

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



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CREATING A GREEN RECYCLING HUB FOR SUSTAINABLE COMMUNITY ENGAGEMENT IN TAMBUN IPOH

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ABSTRACT

This project proposes a community-focused green recycling hub in Tambun, Perak, to address critical urban issues related to waste disposal, public hygiene, and social inclusivity. It explores a design solution that integrates infrastructure for waste sorting, composting, and educational outreach within a multi-functional space. Using ergonomic spatial planning, participatory design theory, and sustainable construction methods, the project enhances public awareness, supports local livelihoods, and promotes environmental stewardship. The hub includes dedicated zones for recycling, eco-commercial activities, community engagement, and recreational use. The architectural response leverages existing site strengths and stakeholder collaboration to facilitate a green lifestyle and integrated urban ecology.

Keywords: Community hub, Sustainable infrastructure, Waste management, Participatory design, Composting,

1. INTRODUCTION

Tambun, Perak, is currently facing escalating environmental concerns due to inefficient waste disposal methods and limited public participation in composting and recycling. According to UN-Habitat (2020), urban centers in Southeast Asia generate over 70% of their municipal solid waste from organic sources, yet only a fraction is properly composted. Locally, a lack of waste separation at the source, low public environmental awareness, and a disconnect between infrastructure and user behavior compound the issue. Despite efforts by municipal bodies like MUMSB, current systems such as STREAM AWCS focus more on collection and transport efficiency rather than encouraging sustainable community engagement. Additionally, urban studies (Stern, 2000; Ajzen, 1991) indicate that behavioral barriers—such as perceived inconvenience or lack of knowledge—hinder citizen participation in recycling practices. The problem this project addresses is the absence of an integrated public infrastructure in Tambun that not only manages waste effectively but also fosters behavioral change and social inclusion in sustainable practices. This architectural proposal envisions a Green Recycling Hub that spatially and functionally responds to this gap, aiming to transform waste into a community asset.

2. METHODOLOGY

2.1 Research Framework and Stakeholder Integration

The research methodology adopted a design-based approach involving site observations, community feedback, and collaborative engagement with stakeholders such as STREAM AWCS engineers and MUMSB. Demographic and behavioral mapping of Tambun residents was used to identify barriers to waste participation and inform spatial programming. Precedent studies of successful recycling facilities were also analyzed to determine effective models of engagement and flow.

2.2 Theoretical Framework and Design Strategy

The Theory of Planned Behavior (TPB), developed by Ajzen (1991), forms the backbone of the design philosophy. TPB asserts that human behavior is guided by intention, which is influenced by attitudes, perceived social norms, and control beliefs. This framework informed both the physical and experiential aspects of the hub: spaces are designed to increase perceived behavioral control (e.g., clear signage and ergonomic drop-off points), establish new social norms (through communal composting events and educational outreach), and shift attitudes via interactive zones like the children's library and public greenhouse. The layout integrates composting facilities, sorting stations, eco-commercial stalls, and recreational nodes into an accessible and coherent flow. A sustainability matrix guided decisions related to zoning, materials, and environmental strategies—such as modular construction using RC and steel, greywater harvesting, and passive ventilation—ensuring both user efficiency and environmental responsibility.

3. FINDINGS

The findings from the Green Recycling Hub project highlight four key outcomes that reflect its environmental, social, and technical strengths. First, the hub significantly reduces environmental impact by incorporating dedicated zones for recycling domestic waste, which decreases the community's dependence on traditional landfill methods. This initiative aligns with the STREAM Automated Waste Collection System, enhancing the locality's waste segregation and transport mechanisms (Figure 1 and Figure 2).



Figure 1 The ground floor plan of the MUMSB recycling facilities incorporating the STREAM AWCS.

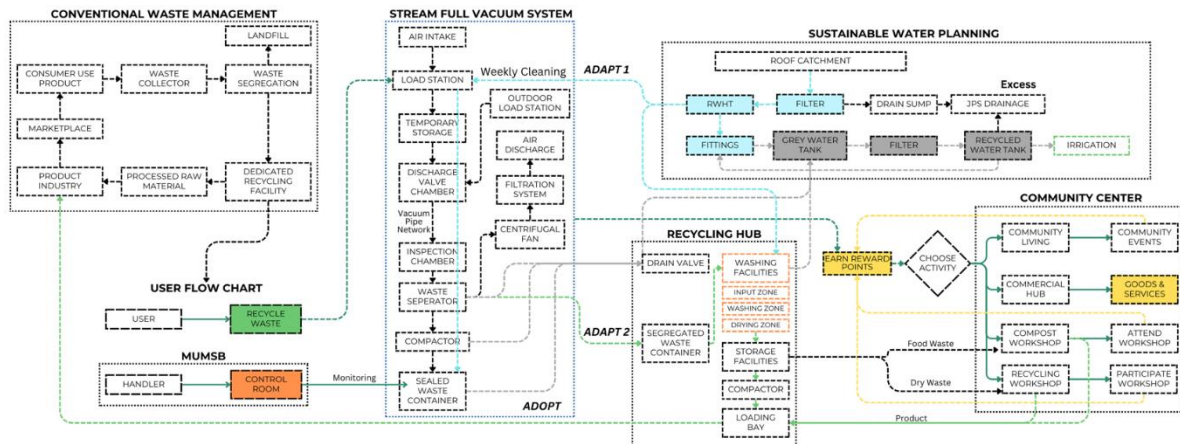


Figure 2 The technical study and integration of STREAM AWCS to the building program.

