



## The Application of Eco-Printed Natural Fibre Fabric in Upcycling Used Clothing as an Innovation in Sustainable Fashion

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### ABSTRACT

The objectives of this research are: (1) To create an application of natural fibre ecoprint fabric combined with used clothing through the upcycling process; (2) To understand the process of making ecoprint fabric and upcycling techniques, from preparing tools and materials to producing the final product; (3) To understand how branding can be used to introduce products to the public and attract buyers. This scientific paper is a project on the application of natural fibre ecoprint fabric in the upcycling of used clothing as an innovation in sustainable fashion. The creation of designs involves several stages, such as (1) determining the pattern, (2) creating a mood board, (3) creating designs or sketches, (4) making patterns, (5) producing clothing, and (6) the marketing process. The method used in this research is R&D with the ADDIE method. This research uses a final project based on the consideration of transforming existing products into new products in collaboration with ecoprint fabric. This final project resulted in a collection of six clothing designs. Ecoprint fabric and used clothing are used to reduce fashion waste. The ecoprint fabric production process utilised environmentally friendly materials. The garments were divided into three colour schemes: two white garments, two blue garments, and two others with white and blue stripes. For branding activities, social media was used under the name @niluwarna

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## 1. Introduction

Fashion can be considered a means of protection from exposure to the outside air and dust, with its function being to enhance one's appearance. The concept of fashion also includes clothing styles and accessories that are currently trending at a given time and in a given context. Individuals who wear clothes do not only consider the basic aspects, but also the aspects of fashion, economics, social factors and aesthetics, making fashion a comprehensive phenomenon driven by these motivations [1].

The trend that is currently being widely discussed is, of course, familiar to many, known as fast fashion. This trend offers a wide variety of fashion choices at affordable prices, attracting more and

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more fast fashion enthusiasts. While this trend offers convenience and advantages, it also has a dark side that requires consideration from various related parties. This dark side manifests in the negative impacts of product manufacturing, which can harm the environment and humans, whether as consumers or workers. The emergence of terms like sustainable fashion and ethical fashion offers a solution. Both support environmentally friendly fashion and the well-being of workers. This approach can have a more positive impact on the fashion industry compared to fast fashion [2].

Environmental issues have been recognized internationally as the most transnational issues, requiring security measures to be taken to protect human rights, national security and peace. Environmental pollution and natural destruction are not only caused by large-scale factories, but can also be caused by small businesses [3][4][5]. Fast fashion in global society is becoming increasingly widespread. If not accompanied by appropriate solutions, this issue will become even more urgent as it can damage the earth [6]. Research by Viky Kimbarlina and Enrico supports the role of sustainable fashion. They stated that 85% of waste reduction has been achieved, and the role of sustainable fashion and fashion product recycling is increasingly being taken up by famous designers, including local brand owners [7]. Environmental pollution can be prevented by practicing sustainable fashion and recycling fashion waste. Recycling old items can produce new, creative products [8].

Responding to environmental issues associated with the fast fashion trend has encouraged the fashion world to delve deeper into sustainable fashion products such as ecoprint. Seeing how the earth is changing every day makes sustainability a necessary step [9]. The phenomenon of fast fashion has serious consequences, as it can cause environmental pollution due to the industry producing textile waste. This is especially true given that the fashion industry is one of the largest industries in the world. The waste produced by this industry, such as chemical dyes, and the excessive use of energy for the production process, have an impact on global warming. The textile sector causes environmental degradation in the industrial sector if swift action is not taken to prevent it. The process of transferring colours and shapes from plants to fabric through direct contact is called the ecoprint technique. The ecoprint technique can be applied by attaching plants that are high in tannins or colour pigments to fabric, rolling the fabric up and tying it, and then boiling it. Opportunities for design development are increasing due to the rise of environmentally friendly products or sustainable fashion [10].

Obtaining new visual possibilities to be applied to fashion products is the goal of ecoprint exploration. This paradigm emerged in the 21st century regarding its application in the creation of fashion products related to sustainable environmental growth. The uniqueness of ecoprint lies in its results because no two colours from plants are the same. This means that taking flowers or leaves from different places will not produce the same colour. Various tips for identifying ecoprint plants that can be used or not are as follows: The first tip is to look for plants with a strong aroma, which is a sign that the plant can be used as a natural fabric dye. The second tip is to rub the plant on your hand or fabric; if the plant is a natural dye, it will leave a colour on the fabric when rubbed directly. The third tip is to soak the plant in water for about 10 minutes. If the colour of the plant changes from its original colour, then the plant can be used as a natural ecoprint dye [11].

