

POLICYBRIEF

No. 5, 2025

A training outcome of the Knowledge Academy for the Resource Nexus (KARE)

Resource Nexus and Stakeholder Synergy: A Sustainable Pathways for Textile Wastewater Management

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Highlights

- Textile wastewater adversely affects agri-culture, livestock, and ecological re-sources, exacerbating challenges for neighboring communities.
- Various stakeholder perspectives high-light the need for greater industry ac-countability in addressing these issues.
- This approach promotes sustainable en-ergy infrastructure, enhanced wastewater reuse, and improved socio-ecological re-silience.
- Industry-community synergies are crucial for driving the sustainability transfor-mation of textile wastewater manage-ment through a robust decision-making process that could incorporate the Re-source Nexus approach.

Introduction

Textile industries are most significantly contributing to water pollution due to its wastewater discharge, impacting aquatic ecosystems health despite its vital role in economic development (Abbas et al., 2020; Cong et al., 2021; Stone et al., 2020). Each year, around 280,000 tonnes of textile dyes are discharged into wastewater globally, primarily due to inefficient dyeing techniques and poor chemical management (Stone et al., 2020). The textile industry alone is responsible for nearly 20% of global water pollution (European Parliament, 2020). Bangladesh contributes up to 6.8% of the global textile export market but faces significant challenges from hazardous wastewater discharge associated with the industry (Bangladesh, 2020). Establishing sustainable practices in the textile dyeing and finishing production chain is crucial for developing bioactive textiles using natural dyes and promoting resilient ecosystems. In Bangladesh, addressing sustainability challenges requires balancing the textile industry's economic value with the environmental harm caused by its production. Managing these trade-offs is crucial, as water- and energy-intensive activities have affected the well-being of neighboring communities over the past four decades. Thus, it is essential to adopt a framework that examines the interconnectivity of

Resource Nexus perspective

Keep the title and replace the questions below with a summary of the resource nexus perspective policy brief.

- Which environmental resources are relevant?
- How are they interlinked?
- Explain why a Resource Nexus perspective is better than a single resource perspective.

resources, particularly those related to water, food security, energy production, and ecosystem health, such as the Resource Nexus framework (Bhaduri et al., 2015). The Resource Nexus framework explores interdependencies among resources like water, soil, climate, and biota, along with derived resources such as energy, ecosystem health, and agri-food (Brouwer et al., 2024; Gomes et al., 2024). It supports integrated resource management, offering context-specific recommendations to reduce siloed approaches and minimize trade-offs (Bleischwitz et al., 2018; Kaddoura & El Khatib, 2017). By understanding these interlinkages, stakeholders can enhance sustainability and resilience in socio-ecological systems.

Resource Nexus in Bangladesh to address water quality issues caused by textile industry wastewater, highlighting its impact on local livelihoods and ecosystem health. Figure 1 shows the approach that aims to guide policymakers in fostering sustainable industry-community relations emphasizing stricter regulations, regular monitoring systems, and techno-ecological innovations.

Policy Options

The several policy options aimed at improving wastewater management in the textile industry of Bangladesh, focusing on enhancing collaboration among stakeholders, strengthening regulations, and promoting sustainable practices. First, adopting an integrated resource management approach, known as the water-energy-ecosystems-food (WEEF) Nexus, can help consider the interconnections between environmental resources, leading to the development of integrated management plans that align the goals of the textile industry with those of local agriculture and fisheries (Gomes et al., 2024). Investing in sustainable technologies is another key policy option, which includes encouraging the adoption of

