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# ENVIRONMENTAL AND SOCIAL SUSTAINABILITY IN TEXTILE MANUFACTURING: A REVISED ANALYSIS OF OEKO-TEX 1000 CERTIFICATION IN UZBEKISTAN

Jumayeva Mahliyo Baxtiyor qizi

PhD Candidate, Department of Metrology, Standardization, and Quality  
Management, Namangan Institute of Engineering and Technology  
E-mail: mahliyohainm94@gmail.com

Mamadaliyeva Dildora Abdumalikovna

PhD, Associate Professor, Department of Metrology, Standardization, and  
Quality Management, Namangan Institute of Engineering and Technology  
E-mail: dildora.textil@gmail.com

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## **Abstract:**

This paper investigates the environmental and social impact of OEKO-TEX 1000 certification in Uzbekistan's textile sector. Through case studies of three certified manufacturers—Bukhara Cotton Textile, Hamzatex, and Monomy—the study evaluates improvements in water and energy efficiency, chemical safety, workplace safety, and export performance. Using a mixed-methods approach, the research combines qualitative interviews, quantitative performance indicators, and document analysis to assess the certification's effectiveness. Results indicate substantial resource savings, enhanced compliance, and increased international competitiveness. Despite initial costs and technological barriers, OEKO-TEX 1000 proves to be a viable model for sustainable industrial development in emerging economies. The study offers policy recommendations to support wider adoption across the sector.



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**Keywords:** OEKO-TEX 1000, sustainability, textile industry, Uzbekistan, certification, resource efficiency, labor standards

### **Introduction**

The global textile industry has long stood as one of the most environmentally burdensome sectors within modern manufacturing. According to the United Nations Environment Programme (UNEP), the industry is responsible for approximately 20% of global industrial wastewater and around 10% of total carbon emissions—a footprint that surpasses that of international flights and maritime shipping combined. This impact stems from the extensive use of water, energy, chemicals, and labor across multiple stages of textile production, including fiber cultivation, dyeing, finishing, and garment assembly.

Beyond its environmental toll, the industry is also intertwined with critical social and ethical issues such as unsafe working conditions, low wages, child labor, and gender-based discrimination—particularly in developing nations where oversight and regulation remain weak. These systemic issues have prompted a global push for accountability, transparency, and traceability, driven by both consumer pressure and stringent requirements from international buyers, retailers, and governments.

To address these multidimensional concerns, a variety of sustainability initiatives have emerged. Some, like the Better Cotton Initiative (BCI), aim to improve cotton farming practices, while others, such as the Global Organic Textile Standard (GOTS), emphasize the use of certified organic materials and minimal chemical inputs. However, many of these frameworks focus narrowly on material input or specific stages of the supply chain.

In contrast, the OEKO-TEX 1000 certification stands out for its holistic approach. Rather than certifying only the end product or raw material, OEKO-TEX 1000 evaluates the entire production site. Its criteria encompass six core areas:

- resource efficiency (water and energy usage),
- chemical safety and hazardous substance management,
- environmental impact and emissions control,
- labor rights and worker protections,



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- waste management, and
  - overall sustainability governance within the enterprise.

This integrated assessment model is particularly relevant for countries like Uzbekistan, which has emerged as a key textile producer in Central Asia. The nation is currently undergoing rapid industrial modernization, driven by state-led reforms, foreign investment, and an ambition to diversify exports beyond raw cotton. However, this transformation also brings challenges, including the need to align local production practices with international sustainability standards to gain access to high-value markets such as the EU and North America.

