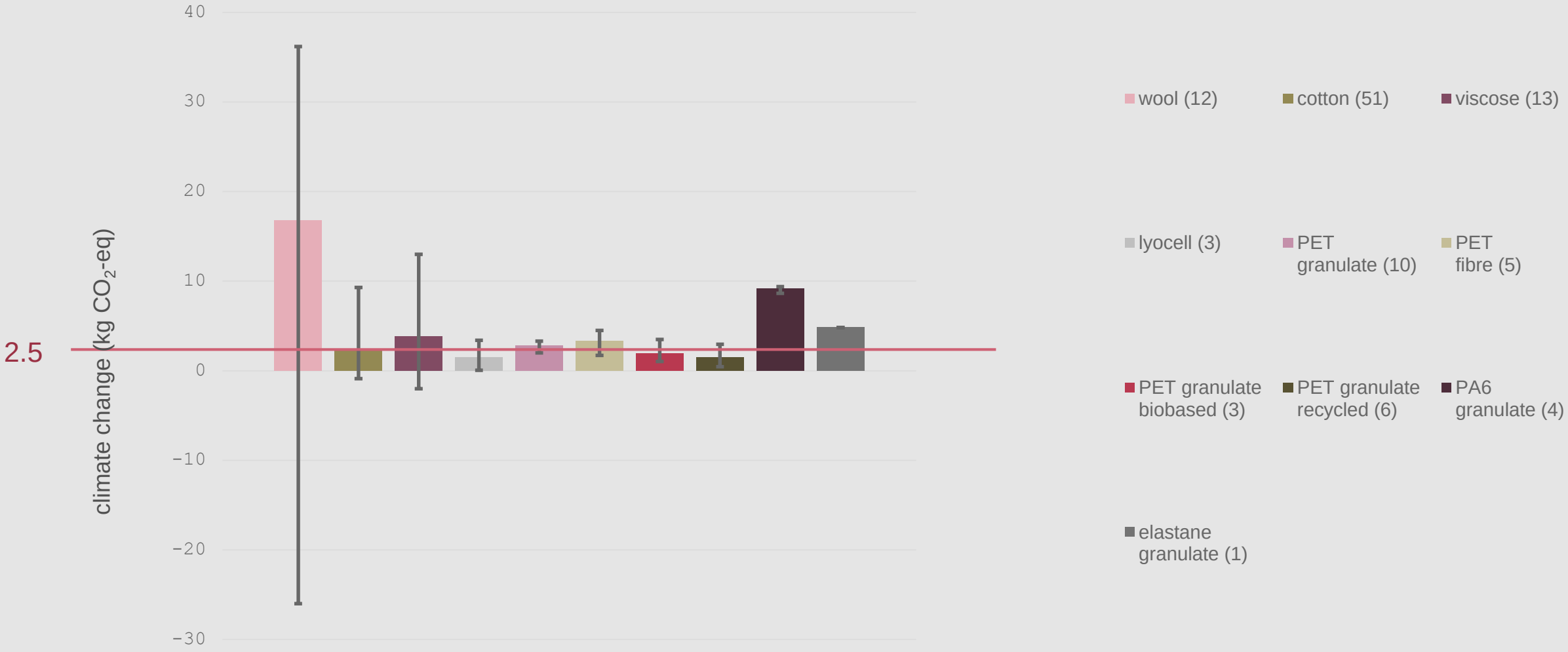






Sandin et al. (2019a)

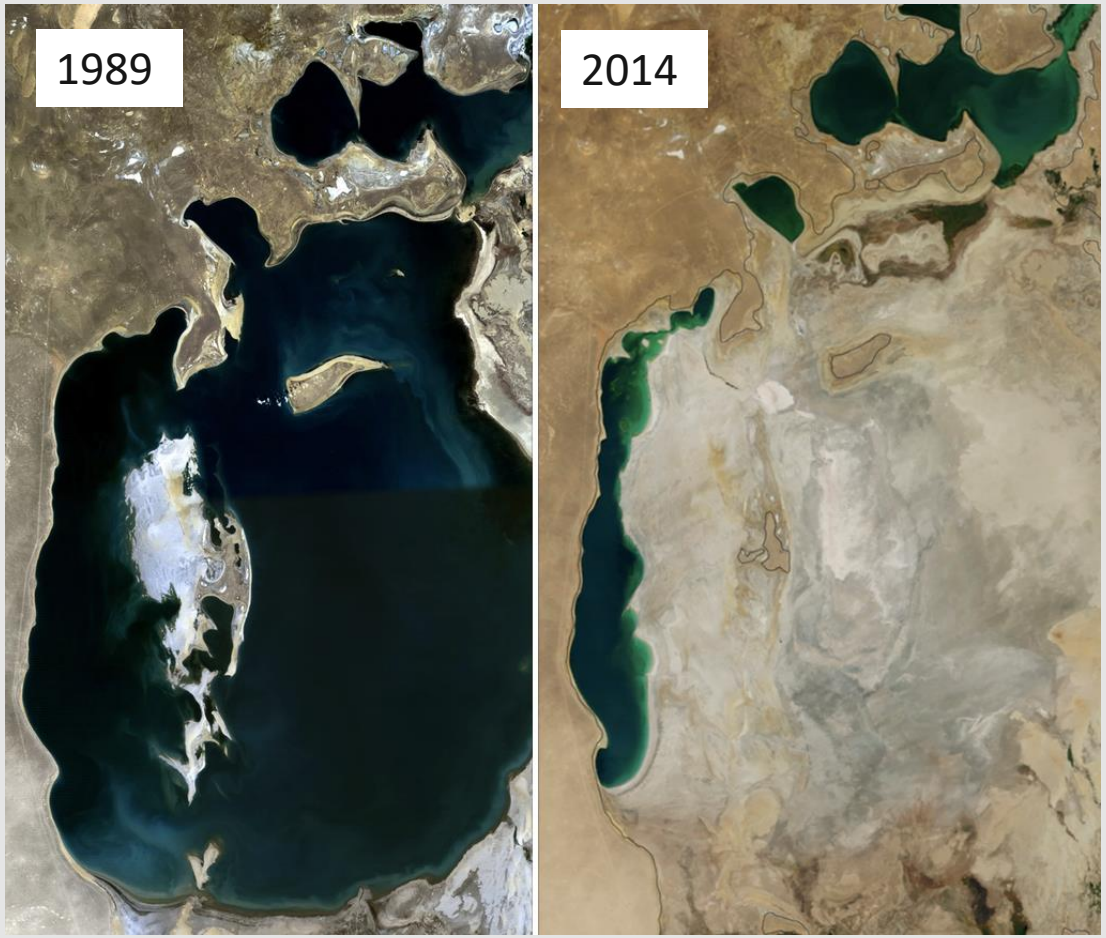
Conclusion from scientific facts: There are no ”sustainable” or ”unsustainable” fibres! It is the suppliers that differ!



Rex et al. (2019)
Sandin et al. (2019b)

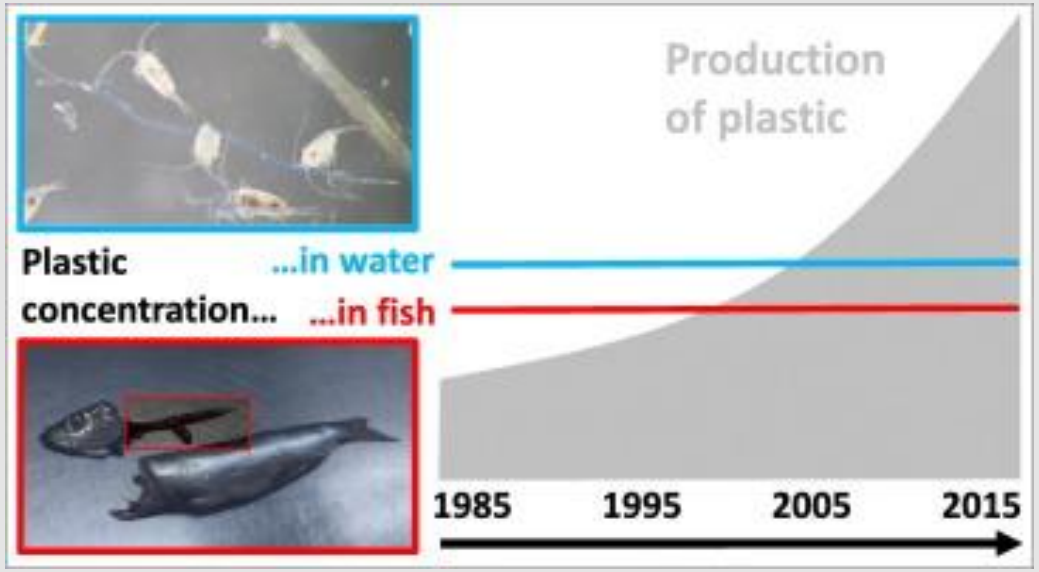
The Aral sea disaster…

But, the sea's depth increased from 30 meters in 2003 to 42 meters in 2008.



The Kok-Aral Dam was built in 2005

Beer et al. No increase in marine microplastic concentration over the last three decades – A case study from the Baltic Sea, 2018



- **First** long term study (more are needed)
- Microplastics have been present in the Baltic environment and the digestive tracts of fishes **for decades**, the levels have **not changed** in this period.
- Microplastic pollution **may be more closely correlated to specific human activities in a region than to global plastic production and utilization as such**.

vision for 2030

- best technique
- too much water
- bad chemicals
- too much energy

today, 50 pieces /year

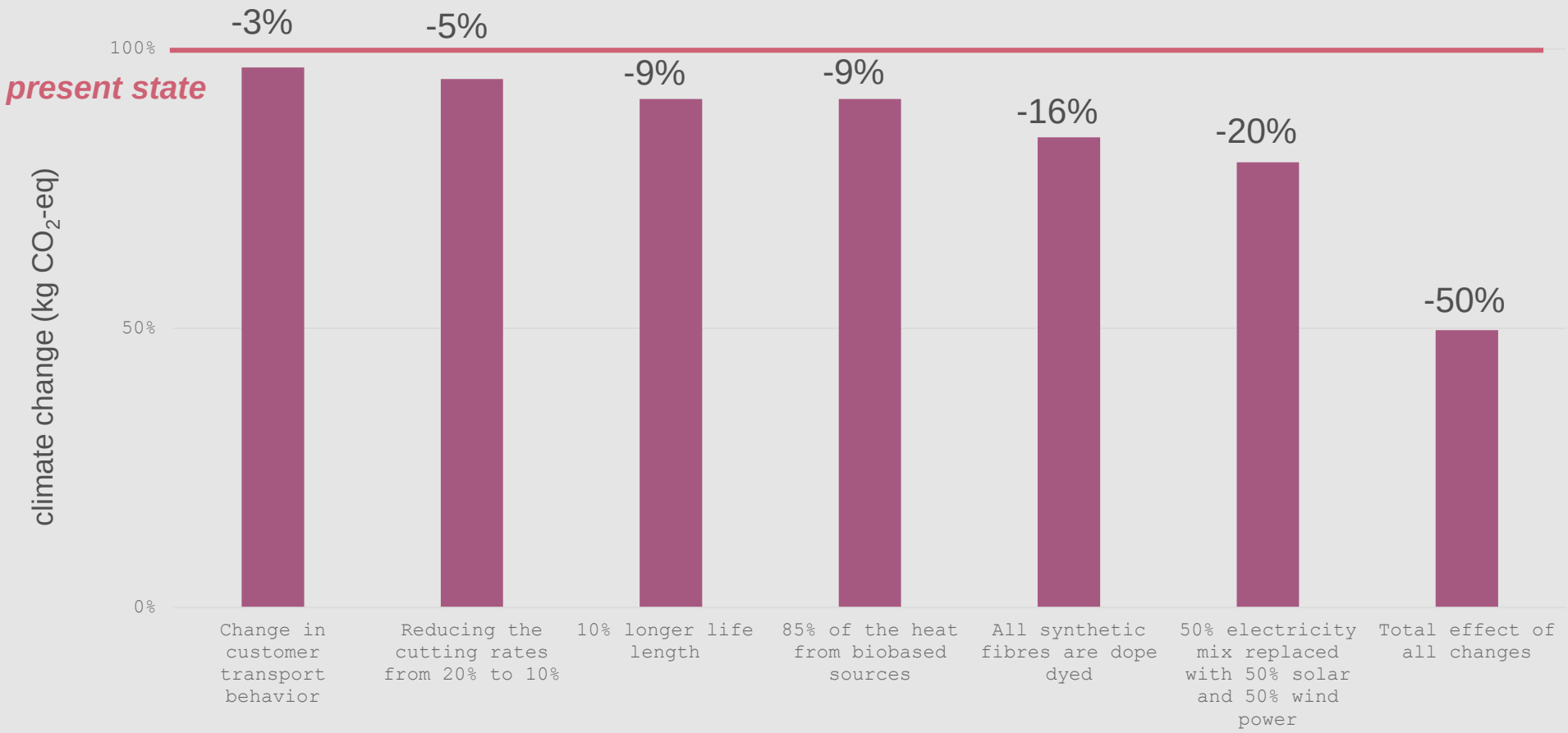
2030, 45 pieces / year

Roos et al. (2019)

“what is measured is improved”

potential to reduce environmental impact

climate reduction



water use

blue water withdrawal as % of mean monthly river flow

Roos et al. (2019)

”The big problem for the climate is carbon dioxide emissions and combustion of fossil fuel.”

Christian Azar, professor vid Fysisk resursteori/ Rymd- geo- och miljövetenskap på Chalmers, hjälper oss att reda ut frågetecknen.

– Det stora problemet för klimatet är koldioxidutsläppen och förbränning av fossila bränslen. Men metan är inte oviktigt. Både koldioxid och metan absorberar värmestrålning från jordytan.

När metan bryts ner i atmosfären bildas växthusgaserna troposfäriskt ozon och stratosfärisk vattenånga. På kort sikt, mindre än ett år efter utsläpp, har metan 120 gånger starkare uppvärmande effekt på jordens klimat än ett motsvarande utsläpp av koldioxid. På hundra års sikt bidrar ett utsläpp av metan cirka trettio gånger mer till växthuseffekten än ett lika stort utsläpp av koldioxid.

