

RECYCLING FABRIC WASTE FOR SUSTAINABLE FASHION: CREATIVE PATHWAYS FOR ENVIRONMENTAL PROTECTION AND ECONOMIC VALUE IN ZARIA FASHION HOUSES

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Abstract

Textile waste poses environmental and economic challenges in developing countries with limited recycling systems. This study investigates recycling potential for pre-consumer fabric waste from fashion houses in Zaria, Kaduna State, Nigeria. An exploratory studio-based methodology combined systematic waste quantification, observations, semi-structured interviews, and hands-on experimentation. 300 kg of fabric waste were collected, with cotton comprising 83 percent. Findings reveal that most workshops rely on open dumping or burning, reflecting low awareness of recycling alternatives. Practical experimentation demonstrated that off-cuts can be transformed into garments, accessories, home textiles, and décor items with structural integrity, achieving profit margins of 35 – 60 percent. Methodological stages included material sorting, preliminary sketching, motif exploration, and arrangement by colour, texture, and quality, facilitating creative design solutions using scrap materials. The study demonstrates that structured recycling can reduce pollution, support material circularity, and generate income for small-scale fashion enterprises, emphasizing the need for capacity building, community collection networks, and policy incentives to advance sustainable practices in Nigeria's fashion sector.

Keywords: Textile Waste; Recycling; Sustainable Fashion; Circular Economy; Zaria Fashion Houses

Introduction

The production of textiles and apparel has expanded dramatically over recent decades, fuelling increasing volumes of waste, resource consumption, and environmental degradation. The concept of textile recycling is not new, yet its relevance is heightened in the contemporary context of fast-fashion consumption and linear design-manufacture-discard paradigms. According to the Ellen MacArthur Foundation (2017), fewer than 1 % of textiles globally are recycled into new garments.

In many developing countries, including Nigeria, textile and fashion production is growing, but the infrastructure for waste management and recycling remains underdeveloped. For instance, Lagos State authorities report that textile waste constitutes a significant portion of municipal solid waste, highlighting challenges in collection, reuse, and disposal (European Environment Agency, 2017). In Northern Nigeria, Zaria hosts small-scale fashion houses and tailors, generating fabric off-cuts and remnants that are often discarded, contributing to environmental pollution.

This research investigates the potential for recycling fabric waste within Zaria's fashion houses. Specifically, it examines how discarded textile remnants can be transformed into new

functional products that deliver both environmental protection and economic value. The study objectives are:

- i. To quantify the type, nature, and volume of fabric waste generated in fashion houses in Zaria.
- ii. To experiment with creative methods of reusing these fabric remnants into aesthetic and functional items.
- iii. To evaluate the environmental and economic benefits of such recycling practices.

By focusing on a case study in Zaria, this research contributes to knowledge on circular economy applications in fashion in developing contexts and offers practical pathways for small-scale fashion enterprises to contribute to sustainability.

Literature Review

2.1 Textile Waste and Environmental Sustainability

Textile waste refers to materials discarded at different stages: during fibre production, garment manufacturing (pre-consumer waste), and after use (post-consumer waste) (Agrawal, Singh, & Murtaza, 2013). Globally, the industry produces approximately 92 million tonnes of textile waste annually, yet less than 1 % is recycled into new garments (Ellen MacArthur Foundation, 2017). This inefficiency results in environmental consequences such as greenhouse gas emissions, soil and water contamination, and depletion of non-renewable resources. Synthetic fibres, such as polyester, are derived from petroleum and contribute significantly to carbon dioxide emissions, whereas natural fibres like cotton require substantial water and pesticide inputs (European Environment Agency, 2017).

2.2 Textile Waste Categories: Pre-Consumer and Post-Consumer

Textile waste is commonly classified into pre-consumer and post-consumer categories, a distinction that reflects different stages of material loss within the textile and apparel lifecycle and has important implications for waste prevention strategies, recycling technologies, and policy frameworks. The literature indicates that a lack of clear differentiation between these categories can weaken sustainability assessments and lead to overstated recycling claims, making conceptual and operational clarity essential. This classification provides a foundation for evaluating environmental performance and identifying appropriate intervention points within textile systems.