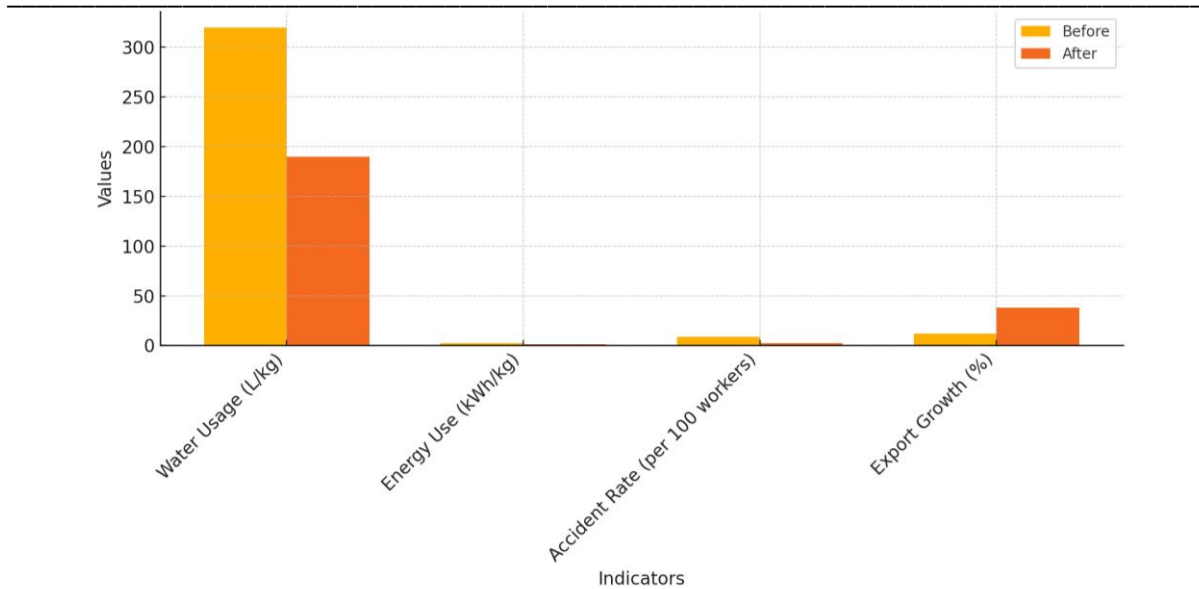
This article examines the practical impact of OEKO-TEX 1000 certification within Uzbekistan's textile sector, focusing on how the standard facilitates environmental improvements, enhances social accountability, and supports economic competitiveness. Through empirical data and company-level analysis, the study aims to contribute to the broader discourse on sustainable industrial transitions in developing economies.

### **Materials and Methods**

This study employed a mixed-methods approach to evaluate the effectiveness of OEKO-TEX 1000 certification in Uzbekistan. A triangulation strategy ensured methodological robustness by combining qualitative insights, quantitative performance data, and document-based validation.

1. **Qualitative Case Studies:** In-depth interviews were carried out with compliance officers, environmental engineers, and HR managers from three OEKO-TEX 1000-certified companies: Bukhara Cotton Textile, Hamzatex, and Monomy. Interview topics covered the certification process, encountered technical and organizational challenges, as well as resulting improvements in operations, compliance culture, and employee morale.

2. **Quantitative Analysis:** Key Performance Indicators (KPIs) were tracked one year before and one year after certification. The analysis focused on four main metrics: water usage, energy consumption, workplace accident rates, and annual export growth. Figure 1 summarizes the comparative results across all companies.



**Figure 1: Comparison of key performance indicators before and after OEKO-TEX 1000 certification.**

3. Document Review: Company audit reports, OEKO-TEX checklists, and national benchmarking data were reviewed to validate the interview findings and verify regulatory compliance levels.

Company selection criteria included: (a) medium-to-large production scale, (b) representation across different regions of Uzbekistan, and (c) transparency in providing post-certification operational data. Each company followed the same OEKO-TEX 1000 certification phases: Internal Self-Assessment, Application Submission, Documentation Review, On-Site Audit, Compliance Evaluation, and Certificate Issuance.

The bar chart reveals a notable reduction in water and energy consumption, with water usage decreasing from 320 to 190 L/kg and energy use dropping from 2.1 to 1.2 kWh/kg. This demonstrates improved resource efficiency across all companies.

Accident rates also fell significantly, from 8.5 to 2.3 per 100 workers, indicating stronger workplace safety protocols and compliance with labor standards.



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Most impressively, annual export growth jumped from 12% to 38%, illustrating the positive market impact of meeting internationally recognized sustainability benchmarks.