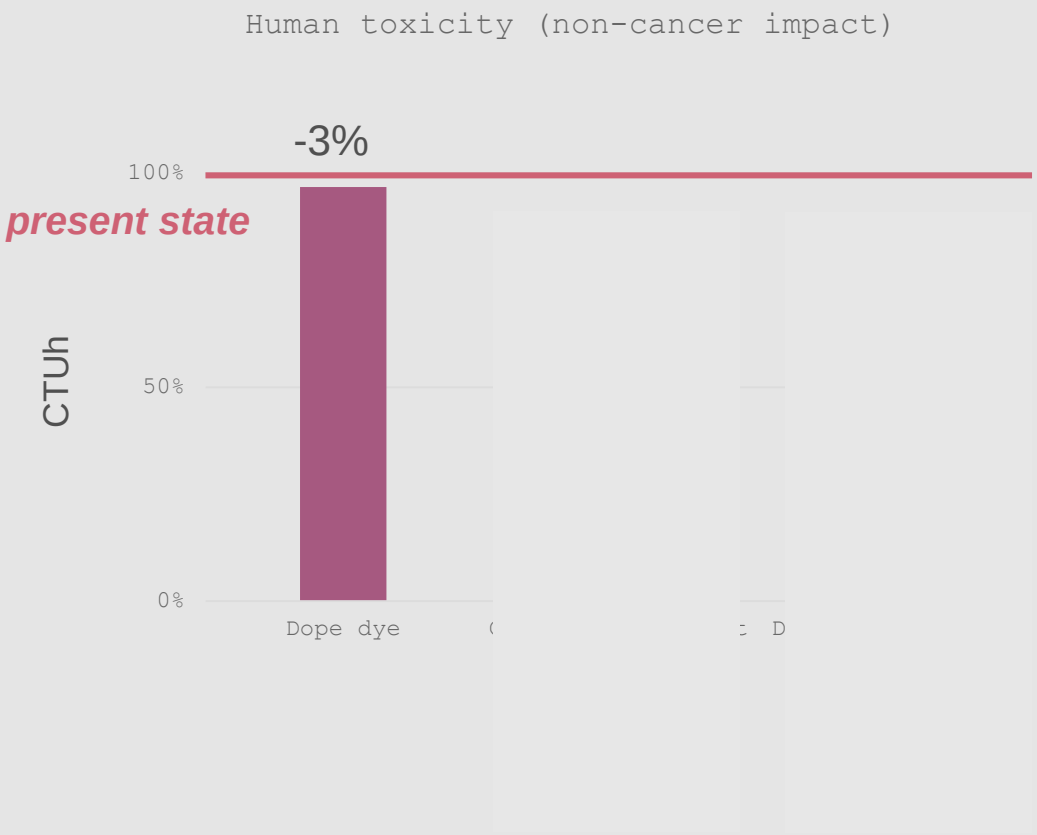
”

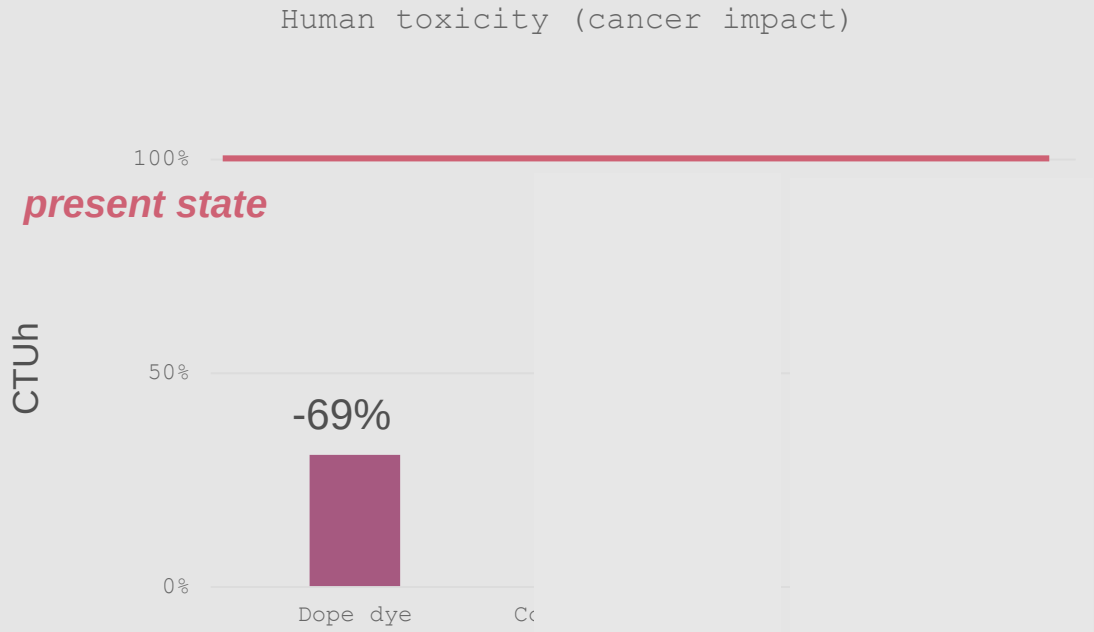
Metanhalten i atmos-

lerade utsl
forskning
Eftersom
är så stor
delen av n

Göteborgs-Posten 10 November 2019

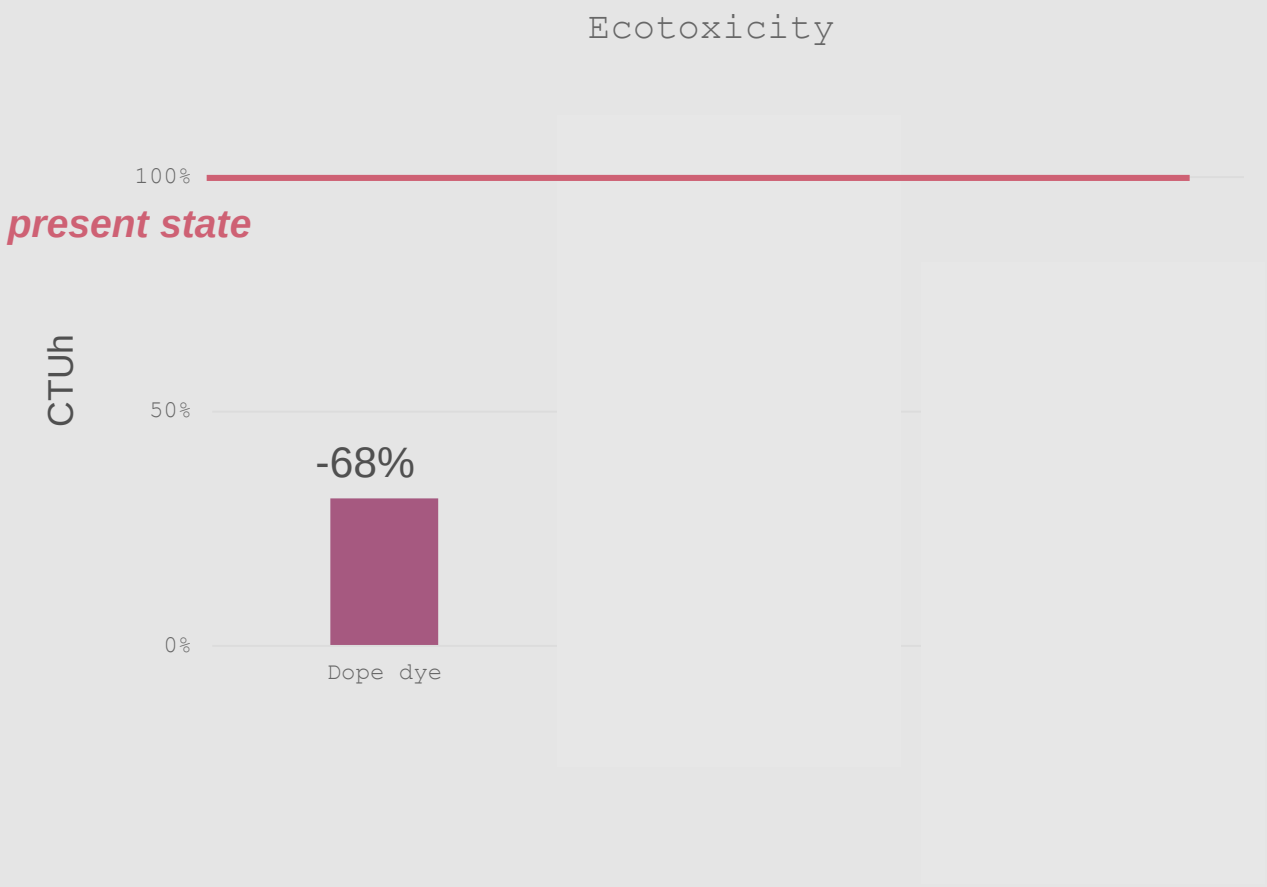
reduce the toxicity by half via spin dye and replacement of 50% of the conventional cotton





Roos et al. (2019)

reduce the toxicity by half via spin dye and replacement of 50% of the conventional cotton



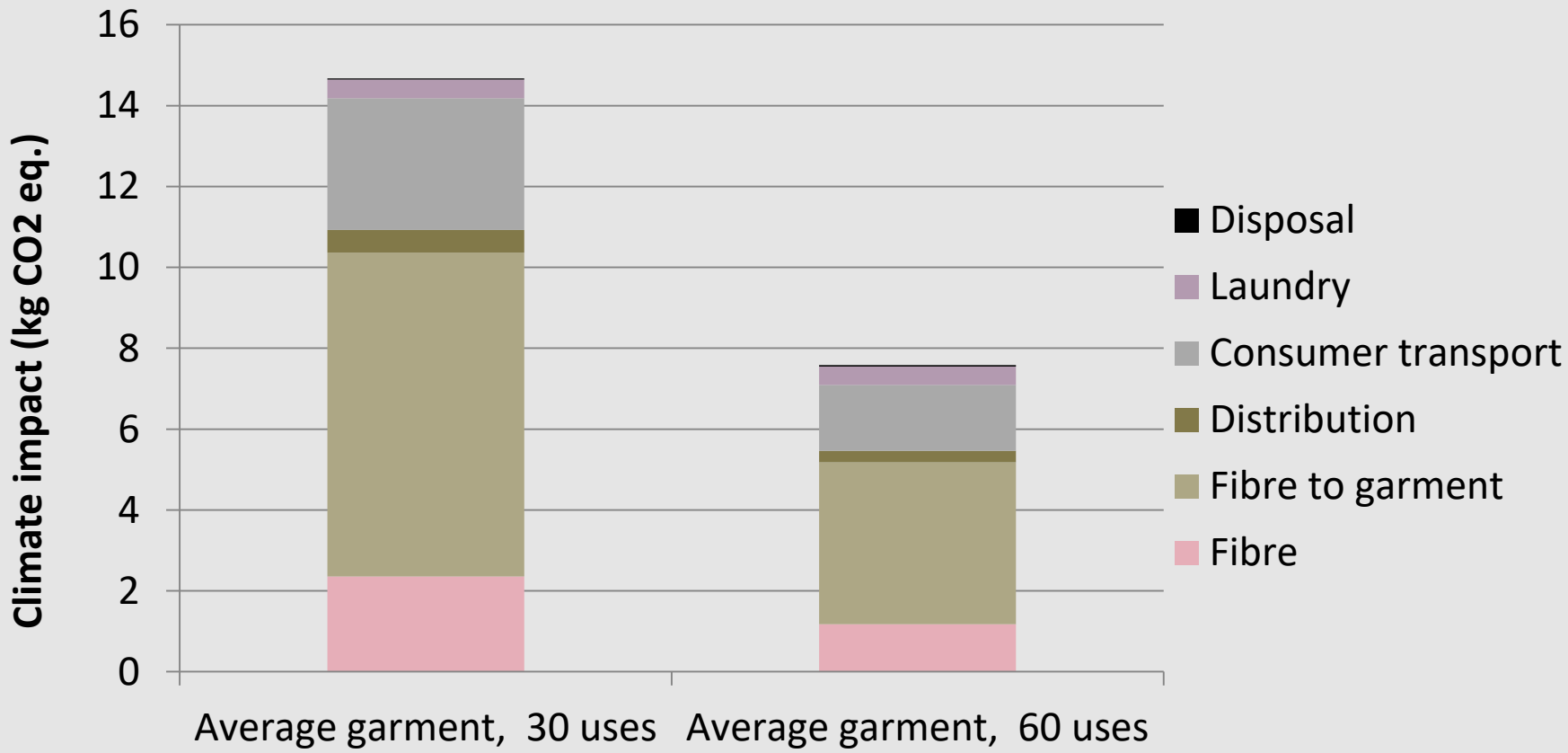
Roos et al. (2019)

Garment ecodesign checklist

Action	Climate	Water	Chemicals
1. Increase life span (resulting in increased number of uses)	impact/ number of uses	impact/ number of uses	impact/ number of uses
2. Better production technology	LESS ENERGY	LESS WATER USE	WASTE WATER TREATMENT
3. Better energy sources	LESS FOSSIL FUEL	-	less toxicity
4. Better chemicals selection and reduction of chemicals' use	LESS CLIMATE IMPACT	LESS POLLUTED WATER	LESS TOXICITY
5. Better materials	-	LESS WATER USE	less toxicity
6. Minimizing microfiber shedding	-	less polluted water	less toxicity
7. Optimize transport and packaging	less fossil fuel	-	less toxicity

LARGE IMPACT / small impact

Optimise the life span!



Climate impact expressed as kg CO_2 equivalents and calculated for a hypothetical average garment of 0.5 kg.

A doubled life length, from 30 uses of the garment (left) to 60 uses of the garment (right), decreases the climate impact by 48% - from 14.7 to 7.6 kg CO_2-eq.

Modified from Roos et al. (2015).

1. Increase the life span!

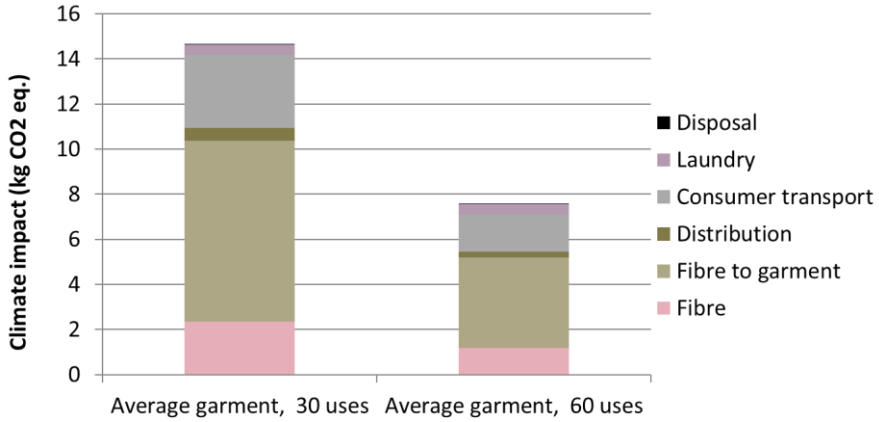
Actions:

A. Analyze which factor(s) decides the life span:

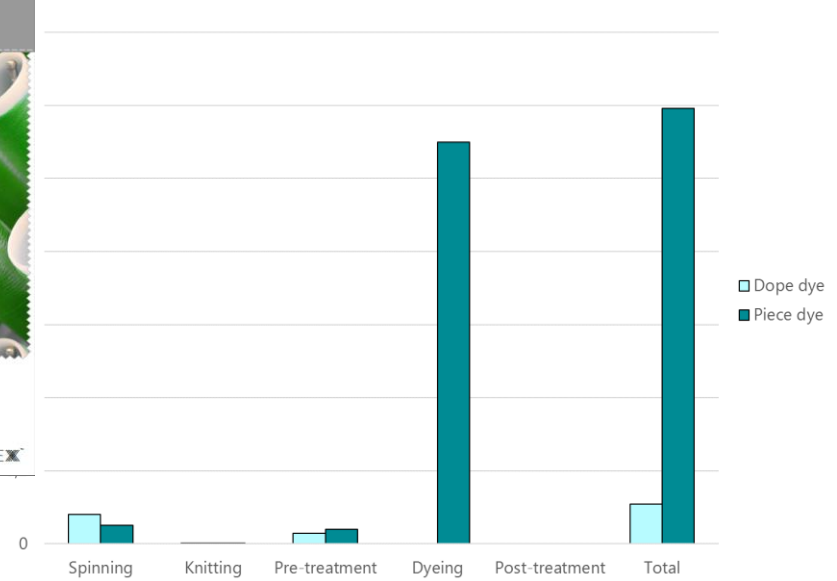
- Do you know how many times does the average customer use the garment?
- Do you analyze causes of returns? (both unused garments and claims made after use)

B. Improve by:

- Define who the intended user is and how many times the garment is expected to be used and include in the design brief.
- Make the design more timeless/classic in collaboration with dedicated customers.
- Guarantee the life length (minimum 10 years?) of your garments.
- Construct the garments to reduce the seam slippage.
- Use fibers with good durability (this may also have a positive impact on micro plastics release).
- Use dyestuff with good durability.
  - Optimal color for gussets, collars and other sensitive parts (shade/dyestuff)
- Select better options for parts that are likely to be worn out first:
  - Prints with lower technical performance than the rest of the garment.
  - Zippers
  - Reflecting tapes
  - Children's trousers (knee)
  - For shoes, sewn soles instead of glued will improve technical life span.
- Provide spare buttons and other trims (often simpler if trims are standardized/carry over)
- Offer mending services for customers
- Take back and resell garments second-hand



2. Better production technology



Actions:

A. Improve efficiency:
- Reduce cutting rates
- Reduce rework in the production facilities

B. Cleaner production:
- Use solution dye/dope dye technology to remove the dyeing step completely.
- Automated dosing systems for less exposure to chemicals for the workers.
- Waste water treatment plant (WWTP) with mechanical, chemical and biological treatment.

