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Production Waste Management System with the Application of Zero Waste for Fashion Products on Ready-to-Wear

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ABSTRACT

Zero waste is one way to minimize waste ranging from production to the end of production. Zero waste has the principle 3R stands for Reduce, Reuse and Recycle. Zero waste is one of the main principles of slow mode. Zero waste is a fashion concept that minimizes the waste of clothing production. In addition, zero waste can also be realized in the form of the utilization of fabric waste that is broken down by the rest of unused production pieces. Ready-to-wear fashion is a ready-to-wear outfit that is produced in large quantities. Zero waste fashion clothing is usually made in all sizes and does not have a detailed pattern. If there are still leftovers, most of it can still be used for accents. Along with the development of technology that makes it easier for people to access information about fashion trends and the emergence of fast fashion retail. Fast fashion presents a variety of ready-to-wear clothes.

Keywords: fashion product, product waste, ready-to-wear, zero waste

Research Article

1. INTRODUCTION

Zero waste is one way to minimize waste ranging from production to the end of production. Zero waste has the 3r principle, which stands for Reduce, Reuse and Recycle. The principle of the concept of zero waste not only 3R but even 4R, even up to 5R as additional Replace and Replant. First reducing and even avoiding the use of products that produce large quantities of waste and single use products. Second reusing means reuse usable products such as reusing packaging that can still be used repeatedly. Third recycling is using products that are easily decomposed an example is organic waste into plant compost. Fourth replace items that are not environmentally friendly, such as replacing plastic packaging using environmentally friendly materials such as plastic made from cassava material so that when exposed to water it will dissolve. The last is replanting or reforestation, replant by using used goods as a medium place (Kharimah & Nursari, 2019).

Zero waste is one of the main principles of slow mode. Zero waste is a fashion concept that minimizes the waste of clothing production (Fitinline, 2021). In addition, zero waste can also be realized in the form of the utilization of fabric waste that is broken down by the rest of unused production pieces (CNN Indonesia, 2019; Comagz#13, 2020)(Comagz#13, 2020). Zero waste mode seeks to minimize the influx of textiles. This system is said to be environmentally friendly because the producing waste will be little, even no waste. This concept is part of sustainable fashion. Holly McQuillan is a researcher on textile waste reduction methods using zero waste patterns and Timo Rissanen is an assistant professor of fashion design and sustainability at The New School for Design, New York. Zero waste has been around for a long time. This mode has been popularized by Holly McQuillan and Timo Rissanen (Leman et al., 2020).

Ready-to-wear fashion is a ready-to-wear outfit that is produced in large quantities. Ready-to-wear clothes can be purchased directly and worn without taking body measurements. Ready-to-wear clothes not only sell casual clothes but there are normal fashions as well (Putri, 2021). The concept of ready to wear or commonly called fast fashion is an industry that always follows the development of trends. Fashion entrepreneurs end up producing fashion goods quickly to stay abreast of trends. Along with the development of technology that makes it easier for people to access information about fashion trends and the emergence of fast fashion retail. Fast fashion presents a variety of ready-to-wear clothes. Fast fashion is a rapid fashion change and many are sacrificed to meet market demand.

In the manufacture of zero waste clothing, according to Rissanen, there are several important aspects that must be fulfilled to ensure both sustainability and market acceptance. The first aspect is appearance, where the visual appeal of the garment must meet consumer expectations. Even though the design follows zero waste principles, it should still be aesthetically pleasing and aligned with current fashion trends to attract consumers. Designers are challenged to create innovative forms and silhouettes while maintaining visual harmony and functionality. Therefore, creativity becomes a key factor in balancing sustainability and design attractiveness (Anggraini & Suhartini, 2021).

The second aspect is the suitability of body size, which means that garments must be adaptable to different body shapes and sizes. In zero waste fashion, this can be achieved through flexible design approaches such as loose silhouettes, adjustable features, or multi-size garments. This approach not only reduces the need for multiple pattern variations but also supports inclusivity in fashion. The third aspect is price, which plays a crucial role in determining market acceptance. Zero waste clothing must be priced appropriately to remain competitive while still reflecting the value of sustainable production processes. Although sustainable materials and techniques may sometimes increase production costs, efficient material usage can help balance overall expenses (Leman et al., 2020).

