

SUSTAINABLE FASHION THROUGH TRADITIONAL TURKISH WOMEN'S CLOTHING TECHNIQUES

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Abstract

The production of garments from fabric involves multiple stages, each contributing to the final product's design and the resulting fabric waste. The fashion industry produces 97 million tons of waste annually, of which 18 million are leftover textiles. Fast fashion increases the amount of textile waste created by industry and consumers. The zero-waste approach has begun to be implemented in clothing design to minimize the amount of fabric waste generated in the pre-consumer production stage. The collection design and patternmaking stages, well before the cutting process, present a pivotal opportunity to apply zero-waste fashion design techniques. At the design stage of zero-waste clothes, the fashion designer and pattern maker precisely plan to ensure that fabric pieces fit together like a puzzle using the entire fabric width. In response to the growing concern over fabric waste, this paper explores how traditional garment construction techniques can be applied to contemporary garment design to reduce waste. Traditional construction methods were used for three dress patterns to explore how they might affect fabric utilization and garment production.

Keywords: *Zero-waste design, Sustainable fashion, Fabric waste, Traditional Turkish clothing*

INTRODUCTION

The fashion industry may seem like a fairy tale- a dazzling reality filled with vibrant colors, exquisite designs, creativity, innovation, and abundant beauty. However, behind this fascinating realm lies a far more troubling environmental impact than most can imagine. Many stages of global fashion, from production to consumption, have profound ecological consequences, particularly related to water use, chemical pollution, carbon emissions, and textile waste (Niinimäki et al., 2020, p. 189). The European Environmental Agency has identified the fashion industry as the fourth-highest consumer of primary resources (Olivar Aponte et al., 2024, p. 2). The fashion industry generates more than 97 million tons of waste annually and

consumes approximately 79 trillion liters of water (Niinimäki et al., 2020, p. 189).

Water is a key resource in fashion, cultivating natural fibers and processing fabrics. This intensive water use leads to local groundwater depletion and drinking water losses worldwide (Niinimäki et al., 2020, p.192). At the same time the fashion industry is the second most polluting industry, resulting in 20% of all global wastewater (Bailey et al., 2022, p. 1). Cotton, one of the most used fibers, requires vast amounts of water and chemicals, contributing to ecological toxicity and water stress (Moazzem et al., 2021; Rex et al., 2019, as cited in Olivar Aponte et al., 2024, p. 1). Furthermore, projections by the Boston Consulting Group (BCG) and the Global Fashion Agenda

(GFA) indicate that water consumption in the industry could rise by 50% by 2030 if current practices continue. Meanwhile, polyester, the most dominant synthetic fiber in the textile market at 82%, derives from fossil resources and releases microplastics into aquatic ecosystems, endangering wildlife and posing risks to human health through the food chain (Bailey et al., 2022; Henry et al., 2019; Palacios-Mateo et al., 2021; Stone et al., 2020, as cited Olivar Aponte et al., 2024, p. 14).

As the industry continues to expand, so does its environmental footprint. Fast fashion, known for its rapid design and production cycles, allows retailers to provide a wide range of low-cost clothing options (Niinimäki et al., 2020, p. 189). By 2030, the global consumption of apparel and footwear is expected to surge from 62 million tons to 102 million tons, equal to 500 billion t-shirts. This growth threatens to push several planetary boundaries beyond their limits (Global Fashion Agenda & The Boston Consulting Group. 2017, p. 2).

One significant yet often overlooked form of fabric waste is pre-consumption waste generated during garment production. Each garment generates an average fabric waste of about 15% per item. Considering the mass production of apparel, this could be translated to over 60 billion square meters of scrap fabric produced annually by the fashion industry (Nursari & Djamal, 2019, p. 98; Ramkalaon & Sayem, 2020, p. 809). Excess fabric is discarded during the conversion of textile rolls into garments. The analysis reveals that much of the waste originates from the beginning of garment production: the design and pattern-making stages. This research analyzes the zero-waste design aspects and construction principles of traditional Turkish clothing, focusing on the women's garments of the late Ottoman era. It was conducted through patternmaking analysis of forty-seven garments from three ethnographic museums in Izmir.