C. Select suppliers that:
- Have environmentally certification or declaration schemes for production facilities
- Keep their waste water treatment plant (WWTP) turned on (also after audits…)
- Offer transparency regarding:
- Sub-suppliers' environmental performance
- Energy use and sources
- Social sustainability and labor conditions

3. Better energy sources

Actions:

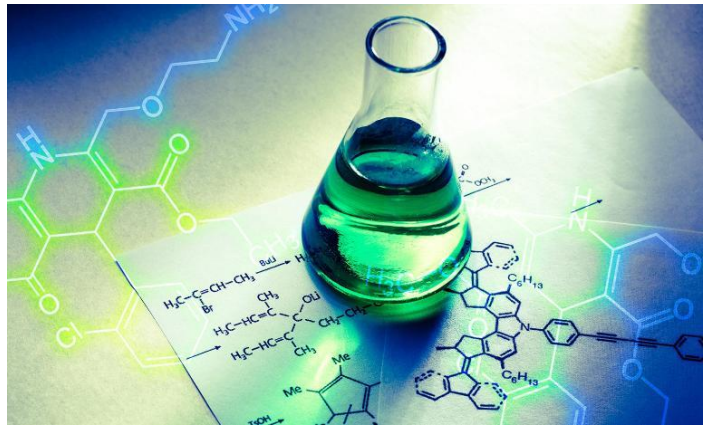
A. Drive change at your suppliers' facilities to more sustainable energy sources:
- Solar panels or wind turbine installation
- Use of bio fuels
- Electric trucks at warehouses

B. Select suppliers that are already using better energy sources:
- E.g. at Laos, high amount of water power, or the Nordic region (Table 2).

Global warming potential for different electricity sources (g CO2-eq./kWh*)		Global warming potential for state grid electricity in different countries (g CO2-eq./kWh*)	
Coal power plant	1,057	China	1,140
Oil power plant	916	Korea	638
Natural gas power plant	600	Laos	211
Wind power plant	14	Lithuania	195
Solar panel	84	Sweden	11

*gram carbon dioxide equivalents per kWh

4. Better chemicals selection and reduction of chemicals' use



Actions:

A. Phase out (unless essential use):
- Persistent organic pollutants (POP)
- Durable Water Repellent treatment – use fluorine/silicon free unless PPE[1] applies
- Antibacterial treatment
- Transport fungicides – keep dry and cool instead

B. Improve by:
- Use dry processes instead of wet processes (e.g. solution dye/dope dye)
- Reduce rework
- Automated dosing systems
- Are there any unnecessary effect chemicals in the garments? (softeners, "easy care" etc.)

C. Select suppliers that:
- Offer safety data sheets
- Offer transparency about what chemicals they use
- Have a good chemicals management work in place

[1]Personal Protective Equipment Regulation (EU) 2016/425.

5. Better materials

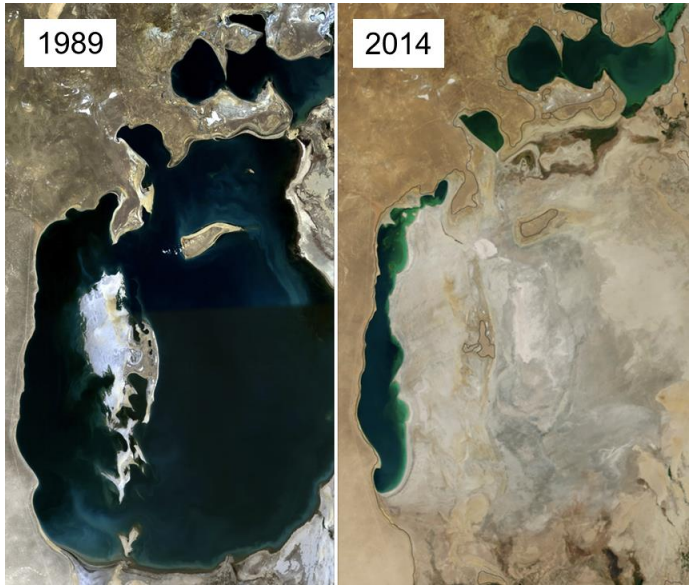
Actions:

A. Replace conventional cotton:
- Can you use e.g. 50/50 forest fiber and cotton fiber?
- Can you use polyester instead of cotton?

B. Select sustainable fibers:
- Set the fibers' life-cycle performance at center stage – including their fit-for-purpose and effects on subsequent production, user behavior and end-of-life options.
- Avoid GMO cotton
- Use fibers with good durability
- Use fibers that can be solution/dope dyed
- Watch out for green-wash! The claim of being "green" must be accompanied by some explanation of in what way, and in case of claims to be "better" – how much better?

C. Avoid unnecessary materials:
- Are there any unnecessary functions in the garments?

D. Standardize trims, attachments, hang tags etc.:
- Increase control for "high risk" materials
- Simplify exchange of buttons etc. in the use phase.



6. Avoid microplastics

Actions:

A. Reduce microplastics generation in the production of the garment:
- Are there any unnecessary brushing operations?
- Use laser or ultrasound cutting if possible.

B. Reduce the amount of microplastics shed from the garment:
- Use materials/constructions that shed less upon mechanical stress during use

C. Reduce the amount of microplastics being carried by the garment:
- Ensure good air quality in the facilities.
- Remove dust from synthetic fibers with dry methods such as vacuum cleaning.

7. Optimise transport and packaging

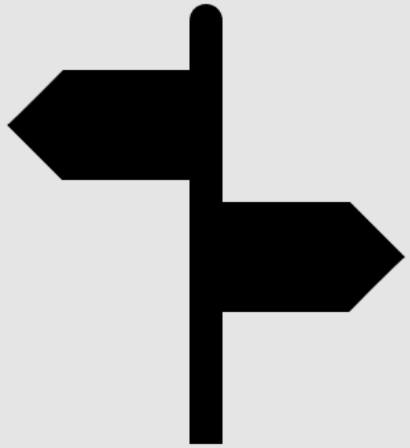
Actions:

A. Reduce air freight:
- Can there be a total ban of air freight in the company?

B. Reduce anti-mold agents (fungicides):
- Pack and store in dry conditions
- Keep dry and cool
- Unpack as soon as goods arrive (humidity, temperature and time drives mold growth)

C. Optimize packaging materials:
- Make sure the packaging does its work and protects the goods
- Reduce the size of the packaging and the amount of packaging material
- Do not use hazardous chemicals (for instance prints)

Recommendations for <u>how</u> to do it



organization

- membership the most important element

business models

- sustainable business models needs promotion for scaling and mainstreaming
- new tools for transparency, traceability, compliance etc.

policy instruments

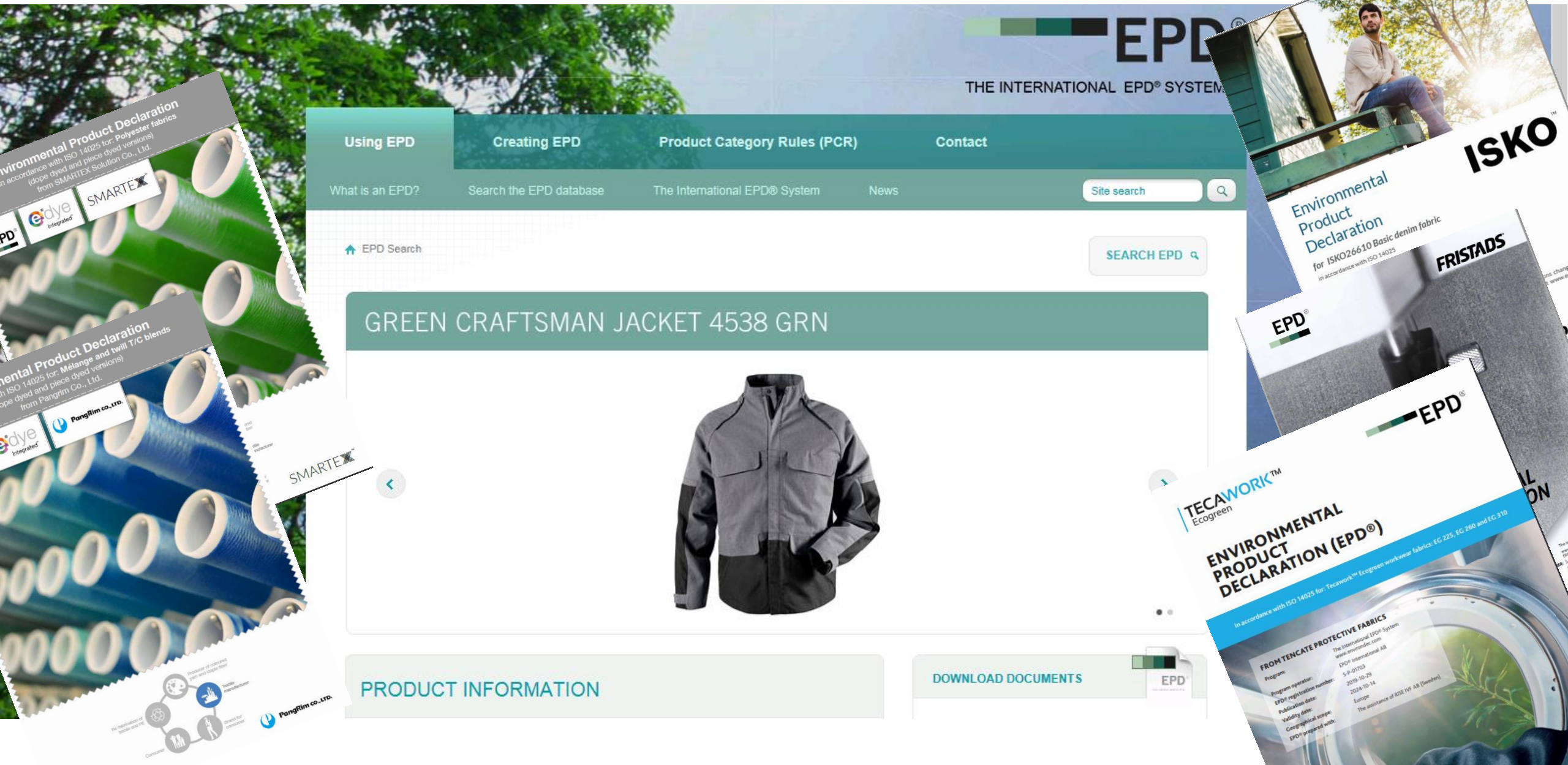
- multi-stakeholder initiatives
- cross-national legislation

common challenge and solution

- cross-organization and cross-national responsibility

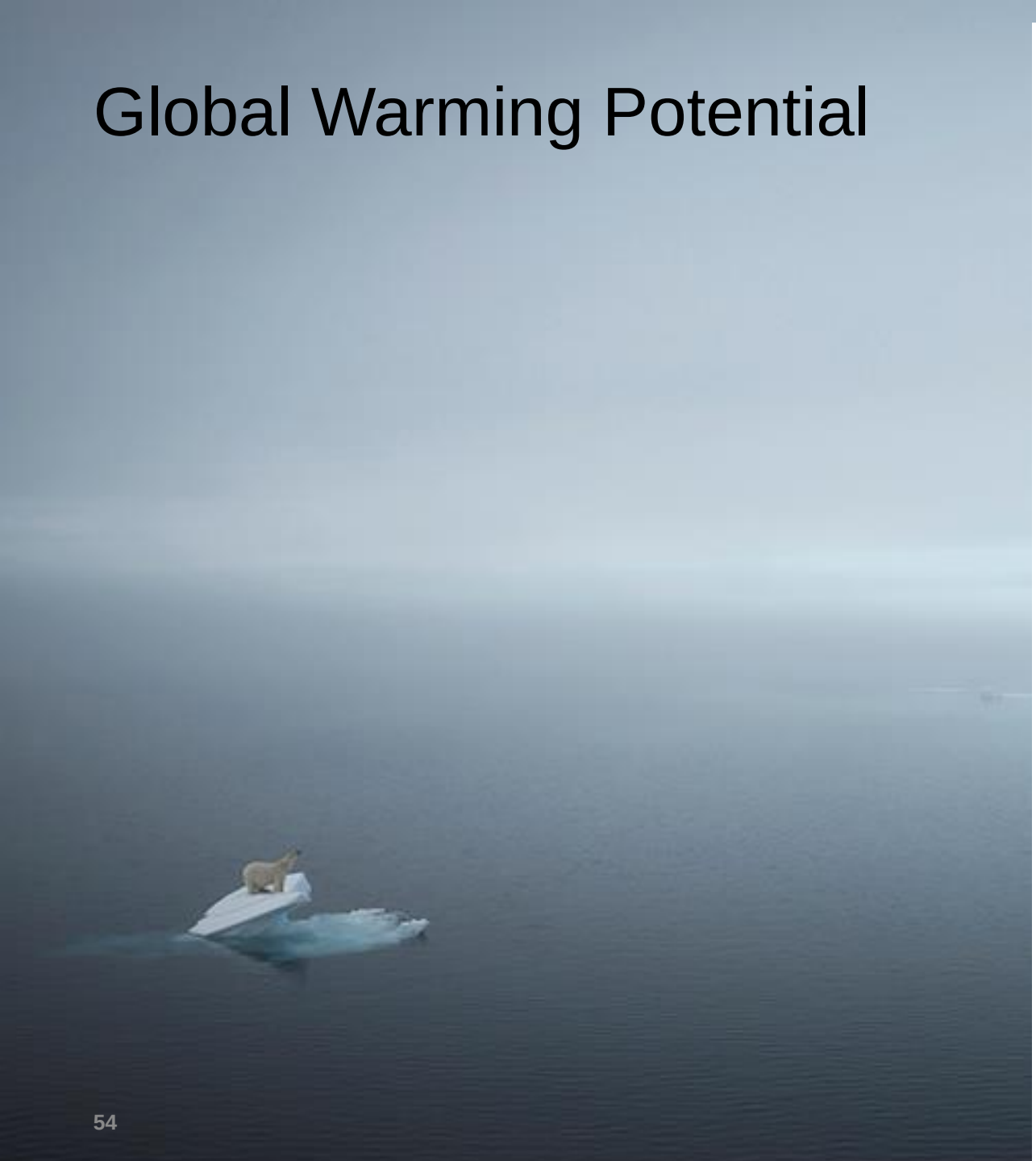
Heinz, C. (2018) Governing sustainability in the garment sector – The European Union's action agenda. IIIEE Theses 2018:2. Lund: IIIEE, Lund University.
Machek, D. (2018) The role of Multi-stakeholder initiatives in Swedish apparel brands' sustainable supply chain management. IIIEE Theses 2018:23. Lund: IIIEE, Lund University.
Pedersen, E.R.G., Lauesen, L.M. and Kourula, A. (2017), Back to basics: Exploring perceptions of stakeholders within the Swedish fashion industry, Social Responsibility Journal.
Reitan Andersen, K. & Pedersen, E. R. G. (2018). Lokal produktion i en global tidsalder. Geografisk Orientering.
Reitan Andersen, K. (2017) Stabilizing Sustainability in the Textile and Fashion Industry. Doctoral Thesis. Copenhagen Business School.
Sendlhofer, T.(2019) Organising Corporate Social Responsibility: The Case of Employee Involvement at Small and Medium-Sized Enterprises. Doctoral Thesis. Stockholm School of Economics.