The fourth aspect is sustainability itself, which is the core principle of zero waste fashion. This includes minimizing textile waste, reducing resource consumption, and ensuring environmentally friendly production processes. Sustainability also involves

considering the entire lifecycle of a garment, from raw material selection to disposal. Designers must ensure that their products contribute positively to environmental preservation while maintaining quality and durability. This aspect reinforces the importance of integrating eco-friendly practices into every stage of fashion production (Rusydiana & Yulistiana, 2021).

The final aspect is production capability, which refers to the feasibility of producing the designs on a larger scale. Zero waste fashion should not only remain as a conceptual or experimental approach but must also be applicable in real production systems, including ready-to-wear manufacturing. Designers and producers need to ensure that the designs can be replicated efficiently without compromising the zero waste principles. This includes optimizing pattern layouts, simplifying construction techniques, and ensuring consistency in quality. By fulfilling these five aspects—appearance, size adaptability, price, sustainability, and production capability—zero waste fashion can become a practical and impactful solution within the modern fashion industry (Winarti et al., 2020).

2. RESEARCH METHODS

This research employs a descriptive-analytical method through a literature review approach. A literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing existing scholarly works relevant to a particular topic. In this study, the literature review focuses on production waste management systems and the implementation of zero waste principles within the fashion industry. The descriptive approach is used to present an overview of concepts, theories, and practices related to zero waste fashion, while the analytical aspect aims to critically examine and compare findings from various sources. By applying this method, the research is able to build a comprehensive understanding of how zero waste principles are integrated into ready-to-wear fashion production processes and how they contribute to environmental sustainability (Anggraini & Suhartini, 2021; Leman et al., 2020).

The data used in this study are secondary data obtained from various credible sources, including scientific journals, conference proceedings, books, and reputable online publications. These sources were selected based on their relevance to the research topic, particularly those discussing zero waste fashion, sustainable design, textile waste management, and ready-to-wear production systems. The process of data collection involves searching, identifying, and selecting literature using specific keywords such as “zero waste fashion,” “textile waste,” “sustainable fashion,” and “ready-to-wear.” The selected literature is then reviewed and categorized based on themes and research objectives. This approach ensures that the data used are valid, reliable, and capable of supporting the analysis conducted in this study (Rusydiana & Yulistiana, 2021; Saeidi & Wimberley, 2017).

Furthermore, the analysis technique applied in this research is qualitative descriptive analysis. This technique involves interpreting and synthesizing information from selected literature to identify patterns, relationships, and key findings related to zero

waste practices in fashion production. The analysis is conducted by comparing different methods, techniques, and strategies used in implementing zero waste principles, such as pattern cutting methods, material selection, and production efficiency. Special attention is given to approaches introduced by experts like Rissanen and McQuillan, which emphasize minimizing textile waste through design innovation. Through this analytical process, the study aims to highlight the effectiveness and challenges of applying zero waste concepts in the ready-to-wear sector (Anggraini & Suhartini, 2021; Celaya, 2019).

Finally, this study also evaluates the relevance and applicability of zero waste principles in the context of modern fashion industry practices, particularly in response to the rapid growth of fast fashion. The evaluation focuses on how literature findings can be applied to real-world production systems and how they contribute to reducing environmental impacts caused by textile waste. By synthesizing various perspectives from previous studies, this research provides insights into sustainable solutions that can be adopted by designers and fashion producers. The results of this literature review are expected to serve as a reference for future research and as a guideline for implementing environmentally friendly production systems in the ready-to-wear fashion industry (CNN Indonesia, 2019; Fitinline, 2021).

