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Heat Pump Symposium

# Sector collaboration workshop: Decarbonizing the textile sector

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***Keywords:***
Textile sector, Heat decarbonization, Energy efficiency, Electrification, High temperature heat pumps

## Introduction

The textile sector is one of the most energy-intensive manufacturing industries globally, with significant thermal energy demand driven by wet-processing operations such as dyeing, washing, bleaching, and finishing. Much of this heat is currently supplied by fossil fuel-based systems, resulting in substantial $CO_2$ emissions. Decarbonizing this sector requires coordinated action across the entire value chain from brands and retailers to manufacturers, technology providers, financial actors, and policymakers.

These characteristics position the textile sector as a strong candidate for electrification through high-temperature heat pumps (HTHPs). However, technological feasibility alone is insufficient. Decarbonization requires coordinated action across all the stakeholders across the textile sector as shown in Figure 1.

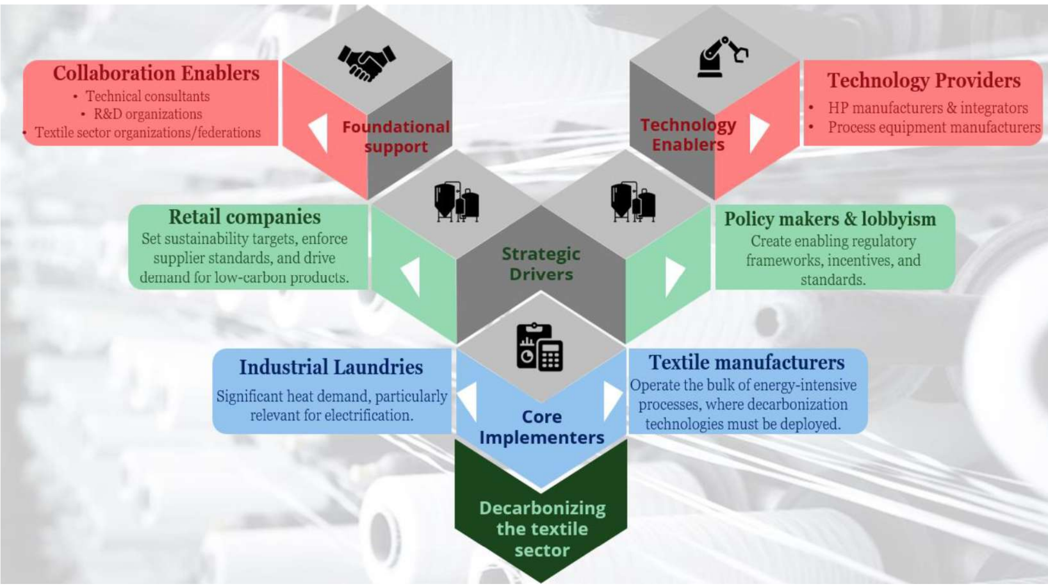


**Figure 1: Textile sector stakeholder mapping**

This sector collaboration workshop contributes to the objectives of IEA Heat Pumping Technologies TCP Project 68, which aims to accelerate knowledge exchange between the stakeholders for efficiently

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decarbonizing various industrial sectors. The specific objective of the textile workshop was to equip stakeholders across the textile value chain with a clear understanding of decarbonization challenges, opportunities and actionable pathways with a focus on electrification, energy efficiency, and high temperature heat pumps (HTHPs), while fostering collaboration to accelerate low-carbon transformation in the global textile industry.

**Workshop Format and Outcomes**

The first part of the workshop consisted of presentations by three different speakers representing different stakeholder groups as illustrated in Figure 1. The second part of the workshop involved a panel discussion with the speakers and an interactive workshop with the audience using mentimeter.

In her presentation, Liv Simpliciano, Senior Campaigner at Action Speakes Louder addressed decarbonization within the sector in a broader sense. She highlighted that renewable electricity targets alone are insufficient to decarbonizing the textile production and requires electrifying process heat, which can be done with solutions that are currently available today. It was further highlighted that clean heat transition requires significant upfront costs and brands have a crucial role to play in providing financial support to their suppliers' transition costs. The scalability of clean heat depends on grid access, electricity pricing and regulatory frameworks, which suppliers cannot influence alone, making brand-level advocacy crucial. Furthermore, without active policy engagement, structural and regulatory barriers will continue to slow electrification.

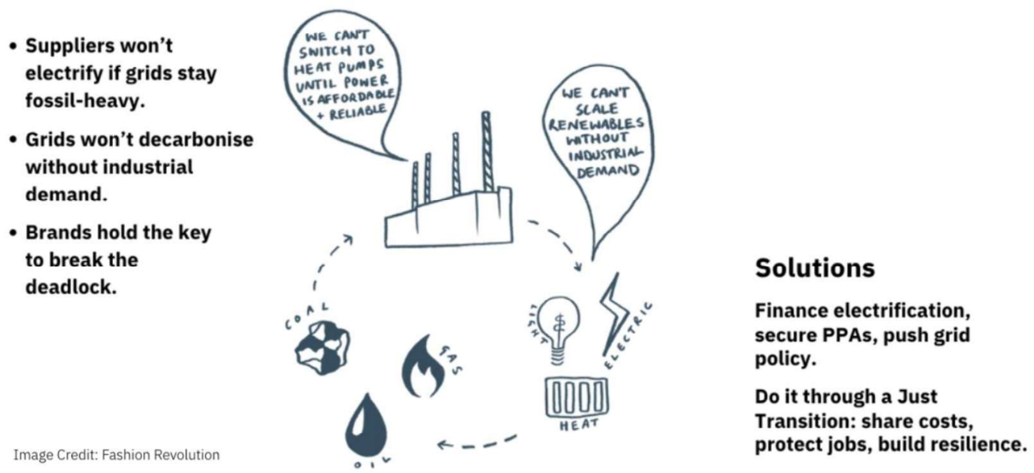


**Figure 2: Why clean heat stalls without coordinated demand. Remark by Liv Simpliciano.**

Building on Liv Simpliciano's insights, Peter Möller, Sustainability Leader at IKEA, addressed the company's ambitious targets to decarbonize supplier production sites and the support they provide in a collaborative manner across the supply chain. IKEA's efforts focus on energy and production efficiency, phasing out on-site coal, increasing renewable electricity use, and electrifying heat. He emphasized the financial, technological, and development support IKEA offers suppliers, highlighting the company's active role in advancing decarbonization across its value chain to move from ambition to implementation.

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Nils Ahlbrink, Senior Consultant at DTI, provided a technical deep dive into process decarbonization through electrification and energy efficiency, highlighting high-temperature heat pumps (HTHPs) as a key solution. He identified the main thermal energy demand hotspots in production (Figure 3), noting that most heat is currently supplied by utility-level boilers and direct gas firing at the process level. Typical temperature requirements range between 120–150°C, with significant waste heat available from wastewater and exhaust air streams. This creates a strong temperature match between process demand and HTHP supply capabilities, underscoring the significant potential of heat pumps to decarbonize industrial process heat.