Trend towards less greenwash and more fact-based communication: ISO 14025 EPDs, PEF, Higg Index etc.



Questions?

Global Warming Potential



the case, it must have occurred several centuries ago, as leprosy became increasingly scarce in the British Isles after the 17th century (*3*). It is also conceivable that humans may have been infected through contact with red squirrels bearing *M. lepraemurium*, as these animals were prized for their fur and meat in former times (*30*). Our findings show that further surveys of animal reservoirs of leprosy bacilli are warranted, because zoonotic infection from such reservoirs may contribute to the inexplicably stubborn plateau in the incidence of the human leprosy epidemic despite effective and widespread treatment with multidrug therapy (*1*).

REFERENCES AND NOTES

1. World Health Organization, *Wkly. Epidemiol. Rec.* **88**, 365–379 (2013).
2. H. D. Donoghue *et al.*, *Infect. Genet. Evol.* **31**, 250–256 (2015).
3. V. J. Schuenemann *et al.*, *Science* **341**, 179–183 (2013).
4. A. Alter, A. Grant, L. Abel, A. Alcais, E. Schurr, *Mamm. Genome* **22**, 19–31 (2011).
5. S. H. Wong *et al.*, *PLOS Pathog.* **6**, e1000979 (2010).
6. N. Fulton, L. F. Anderson, J. M. Watson, I. Abubakar, *BMJ Open* **6**, e010608 (2016).
7. R. Sharma *et al.*, *Emerg. Infect. Dis.* **21**, 2127–2134 (2015).
8. R. Truman, *Lepr. Rev.* **76**, 198–208 (2005).
9. R. W. Truman *et al.*, *N. Engl. J. Med.* **364**, 1626–1633 (2011).
10. X. Y. Han *et al.*, *Am. J. Clin. Pathol.* **130**, 856–864 (2008).
11. P. Singh *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **112**, 4459–4464 (2015).
12. M. Carey, G. Hamilton, A. Poole, C. Lawton, *The Irish Squirrel Survey 2007* (COFORD, Dublin, 2007).
13. S. Harris, G. B. Corbet, *The Handbook of British Mammals* (Mammal Society/Blackwell Scientific, ed. 3, 1991).
14. D. M. Tompkins, A. W. Sainsbury, P. Nettleton, D. Buxton, J. Gurnell, *Proc. R. Soc. B* **269**, 529–533 (2002).
15. E. Stokstad, *Science* **352**, 1268–1271 (2016).
16. Council of Europe, Convention on the Conservation of European Wildlife and Natural Habitats (ETS No. 104), Appendix III (1979). https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=0900001680304356
17. A. Meredith *et al.*, *Vet. Rec.* **175**, 285–286 (2014).
18. V. Simpson *et al.*, *Vet. Rec.* **177**, 206–207 (2015).
19. See supplementary materials on Science Online.
20. J. S. Spencer, P. J. Brennan, *Lepr. Rev.* **82**, 344–357 (2011).
21. J. S. Velarde-Félix, G. Alvarado-Villa, L. Vera-Cabrera, *Am. J. Trop. Med. Hyg.* **94**, 483–484 (2016).
22. L. Vera-Cabrera *et al.*, *J. Clin. Microbiol.* **53**, 1945–1946 (2015).
23. M. Monot *et al.*, *Nat. Genet.* **41**, 1282–1289 (2009).
24. A. J. Drummond, A. Rambaut, *BMC Evol. Biol.* **7**, 214 (2007).
25. B. P. Vieira, C. Fonseca, R. G. Rocha, *Anim. Biodivers. Conserv.* **38**, 49–58 (2015).
26. S. R. Krutnik *et al.*, *Nat. Med.* **9**, 525–532 (2003).
27. C. de Sales Marques *et al.*, *J. Infect. Dis.* **208**, 120–129 (2013).
28. L. B. Adams *et al.*, *Mem. Inst. Oswaldo Cruz* **107** (suppl. 1), 197–208 (2012).
29. P. G. Jessamine *et al.*, *J. Drugs Dermatol.* **11**, 229–233 (2012).
30. P. Lurz, *Red Squirrel: Naturally Scottish* (Scottish Natural Heritage, 2010).

ACKNOWLEDGMENTS

We thank E. Sheehy, E. Goldstein, M. Flaherty, A. Zintl, the National Trust, Forestry Commission Scotland, and Saving Scotland's Red Squirrels for samples, help, and advice. We thank the Genomic Technologies Facility at the University of Lausanne for Illumina sequencing and technical support. Raw sequence read files have been deposited in the Sequence Read Archive of the National Center for Biotechnology Information under accession numbers SRR3672737 to SRR3672758 (NCBI BioProject PRJNA325727), SRR3674396 to SRR3674450 (NCBI BioProject PRJNA325827), SRR3674451 to SRR3674463 (NCBI BioProject PRJNA325856), and SRR3673983; representative TLR1 sequences have been deposited in GenBank under accession numbers KX088139, KX088140, and KX088141. Phylogenetic trees and SNP alignments have been deposited at Treebase under Study Accession URL http://purl.org/phylo/treebase/phylows/study/TB2:S19982. Supported by the Fondation Raoul Follereau and Swiss National Science Foundation grant IZRJZ3_164174 (S.T.C.), the Scottish Government Rural and Environment Science and Analytical Services Division (K.S.), and the Thomas O'Hanlon Memorial Award in Veterinary Medicine (F.McD.).

SUPPLEMENTARY MATERIALS

www.sciencemag.org/content/354/6313/744/suppl/DC1
Materials and Methods
Figs. S1 to S5
Tables S1 to S14
References (*31*–*51*)

21 June 2016; accepted 27 September 2016
10.1126/science.aah3783

ARCTIC SEA ICE

Observed Arctic sea-ice loss directly follows anthropogenic CO_2 emission

Dirk Notz[1]* and Julienne Stroeve[2,3]

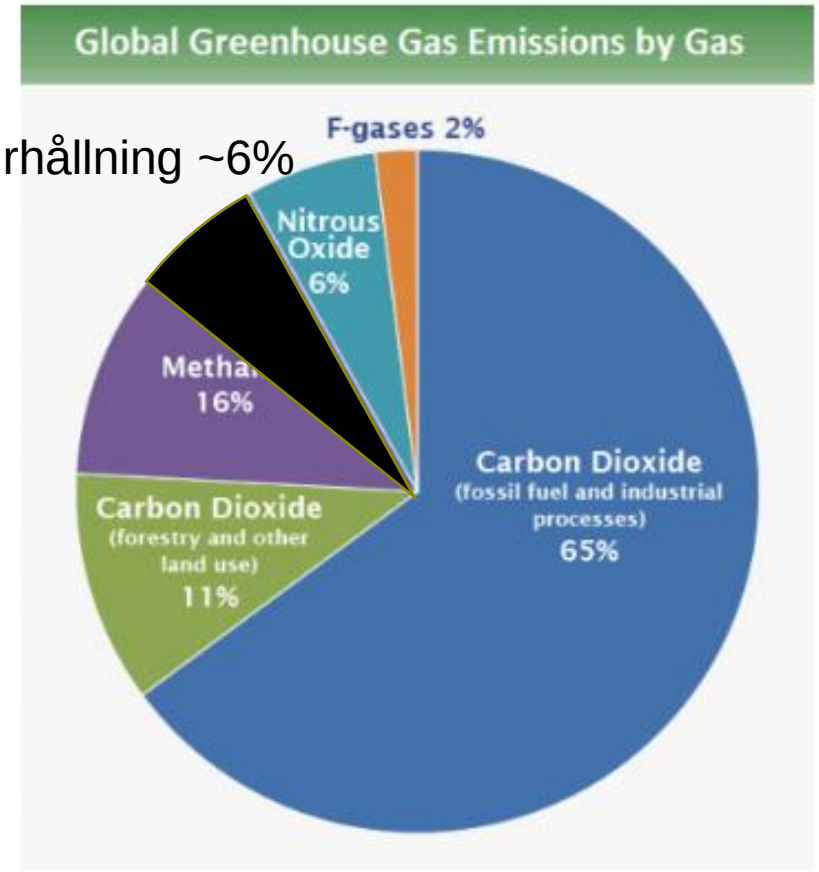
Arctic sea ice is retreating rapidly, raising prospects of a future ice-free Arctic Ocean during summer. Because climate-model simulations of the sea-ice loss differ substantially, we used a robust linear relationship between monthly-mean September sea-ice area and cumulative carbon dioxide (CO_2) emissions to infer the future evolution of Arctic summer sea ice directly from the observational record. The observed linear relationship implies a sustained loss of 3 ± 0.3 square meters of September sea-ice area per metric ton of CO_2 emission. On the basis of this sensitivity, Arctic sea ice will be lost throughout September for an additional 1000 gigatons of CO_2 emissions. Most models show a lower sensitivity, which is possibly linked to an underestimation of the modeled increase in incoming longwave radiation and of the modeled transient climate response.

The ongoing rapid loss of Arctic sea ice has far-reaching consequences for climate, ecology, and human activities alike. These include amplified warming of the Arctic (*1*), possible linkages of sea-ice loss to mid-latitude weather patterns (*2*), changing habitat for flora and fauna (*3*), and changing prospects for human activities in the high north (*3*). To understand and manage these consequences and their possible future manifestation, we need to understand the sensitivity of Arctic sea-ice evolution to changes in the prevailing climate conditions. However, assessing this sensitivity has been challenging. For example, climate-model simulations differ widely in their timing of the loss of Arctic sea ice for a given trajectory of anthropogenic CO_2 emissions: Although in the most recent Climate Model Intercomparison Project 5 (CMIP5) (*4*), some models project a near ice-free Arctic during the summer minimum already toward the beginning of this century, other models keep a substantial amount of ice well into the next century even for an external forcing based on largely undamped anthropogenic CO_2 emissions as described by the Representative Concentration Pathway scenario RCP8.5 (*4*, *5*).

To robustly estimate the sensitivity of Arctic sea ice to changes in the external forcing, we identify and examine a fundamental relationship in which the CMIP5 models agree with the observational record: During the transition to a seasonally ice-free Arctic Ocean, the 30-year running mean of monthly mean September Arctic sea-ice area is almost linearly related to cumulative anthropogenic CO_2 emissions (Fig. 1). In the model simulations, the linear relationship holds until the 30-year running mean, which we analyze to reduce internal variability, samples more and more years of a seasonally ice-free Arctic Ocean, at which point the relationship levels off toward zero. For the first few decades of the simulations, a few models simulate a near-constant sea-ice cover despite slightly rising cumulative CO_2 emissions. This suggests that in these all-forcing simulations, greenhouse-gas emissions were initially not the dominant driver of sea-ice evolution. This notion is confirmed by the CMIP5 1% CO_2 simulations, where the initial near-constant sea-ice cover does not occur (fig. S3A). With rising greenhouse-gas emissions, the impact of CO_2 becomes dominating also in all all-forcing simulations, as evidenced by the robust linear trend that holds in all simulations throughout the transition period to seasonally ice-free conditions. We define this transition period as starting when the 30-year mean September Arctic sea-ice area in a particular simulation decreases for the first time to an area that is 10% or more below the simulation's minimum sea-ice cover during the period 1850 to 1900, and

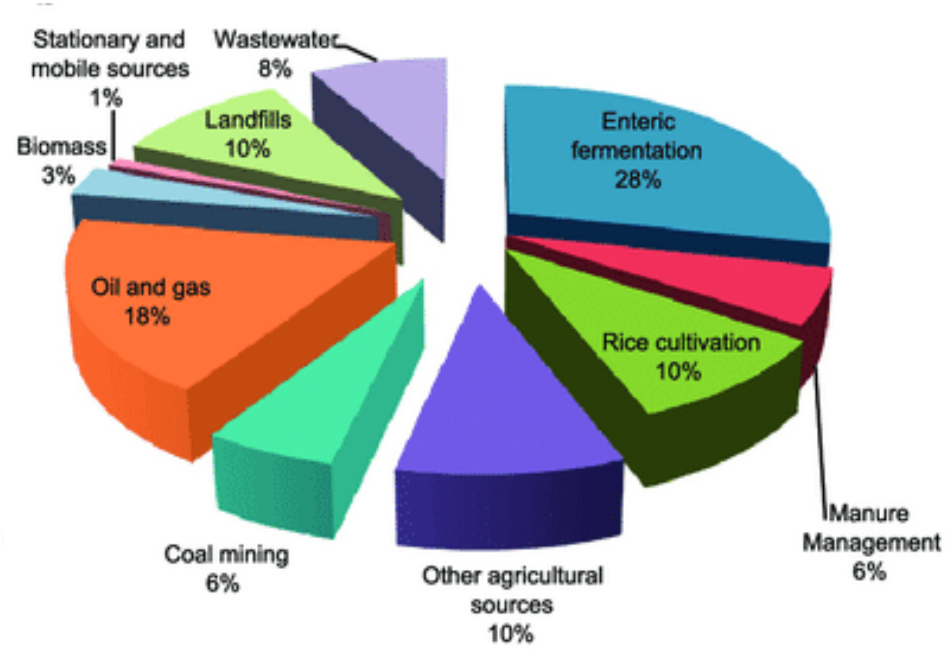
[1]Max Planck Institute for Meteorology, Hamburg, Germany. [2]National Snow and Ice Data Center, Boulder, CO, USA. [3]University College, London, UK.
*Corresponding author. Email: dirk.notz@mpimet.mpg.de

Intergovernmental Panel of Climate Change (IPCC)