### **3. Document Review**

To support and verify interview and metric findings, internal audit reports, OEKO-TEX compliance documents, and official benchmarking tools provided by governmental agencies were reviewed. This process helped identify regulatory gaps and confirmed the validity of improvements.

*Company Selection Criteria.* The three companies were chosen based on:

- Production Scale: Medium to large-scale operations.
- Regional Diversity: Representing various industrial hubs in Uzbekistan.
- Data Transparency: Willingness to share operational data and cooperate during field research.

Each company strictly adhered to all six OEKO-TEX 1000 certification phases:

- Internal Self-Assessment
- Application Submission
- Documentation Review
- On-Site Audit
- Compliance Evaluation
- Certificate Issuance

### **Results**

The OEKO-TEX 1000 certification had a demonstrable and positive impact on all three certified textile companies in Uzbekistan. Both quantitative indicators and qualitative transformations confirm that the certification led to a significant shift toward more sustainable and efficient operations.

- Water Consumption decreased from 320 to 190 L/kg, a 40.6% reduction. This was largely due to advanced water recycling systems, especially implemented at Hamzatex, which reported a 45% cost reduction.
- Energy Use dropped from 2.1 to 1.2 kWh/kg, thanks in part to Bukhara Cotton Textile's transition to solar power, now meeting 40% of their energy needs from renewable sources.



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- Chemical Safety Compliance rose from 62% to 95%, reflecting a major shift in internal chemical management protocols. Monomy spearheaded this improvement by deploying automated chemical dosing and training programs.
  - Workplace Accident Rate saw a drastic decline, from 8.5 to 2.3 incidents per 100 workers, indicating better occupational safety standards and stronger adherence to labor rights.
  - Export Growth surged from 12% to 38%, as global buyers increasingly prefer suppliers that meet internationally recognized sustainability certifications. Each company capitalized on the OEKO-TEX 1000 framework differently, tailoring improvements to their production context while collectively elevating their global brand reputation.

### **Discussion**

The OEKO-TEX 1000 certification demonstrates a comprehensive and actionable framework for promoting sustainable practices in the textile sector. Unlike ISO 14001, which focuses primarily on environmental management systems, or GOTS, which emphasizes organic content, OEKO-TEX 1000 integrates environmental, social, and chemical safety dimensions into a unified compliance system.

In Uzbekistan, the certification played a pivotal role in supporting industrial reform and modernization. The comparative gains shown by Bukhara Cotton Textile, Hamzatex, and Monomy reflect not only the feasibility of sustainable upgrades but also the market demand for ethically produced goods. These improvements facilitated increased exports, particularly to Europe, where compliance with green and ethical sourcing standards is mandatory.

Nonetheless, the transition was not without barriers. Small and medium-sized enterprises (SMEs) in Uzbekistan continue to face several challenges:

- High Initial Investment: Upgrading wastewater systems, installing renewable energy, and modernizing chemical storage units require capital that many SMEs lack.
- Documentation Complexity: Maintaining compliance year-round requires trained staff and digital monitoring systems that are not yet widespread.



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- Knowledge and Technology Gaps: Limited access to the latest environmental technologies restricts innovation among local producers.

Policy recommendations include government-subsidized certification programs, international donor support for infrastructure, and public-private partnerships to expand knowledge dissemination. In the long run, the cost of certification is outweighed by the reputational and operational advantages gained.

### **Conclusion**

OEKO-TEX 1000 certification is more than a label—it is a transformational tool for sustainable development in the textile industry. In Uzbekistan, the application of this certification has led to substantial improvements in water and energy efficiency, chemical safety, labor rights, and international trade potential. Each of the three studied companies—Bukhara Cotton Textile, Hamzatex, and Monomy—showed measurable progress post-certification.

The results suggest that while initial investments and procedural demands are high, the long-term gains include increased profitability, improved worker safety, reduced environmental footprint, and enhanced global competitiveness. As sustainability becomes a standard, not a niche, OEKO-TEX 1000 can serve as a national model for other developing economies.

Future research should expand the sample size, include longitudinal data over several years, and incorporate policy-level analysis to assess systemic impact.

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