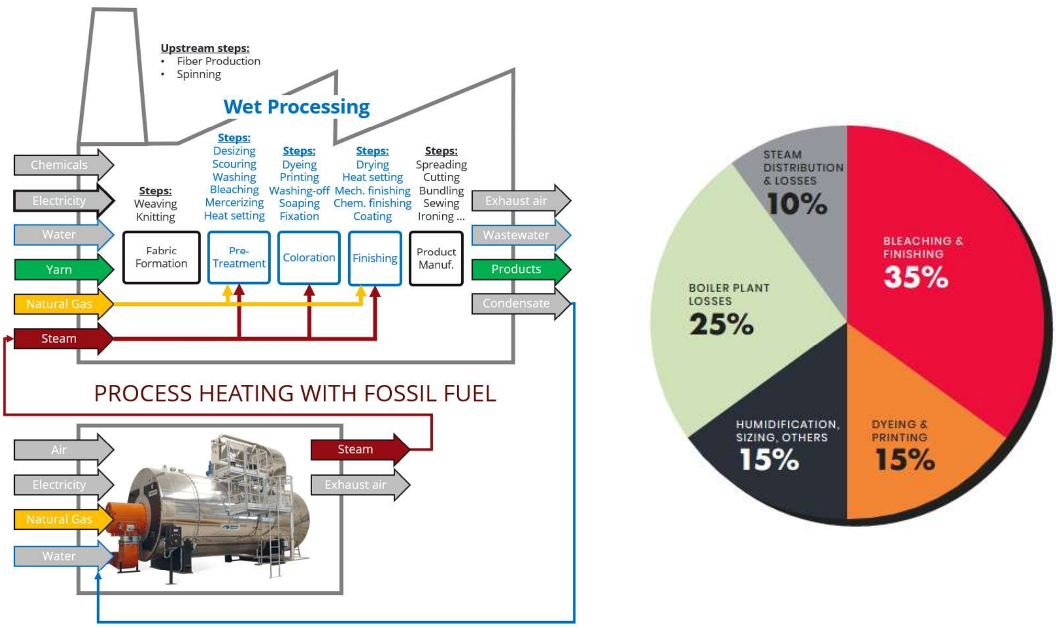


**Figure 3: Characteristic of a typical textile production facility and breakdown of typical thermal energy used in a textile plant (Hasanbeigi et al. 2024).**

The panel discussion and the interactive session revolved around four main questions. The outcomes are summarized below.

***Question 1: What do you currently see as the biggest obstacles to electrification in this sector?***


**Figure 4: Audience inputs for question 1**

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A major barrier to decarbonizing the textile sector through electrification is the lack of full-scale demonstrators and sector-specific technical expertise. Operators in key sourcing regions like Vietnam, India, Pakistan, and Bangladesh tend to prioritize reliability over innovation. Without sufficient reference installations and studies of technologies such as high-temperature heat pumps (HTHPs), there is hesitation to replace conventional coal- or gas-fired boilers. Many facilities also lack in-house capacity for heat integration studies and waste heat mapping, a gap which amplifies perceived technical and investment risks.

Electrification is further complicated by carbon-intensive grids in many Asian textile-producing countries. Since coal and gas still dominate power generation, the real carbon reduction from switching to electric technologies depends on grid emission factors. Grid reliability, capacity limits, and peak demand charges also add uncertainty to investment decisions.

These barriers are transitional. Even on moderately carbon-intensive grids, HTHPs can reduce emissions due to their high efficiency. As renewable capacity grows and manufacturers adopt corporate renewables, on-site solar, or power purchase agreements, electrification becomes increasingly climate-effective. Overcoming current obstacles requires targeted demonstration projects, structured knowledge transfer, and alignment with power sector decarbonization

***Question 2: What do you currently see as the biggest chance to overcome these obstacles from your stakeholder?***

From a stakeholder perspective, several key opportunities can help overcome the current barriers to electrifying process heat in the textile sector.

- Develop sector specific solutions and perform integration studies - Tailored electrification concepts and detailed heat integration studies can reduce technical uncertainty and ensure solutions match real process conditions. This increases confidence and accelerates decision-making at factory level.
- Make good demonstrations in Europe and transfer to Asia - Well-documented demonstration projects in Europe can serve as credible proof points and reduce perceived risks. Structured knowledge transfer can support rapid replication in key Asian production hubs.
- Enhance awareness of solutions available and tech transfer packages - Raising awareness of mature technologies like HTHPs, combined with standardized technical guidelines and case studies, can lower informational barriers and support informed investment decisions.
- Funding for demonstrations - Dedicated public or blended finance mechanisms can de-risk first-mover projects and unlock broader private investment by creating validated reference cases.
- Enable shared risk models across the value chain – Risk sharing between brands, suppliers, and technology providers through co-investment, guarantees, or long-term commitments can align incentives and accelerate large-scale deployment.

***Question 3: Which opportunities should we prioritize to accelerate electrification in the textile sector?***

As shown in Figure 6, while these measures are mutually reinforcing, particular emphasis was placed on expanding pilot projects as a critical enabler of scale. Successful pilots require close collaboration between brands and suppliers to share financial risks, align incentives, and demonstrate technical feasibility under real operating conditions. Well-executed pilot projects can build confidence, generate performance data, and accelerate broader sector adoption.

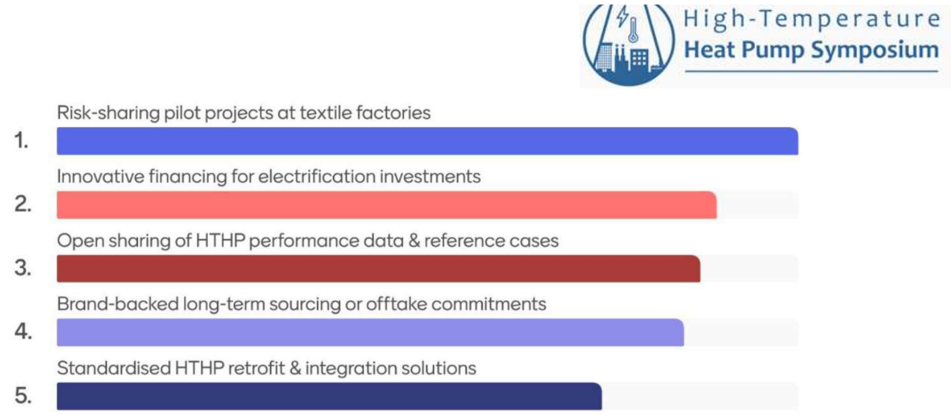


**Figure 5: Audience responses to question 3**

***Question 4: What do we need to do to market ramp-up over the next 12 months is ____________?***

In alignment with the answers to previous questions, the following options were noted as the main focus points emphasizing further demonstrations and pilot projects.

- Demo projects and find early adopters
- Knowledge sharing workshops with various stakeholders and textile dominating countries
- Infrastructure upgrades for more green power in Asian countries

## Conclusions and Future Outlook

High-temperature heat pumps (HTHPs) represent a cornerstone technology for decarbonizing thermal energy in the textile industry. Their strong temperature compatibility with wet-processing requirements, high efficiency, and significant emission reduction potential make them particularly well suited for replacing fossil-based process heat. However, achieving scalable impact requires coordinated, sector-wide action to accelerate knowledge transfer, lower perceived technical and financial risks, and enable systematic electrification across textile supply chains. Going forward, efforts should prioritize refining standardized integration concepts and expanding demonstration projects across key sourcing regions. Through alignment of demand, technology, finance, and policy, the textile sector can move beyond isolated pilots toward large-scale, low-carbon transformation.