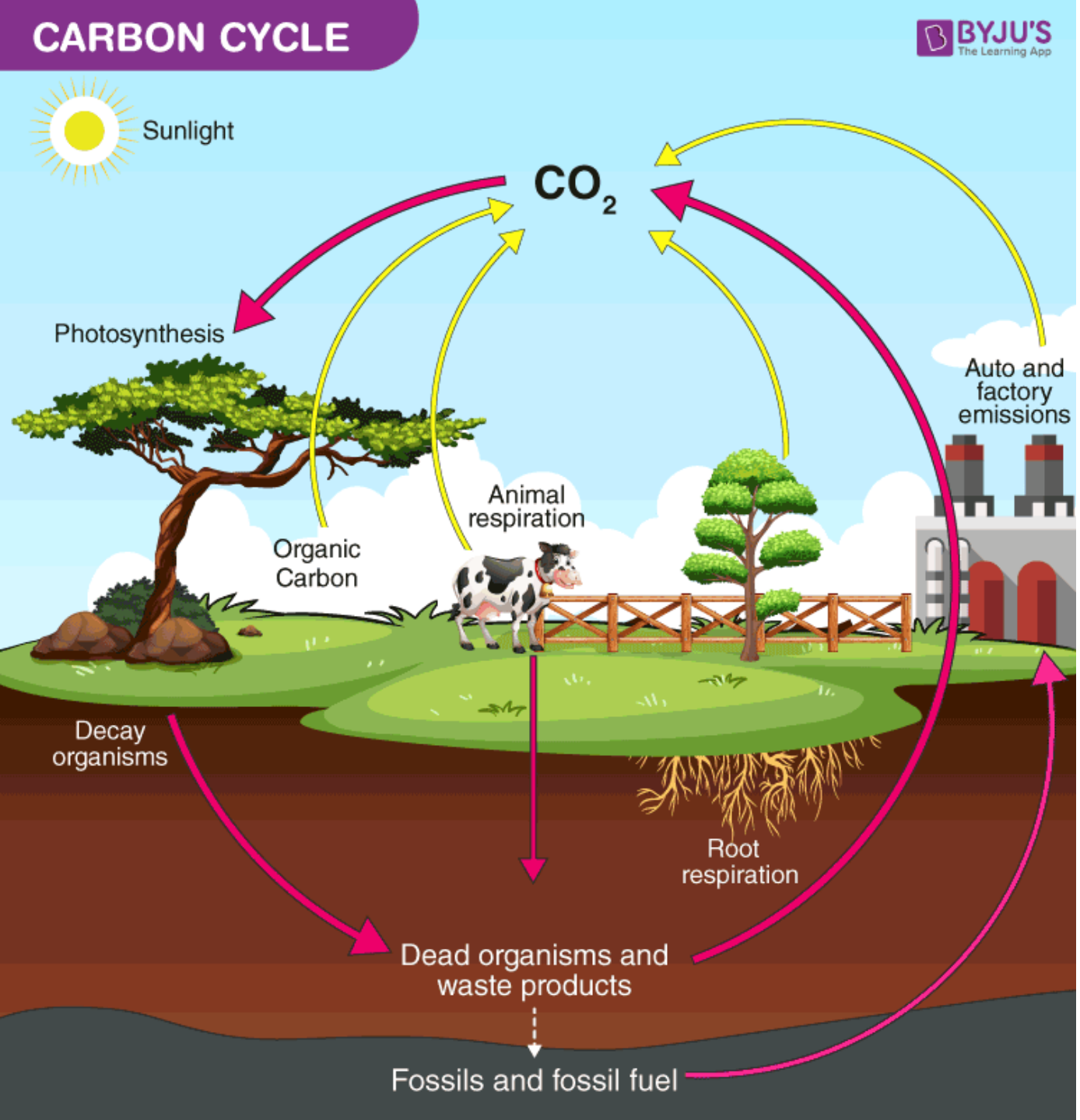
Djurhållning ~6%

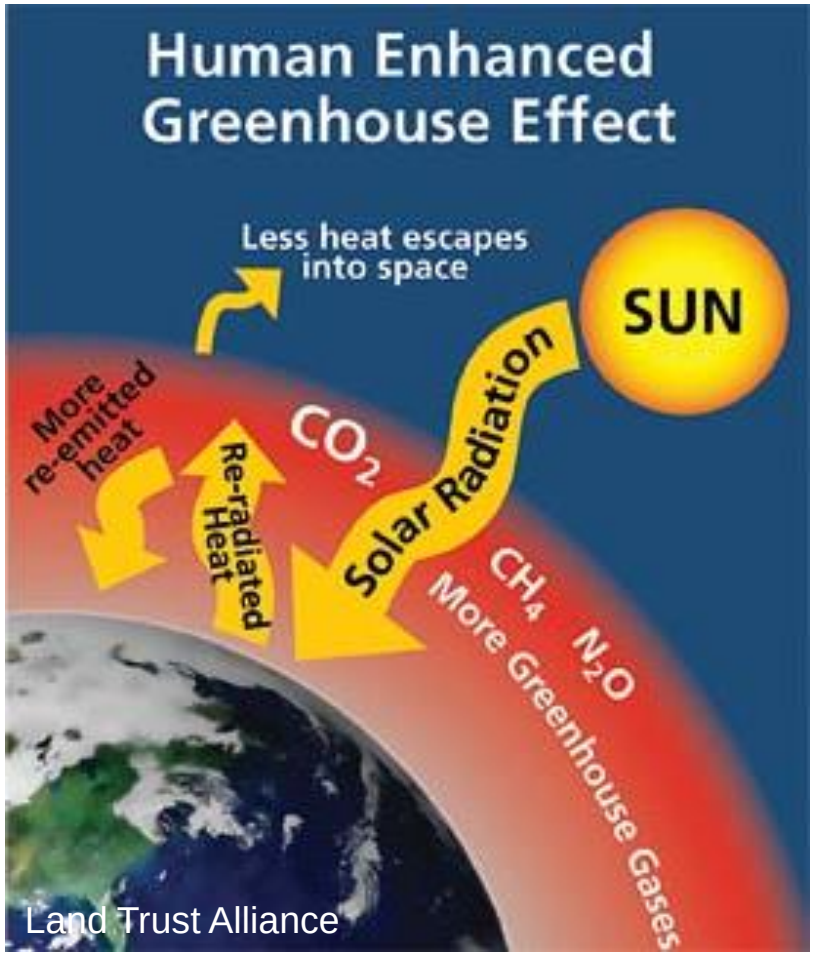
- 76% från CO_2. Domineras av förbränning av fossilt bränsle.
- 6% från N_2O. Från jordbruk samt förbränning av fossilt bränsle.
- 2% från fluorgaser.
- 16% från metan:



IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

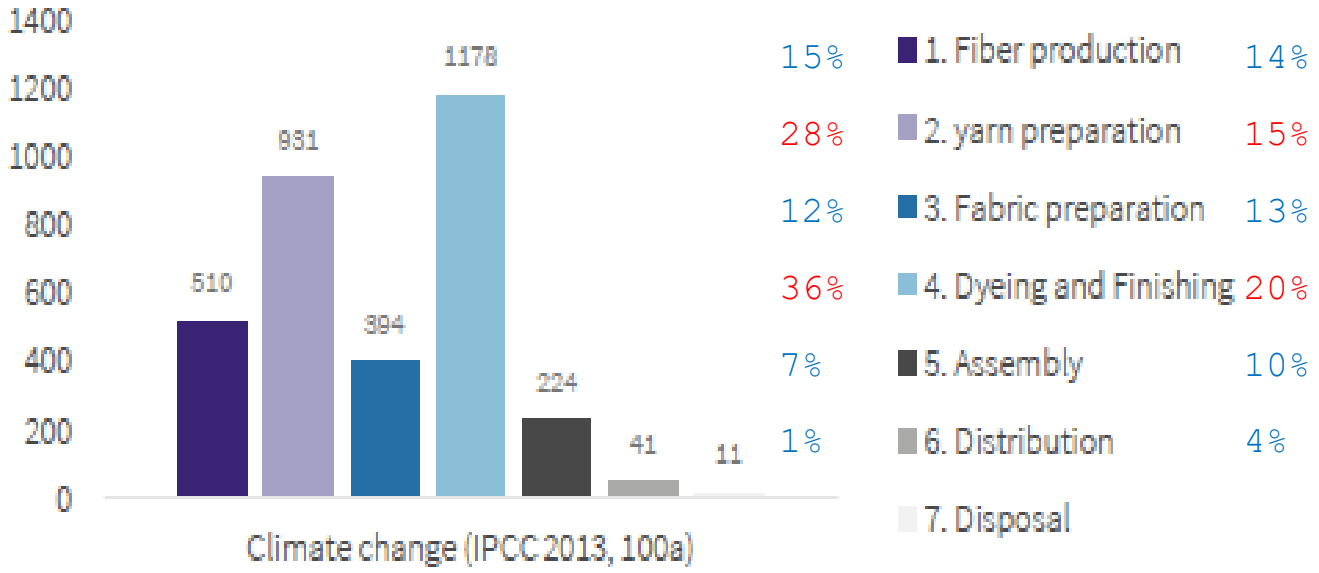
Yusuf, Rafiu & Zainon Noor, Zainura & Abba, Ahmad & Hassan, M & Fadhil Mohd Din, Mohd. (2012). Methane emission by sectors: A comprehensive review of emission sources and mitigation methods. Renewable and Sustainable Energy Reviews. 16. 5059–5070. 10.1016/j.rser.2012.04.008.

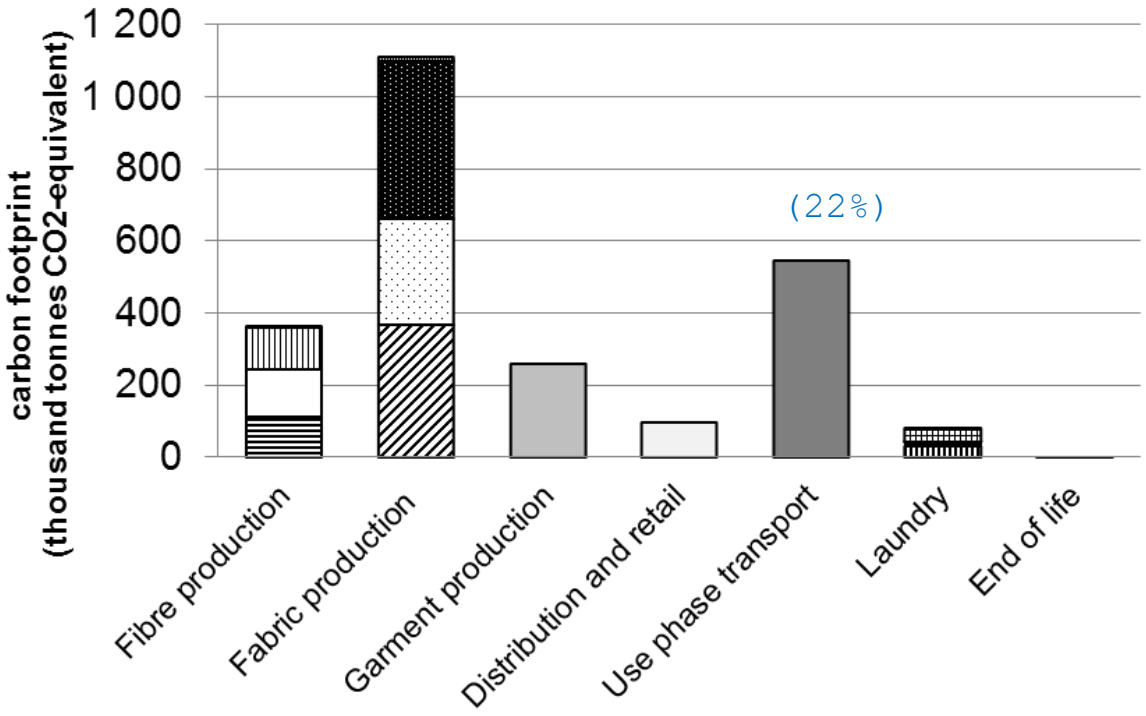

CARBON CYCLE
BYJU'S
The Learning App
Sunlight
CO_2
Photosynthesis
Auto and factory emissions
Animal respiration
Organic Carbon
Decay organisms
Root respiration
Dead organisms and waste products
Fossils and fossil fuel


Human Enhanced Greenhouse Effect
Less heat escapes into space
SUN
More re-emitted heat
Re-radiated Heat
CO_2
Solar Radiation
CH_4 N_2O
More Greenhouse Gases
Land Trust Alliance

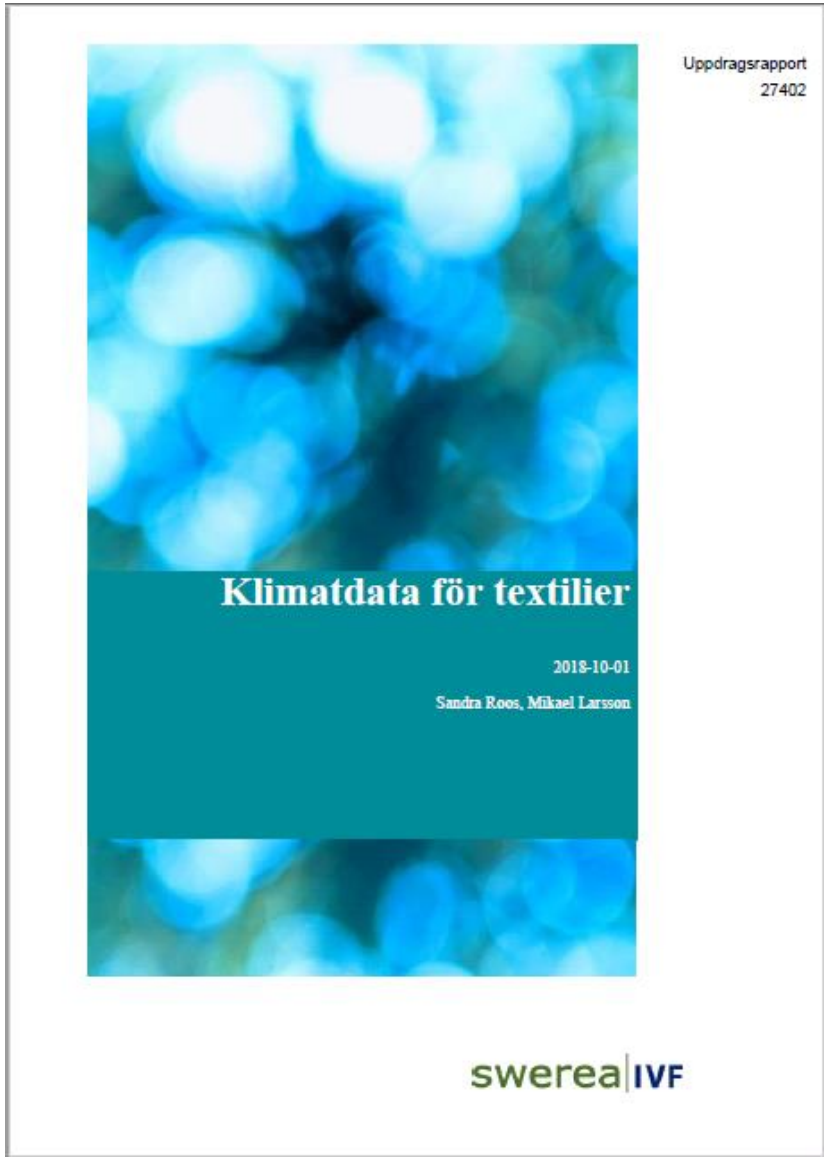
Sweden 2018: collapsing glaciers, forest fires, drought and emergency slaughter

Yarn making and wet treatment the production climate hotspots #1 and #2 in two independent studies





Greenhouse Gases from Textiles - In Sweden



Utsläppen från svensk textilkonsumtion ökar

Publicerad 30 okt 2018 kl 22.39

Klädbytardag på Brygghuset i Stockholm. Foto: MIKAEL SJÖBERG

Klimatutsläppen från svensk textilkonsumtion har ökat med 27 procent – under sju år.

Det visar en studie genomförd av Naturvårdsverket.

– Alla behöver fundera på hur mycket nya kläder man egentligen behöver köpa, säger Karin Lexén, generalsekreterare på Naturskyddsföreningen.

Auxiliaries and functional chemicals in the wet textile processes

- are they vital and properly used?

TEXTILE & FASHION 2030

SUSTAINABILITY BY SWEDEN
THE NATIONAL PLATFORM

TEXTILE & FASHION 2030

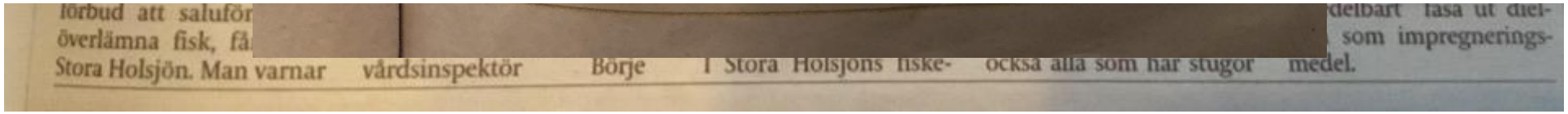
2. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS NO.	Portion(%)	Remarks
Methyl naphthalene	90-12-0	45.0	

Although forbidden in the EU, many companies have production sites or suppliers outside Europe, where the use of NPEO is not forbidden.