ZERO-WASTE FASHION DESIGN AND ZERO-WASTE DESIGN PERSPECTIVES OF TRADITIONAL TURKISH WOMEN'S CLOTHING

ZERO-WASTE FASHION DESIGN

Zero-waste fashion design emerged in response to growing environmental concerns associated with the fashion industry, mainly the significant amounts of textile waste generated during

production (James et al., 2016, p. 143). The term 'zero-waste fashion design' is a progressive methodology intended to eliminate fabric waste from a garment's pattern-making stage, even approaches that do not eliminate the waste entirely (ElShishtawy et al., 2022, p. 191). Under the zero-waste fashion design framework, reducing waste drives innovation and fosters the exploration of new, creative approaches to cutting and construction methods (Kim & Kim, 2022, p. 200). Various designers have contributed to this field through their distinct methods and philosophies, including Timo Rissanen, Holly McQuillan, Julian Roberts, Carlos Villamil, and Yeohlee Teng. Their contributions emphasize innovative pattern-making, holistic design strategies, and sustainable design practices. Tang defines "Zero-waste, as a philosophy, refers to a design method or lifestyle that generates little or no waste, be it textile or time and energy. It is becoming more prominent today, perhaps as an effort to push fashion into a sustainable future" (Interview with Yeohlee Teng, 2017).

Timo Rissanen (2013, p. 19) emphasizes that waste elimination must begin at the design stage for the fashion industry to achieve optimal waste management. Fashion designers should adopt a zero-waste approach in the design and pattern-making stages to promote sustainable practices. Rissanen adds that changes are necessary for current conventional production practices to align with this goal. Zero-waste fashion design can serve as a creative challenge in patternmaking by merging the roles of designer and patternmaker into a cohesive process. This approach emphasizes the consideration of aesthetics and functionality fostering innovative solutions in garment creation while ensuring that all fabric is used effectively (Carrico & Kim, 2014, p. 58). Tan and Chon (2016, p. 165) suggested that the roles of the fashion designer and patternmaker are inherently interconnected, as each relies on the other's expertise and knowledge. Patternmakers are technical designers who grasp the aesthetic elements of design, while fashion designers possess a creative vision informed by the fundamental principles of pattern-making. This co-creative partnership can enhance the efficiency of the design process, transforming it from a transactional to a collaborative relationship.

Ramkalaon and Sayem (2020, p. 816) proposed that the conventional design process in the fashion industry, characterized by segmented stages and minimal communication among

professionals, hinders the implementation of zero-waste patterns in mass production. This approach involves establishing a team of designers and patternmakers who work together from the beginning, integrating patterns with fashion design. The design steps should not proceed in isolation; instead, they should interact continuously to ensure a cohesive development process until the desired prototype is achieved. Despite the growing prevalence of zero-waste design approaches, the adaptation of these techniques in mass production remains a significant challenge for the fashion industry (ElShishtawy et al., 2022, p.195).

ZERO-WASTE DESIGN PERSPECTIVES OF TRADITIONAL TURKISH WOMEN'S CLOTHING

While zero-waste design has gained considerable attention in contemporary fashion studies, its historical application in traditional Turkish clothing has not been fully recognized or explored. Previous research on traditional garments typically focuses on cultural, aesthetic, and functional aspects, with limited attention to the waste-reduction strategies inherent in the design process. In contrast, this study provides a comprehensive analysis of traditional Turkish garments, revealing some common features that support the zero-waste approach. The results show that pattern-making methods used in traditional Turkish clothes, significantly reduce the wastage rate (Aktas & Ozkavruk Adanir, 2024a, p. 354).

The Use of Straight Lines and Geometric Patterns

In contemporary fashion, garments are often constructed using curved lines in areas such as armholes, necklines, hips, waist, and other contours. The pattern pieces include irregularly shaped polygons and asymmetrical elements. They typically result in gaps between the pieces when laid out for cutting. These gaps lead to small scraps of fabric that are considered waste.

In contrast, traditional Turkish women's clothing is characterized by using straight lines and regular geometric shapes mainly rectangles, squares, triangles, and diamond shapes in its construction. Patterns were designed to interweave with one another and allow for more efficient use of fabric. Every edge and seam of these garments are linear elements without curved lines. As these garments are designed from straight-edged regular geometric shapes that share the same cut edges, the

pattern pieces interlock each other. This arrangement eliminates gaps between the pattern pieces, helps to create garments that are easier to produce and allows optimal fabric use. Nancy Micklewright analyzes the construction techniques of traditional Turkish clothing, and she clarifies that all pieces were rectangular or cut along straight lines so that the entire fabric width was used with no scraps left over (1986, p. 188).

It should be noted that selvage was never cut and used as seam allowance. This practice allowed for more economical use of the fabric since it eliminated the need for additional fabric for seam finishing. At the same time, it helped to maintain the seams' strength and durability.