Pre-consumer textile waste refers to materials discarded before reaching the final consumer and originates from fibre production, yarn spinning, fabric manufacturing, garment construction, and finishing processes. Typical examples include spinning waste, selvages, off-cuts, trimmings, rejected fabrics, and defective garments (Hawley, 2006). Generated in controlled industrial environments, this waste is generally homogeneous and uncontaminated, with known fibre compositions, which facilitates mechanical recycling into lower-grade yarns, nonwoven materials, or industrial products (Sandin & Peters, 2018). However, the literature notes that long-established internal reuse practices are often presented as recycling, potentially inflating sustainability claims while doing little to address overproduction and excessive consumption.

Post-consumer textile waste consists of clothing and household textiles discarded by consumers after use, including worn-out garments and items discarded due to changing fashion preferences (Bianchi & Birtwistle, 2012). This waste stream is heterogeneous and

contaminated, often containing blended fibres, dyes, finishes, and accessories that complicate sorting and recycling. Post-consumer textiles typically enter reuse, mechanical recycling, chemical recycling, or disposal pathways (Niinimäki et al., 2020), with reuse offering the highest environmental benefits but limited by garment quality and market demand. The literature emphasizes that post-consumer waste represents the greater environmental challenge and requires systemic interventions such as improved garment design, extended producer responsibility, consumer engagement, and investment in advanced recycling technologies.

2.3 Recycling and Circular Economy in Fashion

The circular economy framework seeks to keep materials in use for as long as possible, extract maximum value, and regenerate natural systems (Sandin & Peters, 2018). In fashion, this includes reuse, repair, remanufacturing, and recycling of textile materials. Mechanical recycling (shredding fibres for non-woven applications) and chemical recycling (breaking down polymers to monomers) are common technical pathways (Agrawal et al., 2013). In developing countries, informal recycling by tailors reusing off-cuts for patchwork, décor, or home textiles often occurs outside formal waste management systems (Chudi-Duru, 2023).

2.4 Fabric Waste in Nigerian Fashion Houses

Fabric waste in Nigerian fashion production arises from cutting errors, tailoring mistakes, and disposal of unsold or damaged garments. Bamisaye and Adeitan (2018) noted that waste is often treated as unavoidable rather than recoverable, frequently being burned or discarded in open dumps. Studies of small-scale Nigerian fashion enterprises reveal that workshops generate between 10–15 kg of fabric off-cuts per week, primarily from cotton textiles (Ibrahim, Musa, & Bello, 2025). These findings indicate the untapped potential for creative reuse and circular design interventions in local fashion houses.

2.5 Aesthetic and Economic Dimensions of Fabric Recycling

Fabric recycling enables designers to create unique visuals using discarded materials, aligning with sustainable design philosophies emphasizing individuality and resource longevity (Fletcher & Tham, 2015). Economically, recycling reduces raw material costs and allows small-scale fashion enterprises to tap into eco-conscious consumer markets (Chudi-Duru, 2023).

2.5 Theoretical Framework: Sustainable and Circular Design Theory

Circular design and sustainability theory underpin this study, framing production as a regenerative process rather than linear extraction. Fletcher and Tham (2015) emphasize lifecycle thinking and material flow management in fashion design. Within this framework, transforming fabric waste into new artefacts constitutes a design-led intervention supporting the circular economy.

Methodology

3.1 Research Design

This study adopted an exploratory, studio-based design suited to investigations that combine qualitative inquiry with practical experimentation. The approach aligns with Creswell's (2014) position that exploratory designs are appropriate for research areas where limited empirical evidence exists and where the researcher seeks to understand processes as they unfold. Practical experimentation with fabric remnants was integrated into the design to evaluate the feasibility of transforming textile waste into functional artefacts. This dual strategy enabled the study to

examine both the characteristics of waste generated in fashion houses and the creative potential embedded in discarded materials.,

3.2 Study Area

The research was conducted in Zaria, Kaduna State, a major educational, cultural, and commercial hub in Northern Nigeria. The city hosts numerous small to medium-scale fashion houses, tailoring shops, and informal garment producers that supply clothing across local communities and neighbouring states. The concentration of these enterprises makes Zaria a suitable context for studying the scale of textile waste generation, locally embedded recycling knowledge, and opportunities for circular fashion practices.