## References

1) Hasanbeigi, A., Springer, C., Wei, D., (2024). Low-carbon thermal energy technologies for the textile industry. Apparel Impact Institute. https://apparelimpact.org/wp-content/uploads/2024/08/Low-Carbon-Thermal-Energy-8.27.24.pdf


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High-Temperature
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Copenhagen 21-22.1.2026
Decarbonizing the Textile sector
Sector collaboration workshop
HTHP Symposium 2026
Chaired by:
Sanduni Pathiraja
Senior Decarbonization Consultant
Danish Technological Institute


Workshop Agenda
1
Introduction (10 minutes)
2
Setting the scene: Decarbonization in the Textile Industry, Liv Simpliciano (10 minutes)
3
Collaboration across the supply chain, Peter Möller (10 minutes)
4
Decarbonization by electrification & energy efficiency: HTHP as a key technology, Dr.-Ing. Nils Ahlbrink (15 minutes)
5
Panel discussion and interactive workshop with mentimeter (40 minutes)
Sanduni Pathiraja
Senior Consultant
DTI
Liv Simpliciano
Senior Campaigner
Action Speaks Louder
Peter Möller
Sustainability Leader
IKEA
Dr.-Ing. Nils Ahlbrink
Senior Consultant
DTI
6
Wrap up and action points (10 minutes)
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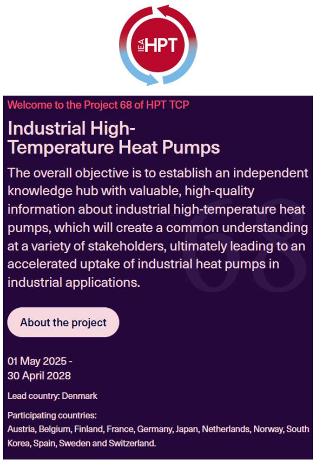
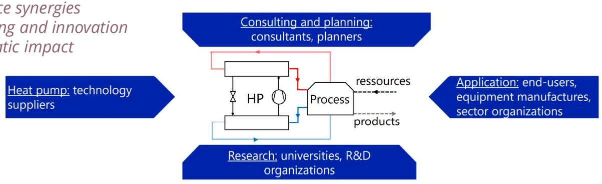
# Sector collaboration

## Powering decarbonization through collaborative efforts




*"Sector collaboration transforms fragmented efforts into systemic change by building a common understanding across stakeholders, aligning demand, technology, finance, and policy to enable a faster, fairer, and scalable decarbonization of textiles.*

- ***Goal project 68 Task 2:*** *Facilitate the knowledge exchange between solution providers and end-users to develop sector-specific solution concepts and increase the awareness for these solutions in the selected sectors.*
- ***Why sector collaboration matters:***
  - *Shared challenges require shared solutions*
  - *Demand alignment across the value chain*
  - *Accelerating technology deployment*
  - *Policy and finance synergies*
  - *Knowledge sharing and innovation*
  - *Creating systematic impact*

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Follow Project 68 of IEA HPT TCP: *https://heatpumpingtechnologies.org/project68/*

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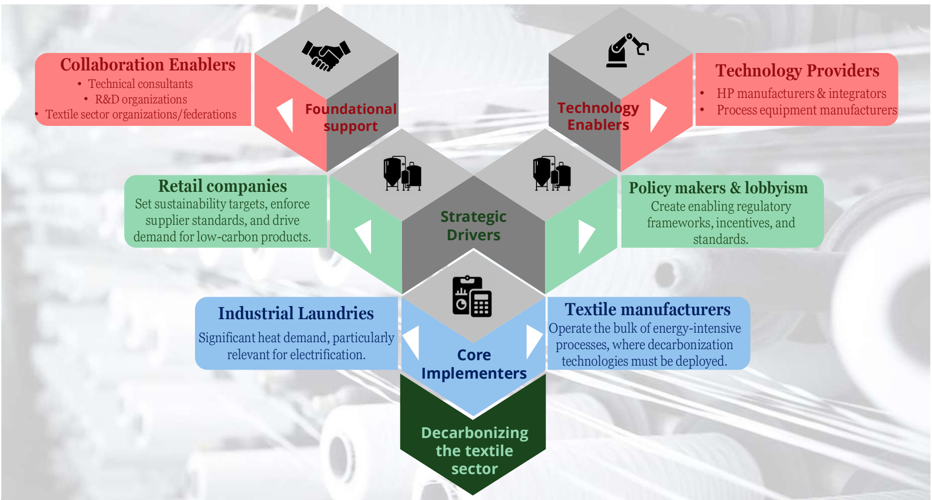
# Textile sector stakeholder mapping

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## Textile sector's first fully electrified HP installation

**Goal:** Pilot one of the first steam generating heat pumps to electrify a facility in Vietnam (Tier 2).

**GHG savings:** 7.09 kg $CO_2$e per kg production
6,089 t$CO_2$e for all sites/year

**Energy savings:** 57 MJ per kg production
49,154 GJ for all sites/year

**Funding:** $ 1,941,175 over a 2-year period

**Investment:** $ 36 per t$CO_2$e reduction

### Major milestone in Viet Nam's textile sector decarbonisation

*Posted on June, 03 2025*

WWF, H&M Group, Apparel Impact Institute and leading supplier Bangjie to pioneer the sector's first fully electrified heat pump installation

**Hanoi, June 5, 2025** - Viet Nam's textile and apparel industry will see the beginning of a shift to high-efficiency electric technology later this year in an effort to decarbonize one of the largest sectors of its economy. It comes as a result of a collaboration between the Apparel Impact Institute (Aii), WWF, H&M Group and textile manufacturer, Bangjie.

wwf
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Aii-funded
TECHNOLOGY

### Bangjie Knitting (Vietnam) Co., Ltd.
### Steam Generating Heat Pump

By implementing a steam generating heat pump, Bangjie will eliminate GHG emissions from heat generation. This will be the first installation of a steam generating heat pump to provide the full heat demand for a facility in Vietnam. Bangjie will generate electricity from onsite solar pv and enter a Direct Power Purchase Agreement to power the heat pump. The installation will be a model example for the entire sector in Vietnam, as well as for other countries, demonstrating one of the first global examples of electrifying the dyeing process.

*Sources:*
- *https://wwf.panda.org/wwf_news/?14146916/Major-milestone-in-Viet-Nams-textile-sector-decarbonisation*
- *https://apparelimpact.org/solutions/steam-generating-heat-pump/*



# Decarbonization in the Textile Industry

**Liv Simpliciano**
**Senior Campaigner at Action Speakes Louder**

ACTION SPEAKS LOUDER

High-Temperature Heat Pump Symposium Copenhagen 21-22.1.2026

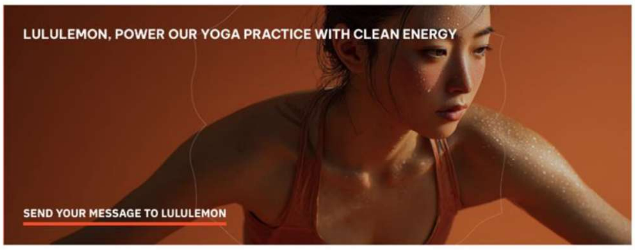
# Sector Collaboration Workshop: Textiles

Liv Simpliciano, Senior Campaigner, Action Speaks Louder

liv@speakslouder.org

## About Action Speaks Louder

Action Speaks Louder (ASL) is a climate campaigning organisation that holds companies accountable to their climate promises, leveraging those promises into tangible action and pushing for greater ambition. We campaign on target companies in the fashion, industrial gases and steel sectors.