Traditional Techniques in Garment Construction and Design

Traditional Turkish women's garments from the late Ottoman era, include a three-skirt robe (*ucetek entari*), a short jacket (*cepken*), a dress, a shalwar, and a shirt. In the nineteenth and early twentieth centuries, the average fabric width of Turkish women's clothing was approximately 50 cm, which was well-suited to the measurements of the female body. During this era, Turkish women's clothing patterns were created using the entire width of the fabric. The three-skirt robe features a narrow, standup collar and a V-shaped neckline, with an open front fastened at the bodice by plaited buttons and loops. The garment, reaching ankle length, includes side slits, front and back skirts widened by godets. Godets are constructed from a rectangle fabric divided lengthwise into six triangles. These triangular pieces are then sewn to the front opening and side slits to add width to the hip and abdomen areas. To construct the front and back body pieces of the three-skirt robes and jackets, the fabric was folded crosswise so that the cut ends match and there is no seam at the shoulders. Then, the front body was cut lengthwise until the neck, and an opening was cut for the neckline. The front and back of the garment were made from a single rectangle (Aktas & Ozkavruk Adanir, 2024b, p. 15) (Fig. 01).

The sleeves were always cut on the crosswise grain of the fabric; therefore, the length of the sleeve was constructed from the width of the fabric. Since the sleeves were cut along the crosswise grain, the sleeve's fabric pattern is aligned perpendicular to the garment's fabric pattern. The sleeves were placed straight to the body without curvature or shaping at the armhole. Triangular gussets were



Fig. 01

positioned under the armholes. Designing sleeves with this method involves simpler patternmaking techniques and regular geometric shapes that are easier to sew and assemble.

Traditional Turkish shalwar comprises many diverse construction methods, sizes, shapes, fabric types, and embroideries. Even though the measurements and proportions of the pieces used to make a shalwar varied, the logic of pattern-making with a zero-waste approach has been applied to all ranges. Nancy Micklewright points out that the visual effect relied on the generous but not wasteful use of fabrics and other materials. Even though the tailoring of the garments seems simple, they were carefully constructed, and great attention was paid to the details. The shalwar is made from two leg pieces on the sides and crotch pieces extending to the waist that connect the leg pieces. The number of crotch pieces may increase when the crotch is formed by sewing fabric pieces vertically to each other following the straight line of the fabric. There are often seams in the center front and the center back; however, there are no seams or stitching on the sides as they are placed on the fabric fold. The sides are rectangular without being cut. In

some examples, the fabric is turned inside to make plackets for the drawstrings at the waist and the bottom of each leg, while in other samples, extra fabric is added.

The *cepken* is a type of short jacket that holds significant importance in traditional Turkish clothing. It is typically worn on top of a three-skirt robe and shalwar. The design of the *cepken* features an open front and a cropped length, typically ending above or at the waistline. It's characterized by its small stand-up collar and long sleeves, which hang down to the palms. Geometric-shaped (Triangular, quadrilateral, or diamond-shaped) gussets are often added to the jacket to add fullness. Some short jackets show extended gussets that run from the armhole down to the waist. The quadrilateral gussets are cut longer and wider from a rectangular fabric to provide extra flexibility. Additionally, the sleeve is constructed from a single piece of cloth.

The traditional shirt was the first layer of clothing worn by women and men. It was prepared without a neck opening and could be opened and decorated according to the wearer's preferences. Interestingly, the shirt could also be worn upside down, with the hem becoming the waistband and the sleeves covering the legs to wear as underwear.

Analyzing the Fit and Function of Gussets and Godets

In traditional Turkish clothing, the elimination of curved lines is compensated by adding triangular and quadrilateral-shaped gussets and godets in areas such as the underarms, sides, waist, hips, and crotch. These additions enhance comfort and facilitate ease of movement, allowing the garments to better conform to the body's shape and improving overall fit.

Gussets and godets are important elements in the formation of traditional clothing. Micklewright states that the sleeve part of the garments was formed by a large rectangular piece of fabric and a small gusset (1986, p. 191). A gusset is a triangle or quadrilateral-shaped piece inset between the seams of the sleeve and bodice in the underarm area, providing additional space and improving the fit of garments such as three-skirt robes, dresses, shirts, or jackets.

A godet is a large triangular or quadrilateral-shaped piece, inset between two pieces of fabric or into a slit to add volume to the hem of the garment. Godets were placed on both sides of the skirt and shirt. As a result, the garment's body

is widened. The shape and placement of geometric pieces added to the underarm area for fullness can create the illusion of curved lines. Although the pieces may be angular, their strategic positioning allows them to mimic the body's natural curves.