Second, the project promotes community empowerment through spatial design that integrates inclusive public facilities. These include eco-retail areas, a children's library, a nursery, and a fitness zone encouraging multi-generational use and social cohesion. The architecture responds to local needs by providing both functional infrastructure and social amenities that encourage behavioral shifts toward sustainable living. Third, collaboration with key stakeholders such as MUMSB and STREAM AWCS was crucial in aligning the project with municipal goals and technical feasibility. This integrative approach ensures smoother operations, greater public trust, and increased adoption of eco-conscious behaviors among residents. Finally, the design leverages modular construction systems using reinforced concrete (RC) and steel to allow flexible expansion and efficient maintenance. Environmental strategies, such as passive ventilation and water reuse, are embedded within the hub's spatial matrix. The ergonomic layout supports intuitive waste flow, improving public interaction with the recycling process (Figure 3).

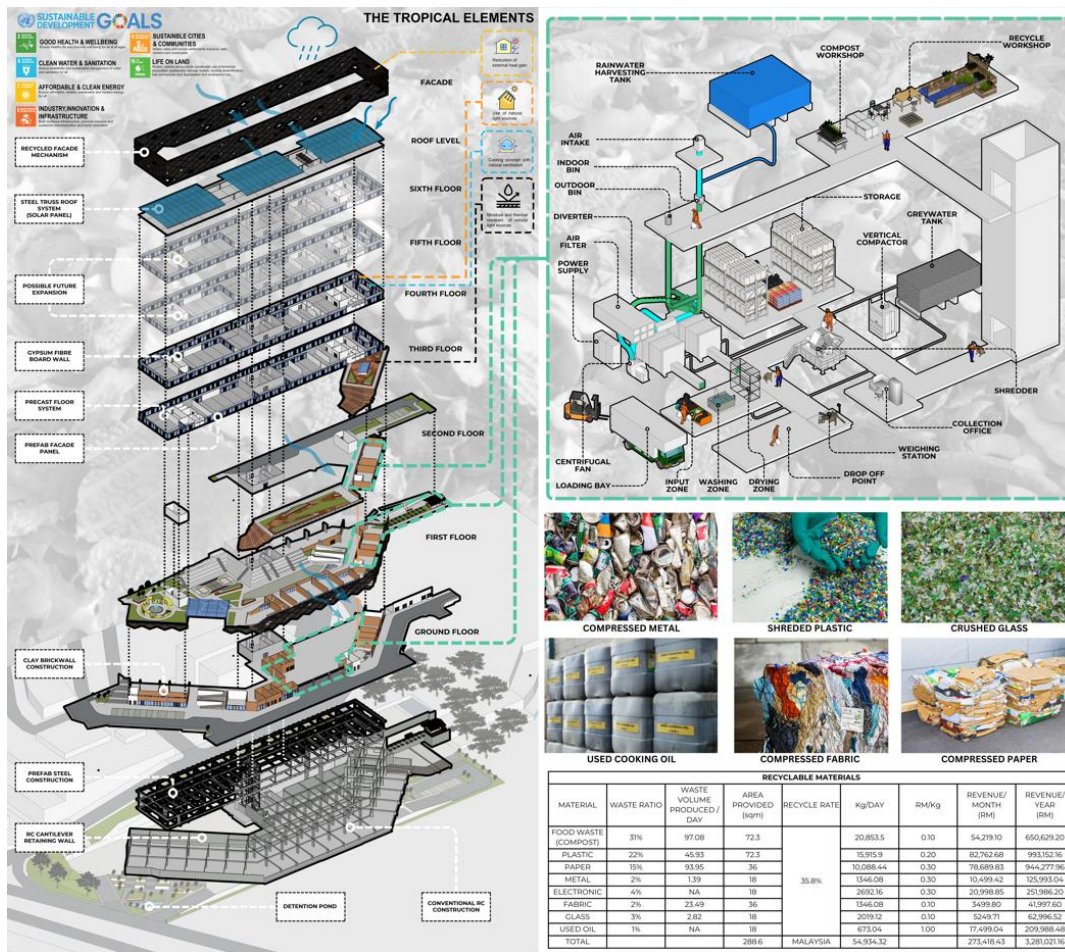


Figure 3 The building diagrammatic overall layout and structure incorporating the AWCS and the collection data for the building located in Tambun Ipoh Perak.

4. CONCLUSION

This project demonstrates how architectural intervention can drive sustainable change through community infrastructure. The Green Recycling Hub not only addresses environmental concerns but also revitalizes urban interaction through design. It becomes a replicable model for cities facing similar waste and social integration challenges.

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