Examining Cut-and-Sew Textile Waste within the Apparel Supply Chain

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ENVIRONMENTAL PROBLEM

Clothing manufacturers generate pre-consumer textile waste in the production process. As garments are cut and sewn, an estimated 10–15% of fabric is discarded. In 2022, global fiber production reached a record 116 million tonnes. If all of this fiber was utilized for garment production, 11.6–17.4 million tonnes would be discarded in the cut-and-sew process. This textile waste exits manufacturing facilities and enters the waste stream where it presents environmental and public health risks to the surrounding community, ultimately being disposed of in landfills, incinerators, open dump or burn sites, or recycling facilities.

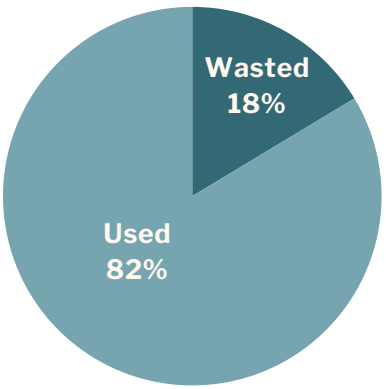
Pre-consumer textile waste is a hidden sustainability issue. The main driver is the structure of the apparel industry's supply chain. Apparel brands do not own their production facilities; instead, brands contract with independent factories to sew their garments. Brands place garment orders to factories and pay the price of the finished garment, not the fabric it was sewn from. Therefore, it is challenging to track and minimize pre-consumer waste. After reviewing 40 apparel brand websites, the team found no public disclosure of the volume or weight of pre-consumer waste created in the cut-and-sew process.

OBJECTIVES

1	Quantify the amount of pre-consumer cotton, nylon, and polyester waste generated within Patagonia's Vietnamese supply chain.
2	Determine the environmental and public health impacts associated with disposing of textile waste in landfill, incinerator, and mechanical and chemical recycling facilities.
3	Recommend waste management strategies to minimize environmental and public health impacts based on Vietnam's regional challenges and opportunities.

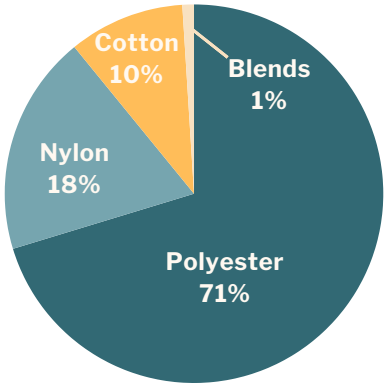
WASTE QUANTIFICATION

Wasted vs. Used Fabric



Approximately 10 million units of product were created for Fall and Spring 2022 seasons, requiring ~3,500 tonnes of material. Of that, an average of 2,820 tonnes were used and 640 tonnes were wasted.

Breakdown by Material Type



Of the total material wasted, the majority was polyester, followed by nylon, cotton, and blends. This distribution was representative of the amounts of each material used to make garments in Vietnam.

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DISPOSAL METHOD TRADEOFFS

- **Landfill:** The environmental and public health impacts of unsanitary landfills (unlined) are more significant than those of sanitary (lined) landfills. 80% of landfills in Vietnam are unsanitary, meaning landfilled textiles have a more significant impact in Vietnam than in a regions with sanitary landfills.
- **Incineration:** One-fifth of incinerators in Vietnam do not contain an exhaust gas treatment system or do not meet the country's air pollutant criteria. Only a few of the 381 incineration facilities have the ability to convert combustible waste to energy (WTE). Incineration in Vietnam has more significant impacts than regions with predominantly WTE facilities or regulated incinerators.
- **Recycling:** While there is little research on the specific impacts of mechanical and chemical recycling, energy and chemical usage are the largest resource concerns. Textile recycling has environmental advantages compared to the other disposal methods, especially when the recycled material avoids the primary production of textiles.

KEY TAKEAWAYS

1. Supply chain structure, lack of waste traceability, and competition concerns make it difficult for the apparel industry to quantify pre-consumer textile waste.
2. The impact of waste on the environment and public health varies widely on the location. Factors such as energy sources, waste management infrastructure, regulations, monitoring, and landscape all play a role in determining the severity of impact.
3. Vietnam faces challenges in managing its waste due to a lack of pollution control technology in its landfills and incinerators. Therefore, it is essential to prioritize waste prevention, recycling, and reuse until these systems are updated.
4. Life cycle assessments (LCA) are a valuable tool in assessing and quantifying impacts. However, an LCA's system boundaries do not always capture all environmental and public health impacts especially when they do not include the disposal phase of the product.

RECOMMENDATIONS

Legislation
Advocate for including pre-consumer textile waste metrics in mandatory sustainability disclosures to increase traceability in the apparel supply chain.

Collaboration
Prioritize sorting materials in factories by establishing communication channels with brands in shared manufacturing facilities to increase recycling efficiency and decrease recycler cost.

Development
Increase circularity of pre-consumer textile waste by supporting the research, development, and scalability of chemical recycling technologies.

PROJECT IMPACT

This project raises awareness about pre-consumer textile waste and the impacts of current disposal methods. By identifying existing data gaps, the team hopes this report encourages collaboration and further research in the apparel industry. It is recommended that future research focus on the textile-specific environmental and health impacts of landfill, incineration, and recycling, specifically in regions that produce most of the world's apparel, like China, India, Bangladesh, and Vietnam. Additionally, future work can expand on quantifying additional sources of pre-consumer waste such as damaged or unsold garments, and the impacts of microfiber pollution. Addressing these research areas can fill critical data gaps, enhance understanding of textile waste impacts, and develop evidence-based strategies for sustainable waste management in the apparel industry.

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