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2

## Overview of the Textile Sector

- Hyper globalised, fragmented supply chain:
  - **Buyer-driven model:** manufacturers operate under intense cost and margin pressure.
  - Climate targets are set by brands upstream, often without supplier input or investment commitments.
- Energy intensive thermal processes clustered in **dyeing, finishing & washing**.
- **Majority of emissions sit where the decision-making power, capital and risk are least shared.**

ASL

3

## Transparency Status Quo

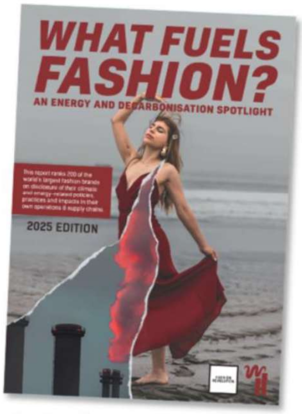


Image Credit: Fashion Revolution

The ***What Fuels Fashion?*** report is an energy and decarbonisation spotlight assessing how transparent 200 of the world's largest fashion brands across all markets (e.g. luxury, high street, sportswear and fast-fashion) against various decarbonisation indicators.

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4

## Clean Heat: The Missing Link in Textile Decarbonisation

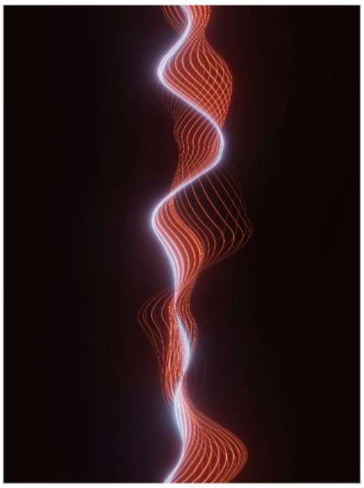
- **Few brands disclose how they address energy at supply chain level: 10%** of brands disclose supply chain renewable electricity targets and even fewer **(6%)** disclose broader renewable energy targets.
- **Electricity targets alone do not decarbonise production.** Without electrifying process heat, heating, steam and drying will remain fossil-fuelled.
- **Fossil heat is embedded:** Only **18%** of brands disclose a coal phase-out target, indicating that fossil heat remains embedded in the production systems they are planning for.

ASL❯ 5

## Electrification: High Technical Potential, Low Uptake

- Textile processes operate largely within temperature ranges compatible with existing electrification technologies.
- Close to **100% of textile process heat could be electrified** with solutions available today.
- Yet, only **6%** of major brands disclose any information on their efforts to electrify high-heat processes.

**This points to a significant gap between technical feasibility and market signalling.**



ASL❯ 6

## Examples ❯

- **Vietnam - Bangjie (H&M customer)** > supported by **WWF-Viet Nam**, **Apparel Impact Institute**, **Hauhouse E&C (HEC)** and **Vu Phuong Group**.

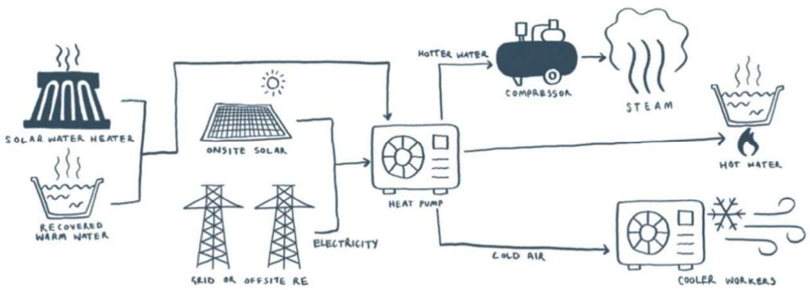



Image Credit: Fashion Revolution, image adapted from WFF

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7

## Decarbonisation Targets Lack Transparent Cost and Risk-Sharing

- **Clean heat transitions require significant upfront and ongoing costs.**
  - Without clarity on cost-sharing, suppliers face high financial risk when shifting from fossil to clean heat.
- **Very few brands disclose how they are going to financially support their suppliers' transition costs.**
  - Only **6%** disclose CapEx support and **2%** OpEx.
- Buyer-driven power dynamics mean **suppliers are often expected to absorb transition costs without long-term commercial guarantees.**

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8

## Very few brands engage publicly on the policy conditions needed for clean heat

- **7%** of brands disclose how they engage with renewable energy advocacy in producing countries, and only **2%** disclose outcomes.
- **Brand-level advocacy is critical:** clean heat scalability depends on grid access, electricity pricing, and regulatory frameworks that suppliers cannot influence alone.
- Without active policy engagement, structural and regulatory barriers will continue to slow electrification.

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9

## Why Clean Heat Stalls Without Coordinated Demand❯

- **Suppliers won't electrify if grids stay fossil-heavy.**
- **Grids won't decarbonise without industrial demand.**
- **Brands hold the key to break the deadlock.**

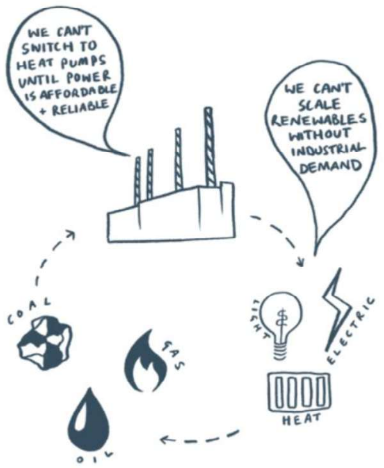


Image Credit: Fashion Revolution

### Solutions

**Finance electrification, secure PPAs, push grid policy.**

**Do it through a Just Transition: share costs, protect jobs, build resilience.**

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## Additional Barriers to Scaling Clean Heat

- Hyper-globalised supply chain: local grids, infrastructure and climate risks vary = **no one-size-fits all approach.**

- **Electrification is not a silver bullet:** Entrenched issues in the industry (like unfair purchasing practices, unequal power dynamics between brands and suppliers) must be addressed.