Fashion issues also arise due to the trade in second-hand clothing, which is sometimes illegal because it is imported from other countries without going through the legal customs and excise process. Information obtained from the agency handling related issues indicates that the import of second-hand clothing has exceeded limits because the amount is increasingly uncontrollable. Indonesia has become one of the top countries due to the large amount of second-hand clothing trading. The number of second-hand clothes sold to date has increased over time. Most transactions or sales of second-hand clothes are centered in major cities throughout Indonesia. Moreover, the

current trend of second-hand clothes is becoming increasingly well-known and in demand among young people, who are the biggest target market in the fashion industry. Thrift shopping is the term used to describe the buying and selling of second-hand clothing. The purpose of thrift shopping is for consumers to save money because the prices are relatively cheap, as new fashion items are currently much more expensive than thrift items, and there is also a wide variety of products available.

Everyone is free to choose products to buy according to their preferences, whether they are environmentally friendly, whether they will recycle the products in the future or modify them and turn them into collections [8]. Based on these issues, buying large quantities of second-hand clothing without knowing the impact of second-hand clothing waste accumulation can affect the health of users as well as sustainability. The processing of used clothing waste using upcycling techniques is needed as an alternative to reduce the impact on the environment. This technique will become increasingly popular with the public as the lifespan of clothing becomes longer.

Trends in certain styles or product designs are easily abandoned when they are no longer in vogue, as fashion trends change with the times and will continue to evolve. It is very important to encourage people to take an interest in second-hand clothing. One way to do this is by creating new designs that can be applied to old products. This redesign activity will further encourage the community to reuse unused products by making them more attractive than before. In an effort to improve the functionality of products, upcycling is carried out. Upcycling clothing can help reduce waste from second-hand clothing and aims to utilize existing second-hand clothing for reuse [13].

From this description, the author was inspired to create a project involving the production of clothing from ecoprint natural fibre fabric combined with used clothing such as shirts or blouses using the upcycle method. Ecoprint fabric is made from the initial processing of the material (mordant) to the creation of ecoprint motifs using the steam technique. After that, the ecoprint fabric is ready to be sewn into a combination of used clothing so that it looks different from before and has a unique character. The problem that can be concluded from the explanations above is the reason for choosing this title, namely the accumulation of fashion waste from year to year, which is increasing in quantity and requires an appropriate solution to overcome it. Finding a solution to this problem requires a long process, so it is hoped that this project will be able to provide an appropriate solution.

The existence of sustainable fashion to minimise the impact of fast fashion trends requires the involvement of all levels of society and marketing strategies to maintain the industry and society. The idea of incorporating ecoprint fabric into the upcycling technique for used clothing is designed to transform unused items into functional products by using ecoprint fabric as a way to make clothing more appealing. Ecoprint itself is already very well known on its own, but to maintain its existence, further development is needed in the form of collaboration with upcycling techniques for used clothing.

## 2. Method

This study utilized a final project-based development design. This development design was used with the aim of modifying an existing product, which was then processed and refined through the application of ecoprint fabric to increase its value. In general, there are five steps in the ADDIE model, namely Analyze Design, Develop, Implement and Evaluate [15].

### 3. Results and Discussion

#### 3.1. Results

The stages of ADDIE are as follows: The first stage is analysis, which involves analyzing what is needed to address the problem and finding the right solution to deal with it. The first step is to create your own ecoprint fabric, from processing the fabric to dyeing it. The process is done manually using natural plant-based dyes. The ecoprint technique used is the steam technique, where leaves are arranged on fabric that has been pre-treated with a mordant. Next, collect used clothing you already own and purchase some used clothing at thrift events or thrift shops. Some garments were purchased at the Jatinom market, thrift events in Colomadu, thrift events at the Tirtonadi terminal, and the UMS thrift store. The production process was combined with upcycling techniques, which involve processing used materials by changing the design and adding materials to the garments to make them look different from before. The products created were women's clothing that could be worn for various formal and informal occasions.