The size of the gussets and godets varies according to the wearer's measurements. These additions are essential for customizing garments to fit the individual. This adaptability is crucial in traditional clothing, where a tailored fit and aesthetic appeal are highly valued (S. Tansuğ, personal communication, January 8, 2022).

Another sustainable method used in traditional clothing is the incorporation of drawstring closures, which gather and tighten the waist to secure the shalwar on the body. Drawstrings are also applied at the ankles. This technique provides a perfect fit for multiple sizes, accommodating changes in body weight. The adjustable drawstrings ensure the shalwar remains comfortable and well-fitted, enhancing the garment's longevity.

APPLICATION OF TRADITIONAL TURKISH ZERO-WASTE TECHNIQUES IN CONTEMPORARY GARMENT CONSTRUCTION

In mass garment production, patterns are often cut from fabric without aligning the edges, resulting in irregular pieces that do not fit together efficiently, much like mismatched puzzle pieces. This method frequently leads to significant fabric waste. However, a more efficient and sustainable method inspired by traditional clothing construction could provide practical solutions to this problem. Traditional techniques, such as using straight lines, regular geometric shapes, and incorporating elements like godets and gussets, were used to design three dress patterns to optimize fabric use and minimize waste.

The white dress featuring a fish pattern is made from remnant fabric measuring approximately 150 cm in width and 110 cm in length. This dress pattern consists of fourteen pieces. Traditionally, the front and back pieces of the dress are made from a single rectangular fabric, folded in half with the shoulder positioned along the fold. As contemporary fabric widths have increased, the traditional pattern was adjusted to maximize the use of the fabric's full width. The front and back bodies are constructed from separate pieces stitched together at the shoulders. The dress features underarm gussets and triangular godets

arranged at the front and sides of the garment (Fig. 02).

The off-white mesh summer dress is made from a remnant fabric that measures 150 cm in width and 200 cm in length. The design includes ten pieces, with four godets added to the sides of the front and back pieces and two gussets positioned under the arms. The front, back, and sleeve pieces all have the same width (Fig. 03).

The white cotton dress and belt are made from a remnant fabric that measures 150 cm in width and 170 cm in length. The dress pattern includes fourteen pieces. The skirt features six triangular godets positioned at the center front, center back and sides of the garment. Underarm gussets are included to enhance comfort and movement (Fig. 04).

The dresses were constructed using only rectangles, triangles, and squares. The pattern pieces were arranged without gaps, and the selvages were used as seam allowance.

CONCLUSION

Fashion firms still benefit from the fast fashion model, but the industry's long-term sustainability relies on moving away from this model and implementing sustainable practices. Certain software programs automatically optimize the marking process by arranging irregular pattern pieces on strips of fabric. However, approximately 15% of the fabric is wasted during this process. The successful integration of these methods shows how traditional knowledge can inform and inspire contemporary sustainable fashion practices, providing valuable insights for designers aiming to address the growing concerns of textile waste in the fashion industry. These garments are constructed using almost the entire fabric, ensuring that fabrics are consumed to their fullest potential, thereby minimizing scraps and remnants.

Zero-waste fashion design is a promising approach to reducing the fashion industry's environmental impact. Numerous designers and researchers are actively exploring methods to eliminate fabric waste generated during garment manufacturing. By carefully planning and strategically designing pattern pieces in collaboration with designers and pattern makers, effective solutions are created to minimize fabric waste that would otherwise contribute to environmental degradation. This approach challenges designers to think creatively and encourages the industry to prioritize ecological



Fig. 02



Fig. 04



Fig. 03

responsibility, ultimately leading to a more sustainable and ethically conscious fashion system. As the fashion industry approaches a critical turning point, the need for transformative change has never been more urgent.

CAPTIONS

[Fig. 01] Silk ikat, striped kutnu, three-skirt robe, early 20th century, Izmir Ethnography Museum. Photo: Ceren Aktas.

[Fig. 02] Fish-printed white dress designed by using traditional pattern-making techniques Photo: Ersan Çeliktas, Model: Ipek Uyarer.

[Fig. 03] Off-white mesh summer dress designed by using traditional pattern-making techniques Photo: Ersan Çeliktas, Model: Ipek Uyarer.

[Fig. 04] White cotton dress designed by using traditional pattern-making techniques Photo: Ersan Çeliktas, Model: Ipek Uyarer.

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