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11

## Collaboration across the supply chain

**Peter Möller**
**Sustainability Leader at IKEA**


Supply
IKEA Purchasing Development: Collaboration across the supply chain
Peter Möller
Sustainability Leader, Energy
IKEA
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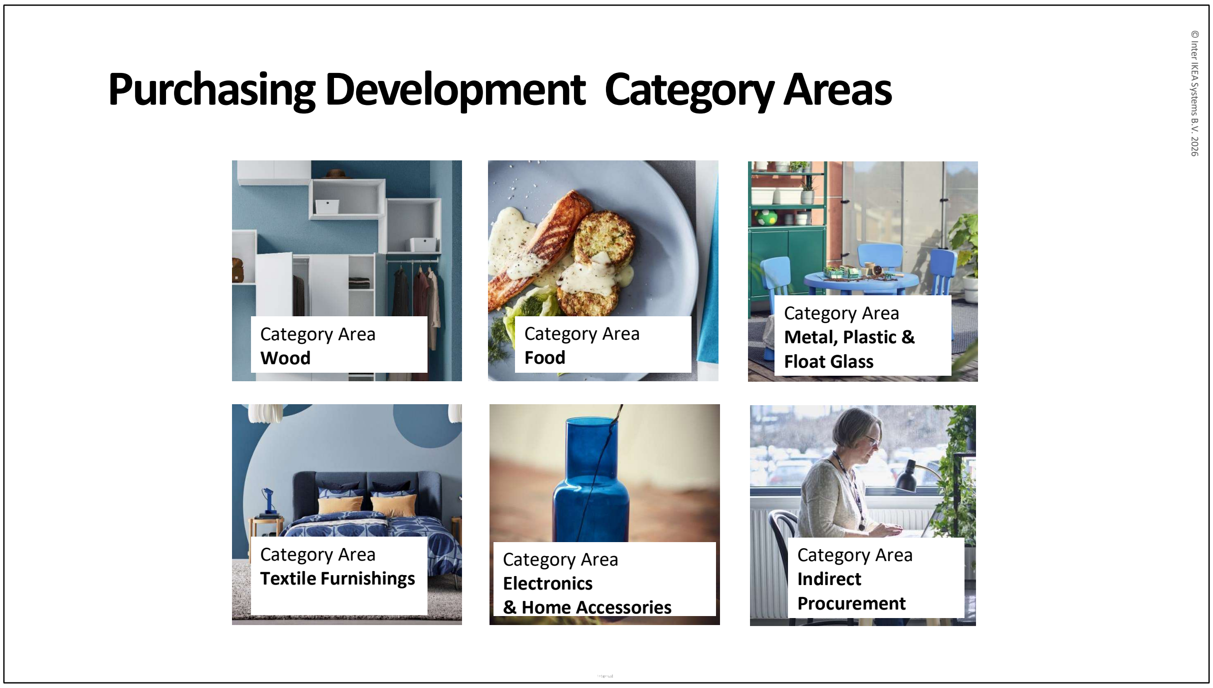
Purchasing Development Category Areas
Category Area
Wood
Category Area
Food
Category Area
Metal, Plastic &
Float Glass
Category Area
Textile Furnishings
Category Area
Electronics
& Home Accessories
Category Area
Indirect
Procurement
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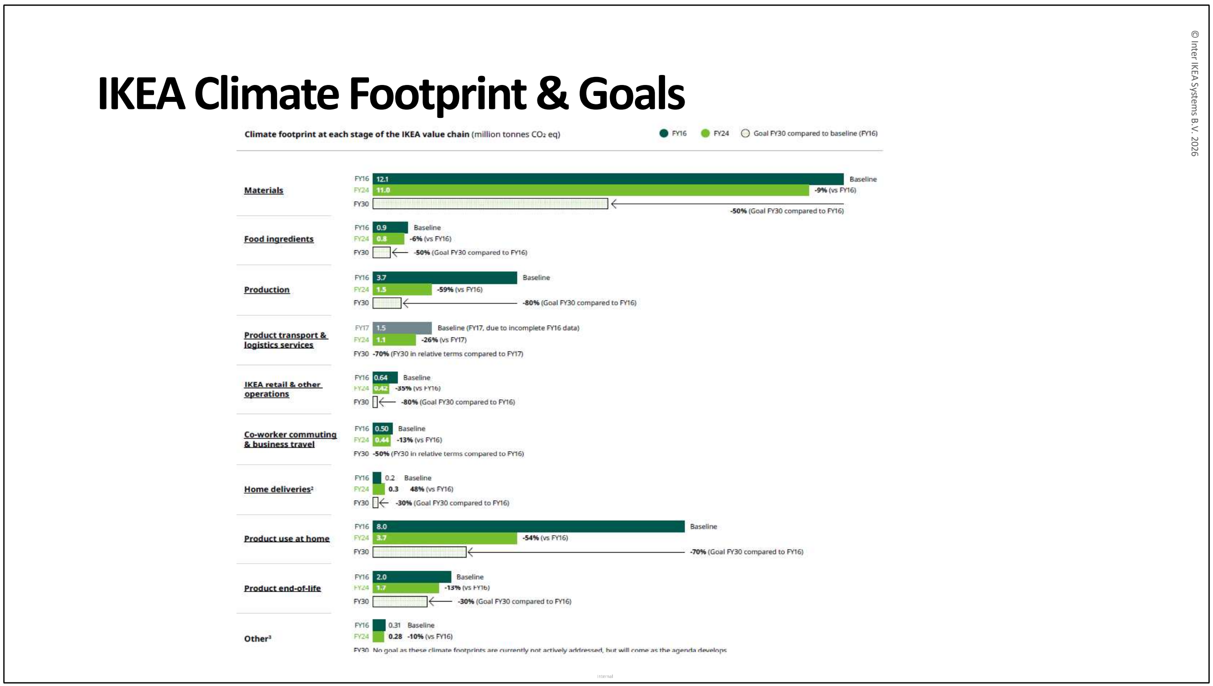
IKEA Climate Footprint & Goals
Climate footprint at each stage of the IKEA value chain (million tonnes CO₂ eq)
FY16
FY24
Goal FY30 compared to baseline (FY16)
Materials
FY16 12.1 Baseline
FY24 11.0 -9% (vs FY16)
FY30 -50% (Goal FY30 compared to FY16)
Food ingredients
FY16 0.9 Baseline
FY24 0.8 -6% (vs FY16)
FY30 -50% (Goal FY30 compared to FY16)
Production
FY16 3.7 Baseline
FY24 1.5 -59% (vs FY16)
FY30 -80% (Goal FY30 compared to FY16)
Product transport & logistics services
FY17 1.5 Baseline (FY17, due to incomplete FY16 data)
FY24 1.1 -26% (vs FY17)
FY30 -70% (FY30 in relative terms compared to FY17)
IKEA retail & other operations
FY16 0.64 Baseline
FY24 0.42 -35% (vs FY16)
FY30 -80% (Goal FY30 compared to FY16)
Co-worker commuting & business travel
FY16 0.50 Baseline
FY24 0.44 -13% (vs FY16)
FY30 -50% (FY30 in relative terms compared to FY16)
Home deliveries²
FY16 0.2 Baseline
FY24 0.3 48% (vs FY16)