The second stage is design, planning a product concept based on research into the problems faced. The concept plan is the meaning of a design. Design in fashion requires harmony between the source of ideas from the shape of objects and patterns or colours. Colour itself is very influential in making clothes look lively. Choosing the right colours and combinations will help make the clothes more attractive when worn. Mistakes in colour selection will detract from the garment and the wearer. Garments also need a point of interest that draws the viewer's attention. Supporting items can be applied in colour, decoration, innovative stitching or patterns that still match when combined with the garment. Harmony means that even though something is different, when combined it is still beautiful and blends well. The design stage is one that can be undertaken after analysis has been completed. It will require elements that serve as materials for garment creation, such as second-hand clothing, blank tiles, plain Toyobo cotton, lining fabric, and lace embellishments, all combined using upcycling techniques and the application of ecoprint fabric as the focal point (point of interest).

Designing involves determining themes and fashion trends. Based on trend forecasting for 2024/2025 with the major theme of Resilient, this collection falls into the fusion sub-theme group. The ease of creating connections that produce unprecedented ideas, even if they are unfamiliar, can be said to be a characteristic of this sub-theme. The foundation of the fusion concept is the idea that differences, when combined, create balance. Fashion products fall under this theme based on their existence as a collaboration between ecoprint fabric and second-hand clothing.

The design process began with creating design sketches. In this collection, plain garments were redesigned into new garments that were different from the originals. The designs were created by changing and adding ecoprint elements to certain parts. The resulting designs were adapted to the original shape of the used garments that were altered in certain parts. The design sketches were created manually using pencils and paper, which were then consulted beforehand. The process continues with colouring the designs, which are created in two versions: manual designs using watercolours and digital designs using the ibis paint x digital application. The colours used are in accordance with the planned colour theme, such as the natural colours of the ecoprint fabric combined with the original colours of the used garments. There is a combination of colours that adds a unique impression and emphasizes the collaboration sub-theme. The use of fabric is already visible in the coloured designs.

The next stage is development, or turning the plan into a tangible product, which is the third stage of the lengthy process. This stage involves preparation, implementation, and evaluation of the product results. Preparatory activities involve gathering the tools and materials needed to make the

product, such as ecoprint, used clothing, and sewing tools and materials. As a benchmark for developing clothing at this stage, it is also necessary to calculate material requirements and plan the selling price. Implementation activities involve applying ecoprint fabric to upcycled used clothing. Ecoprint is applied to used clothing according to the design. The ecoprint fabric is adjusted to the pattern, then the clothing material is cut and joined with the ecoprint fabric that has been cut according to the pattern, then sewn with a sewing machine until finished. Evaluation activities such as quality control are carried out on the sewing results and pressing. The process of making the lining pattern is made to the same size as the original garment. This is done by re-measuring the used clothing and then making a pattern according to the size on paper.

During the implementation stage, the product is tested to measure its quality. Implementation involves testing whether the product is truly fit for consumption. The suitability of a product can be measured from the creation of a design that is appropriate for the target market. Then, in terms of the materials that form the basis of the product, whether the quality meets standards, the origin of the raw materials must be considered so that the finished product does not deteriorate quickly. Furthermore, by prioritizing product quality, starting from comfort, the quality of the stitching, and resistance to things such as weather. Finally, it is necessary to consider the selling price, which is based on the calculation of costs during the production process, labour costs, and operational costs.

After that, brand the product using appropriate promotional media, to be used during the initial introduction stage, and can be done continuously through social media, because in this day and age, the majority of people have smartphones and their own social media accounts, with preferences that match their individual account settings, making it easy to target people who are likely to be interested in this product. In addition to social media, marketing can also be done through exhibitions, bazaars, or expos, so that people not only learn about the product, but also see and touch it directly to understand its characteristics and texture. This allows the product's advantages to be conveyed directly to potential customers, enabling them to consider whether it is suitable for them and make a purchase. Furthermore, customer feedback can be used to continuously improve product quality.

The evaluation stage is also an important point because the product created must also be acceptable to others. At this stage, there is an evaluation carried out by experts in their field, which is called formative evaluation. The results of each learning step evaluation can lead to the development of learning to the next step or phase [16]. There is also an evaluation carried out by the community as the target market for the product, called summative evaluation. Both are needed to obtain feedback or input on whether the product is ready to be marketed or needs additional improvements. To conduct formative evaluation, assistance from experts in the field is required, namely supervisors and final project examiners who are involved in the fashion world. Meanwhile, summative evaluation is carried out by offering the product to the community to attract their interest in purchasing it. Both are carried out to determine the feasibility of the product in terms of the product itself, its selling price, quality and uniqueness.