3. RESULTS AND DISCUSSION

According to (Saeidi & Wimberley, 2017) the fashion industry produces approximately 400 billion square meters of fabric annually, with around 60 billion square meters becoming waste, which is equivalent to 15% of the total material used in production. This significant amount of waste highlights the urgent need for more sustainable production systems within the fashion industry. One of the approaches that has gained attention is the application of zero waste fashion design, which focuses on minimizing or even eliminating textile waste during the design and production stages. Zero waste fashion design is a method that integrates pattern-making techniques with creative design strategies to ensure that all fabric is utilized efficiently without leaving unused scraps. This concept shifts the traditional approach of garment production into a more sustainable and environmentally responsible practice. Various techniques have been developed to support this method, all of which aim to eliminate fabric waste directly from the garment production process through design innovation (Anggraini & Suhartini, 2021).

In addition, zero waste design not only reduces environmental impact but also encourages designers to think more creatively and strategically in constructing garments. Designers are required to consider fabric layout, pattern efficiency, and multifunctional design elements from the early stages of production. This approach often leads to innovative silhouettes and unique garment constructions that differ from conventional fashion design. Moreover, the implementation of zero waste methods can contribute to cost efficiency in the long term, as material usage becomes more optimized. The integration of sustainability into design processes also aligns with the growing consumer awareness of environmentally friendly products. As a result, zero waste fashion is not

only a solution to textile waste problems but also a competitive advantage in the modern fashion industry (Leman et al., 2020; Rusydiana & Yulistiana, 2021).

Furthermore, the application of zero waste principles in ready-to-wear fashion presents both opportunities and challenges. On one hand, ready-to-wear production requires efficiency and mass production, which can make the implementation of complex zero waste techniques more difficult. On the other hand, with proper planning and innovation, zero waste methods can still be adapted to fit industrial production systems. Techniques such as efficient pattern cutting, modular design, and the use of fabric remnants for additional design elements can support this process. Therefore, zero waste fashion design plays a crucial role in transforming the fashion industry toward more sustainable practices while maintaining functionality and aesthetic value (Anggraini & Suhartini, 2021).

The methods and stages used by McQuillan and Rissanen support zero waste. The first is Planned Chaos. Chaos patterns or planned blocks are put together so that the pattern of body parts and others becomes one. The planned chaos is divided into two, namely Jigsaw Cutting. This method was created by designer Mark Lui. Jigsaw cutting sets the pattern on top of the fabric like a puzzle so that all the pieces are useful. This technique also removes the rest of the fabric by cutting from the rest of the fabric used as a collar, and bags (Celaya, 2019). The second method of planned chaos is Reduction Cutting or usually called Subtraction Cutting. This method was created by Julian Robert. This pattern is not cut to show the outside of the clothing but shows unused space as the production process continues. This method is implemented with the user's ability to cut material accurately even if they do not use calculations (Gultom, 2021). Second method of the zero waste stage is Geo Cut. These geo pieces use geometric shapes such as triangles, squares and circles. This method is used in the manufacture of kimonos. The third method is to Cut and Hang, this technique is controlled by draping. So designers will play with fabric curtains (MaiB, 2017). The fourth method is to reuse patchwork and thread (Winarti et al., 2020).

There are several materials and supporting strategies that play an important role in the implementation of the zero waste method, in addition to efficient pattern cutting techniques during the production process. One of the main approaches is to invest in high-quality and durable materials. Choosing materials that have long-lasting durability can significantly reduce the frequency of clothing disposal, thereby minimizing textile waste. Consumers are encouraged to consider the lifecycle of clothing before making a purchase, including how long the item can be used and what will happen when it is no longer wearable. If environmentally friendly or biodegradable materials are not yet widely used, the risk of environmental pollution can still be reduced by prioritizing quality over quantity. This approach helps prevent the habit of excessive consumption and reduces the accumulation of waste caused by fast fashion practices (Fitriandiani, 2019).