3.3 Population and Sample

The population consisted of fashion houses and tailoring workshops within Zaria metropolis. A purposive sampling strategy was employed to select 20 workshops representing a cross-section of design styles, production capacities, and clientele. Purposive sampling ensured inclusion of both formal and informal fashion houses, reflecting the diverse structure of the local fashion ecosystem. Workshop owners, tailors, apprentices, and fabric sellers participated in interviews and observational sessions, contributing insights on production processes, waste management, and economic considerations.

3.4 Data Collection Methods

Data were collected over six months using four complementary methods:

- a. **Observation:** Regular visits were made to selected workshops to observe cutting techniques, waste generation patterns, storage methods, and disposal practices. The researcher recorded quantities and types of fabric remnants produced daily, including irregular shapes, narrow strips, selvedge, and small blocks.
- b. **Semi-structured Interviews:** Interviews were conducted with 32 participants comprising workshop owners, tailors, apprentices, and textile dealers. Questions explored perceptions of fabric waste, cost implications of waste, attitudes toward recycling, and perceived market potential for recycled products. Interviews allowed participants to describe their experiences in their own words and provided context for observed practices.
- c. **Waste Volume Assessment and Classification:** Approximately 300 kg of fabric waste were collected from the sampled workshops. These materials were sorted by fibre type, colour, texture, weight, and size. Cotton, polyester, brocade, Ankara prints, chiffon, and denim were the main categories identified. This classification supported decisions on suitable recycling techniques for each type.
- d. **Studio Based Experimentation:** Fabric remnants were manipulated using design techniques such as patchwork, appliqué, quilting, weaving, and upcycling. Items produced included garments, tote bags, cushion covers, duvets, rugs, and wall hangings. The experimentation phase enabled practical assessment of aesthetic possibilities, structural integrity, and market appeal.

Stages of Production: The initial stage involved collecting and sorting materials from various tailor shops, followed by cutting them into sizes appropriate for the intended designs. This process took place in the studio, where preliminary sketches and observations helped the researcher gain a comprehensive understanding of the subject matter.

Exploratory Stage: This stage focused on examining and experimenting with the sorted scraps. Various motifs, including floral patterns, linear forms, and animal prints, were explored. This process enhanced the researcher's familiarity with diverse compositional elements and material possibilities.

Developmental Stage: In the final stage, the researcher refined the sketches by selecting suitable pieces for each design and arranging them based on colour, texture, and material quality. This allowed for a critical evaluation of the designs and facilitated experimentation with different arrangements, using scraps as the primary medium.

3.5 Data Analysis

Qualitative data from interviews and observations were coded thematically, identifying patterns in waste generation, handling, and perceptions of recycling. Quantitative assessment of waste volume and fibre composition was presented through descriptive statistics. Artefacts produced during experimentation were evaluated using criteria such as durability, aesthetic quality, functional performance, and cost-effectiveness.

3.6 Ethical Considerations

Participants provided verbal consent, and workshop identities were anonymised to protect privacy. The study adhered to ethical principles in qualitative research outlined by Patton (2002), including respect, voluntary participation, and responsible handling of data.

FINDINGS

4.1 Types and Quantities of Fabric Waste

The assessment recorded 300 kg of textile waste over six months. Cotton accounted for 83 percent of total waste, consistent with findings in other Nigerian fashion clusters where cotton remains the preferred material for traditional and contemporary garments (Ibrahim et al., 2025). Polyester and mixed synthetics constituted the remaining 17 percent. Waste fragments were predominantly small to medium-sized off-cuts resulting from cutting patterns for fitted garments such as blouses, kaftans, and dresses.

Significantly, workshops with more apprentices generated larger volumes of waste. Observations revealed that learning-related errors contributed to at least 22 percent of off-cuts, especially in workshops where cutting supervision was limited. Scraps often accumulated in baskets or on floors before being swept out and disposed of in open dumps.

