

## **Sustainable Innovation 2021**

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## **Single-Material Yield Analysis of Garment Factories**

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The fashion industry is worth 1.3 trillion dollars worldwide and is “conservatively” responsible for at least 3.2% of the anthropogenic global CO<sub>2</sub> emissions. About 16% of its environmental impact can be attributed to the fabric wasted during the manufacturing process. However, the industry considers the waste to be the cost of doing business and remains mostly unconcerned about its minimisation. A strategy to get past this inertia could be to assign economic value to the waste; this approach requires waste quantification. Much of the existing waste data for garment factories are based upon assumptions or expert opinions. Very few have attempted to quantify it. The small number of studies that did attempt it have focused on off-cut waste. The aim of this research is to get an overview of the total amount of fabric wasted during the manufacturing of apparels, starting from fabric purchase to final product shipping, to economically and environmentally assess the waste. This research compares various material waste analysis methods and identifies Zero Loss Yield Analysis (ZLYA), which relies on standard readily-available documents, to be well-suited for the purpose, obviating the need to visit factories to gather data. An analysis of seven garment factories in Bangladesh showed that average fabric waste is about 20.1%. The cost of this wasted fabric represents about 8.3% of the factory revenue, which is more than the average net profit margin (5.8%). This thesis also outlines various realistic waste-mitigation scenarios that could increase the profits by almost one-and-a-half times to 8.5%. Eliminating all waste could increase the factory profit margin to 14.5%. Scaled up globally, the wasted fabric represents approximately 53 billion USD. To provide a sense of scale, this figure is equivalent to the GDP of Serbia or Uzbekistan in 2018. The emission from the waste is about 211 million tons of CO<sub>2</sub>, which is more than the greenhouse gas emissions of the Netherlands. The wasted fabric consumes about 17.5 billion m<sup>3</sup> of water, which is equivalent to 0.7% of the global freshwater withdrawal. The wasted fabric is also responsible for 4 % of global industrial water pollution. These impacts could be reduced by up to 31% under the ‘realistic’ waste mitigation strategies identified.