12. ECOLOGICAL INFORMATION

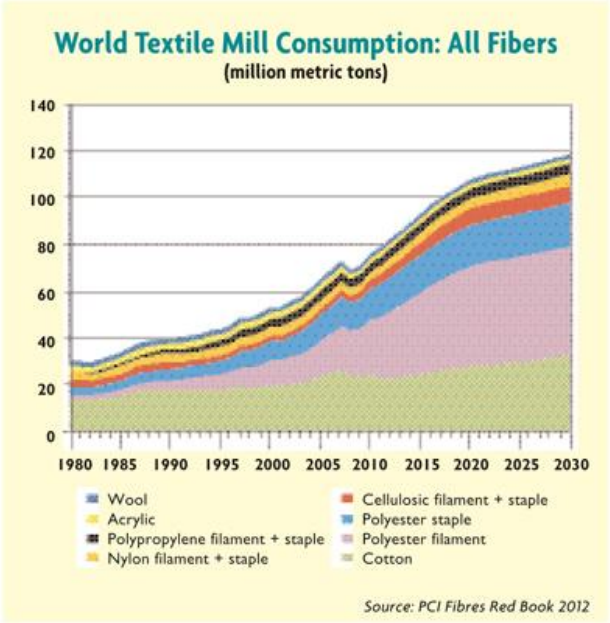
Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants


förbud att saluför
överlämna fisk, få
Stora Holsjön. Man varnar vårdsinspektör Börje I Stora Holsjöns fiske- också alla som har stugor
delbart fasa ut diel-
som impregnerings-
medel.

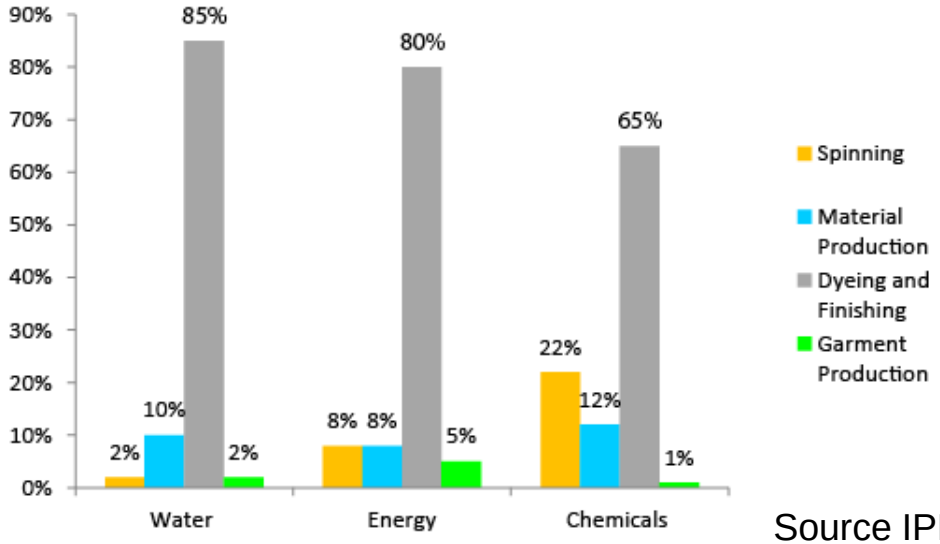
Challenges in the dye-houses

- Huge consumption of resources and high emissions.

- Increased need for textiles



- Higher customization with same production conditions.



Source IPE, 2012

www.colorpsychology.org

What comes out from a dyehouse?

Quality: 100 % Cotton Single Jersey
Spec: 160 g/sqm - 150 cm circular knit
Batch size: 1050 m ➔ 250 kg

Total dyeing machines: 30
Total batches in a year: 25 000
Total dyed cotton single jersey: 6 300 tonnes/year

Total wastewater m^3/year: 1 260 000 (using 200 l/kg)

<u>In wastewater if dyeing ratio 1:10</u>

Dyes 30% unfixed: 60 tonnes

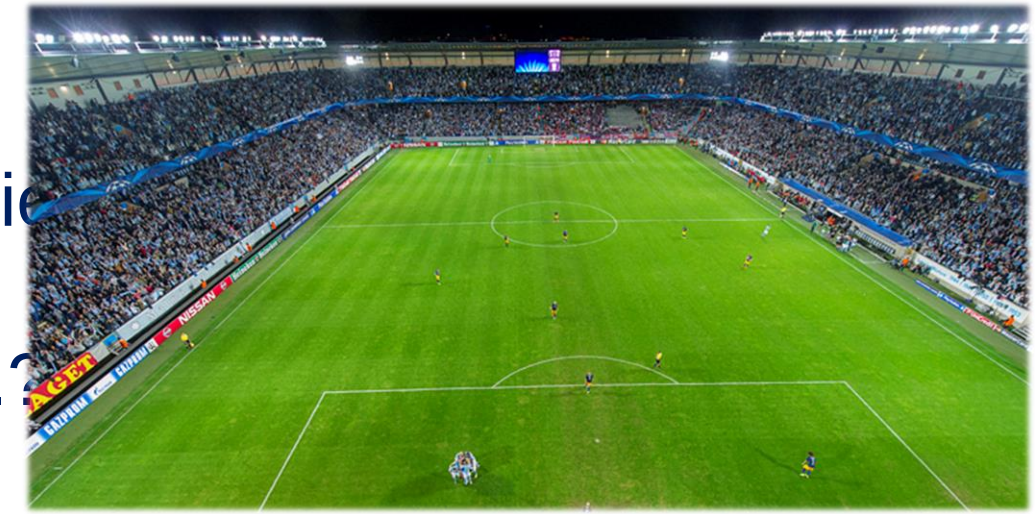
Salt: 4 000 tonnes

Alkaline: 2 000 tonnes

Other auxiliaries: 600 tonnes

Total area of pallets - close to a soccer fie

1 tonnes



What if you do not fill up to a full batch...?

Not mention all energy used for heating up the dye bath....

With energy mainly produced by coal.

Experts estimate that **half** of the fabric dyed worldwide comes out the wrong color and needs a correction. Good dyers get things right first time and use much less water, energy and chemicals as a result.

Recycled, organic fabric that is dyed in a poorly managed dyehouse will likely have a much higher environmental impact than a conventional fabric dyed in a well-managed dyehouse.

Natural Resources Defense Council April 2012

Lack of relationship between buyer and dyehouse!

Bangladesh pollution. New York Times.

Citarum River, Indonesia 2016. By Larry C. Price.

Nu tas slutliga steget för att giftsanera Viskan

- Saneringen av Viskans bottnar nedströms Borås kan vara på gång inom några år. För nu är ansökan om förberedelserna för det omfattande arbetet klar.
- Att oskadliggöra de mycket farliga gifterna har blivit än viktigare då risken för höga flöden ökat i klimatförändringens spår.

BT, 2019

Pollution in The Hangzhou Bay Area. Greenpeace.

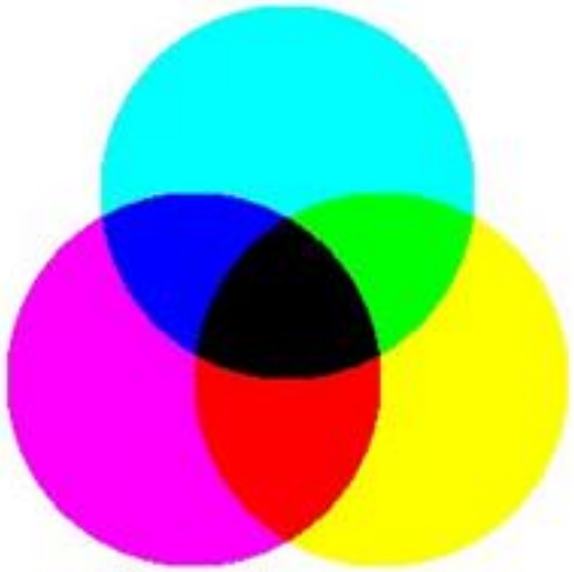
”New” Technology……

Dope dyeing

www.arcedition.com

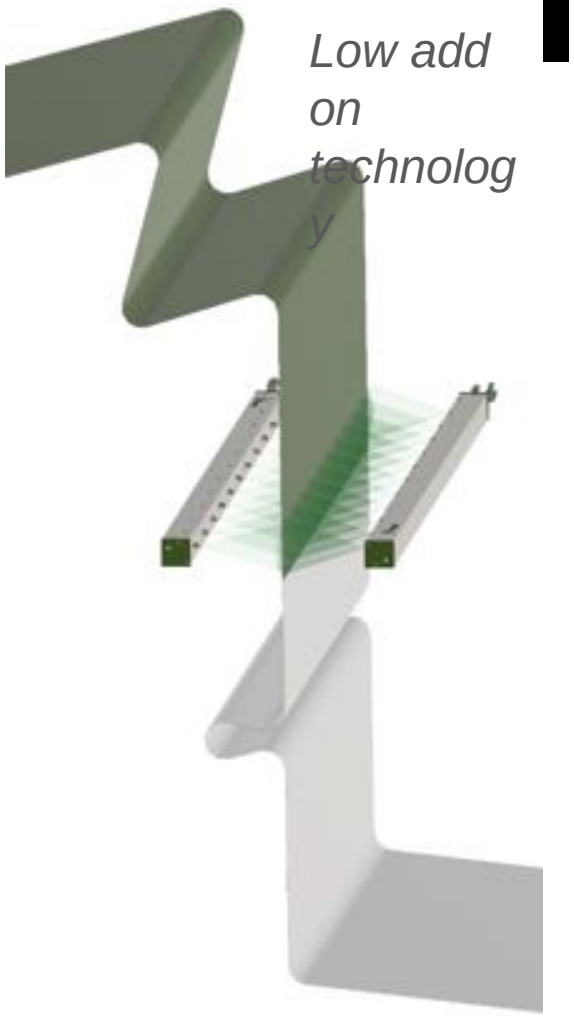
Supercritical CO_2

drydye



Digital printing

Low add on technology

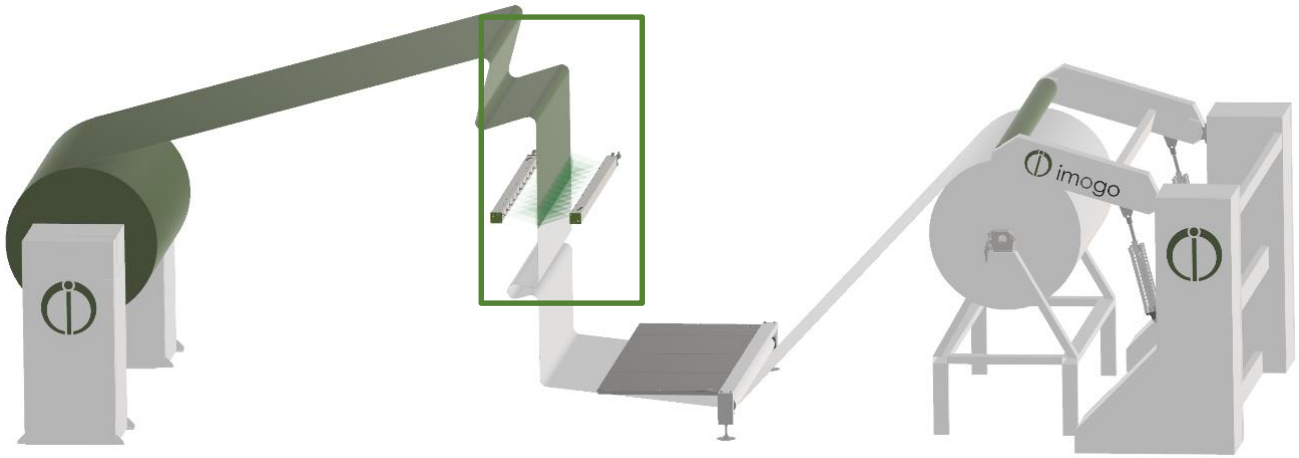


#Digitaldyeing
www.imogotech.com

How it works:

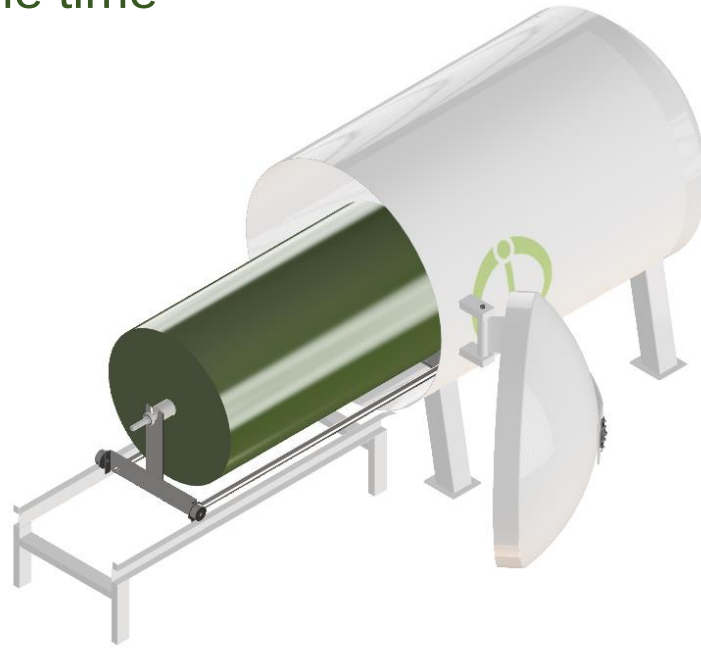
1. Dye application

- Savings on chemistry
- Controlled pickup – no variation in bath ratio
- All dyestuff on the fabric
- Easy and quick change between colours
- Adjustable speed
- Small to large batches with same settings
- Applicable on all dyeable fibres and most dye classes



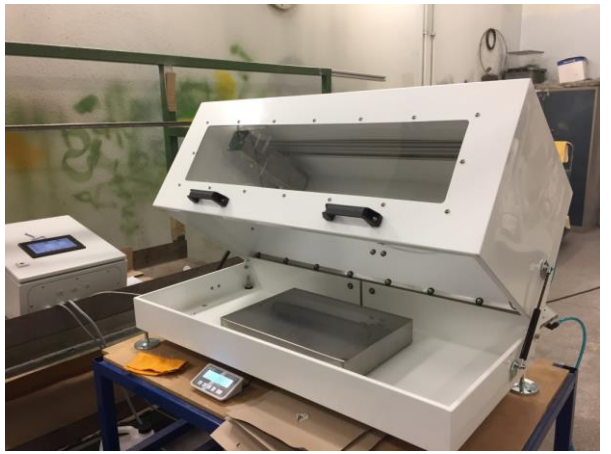
2. Fixation

- Savings on energy
- No need for temperature gradient
- No steam or extra water added
- No contamination - cleaning between batches not critical
- Several batches in different colours fixated at same time



Project *FlexDyer*®

2015: From greige to grace - Idea to develop a textile process where the need to be unique on the market is meet



2017: Research related Verification project 1.0

2018: Research related Verification project 2.0

Oct 2018: Imogo founded

April 2019: Lab unit from TEKO - MiniMax

2019: Smart Textiles project

- Develop a method for high reproducibility and eliminate the risk of reworking – Do it Right-first-time.