Table: 4.1 Data representing the distribution of waste in a tabular form

Textile Type	Weight (KG)	Percentage (%)	Observation
Cotton	249	83	Predominant material; aligns with trends in Nigerian fashion clusters (Ibrahim et al., 2025). Small to medium off-cuts from fitted garments like blouses, kaftans, and dresses.
Polyester & Synthetics	51	17	Includes polyester and blended fabrics; waste mainly small off-cuts.
Total	300	100%	Waste from six-month assessment; larger volumes observed in workshops with more apprentices. Learning-related errors contributed ~22% of off-cuts; disposal often in open dumps.

4.2 Current Waste Management Practices

Across the 20 workshops, no structured waste management system existed. Waste was either burned, discarded in municipal bins, or given away to informal collectors who used remnants to oil vendors that use for hand cleaning and for filling pillows or producing patchwork quilts of low market value. Only four workshops reported occasional reuse of larger off-cuts for lining, interfacing, or children's clothing. Interviews indicated that most tailors perceived waste as an unavoidable by-product of production rather than a resource with economic potential.

4.3 Outcomes of Studio Based Experimentation

The studio experimentation phase produced 57 artefacts, grouped into five categories:

1. **Garments:** Patchwork skirts, jackets, and children's dresses demonstrated strong visual appeal, especially when combining Ankara prints with plain cotton.



Plate 1: Bubu Gown



Plate 2: Jacket

2. **Bags and Accessories:** Tote bags, purses, and pouches made from layered remnants had high structural stability due to reinforced stitching. These items attracted positive feedback from consumers during informal market testing.



Plate 3: Bag

3. **Home Textiles:** Duvets, cushion covers, floor mats, and table runners created from layered scraps and quilting techniques exhibited durability and functional comfort.
4. **Rugs and Wall Art:** Braided and woven strips of cotton produced vibrant rugs and decorative panels, showcasing aesthetic versatility.



Plate 5: Centre Rug

5. **Décor Items:** Fabric flowers, tassels, and modest wall hangings illustrated the potential for small decorative pieces derived from narrow strips usually considered unusable. The experimentation demonstrated that off-cuts collected from Zaria workshops have sufficient structural and aesthetic value to support a small-scale recycled product line. Importantly, the cost of producing these items was significantly lower than using new materials, leading to profit margins ranging from 35 to 60 percent depending on the product.

4.4 Environmental and Economic Implications

Recycling the 300 kg of collected waste prevented the release of pollutants that would have emerged from open burning and dumping. Cotton fibres degrade more easily than synthetics, yet their accumulation still contributes to soil obstruction and micro-fibre dispersion. Preventing synthetic waste from reaching dumps reduced potential long-term environmental hazards associated with slow decomposition and chemical leaching.

Economically, if scaled across the estimated 200–300 fashion houses in Zaria, the reuse of a similar volume of waste could yield substantial income for local designers while reducing raw material consumption. This aligns with Okeke's (2025) argument that circular initiatives can generate livelihoods for small enterprises in Nigeria.

Discussion of Findings

The findings highlight significant opportunities for integrating circular design principles into the operations of small-scale Nigerian fashion houses. Waste generation patterns reflect a lack of structured cutting techniques, limited training in zero-waste approaches, and the absence of supportive policy frameworks that encourage reuse. This situation mirrors observations by Bamisaye and Adeitan (2018), who noted that waste management in Nigeria's fashion sector remains largely informal and unregulated.

The study demonstrates that fabric remnants possess substantial creative and commercial potential when channelled through structured recycling processes. Studio experimentation confirmed that diverse products can be generated without sophisticated machinery, making recycling feasible for small workshops. These findings align with Sandin and Peters (2018), who argue that recycling contributes to reduced environmental burdens while supporting material circularity.

Adoption of circular practices, however, depends on access to training, awareness, and supportive networks. Interviews revealed that many tailors lacked knowledge of recycling techniques, underscoring the need for curriculum reforms in fashion design programmes. Okeke (2025) similarly emphasises the importance of education and policy alignment in building Nigeria's sustainable fashion ecosystem.

