

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



14TH **INDES** 2025

ENVIRONMENTAL • SOCIAL • GOVERNANCE



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INVENTION, INNOVATION &
DESIGN COMPETITION 2025

Organized by:

Office of Research, Industry,
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ABSTRACT

Textile waste has emerged as a pressing global environmental issue, and Malaysia is no exception. With over 2,000 tonnes of textile waste being discarded into landfills daily, largely due to fast fashion consumption and low recycling infrastructure, there is a dire need for sustainable and innovative solutions. This project explores the development of an eco-friendly sleeping bag designed specifically for the homeless, utilizing discarded textiles as a primary resource. The research highlights the integration of sustainable design principles to address both environmental degradation and social welfare. A detailed needs analysis was conducted through engagement with social workers and homeless communities to identify essential product criteria: affordability, warmth, water resistance, portability, and durability. Through an iterative design process, the research team constructed a prototype using recycled polyester, insulating materials, and waterproof fabrics. The prototype was field-tested for usability, comfort, and weather resistance. Design refinements were made to improve portability, thermal efficiency, and cost-effectiveness without compromising sustainability. The findings indicate that even varied-width discarded fabrics, when properly layered and assembled, can effectively be repurposed into high-functioning sleeping bags. The final product not only meets the target users' needs but also promotes circular economy practices by diverting waste from landfills. This innovation demonstrates the potential for design-based social impact by merging sustainability with humanitarian support. The project contributes to environmental preservation while simultaneously improving the quality of life for underserved populations. It also offers a replicable model for future product development involving upcycled materials.

Keyword: Textile waste, sustainable design, circular economy, homelessness, sleeping bag innovation

1. INTRODUCTION

In 2018, around 195,300 tons of textile waste were disposed of by Malaysians. Presently, more than 2,000 tonnes of textile waste are disposed of in landfills each day in Malaysia, highlighting the seriousness of textile pollution as an escalating environmental hazard (The 12th International Innovation, Invention and Design Competition [INDES], 2023). Research in Kuala Lumpur indicated that textile waste differs by location: affluent residential areas generated 1.43%, medium-income areas 3.55%, low-income areas 5.47%, commercial districts 1.91%, and institutional spaces 4.65% (INDES, 2023).

Meanwhile in 2020, Malaysia's recycling rate was at 30.67%, markedly inferior to South Korea's 49%, Singapore's 59%, and Taiwan's 60% (INDES, 2023). The primary factors contributing to this situation include insufficient recycling infrastructure, a lack of public awareness, and the culture of fast fashion, characterized by the hasty disposal of inexpensive, trend-oriented apparel. Inadequate disposal methods, including open dumping and illicit incineration, exacerbate environmental degradation by releasing harmful substances and microplastics into the atmosphere, soil, and water (INDES, 2023). These problems highlight the pressing necessity for ecological and socially responsible design solutions to tackle the growing fabric waste crisis.

2. METHODOLOGY

Understanding the actual needs of homeless communities was the foundation of this study. Through interviews and engagement with social workers and individuals experiencing homelessness, the research team identified five essential requirements for sleeping bag design: affordability, thermal insulation, water resistance, portability, and durability. These insights echo real-world social design practices where functionality and context-specific usability are prioritised (These mobile homeless shelters fit in a backpack, 2019).

Constructing a Working Prototype

The process of design was heavily reliant on the selection of materials. Fabrics made of recycled polyester, insulating padding, and waterproof materials were selected taking into consideration their availability, functionality, and environmental friendliness. These materials have been demonstrated to be effective in other do-it-yourself and upcycling models, such as the creation of sleeping bags from comforters (Puffy Editorial Team, 2024) and open-source guidance for the construction of sleeping bags (My Material Life, 2016).

Following the completion of component testing, a prototype that successfully functions was built. This prototype had waterproof shells, insulating layers, and zippers. After that, the constructed prototype was put through a series of field tests in a variety of weather settings to determine its level of comfort, portability, and ability to provide protection. Further design modifications were based on the feedback received from users throughout the testing phase. This method is influenced by grassroots ideas such as Nirvaan Somany's project to upcycle jeans into sleeping bags for the homeless, which combines the reduction of waste with the promotion of social welfare (CSRBox, n.d.).



Image 1. Deconstructing Sleeping Bag

A sleeping bag in Picture 1.0 was assembled layer by layer in one of the steps, to figure out how each piece of cloth made into a sleeping bag one at a time. The sleeping bag's creation was made possible by this method, guaranteeing its future usability.

3. FINDINGS

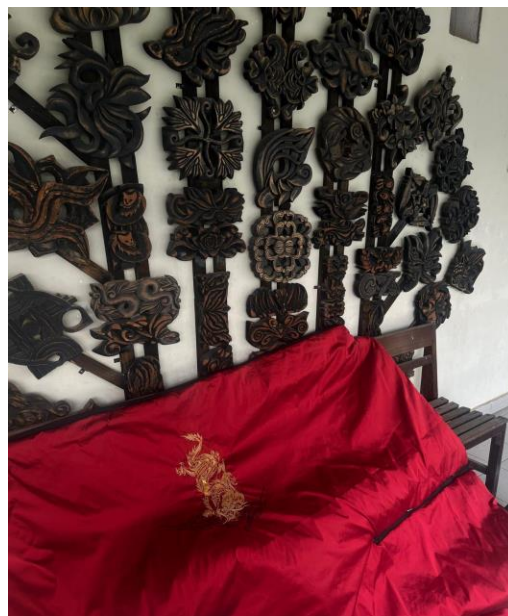


Image 2. Sleeping Bag

The results of the experiment demonstrated that the width of the fabric that was utilized had a significant impact on the ability to successfully make a sleeping bag, regardless of the material composition of the fabric. As can be seen in Picture 2.0, an open fabric that was formerly utilized to produce sleeping bags actually possesses a high quality that can be utilized for future applications.

4. CONCLUSION

The quick fashion industry, low recycling rates, and a lack of waste treatment facilities in Malaysia are all contributing factors to the country's growing textile waste problem, which is a serious environmental issue that is also growing. Due to the substantial amount of waste fabric, particularly from low-income residential areas, which contributes to pollution and the loss of resources, there is an immediate need for solutions that are sustainable.

In addition, the situation presents an opportunity to develop items that are both helpful and kind to the environment, such as sleeping bags for people who are homeless. Not only can sleeping bags be manufactured to be warm, waterproof, and portable, but they can also be made to be priced and environmentally friendly if the design, material selection, and testing are done with care. In addition to contributing to the reduction of waste from textiles, these technologies have the potential to improve the lives of those who are part of underprivileged group.

It is possible for us to get closer to a future that is more responsible, compassionate, and circular if we use sustainable design to address social and environmental challenges.

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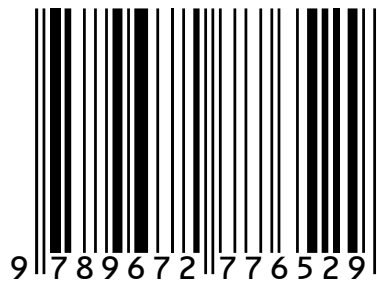
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