Nov 2019: Pilot scale line (1700 mm width) at Imogo Test Center, Borås

Still much to do:

- Finding optimum pickup.
- Studying input volumes of chemicals and the need for those in different dyeing processes.
- Reduce the number of process steps in textile production, ex. drying and finishing steps by better process control. Combine dyeing with finishing.

IMOGO Test Center, Borås

Auxiliaries and functional chemicals in the wet textile processes - are they vital and properly used?

Probably not. We can easily do a lot more!

Who likes to contribute?

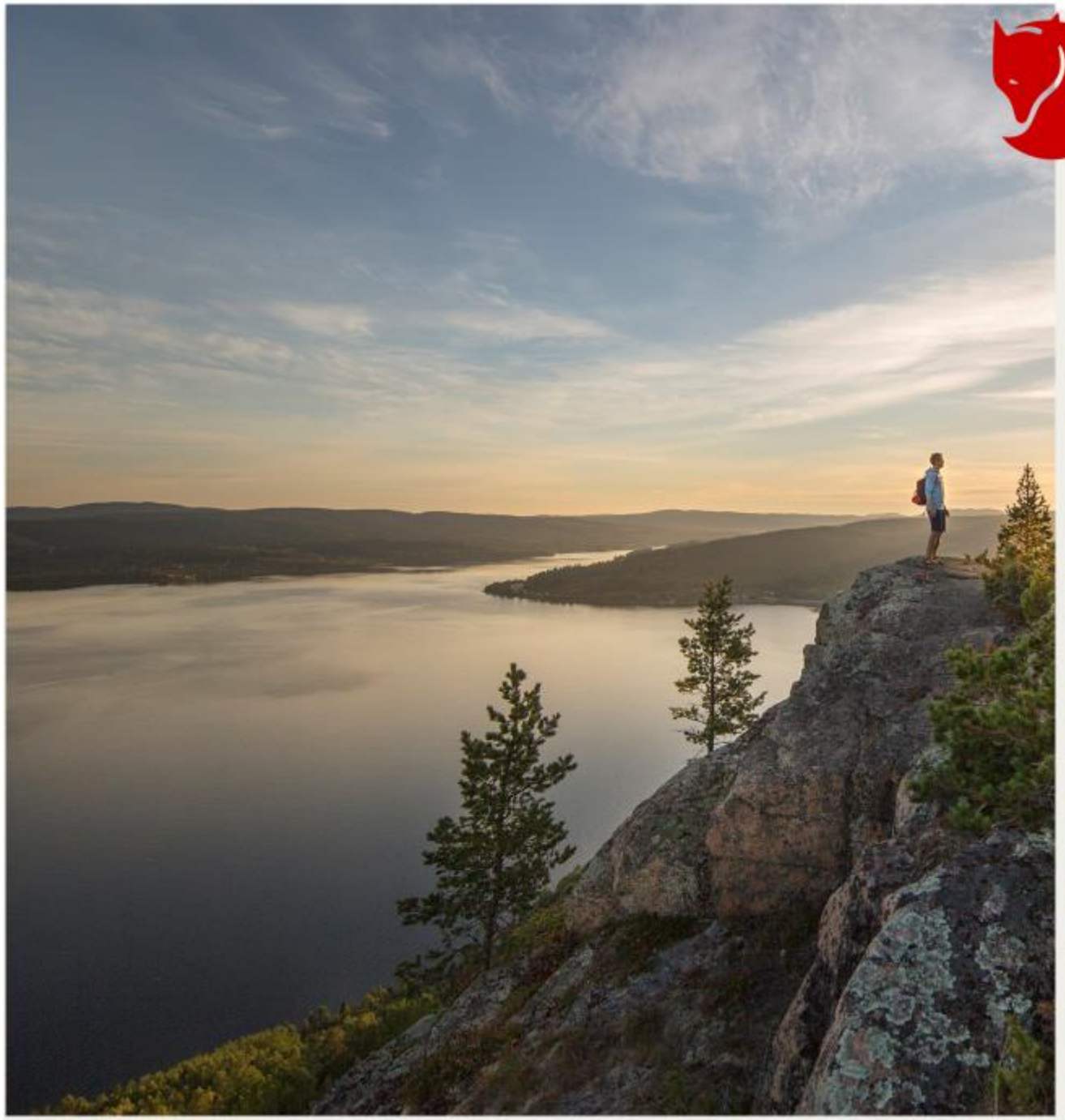
TEXTILE & FASHION 2030

SUSTAINABILITY BY SWEDEN
THE NATIONAL PLATFORM

THANKS!

How Free Can we be, facing out PFC

Felix Aejmelaeus-Lindström
Material Responsible, Fjällräven
felix.lindstrom@fjallraven.se



“We’ve been trekking for more than 50 years; I hope we never get there.”

Åke Nordin

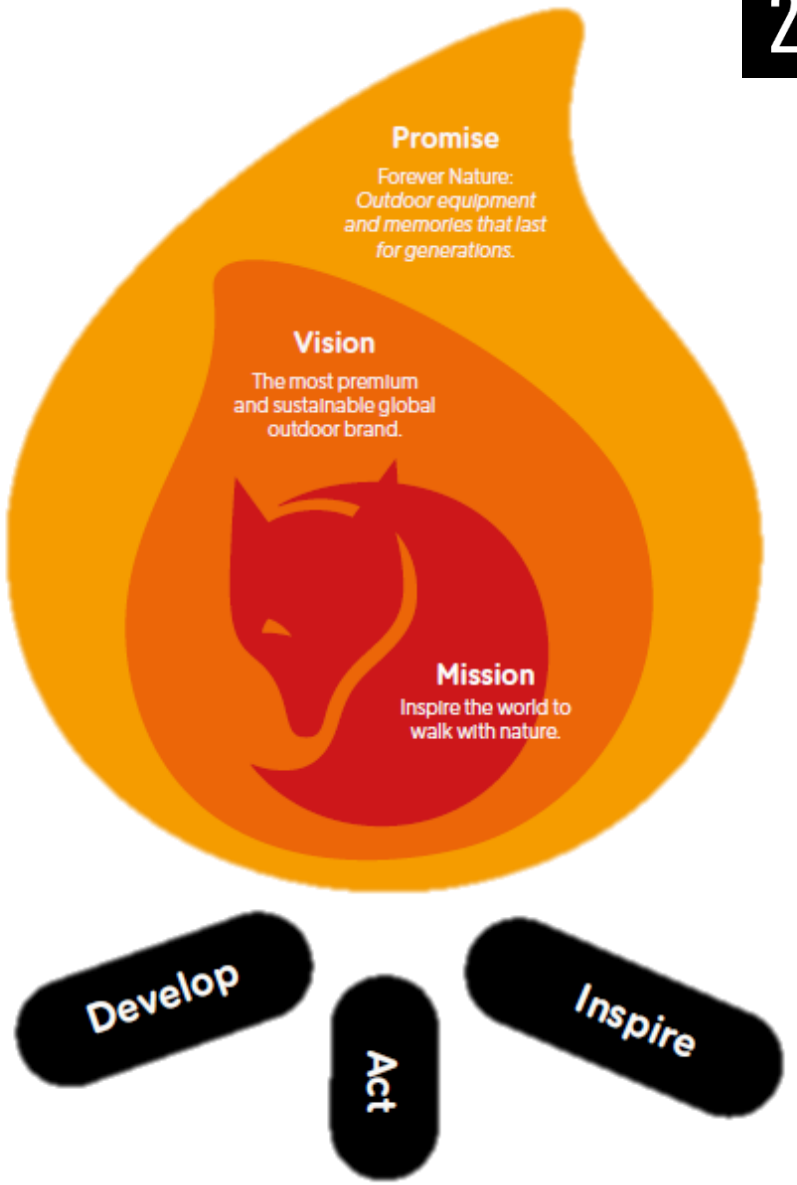
- *Established in the 1960s*
- *Available in over 70 countries worldwide*
- *Product segments garments for trekking and outdoor lifestyle, backpacks, tents, sleepingbags and daypacks*

Mission

Inspire the world to walk with nature

Vision

The most premium and sustainable global outdoor brand. Keeping nature in business forever.



TEXTILE & FASHION 2030

DEVELOP

Develop durable, functional and timeless equipment

Act

Act responsibly towards people, animals and nature

Inspire

Inspire and encourage people to live an active outdoor life


Facing out PFC

The start

TEXTILE & FASHION 2030

Where do we want to go?

- PFC free
- Functional
- Non toxic

Where are we?

- Mapping the dwrs we where using

- Where do we use it?

- What alternative chemistrys are available?

- What are their drawbacks?

TEXTILE & FASHION 2030

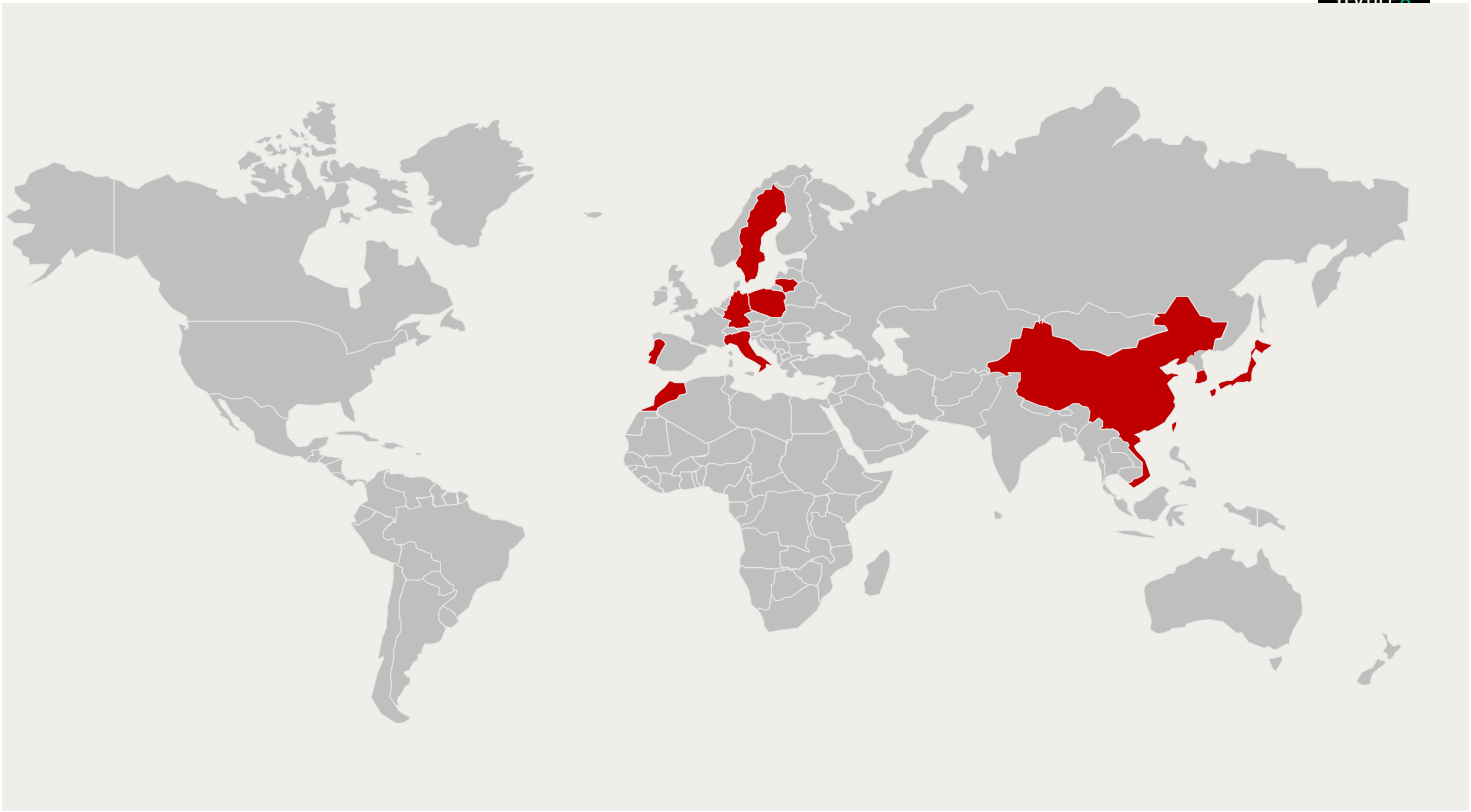
The alternatives?

- WAX
- Paraffins/hydorcarbons
- Silicones
- Dendrimers

The function ?

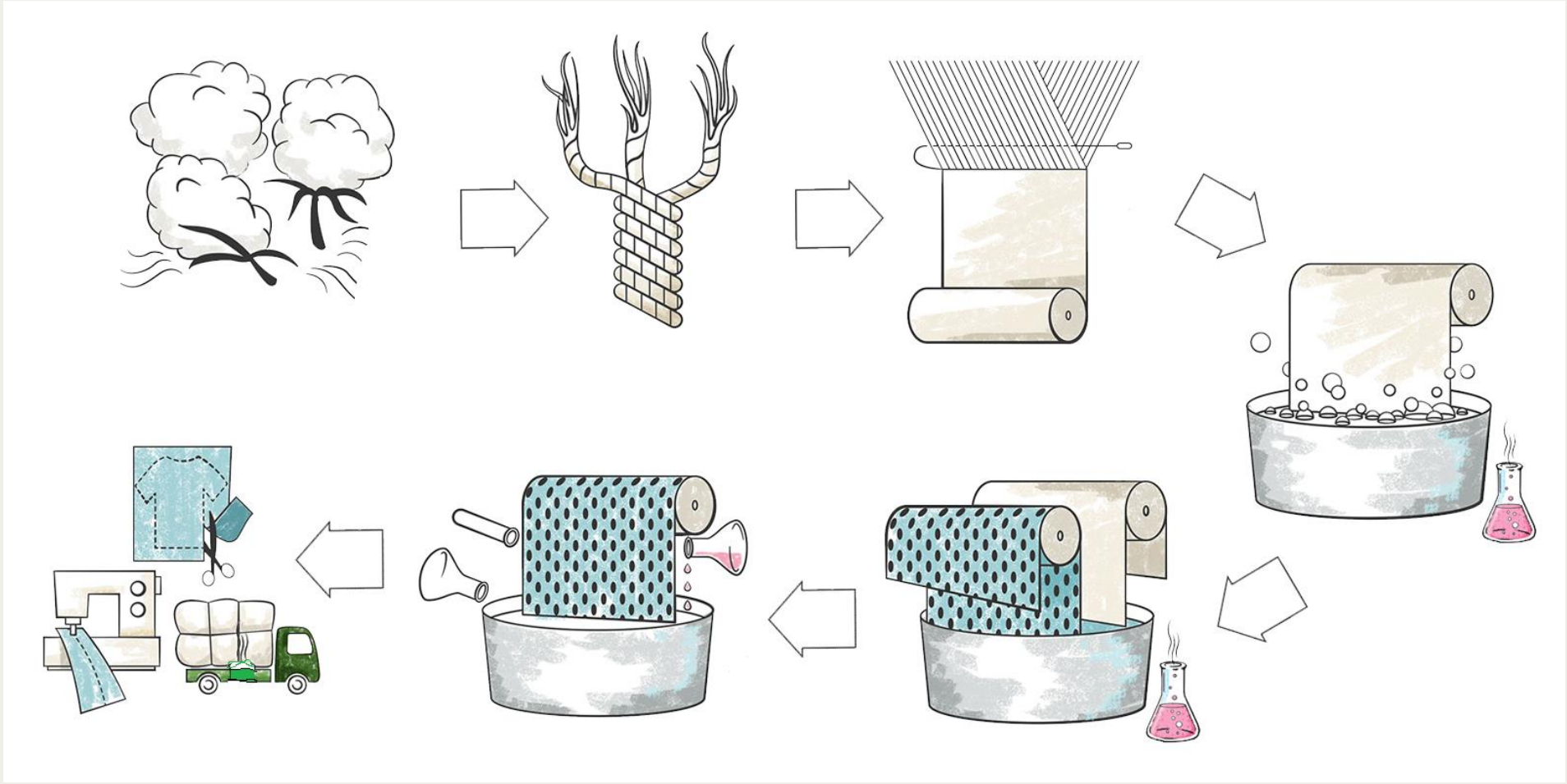

Sustainability?
Are we doing a good substitution?