Conclusion

This study examined the environmental and economic potential of recycling fabric waste in fashion houses within Zaria, Kaduna State. Through observations, interviews, and of studio-based experimentation, the research identified significant volumes of pre-consumer textile waste, predominantly cotton, generated during garment production. The findings reveal that current disposal practices rely heavily on burning and dumping, reflecting the absence of structured recycling systems and limited awareness among practitioners.

The experimentation demonstrated that fabric remnants can be transformed into a broad range of functional and aesthetic items, including garments, accessories, home textiles, rugs, and décor pieces. These artefacts exhibited strong structural resilience and visual quality.

Recommendations

1. Design schools should incorporate zero-waste design, recycling, and upcycling into fashion curricula.
2. Government should establish community-based networks for collecting and redistributing fabric off-cuts.
3. Design schools should provide training for tailors and apprentices on waste reduction techniques.
4. Fashion designers should promote recycled products through exhibitions and local fairs.
5. Fashion designers should encourage the adoption of zero-waste cutting methods.
6. Government should introduce incentives supporting enterprises that practise sustainable production.

Suggestions for Further Research

- i. Market studies on consumer perceptions of recycled fashion.
- ii. Investigations into digital pattern technologies as tools for waste reduction.
- iii. Business models for scaling textile recycling in small enterprises.

References

- Agrawal, P., Singh, R. K., & Murtaza, Q. (2013). A literature review and perspectives in reverse logistics. *Resources, Conservation and Recycling*, 97, 76–92. <https://doi.org/10.1016/j.resconrec.2015.02.009>
- Bamisaye, T., & Adeitan, A. (2018). Waste management practices in Nigerian fashion industries. *Journal of Environmental Design and Management*, 10(2), 45–59.
- Bianchi, C., & Birtwistle, G. (2012). Consumer clothing disposal behaviour: A comparative study. *International Journal of Consumer Studies*, 36(3), 335–341. <https://doi.org/10.1111/j.1470-6431.2011.01011.x>

- Chudi-Duru, O. (2023). Circular economy opportunities in Nigeria's textile industry. *African Journal of Sustainable Development*, 12(1), 88–105.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.
- Ellen MacArthur Foundation. (2017). *A new textiles economy: Redesigning fashion's future*. <https://www.ellenmacarthurfoundation.org/articles/the-trends-and-trailblazers-creating-a-circular-economy-for-fashion>
- European Environment Agency. (2017). *Textiles and the environment – the role of design in Europe*. <https://www.eea.europa.eu/publications/textiles-and-the-environment-the>
- Fletcher, K., & Tham, M. (2015). *Fashion and sustainability: Design for change* (2nd ed.). Laurence King Publishing.
- Hawley, J. M. (2006). Textile recycling: A system perspective. In Y. Wang (Ed.), *Recycling in textiles* (pp. 7–24). Woodhead Publishing.
- Ibrahim, M., Musa, S., & Bello, A. (2025). Textile waste generation and reuse practices in small-scale Nigerian fashion enterprises. *Journal of Textile Research in Africa*, 7(1), 33–49.
- Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). The environmental price of fast fashion. *Nature Reviews Earth & Environment*, 1(4), 189–200. <https://doi.org/10.1038/s43017-020-0039-9>
- Okeke, U. (2025). Sustainable fashion and circular economy initiatives in Nigeria. *Journal of Environmental Policy and Planning*, 19(3), 211–229.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage Publications.
- Sandin, G., & Peters, G. M. (2018). Environmental impact of textile reuse and recycling – A review. *Journal of Cleaner Production*, 184, 353–365. <https://doi.org/10.1016/j.jclepro.2018.02.266>
- Vanguard News. (2025, September 12). Stakeholders push for policy as report highlights gaps in Nigeria's circular fashion ecosystem. <https://www.vanguardngr.com/2025/09/stakeholders-push-for-policy-as-report-highlights-gaps-in-nigerias-circular-fashion-ecosystem>