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COMPREHENSIVE ENVIRONMENTAL IMPACT COST QUANTIFICATION MODEL OF TEXTILE PRODUCTS

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Abstract

Global warming, air and water pollution, and other ecological challenges significantly hinder sustainable human development. The textile industry, while crucial to national economies, poses considerable environmental risks. Current evaluation tools often fail to normalize various environmental impact indicators, and few studies examine these impacts from an economic perspective. This research quantifies the multidimensional environmental impacts of textile production through a unified comprehensive index, enabling cross-process evaluation. By employing comprehensive environmental impact assessment frameworks, the study assesses the effects of greenhouse gases (GHG), volatile organic compounds (VOCs), and wastewater pollutants on human health and ecosystems. Additionally, it introduces a novel method for quantifying environmental impact costs for textile products, integrating the Environmental Profit and Loss (EP&L) method with the willingness-to-pay (WTP) approach. Example was provided based on viscose fiber production. The result reveals that GHG emissions account for 52.88% of the total environmental impact cost, followed by VOCs at 38.48%, with water eutrophication from wastewater pollutants contributing only 8.64%. This case study confirms the scientific feasibility and applicability of the proposed methods for textile products, facilitating comparability among various textile products and supporting informed decision-making.

Key words: comprehensive environmental impact cost, greenhouse gases, textile products, volatile organic compounds, wastewater pollutants

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