FY30 -30% (Goal FY30 compared to FY16)
Product use at home
FY16 8.0 Baseline
FY24 3.7 -54% (vs FY16)
FY30 -70% (Goal FY30 compared to FY16)
Product end-of-life
FY16 2.0 Baseline
FY24 1.7 -13% (vs FY16)
FY30 -30% (Goal FY30 compared to FY16)
Other³
FY16 0.31 Baseline
FY24 0.28 -10% (vs FY16)
FY30 No goal as these climate footprints are currently not actively addressed, but will come as the agenda develops
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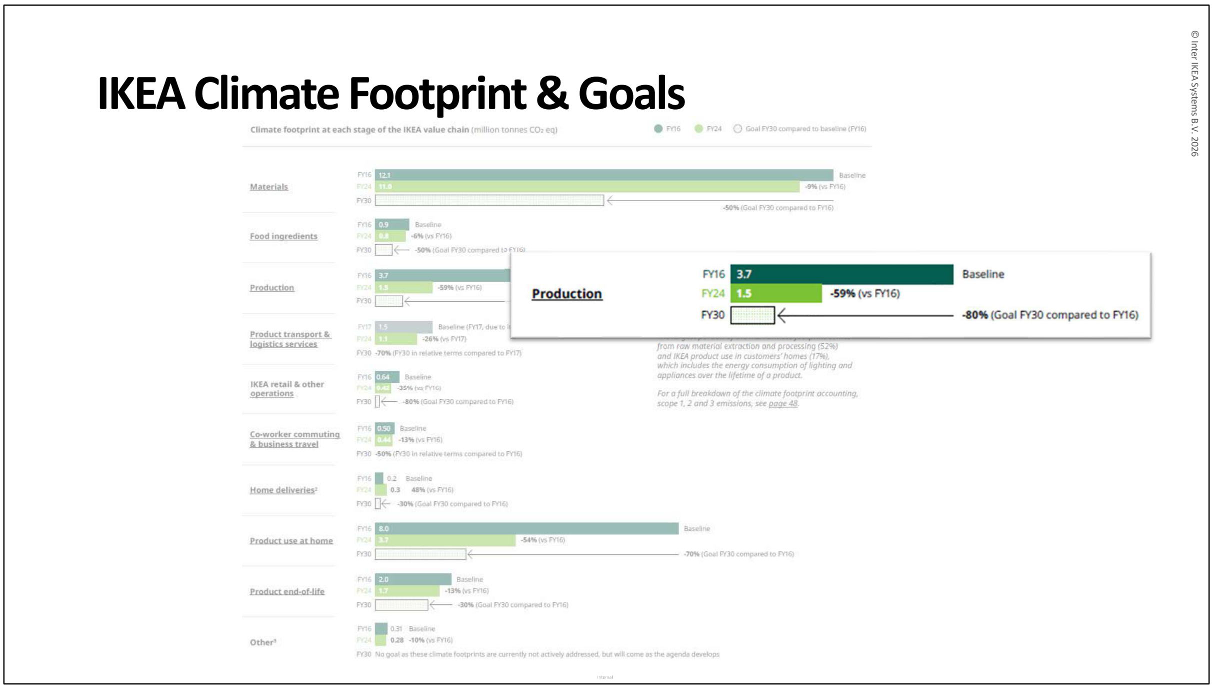
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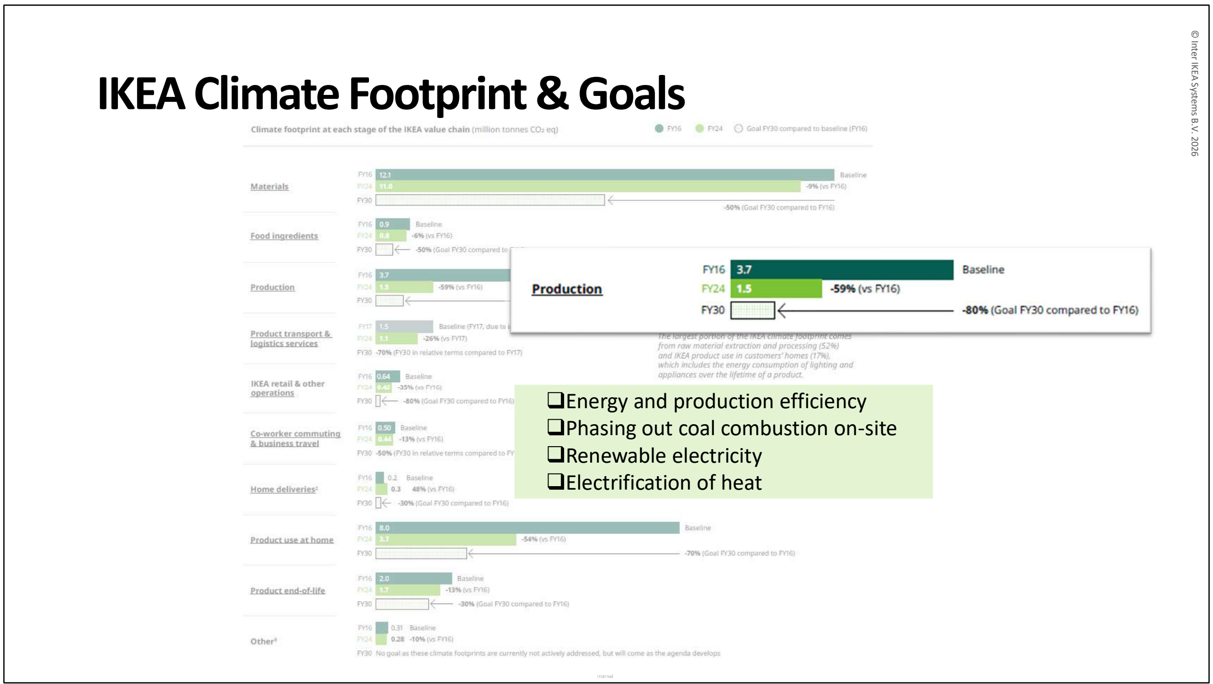
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Production
FY16 3.7 Baseline
FY24 1.5 -59% (vs FY16)
FY30 -80% (Goal FY30 compared to FY16)
The largest portion of the IKEA climate footprint comes from raw material extraction and processing (52%) and IKEA product use in customers' homes (17%), which includes the energy consumption of lighting and appliances over the lifetime of a product.
❑Energy and production efficiency
❑Phasing out coal combustion on-site
❑Renewable electricity
❑Electrification of heat
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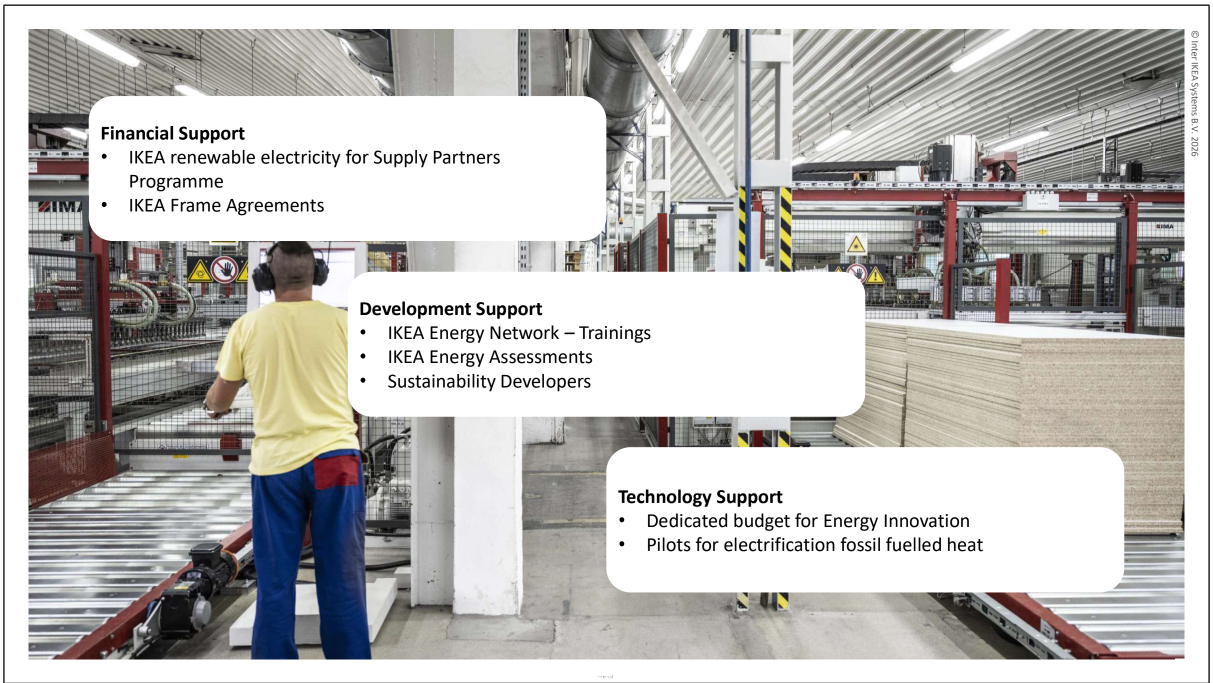
Financial Support
• IKEA renewable electricity for Supply Partners Programme
• IKEA Frame Agreements
Development Support
• IKEA Energy Network – Trainings
• IKEA Energy Assessments
• Sustainability Developers
Technology Support
• Dedicated budget for Energy Innovation
• Pilots for electrification fossil fuelled heat
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# Decarbonization by electrification & energy efficiency