CONFIDENTIAL

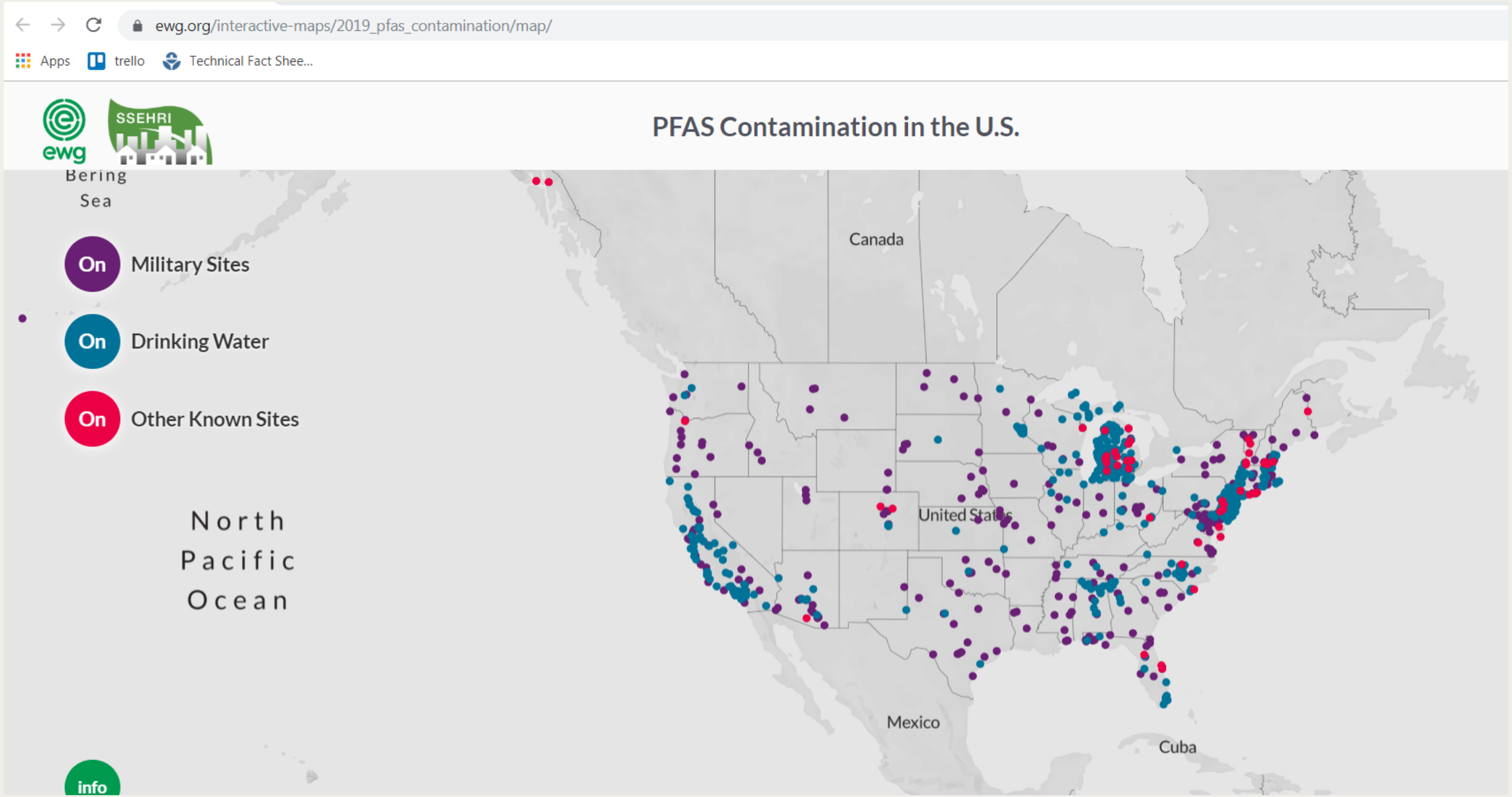


implementation

Process related contaminations




Environmental contaminations


ewg.org/interactive-maps/2019_pfas_contamination/map/
Apps
trello
Technical Fact Shee...
ewg
SSEHRI
PFAS Contamination in the U.S.
Bering Sea
On Military Sites
On Drinking Water
On Other Known Sites
North Pacific Ocean
Canada
United States
Mexico
Cuba
info


Today?


WATERPROOFING
IMPREGNATION


Thank you!

FRISTADS GREEN CONCEPT

Measuring the total impact of a garment –
Environmental Product Declaration (EPD)

Lisa Rosengren

FRISTADS®


FRISTADS
FIRST IN
THE WORLD
FRISTADS

ABOUT FRISTADS

- Part of the Fristads Kansas Group, the largest workwear group in Europe
- Operates in more than 20 countries
- Owns two production facilities: Latvia and Ukraine
- Annual sales of about EUR 450+ million
- About 1600 employees, 180 based in Sweden
- Head office in Borås, Sweden
- Privately owned by Christian Dyvig and Michael Hauge Sörensen

FRISTADS

THE BEGINNING…

- Mission – to create a sustainable collection
- What is true sustainability?
- How do we know?
- Sandra Roos, LCA expert at RISE
- Creating an EPD at garment level
- The rules had to be set!

PCRS (PRODUCT CATEGORY RULES)

- PCRs are documents that provide rules, requirements and guidelines for developing an EPD for a specific category
- Founding of an international committee through RISE to define the rules
- Suggestions and basis for the rules were defined in accordance with ISO 14025
- What scope?
- From Cradle to Gate
- Different PCR categories for different garments, trousers, jackets etc.
- Necessary to display test results in order to be transparent

FRISTADS

WHAT IS AN EPD?

- Standardised methodology for reporting environmental performance of products (ISO 14025)
- The relevant standard for Environmental Product Declarations (EPD) is ISO 14025, where they are referred to as "type III environmental declarations"
- An EPD is created and registered in the framework of a programme, such as the International EPD® System
- The IES online database currently contains more than 850 EPDs for a wide range of product categories from companies in 40 countries

EPD®
THE INTERNATIONAL EPD® SYSTEM

FRISTADS

IMPLEMENTATIO N

- ✓ Visit factories
- ✓ Data collection
- ✓ Fibre and wet treatment
- ✓ Which chemicals?
- ✓ Water usage per kg raw material?
- ✓ What energy source?
- ✓ Machine time?
- ✓ Transportation
- ✓ Comparative product

FRISTADS

FABRIC & TRIMS

- Today, water consumption and chemicals have the greatest impact on the environment in the textile industry
- Carefully chosen fabrics and trims
- Dope dyed recycled polyester
- Undyed cotton
- Recycled PES zippers
- Screw buttons in raw metal

DESIGN & CONSTRUCTION

- Special folding
- Less machine time
- 100% usage of fabric

FRISTADS

EFFICIENT PACKING AND SHIPMENT

- We avoid the use of plastic bags
- The garments are folded using a special folding technique, making packing more effective
- Takes up less space
- Optimized use of transport capacity
- All transport is by sea and road, which has significantly lower environmental impact than air transport

CRAFTSMAN JACKET 4538 GRN
Article no 130513

T-SHIRT 7520 GRK
Article no 129825

CRAFTSMAN TROUSERS 2538 GRN
Article no 129663

FLEECE JACKET 4921 GRF
Article no 129826

COMFORT PADS for knees and elbows

FRISTADS

RESULT EPD — Fristads T-shirt 7520 GRK

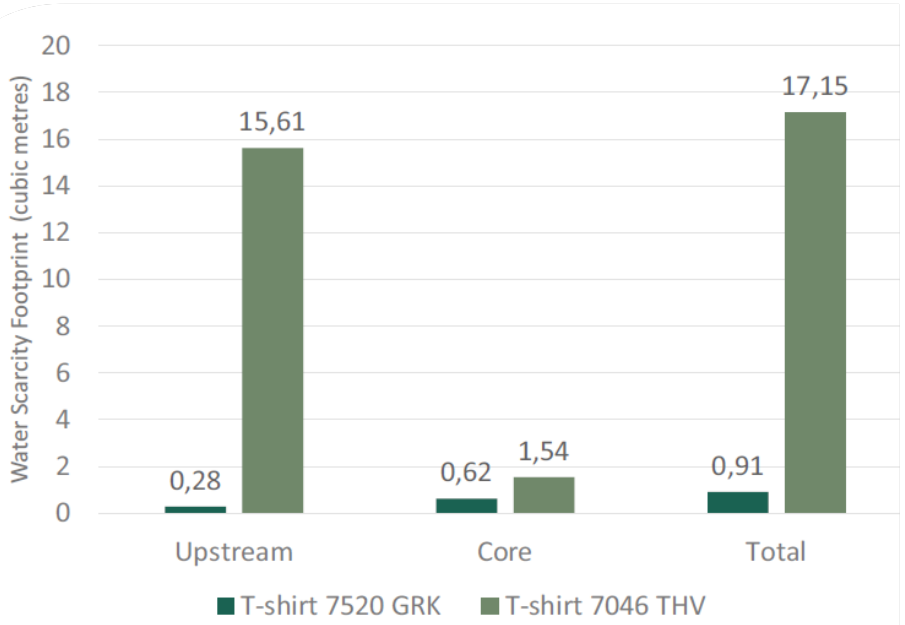


Figure 2. The Water Scarcity Footprint of T-shirt 7520 GRK and T-shirt 7046 THV. Figures for one t-shirt.

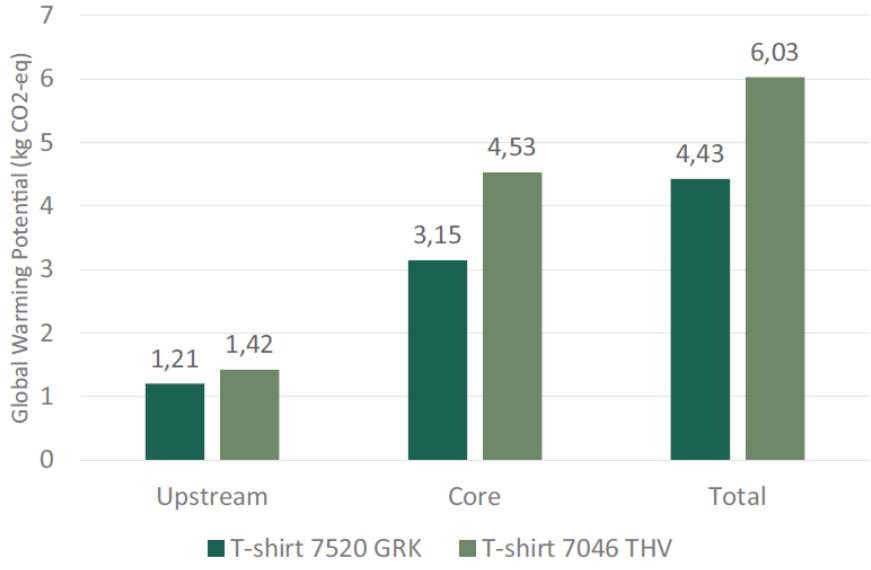


Figure 3. The Global Warming Potential of T-shirt 7520 GRK and T-shirt 7046 THV. Figures for one t-shirt.

FRISTADS

WORKWEAR BUSINESS

- Calculate total impact
- CO_2 emissions
- Water usage
- More product categories
- Tender business
- Comparison tool for companies

FRISTADS

CHALLENGES

- Setting the standards
- Educate suppliers
- Comparison product
- Time-consuming and knowhow-intensive

WHAT NEXT?

- Fristads wants to make a difference!
- We are on a journey!
- More EPD´s to come!

FRISTADS


reddot award 2019
winner
PCIAW
PROFESSIONAL ASSOCIATION
CLOTHING INDUSTRY WORLDWIDE
WE AIM HIGHE
R
Our groundbreaking work on our Green concept has attracted much attention in the world.
We are proud to have received two acknowledged design awards for our sustainability achievement.
FRISTADS

FRISTADS

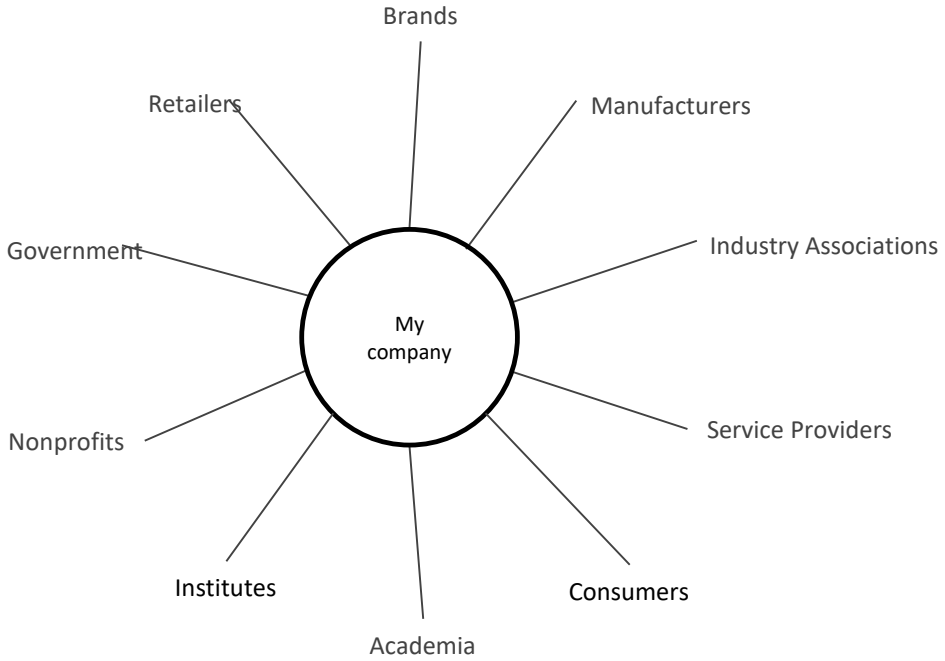
Present situation

Company Profile

Number of employees:
Segment:
Number of seasons:
Purchasing model
Own production, CMT, Full Package
Production countries:

Stakeholder analysis

How do we work with stakeholders to
improve sustainablity at material & chemistry level?



Type of product/ process	Identified possibilities for material selection/ chemical substitution

Name:_____
Company:_____
E-mail:_____
Telephone:_____
Interested in participating in Textile Challenge Project? Yes / No

	Product development, design & product planning					**Production**				**General Business & Sustainability**		
	Design strategies and functionality specification	Material choice	Sourcing & Supplier choice	Planning and sales	User manual and table of content	Energy use	Waterus e	Chemical use	Waste-water managemen t	Strategies and business developmen t	Brand and transparenc y	CSR-policy
Our opportunities												
Our obstacles												
Our responsibilites												

Support needed