

Development of a Comprehensive Sustainability Assessment Model for Sri Lankan Garment Factories

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I. INTRODUCTION

The garment industry in Sri Lanka is the backbone of its economy, contributing to more than 40% of total export revenue [2]. In an increasingly globalized market, the demand for sustainable production practices, environmental responsibility, and ethical labor conditions continues to grow [6]. Global frameworks such as the Higg Index and Global Reporting Initiative (GRI) have been instrumental in guiding factories to adopt sustainability standards [9]. However, these frameworks often lack the cultural specificity needed to address the unique regulatory, social, and environmental context of Sri Lanka [3].

While Sri Lankan factories have generally excelled in worker welfare and ethical labor practices, gaps remain in environmental sustainability, particularly in water and energy management [10]. This research addresses the need for a localized sustainability assessment model for Sri Lanka that aligns with global benchmarks such as the UN Sustainable Development Goals (SDGs) while reflecting the local context.

II. LITERATURE REVIEW

Previous studies have evaluated sustainability within the textile sector through various global indices. The Higg Index, for example, assesses environmental and social impacts across the supply chain, but it is largely generalized for global use, making it less effective in addressing region-specific challenges (Sustainable Apparel Coalition, 2021). Similarly, assessments by the Global Reporting Initiative (GRI) tend to focus on macro-level sustainability indicators that may not capture the nuanced operational issues at local levels [4].

Studies specific to the Sri Lankan garment industry have highlighted the strengths of initiatives like the "Garments without Guilt" campaign by the Joint Apparel Association Forum [7], which focuses on ethical labor practices. However, gaps in environmental sustainability—especially in water management and waste reduction—remain a concern [1], [10].

More localized models have been proposed for assessing sustainability in specific industries, framework for small- to medium-scale industries in Sri Lanka [3]. This study seeks to build upon these efforts, offering a model that integrates global best practices from the Higg Index while addressing the unique regulatory and environmental challenges of Sri Lanka.

III. MATERIALS AND METHODS

To develop the proposed sustainability assessment model, a two-phase methodology was employed. Phase one involved a comprehensive literature review focusing on sustainability assessments within the textile industry globally, including frameworks such as the Higg Index [9], ISO 14001 environmental management standards (ISO, 2015), and specific assessments for the Sri Lankan garment sector (JAAF, 2017). This phase also analyzed national environmental regulations (Central Environmental Authority, 2024) and international benchmarking practices [9].

A comprehensive list of sustainability factors was identified for garment production in Sri Lanka, covering environmental, social, and ethical pillars. Key environmental factors include energy management, chemical handling, air emissions, waste management, wastewater treatment, and noise control. Social and ethical factors cover labor practices such as preventing forced and child labor, health and safety, wages, and employee treatment. Each factor was further divided into sub-factors for detailed evaluation. Expert consultations were used to assign weights to each sub-factor, reflecting their importance in assessing sustainability, with weights ranging from 1 (low

impact) to 5 (very high impact), ensuring a balanced and precise assessment to guide improvement priorities in factories.

Phase two involved primary data collection through field visits to 50 garment factories across Sri Lanka. Data was collected global frameworks like the Higg Index by integrating local via structured surveys distributed using a mobile app developed environmental, social, and ethical factors. The model also offers with Python and Streamlit. The survey included questions a robust method for benchmarking sustainability performance drawing on global standards from the Higg Index [8] and local against international standards, while remaining responsive to compliance with Sri Lankan labor laws (Labor Department, the unique challenges faced by the Sri Lankan industry

$$\text{SL Sustainability Index} = \frac{\sum_{i=1}^n C_i \times f_i}{\sum_{i=1}^n C_i \times g_i}$$

Where, c_i = weight of the i^{th} sub factor unit
 f_i = total points of the i^{th} sub factor
 g_i = maximum points of the i^{th} sub factor
 n = total number of sub factors

Fig 1. Sustainable Index Formula

IV. RESULTS AND DISCUSSION

The results revealed notable differences in sustainability performance across the environmental, social, and ethical pillars. A comparative analysis of the environmental and social indices showed that, on average, factories are performing better in social sustainability than in environmental aspects. While social factors, such as fair labor practices and worker wellbeing, are well-managed, the gap in environmental performance indicates a need for greater focus on areas like energy efficiency, water conservation, and emissions control.

The leaderboard analysis, which compiled overall sustainability scores by averaging the environmental and social indices, provided insights into the leading and mid-level performers, as well as areas where improvement is required. Factories leading in sustainability have implemented strong management strategies across both environmental and social domains, while lower performers may benefit from adopting best

practices from higher-ranking companies.

A key finding of this study is that while international benchmarking tools like the Higg Index provide a broad framework, they do not fully address the regional nuances in the Sri Lankan context. Factories that performed well in social sustainability still lagged in key environmental metrics, such as energy efficiency and water recycling. By aligning the new model with both local regulatory standards and global goals, Sri Lankan factories can bridge this sustainability gap while maintaining international competitiveness.

IV. CONCLUSION

The proposed sustainability assessment model for Sri Lankan garment factories effectively addresses the shortcomings of global frameworks like the Higg Index by integrating local environmental, social, and ethical factors. The model also offers a robust method for benchmarking sustainability performance against international standards, while remaining responsive to the unique challenges faced by the Sri Lankan industry. This study recommends that future research expands on the model by incorporating other sectors within the textile and apparel industry and exploring cross-border applicability.

Furthermore, a focus on policy interventions that incentivize environmental sustainability, like those successfully implemented in worker welfare, will be crucial for the industry's continued global competitiveness.

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