**Dr.-Ing. Nils Ahlbrink**
Senior Consultant at Danish Technological Institute

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https://elteksmak.com.tr/en/Poslu-Gen4-Stenter/

## Decarbonization by electrification and energy efficiency:

## HTHP as a key technology

**Dr.-Ing. N. Ahlbrink**

**Senior Consultant**

TEKNOLOGISK
INSTITUT

# Agenda

- Characteristics of a typical textile production facility
- Technical concepts for electrification & energy efficiency
- Discussion and outlook

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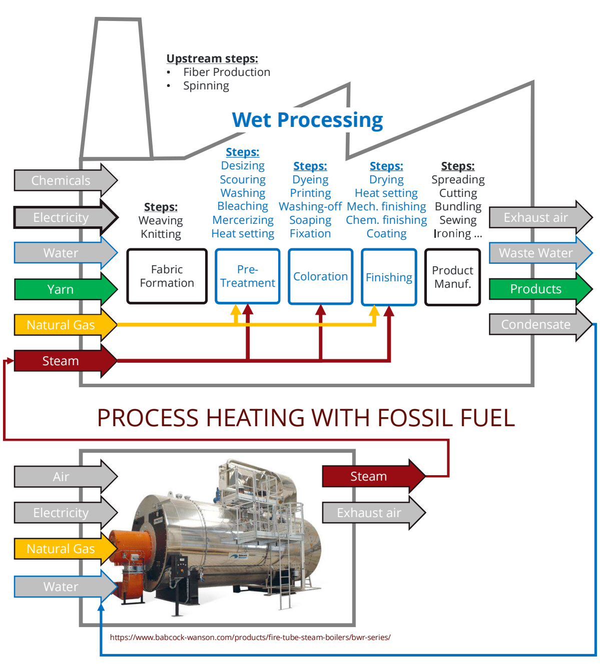
# Characteristics of a typical textile production facility

- Extremely wide variety of fibers, fabrics, designs, colors, and processes
- Predominantly water-based (wet) processing, resulting in a high thermal energy demand
- Thermal energy is typically supplied by:
  - Coal-fired or natural-gas-fired …
  - steam boilers or thermal oil boilers …
  - with associated distribution networks
- Combination of utility level boilers and direct gas firing on process level

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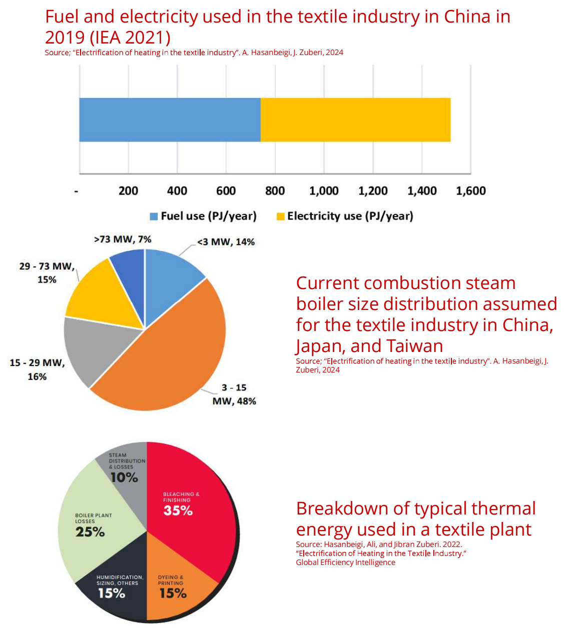
# Characteristics of a typical textile production facility

- Roughly equal split between electricity and heat demand
- Steam/thermo oil mainly supplied by small to mid-size boilers
- Boilers and steam distribution are major sources of energy inefficiencies



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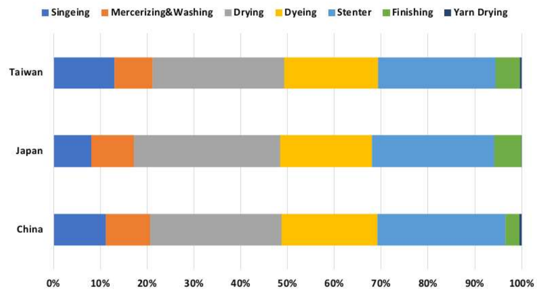
# Characteristics of a typical textile production facility

- **Drying, dyeing, and stenter machines are major $CO_2$ contributors**
- **Cotton wet processing typically needs heat at 120–150 °C**
- **Artificial yarns generally require higher temperatures (+30 °C) than natural yarns**
- **Multiple waste heat sources available**
  - Wastewater around 60-80 °C
  - Exhaust air streams at 60–150 °C

Contribution to total $CO_2$ emissions reduction
Source: "Electrification of heating in the textile industry". A. Hasanbeigi, J. Zuberi, 2024




Typical process steam temperatures suitable for industrial heat pump applications
Source: "Electrification of heating in the textile industry". A. Hasanbeigi, J. Zuberi, 2024

| Process | Steam temperature (°C) |
|---|---|
| Desizing | 120 |
| Scouring | 120 |
| Mercerizing & Washing | 120 |
| Bleach & Wash/rinse | 120 |
| Drying | 150 |
| Dyeing & Washing | 150 |
| Printing | 150 |
| Finishing (Pad-dry-cure) | 120 |

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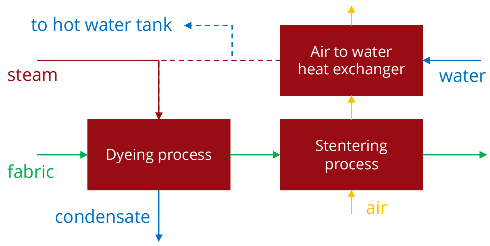
# Technical concepts for electrification & energy efficiency

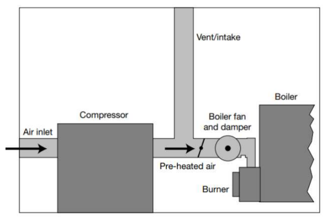
## Energy efficiency measures

- Implement and expand **energy monitoring**
- Improve steam boiler efficiency
- Reduce steam network leakages
- Reduce heat losses (better insulation)
- **Use waste heat** from air streams
- Use waste heat from air compressors
- Use waste heat from wastewater
- Increase use of **indirect steam systems**
- **Electrify processes** where feasible

Example: Use waste heat from air streams




Example: Use waste heat from air compressors
Source: "Sustainable energy solutions for the textile industry – A case study approach". R. Ebenezer, KTH, 2025



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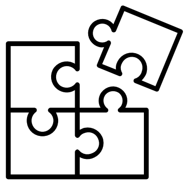
## Technical concepts for electrification & energy efficiency

- Key wet-processing machines are available with multiple heating options (gas, steam, thermal oil, electric)
- Need to balance low-carbon utility-integrated heating with process-integrated electric heating
- HTHP process integration must be developed in close collaboration with equipment manufacturers



**Low-carbon utility-integrated heating**
- Electrical boilers
- Sustainable biomass fired boilers
- High temperature heat pumps
- Steam / pressurized water / thermo-oil network
- Thermal storage

**Process-integrated electric heating**
- Integrated high temperature heat pumps
- Electrical heating (resistive, induction, radio-frequency (RF), infrared, ultra-violet (UV), microwave)

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## Technical concepts for electrification & energy efficiency

- Good match between required process temperatures and HTHP supply temperatures
- Available HTHP capacities are comparable to conventional steam boilers used in textile plants

Typical process steam temperatures suitable for industrial heat pump applications