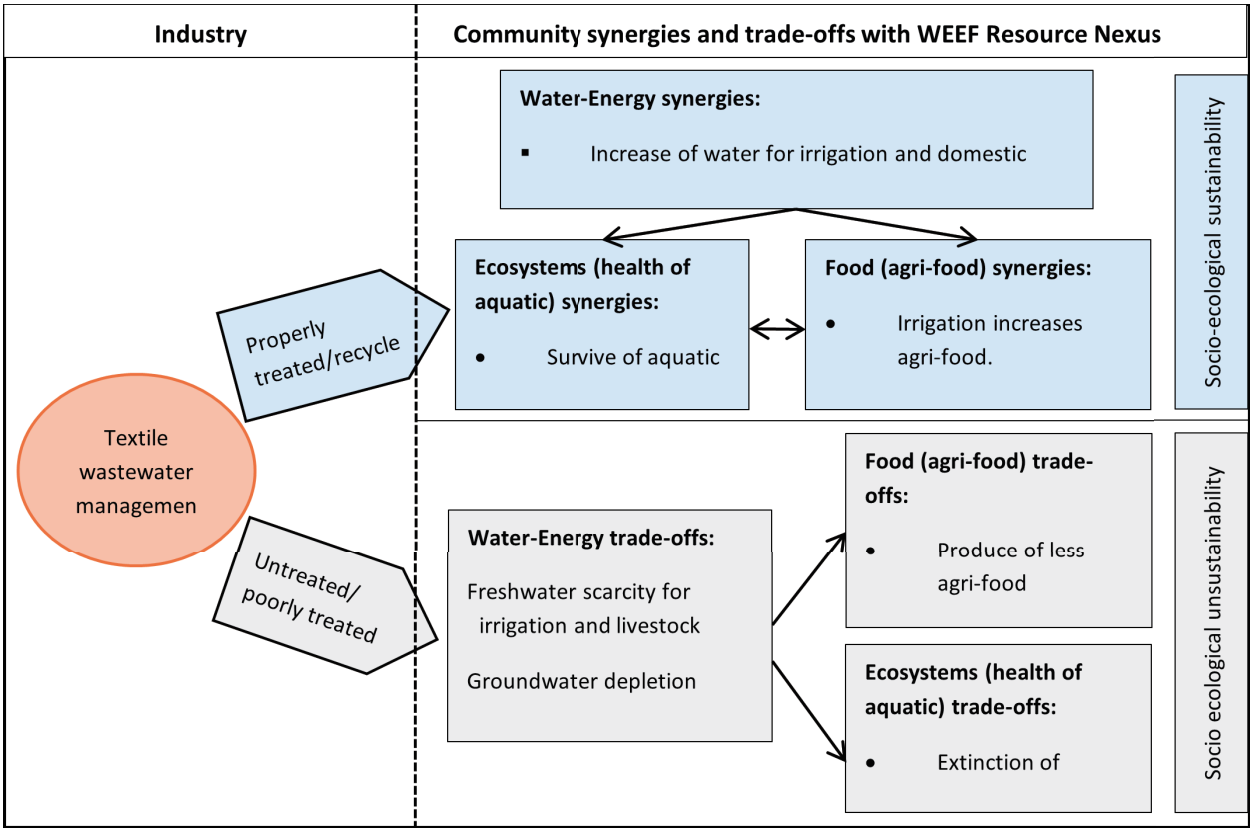


Figure 1: Water-Energy-Ecosystems-Food (WEEF) Nexus relationships illustrate the industry-community synergies and trade-offs of socio-ecological sustainability. Retrieved from (Gomes et al. (2024).

advanced wastewater treatment technologies within the textile industry and providing financial incentives for manufacturers that invest in sustainable effluent treatment plants (ETPs). Additionally, capacity building and training programs are essential for equipping industry stakeholders, local authorities, and community members with knowledge of sustainable wastewater management practices.

This can be facilitated through partnerships with educational institutions and NGOs to deliver tailored training sessions.

Furthermore, enhancing monitoring and reporting mechanisms is vital; improving monitoring systems for wastewater discharge and requiring textile producers to publicly report their wastewater management practices and environmental performance can foster accountability.

Promoting public awareness campaigns to educate consumers and stakeholders about the importance of sustainable textile practices is crucial.

Utilizing various communication channels to disseminate information and engage the public will help build a culture of sustainability. By implementing these comprehensive policy options, stakeholders can work collaboratively to create a more sustainable and resilient textile industry while addressing the environmental and social challenges posed by wastewater discharge, ultimately protecting local ecosystems and improving the livelihoods of affected communities.

Recommendations

For Decision-makers

To address the pressing challenges of wastewater management in the textile industry, a multifaceted and collaborative approach is essential. The following recommendations highlight key policies to foster sustainability transformation of efficient textile wastewater, and ensure environmental resilience:

1. Investment in eco-technology training: Equip industry professionals with specialized training in eco-technologies to promote sustainable practices and efficient wastewater management systems.