In addition, recycling unused clothing is another important step in supporting zero waste principles. Clothing that is no longer used does not necessarily have to be discarded, but can be repurposed into new products or redesigned into different styles. This practice

not only extends the life of garments but also reduces the demand for new raw materials in the production process. Furthermore, the concept of bartering or exchanging clothing items with others can also contribute to waste reduction. Through this practice, individuals can refresh their wardrobe without purchasing new items, thereby reducing consumption and waste generation. Bartering can be done within communities that share similar preferences in fashion, making it both an environmentally and socially beneficial activity (Rusydiana & Yulistiana, 2021).

Another important factor is paying close attention to the type of material used in clothing production. Selecting fabrics that are biodegradable or made from natural fibers, such as linen or hemp, can help reduce environmental impact when the product reaches the end of its lifecycle. These materials tend to decompose more easily compared to synthetic fabrics, which can take years to break down. Moreover, environmentally friendly materials often require fewer chemicals and less water during production, making them more sustainable overall. Therefore, awareness of material selection is essential not only for producers but also for consumers in supporting the implementation of zero waste fashion. By combining material selection, recycling practices, and conscious consumption behavior, the zero waste concept can be more effectively applied in everyday life (Fitinline, 2021; Sasetyaningtyas, 2020).

There are also various products developed to support the implementation of zero waste fashion, particularly through the use of environmentally friendly materials. One of the main approaches is selecting fabrics that are not only sustainable in production but also easily decomposable at the end of their lifecycle. Environmentally friendly fabrics are increasingly being developed and promoted as alternatives to conventional textile materials, which often rely on synthetic fibers and chemical-intensive processes. The use of such materials is essential in reducing the negative environmental impact of the fashion industry, especially in terms of waste accumulation and pollution. By prioritizing eco-friendly fabrics, designers and manufacturers can contribute to a more sustainable production system while maintaining product quality and functionality (Rusydiana & Yulistiana, 2021).

One example of an environmentally friendly fabric is linen, which is derived from the flax plant. Linen is known for its biodegradability and minimal environmental impact during production. The flax plant is relatively resilient and can grow in poor soil conditions, requiring less water compared to other crops such as cotton. In addition, the production process of linen generally involves fewer chemicals and can even be carried out without the use of pesticides, making it safer for both the environment and human health. Another advantage of linen is that its by-products can be utilized for other purposes, such as in the production of varnish or materials for carpentry. These characteristics make linen an ideal material in supporting the principles of zero waste fashion and sustainable textile production (Sasetyaningtyas, 2020).

Another material that supports zero waste fashion is hemp fabric, which shares several similarities with linen but offers additional advantages. Hemp fibers are known

to produce a higher yield compared to cotton and linen, making them more efficient in terms of resource utilization. The cultivation of hemp also requires minimal chemical input and can grow quickly in various environmental conditions. Furthermore, hemp plants produce not only fibers but also seeds and oils that can be utilized in other industries, increasing their overall value. Hemp fabric is highly absorbent, durable, and biodegradable, making it suitable for long-term use and easy decomposition after disposal. Therefore, the use of materials such as linen and hemp demonstrates how material selection plays a crucial role in achieving the goals of zero waste fashion and promoting a more sustainable fashion industry (Fitinline, 2021).

4. CONCLUSION

With the development of the times, technology has also developed. In addition to the development of technology, it has also become a trend in the world. The development of this trend can be seen on social media. With the development of the trend that is getting faster fashion. Fast fashion is a rapid fashion change, and many are sacrificed to meet market demand. Fast fashion has a negative impact on the world, one of which is environmental damage, such as water and air pollution. Fast fashion occurs in ready-to-wear, because the greatest needs of society are clothes that are directly worn or ready to wear. Clothing waste is one of the largest in the world. This is due to human negligence. Therefore, designers began to create the concept of zero waste applied to fashion products. Zero waste mode tries to minimise the influx of textiles. This system is said to be environmentally friendly because the resulting waste will be little or even no waste. Zero waste is part of a sustainable mode. There are also ways of cutting patterns that are applied to support the zero-waste method. In addition, you must be careful in the selection of materials to be used and certainly not present at any party. So, in designing, there are several things that must be done to support the zero-waste method.

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