Source; "Electrification of heating in the textile industry". A. Hasanbeigi, J. Zuberi, 2024

| Process | Steam temperature (°C) |
|---|---|
| Desizing | 120 |
| Scouring | 120 |
| Mercerizing & Washing | 120 |
| Bleach & Wash/rinse | 120 |
| Drying | 150 |
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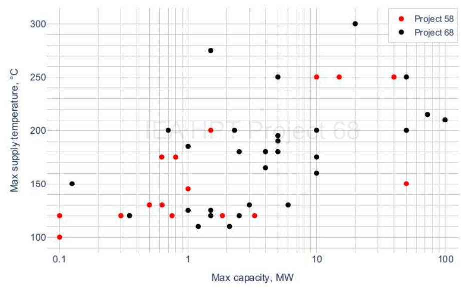
| Finishing (Pad-dry-cure) | 120 |

Maximum supply temperatures as a function of maximum capacity

Source; "Industrial High-Temperature Heat Pumps, Task 1 – Technologies". Yearly report 2025. B. Zühlsdorf, 2025



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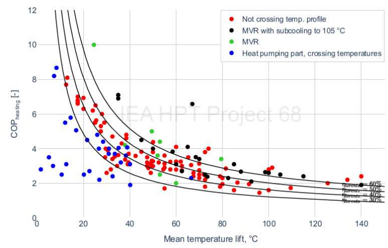
# Technical concepts for electrification & energy efficiency

- Multiple waste heat sources available, requiring detailed integration studies
- HTHPs offer significantly higher efficiency than conventional and electric boilers
- Example: Steam-generating HTHPs integrated at utility level at two temperature levels

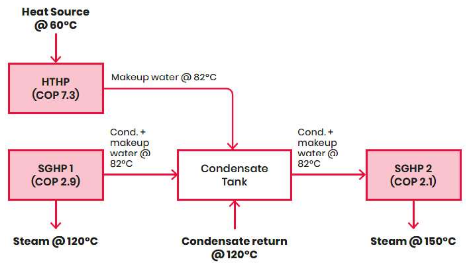
COP heating as a function of temperature lift

Source: "Industrial High-Temperature Heat Pumps, Task 1 – Technologies". Yearly report 2025. B. Zühlsdorf, 2025




Industrial heat pump applications to meet steam demand at a typical wet-processing textile factory

Source: "Low-Carbon Thermal Energy Roadmap for the Textile Industry". apparel impact institute. 2025

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# Discussion and outlook

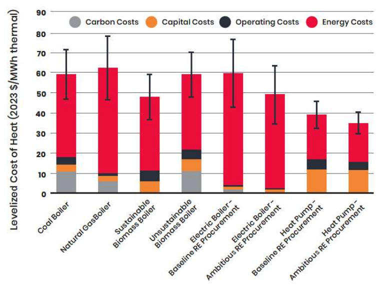
- HTHPs will be a key element in electrification, offering:
  - High efficiency
  - Strong $CO_2$ reduction potential
  - Low levelized cost of heat
- Integration concepts still need refinement
- Remaining technology maturity challenges must be addressed

Cross-Technology comparison matrix for the low-carbon thermal technologies and alternative fuels

Source: "Low-Carbon Thermal Energy Roadmap for the Textile Industry". apparel impact institute. 2025


Levelized cost of heat (LCOH) for steam generation of the analyzed technologies for a typical textile wet-processing facility in China

Source: "Low-Carbon Thermal Energy Roadmap for the Textile Industry". apparel impact institute. 2025



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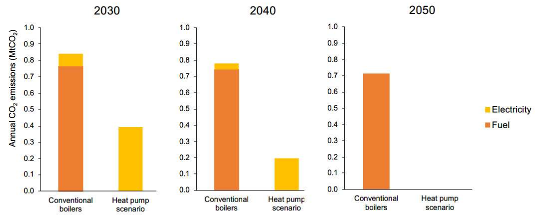
## Discussion and outlook

- Large HTHP potential is clearly evident
- Initial technical concepts identified but need further refinement
- Key barriers to address:
  - Knowledge and education gaps
  - Limited supply
  - Need for further development
  - No one-size-fits-all solution

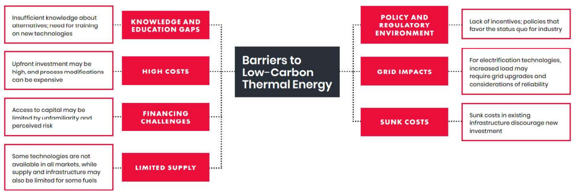
Current combustion steam boiler size distribution assumed for the textile industry in China, Japan, and Taiwan

Source; "Electrification of heating in the textile industry". A. Hasanbeigi, J. Zuberi, 2024




Barriers to low-carbon thermal energy in the textile energy

Source; "Low-Carbon Thermal Energy Technologies for The Textile Industry". apparel impact institute, August 2024




## Thank you!

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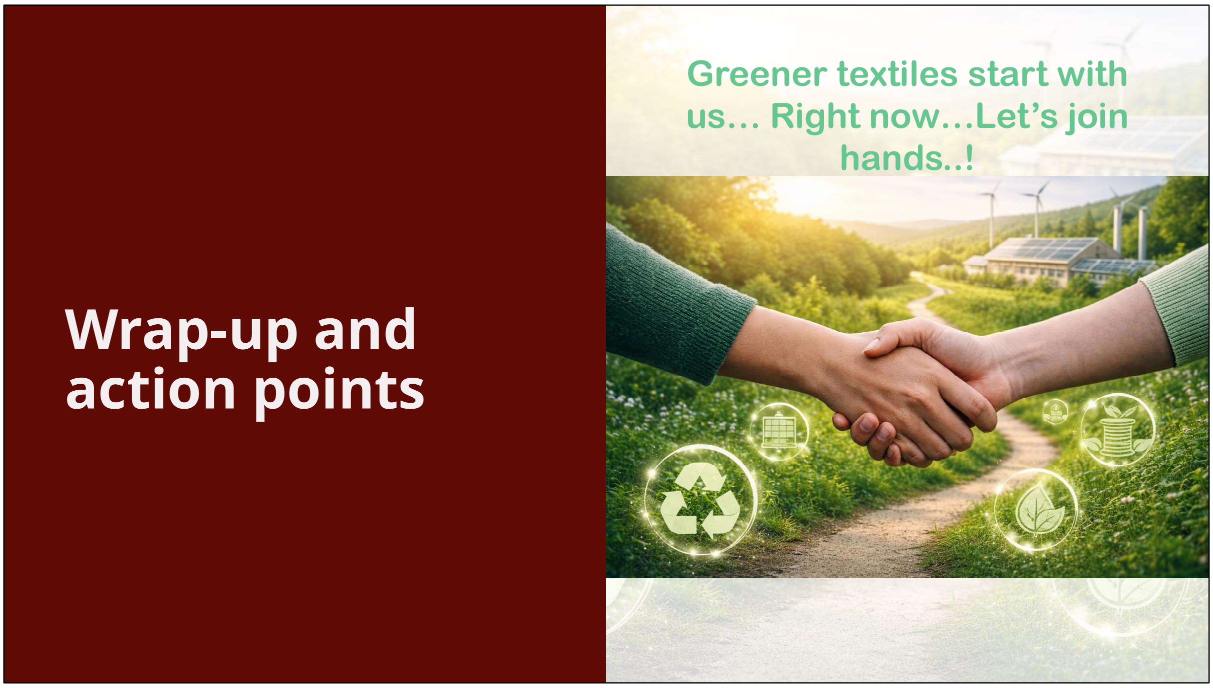
Wrap-up and action points
Greener textiles start with us… Right now…Let's join hands..!


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