This final project produced six front and back fashion designs and products with six different looks in one collection. The following are the results of fashion products applying ecoprint natural fibre fabric to upcycled used clothing:



Figure 1. Ecosea Shirt and Outer



Figure 2. Keyless Shirt



Figure 3. Senia Dress



Figure 4. Kaalea Blouse



Figure 5. Sisi Dress



Figure 6. Bumblee Long Dress

### 3.2. Discussion

Based on the research results obtained using the ADDIE R&D method, it can be discussed in relation to the research results produced in accordance with the research problems targeted.

## Creating Designs for Clothing

The women's clothing designs in this collection refer to efforts to create sustainable fashion by utilizing used clothing waste to make new clothes through the application of ecoprint fabric. This collection was created by following the characteristics found in the Fusion or collaboration sub-theme. The garments are made using standard sizes from used clothing, natural colours from ecoprint fabric, and involve upcycling techniques. Various characteristics found in the sub-theme are highlighted in the creation of clothing designs in this collection. In addition to referring to the 2024/2025 trend forecasting, this creation is also supported by concepts obtained from sources of ideas. The women's clothing collection is inspired by the application of natural fibre ecoprint fabric in upcycling used clothing, which is a modification of basic shirt clothing to make it more unique and modern.

Next, look for various inspirations to use as sources of ideas. Put the ideas on a mood board so that they are easier to understand and do not cause misunderstandings. After that, the next step is to sketch the clothing design, colour design, decoration design and additional materials. Careful thought is needed in the design process because the design must allow more space for ecoprint on used clothing. Several revisions are needed to achieve the desired result. During the sewing process, we encountered obstacles in finishing the used clothing, as some of it was sewn with a sewing machine, so the resulting garments were not as smooth as boutique garments.

### Creation of the Collection

The final collection consists of clothing made from ecoprint fabric applied to upcycled second-hand clothing. There are six pieces of clothing, two in white, two in blue, and two with stripes. The colours are blue, white and yellow from the ecoprint. The designs are mixed, meaning that the presence of ecoprint varies across each garment—some are predominantly ecoprint while others are less so, to avoid monotony.

The garments in the collection were designed from the outset, starting with the creation of the ecoprint fabric motif concept. Tools and materials were prepared, and ideas were developed. These were then translated into both manual and digital designs. Finally, the garments were sewn according to the patterns and finished.

### Product Branding

Product branding is carried out in several stages. First, determine a suitable brand name, create a brand logo, determine packaging that supports the environmental concept, create a vision and mission, and determine the branding media. Publication formats to introduce the product during branding activities are essential, such as uploading videos and photos on social media platforms like Instagram, TikTok, and YouTube. Branding activities aim to capture the attention of the general public, particularly young women who are the target consumers. These efforts are made to ensure that the clothing products produced can attract the attention of the market and enthusiasts of sustainable fashion.

### Advantages of Clothing Products

Women's clothing should be made from comfortable materials, well-fitting sizes, and stylish designs, as these garments reflect the wearer's character or image. This clothing product utilizes eco-print fabric made from natural fibres that do not irritate the skin and absorb moisture. Additionally, the materials and production process for eco-printing use natural ingredients that are safe for human health and environmentally sustainable. Upcycling used clothing can help reduce fashion waste.

#### 4. Conclusions

This final project produced six front and back fashion designs and products with six different looks in one collection. The following are the results of fashion products applying ecoprint natural fibre fabric to upcycled used clothing (1) Ecosea Shirt and Outer, (2) Keyless Shirt, (3) Senia Dress, (4) Kaalea Blouse, (5) Sisi Dress, (6) Bumblee Long Dress. Based on the concept of planning and implementing the production of clothing using eco-printed natural fibres in upcycling used clothing in order to fulfil the final project, before creating a product, it is necessary to conduct a needs analysis in the form of research on market needs or target markets. This activity aims to divide the community into groups based on their characteristics. Then, the framework described in several points, this method can be a reference for designing and improving creative ideas in the design or manufacturing process. There are four market segmentation variables that need to be explored in various segments, all of which are very important in determining the right target market for the product to be made. The implementation process is a continuation of creating fashion products after determining the target market.

#### Conflict of interest

The authors declare no conflict of interest.

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