Textile industry contributes significantly to global water pollution, with Bangladesh, as a major exporter, facing severe challenges from hazardous wastewater discharge that harms local ecosystems and communities. Integrating the Resource Nexus approach, which interlinks water, energy, material, and ecosystem health, is crucial for addressing these issues and fostering sustainable wastewater management in the industry.

2. Robust policies and environmental governance:

Establish comprehensive regulations to enforce effective wastewater treatment and ensure compliance with environmental standards.

3. Optimization of tangible environmental resources:

Promote efficient water use and recycling measures to improve overall water quality and minimize resource wastage.

4. Governmental prioritization:

Allocate resources and incentives to develop and adopt eco-friendly technologies, enhance resource monitoring, and ensure sustainable wastewater practices.

5. Improve regulatory frameworks:

Re-vise existing laws to address environmental and community concerns more effectively, ensuring accountability and transparency in the textile sector.

6. Enhance monitoring and proactive measures:

Develop robust monitoring mechanisms for ETPs to ensure their efficient operation and reduce environmental pollution.

7. Investment in eco-technological innovations:

Support the integration of green technologies, renewable energy, and safer chemical alternatives to reduce the environmental footprint of wastewater treatment processes.

8. Stakeholder engagement and enforcement:

Facilitate partnerships between government, industry, and

civil society to align industry practices with environmental objectives and improve governance.

9. Collaborative efforts for sustainability: Mobilize collective efforts across sectors to drive systemic changes in wastewater management and achieve long-term sustainability goals.

10. Research engagement: Cooperate with academia, industry experts, and government bodies to develop innovative solutions and address knowledge gaps in sustainable wastewater management.

For the Textile Industry

To achieve a sustainable and resilient textile industry in Bangladesh, comprehensive policies are needed that integrate human resource development, eco-technological advancements, regulatory frameworks, and stakeholder collaboration. The following recommendations can drive this transformation:

1. Enhancement of Human Resource Management (HRM): Invest in work-force training and management to align skills and performance with sustainable practices and eco-technologies.

2. Advancements in Eco-Technological Infrastructure: Prioritize green energy and best use of environmental resources integration and industry-specific ETPs to minimize environmental impacts.

3. Sustainable Wastewater Practices: Conduct research on innovative wastewater solutions while integrating Resource Nexus approaches to optimize water, energy, and material efficiency.

4. Regulatory and Monitoring Mechanisms: Strengthen enforcement mechanisms and promote inclusive policies to align industrial operations with sustainability goals through stakeholder collaboration.

5. Stakeholder Engagement and Collaboration: Recognize and incorporate community and various stakeholders' perspectives to build trust and enhance the effectiveness of environmental initiatives.

6. Research and Development (R&D): Commit to innovation through cutting-edge technologies and collaborative research with academia, policymakers, and technology providers.

7. Transparency and Accountability: Adopt transparent operational practices by disclosing environmental metrics and publishing sustainability reports to build stakeholder trust.

8. Socio-Economic and Environmental Sustainability: Balance economic growth with environmental preservation while fostering community livelihoods for long-term resilience.

Action Points

1. Adopting a Resource Nexus Approach: Policymakers and stakeholders need to urge to adopt a Resource Nexus approach
2. Improving Resource Availability: Enhancing the availability of essential resources, such as energy and freshwater
3. Coordinated Effort for Sustainability: A coordinated effort involving government agencies, NGOs, industry leaders, associations, buyers, auditors, and UN agencies
4. Prioritizing Food Safety and Environmental Well-being: Paving the way toward a sustainable future that prioritizes food safety and environmental well-being

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Acknowledgements:

The authors acknowledge that this policy brief is based on the following paper

Gomes, K., Morris, J., Miggelbrink, J., Guenther, E., & Caucci, S. (2024). Resource Nexus for decision-making: an industry-community synergistic approach for textile wastewater management. *Local Environment*, 1–22. <https://doi.org/10.1080/13549839.2024.2423762>

This policy brief is the output of training presented by Andrew Dunn

(UNU-CRIS) and Thato Masire (UNU-FLORES) to NEXtra doctoral researchers at UNU-FLORES in 2024/25. The training was partially funded by DAAD (Deutscher Akademischer Austauschdienst).

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