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Building a Tiny House from Waste

An alternative platform for exploring sustainability

ABSTRACT

This paper contributes to the understanding of how critical reflection can be applied to sustainability. This was accomplished by tracing the progression of a tiny-house project over time and the associated activities, which involved sourcing secondhand and discarded materials. We are a group of researchers and practitioners who worked together to explore and challenge the established norms of sustainability in housing practices: who is building, what is being built, with what materials, and through which processes. The use of discarded materials as resources for building a tiny house came to be decisive in shaping a platform for inclusion and sustainable practices. While the most common practice of building involves buying the materials needed at a lumber yard, working with discarded and secondhand materials requires time and flexibility. Tools play a central role in adapting random waste to specific purposes, a process that also demands skills in handling tools creatively. Additionally, gathering, organizing, and cleaning are activities that should be given special attention when working with these types of materials. In this paper, we explain how we reinjected waste materials into the production chain and how our work contributes to sustainable development from environmental and social perspectives. The argument for sustainability in our research revolves around exploring processes that include more groups in society and alternative ways of organizing the resources available.

Keywords:

Sustainability, waste, social practice theory, queer, house.

INTRODUCTION

For most people, planning and building their own houses is beyond their imagination. Architects and building companies design houses as ready spaces in which people can move. People's homes are made to require little care, putting the residents in the role of passive users with no power to reimagine and/or repair their home. Houses have become bound to a consumerist society that promotes a culture of buying and discarding. People's houses have an impact on their roles as residents, where consumption is prioritized over being, doing, and producing (Slater, 1997). The constant flow of newly produced materials makes usable materials obsolete and generates large amounts of waste (Strasser, 1992). In fact, waste is generated at all stages of a house's production chain. For example, materials that do not meet specifications and standards due to, for example, poor handling and storage are rejected and end up as waste (Tafesse & Adugna, 2021).

In a consumerist society, people have the opportunity to constantly reevaluate what is considered clean, ugly, smart, or functional. In many cases, restoration and change are motivated by aesthetics, regardless of technical quality and performance (Plesser et al., 2013). Thus, the actual objective of reducing the generation of waste and, more generally, carbon emissions cannot be reduced only by making houses technically better and more efficient.

The tiny house movement offers an alternative to the consumerist paradigm in the housing sector by making the construction process accessible and allowing future users to be involved in designing and building (Boeckermann et al., 2019). It also promotes small and movable living spaces and, thus, a change in the prevailing European way of living. Such a change is hard to implement but can be decisive, as evolving toward sustainability depends on worldviews and beliefs as much as on technicality (Mang & Haggard, 2016).

This paper is based on a tiny-house project in which we included people and materials usually excluded from construction projects and explored how active participation and use of available resources can contribute to social and environmental sustainability.

In our research, we draw upon different concepts of sustainability, since there is no unified definition of the term. Sustainability is often described through the pillars of environmental, economic, and social dimensions (Purvis et al., 2019). Even though social sustainability considers factors such as quality of life, equity, and inclusion (Partridge, 2014), among others, it does not make use of human movement capacity nor does it link physical activity as a resource in the sustainable development (Salvo et al., 2021).

The conventional way to promote sustainability has been through what Shove (2010) calls the ABC model—attitude, behavior, and choice—which seeks to influence individual behavior as a means to achieve broader change. Within design, sustainability has been framed as “an act of choosing or informing choices of future ways of being” (Blevis, 2007). In the article “Elimination by Design,” Tony Fry argues for a radical reduction of the unsustainable rather than the creation and consumption of more “green” things. Mang and Reed (2012) posit that what is sustainable changes over time (p. 36). As suggested by the authors, we want to explore how citizens can “move from passive consumers of expert-designed sustainable products to actively ‘owning’ responsibility for their continuing sustainability” (Mang & Reed, 2012).

There are different examples of research within the design field connected to building, home, participation and sustainability, such as: participatory housing (Hilmer, 2020; Nuraeny et al., 2020); self-build with untrained builders (Heslop, 2021); building and living in a delimited space (Desjardins & Wakkary, 2016), literature review on home and domestic experiences (Desjardins et al., 2015); alternative dwellings (Oogjes et al., 2018). While previous research demonstrates examples of participation and sustainability, our work offers a novel context and approach that adds a layer of physical activity to sustainability discussion in relation to queer feminist theories.

We attempt to open the ideation and building process to people and describe the possibilities we see unfold when using discarded and secondhand materials. Our aim is to challenge existing methods of house building, which use binary concepts such as producers/consumers, efficiency/waste, and standard/nonstandard, and bring nuance to the prevailing way of understanding sustainability. We are inspired by and investigate how queer feminist theories and methodologies may help us articulate our ongoing work. For example, the spatial arrangements of buildings and interior objects both reflect and reinforce societal norms, and existing gender-based assumptions—such as the decorative and structural divide—have been reconsidered by feminist architectural theory (Ahmed, 2008, 2017; Bonnevier, 2007). It is our long-term goal to work toward building a society that resists discrimination and pulls apart hierarchies.

MATERIALS AND METHODS

Our approach involves staging the process of building a tiny house at two different sites where we interact with visitors and involve women and non-binary persons in related activities. The research presented is framed by the knowledge-creating paradigm described by Frayling (1994) and Gaver (2012) as “research through design.” We aim to move beyond conventional ways of reflecting on sustainable practice and investigate who is building, what is being built, with what materials, and through which processes.

To analyze our findings, we used social practice theory as a theoretical framework. This theory focuses on practice as the main unit of analysis and sees the individual as a carrier of the practice, in which their behavior is embedded in the prevailing organization of the practice (Shove et al., 2012). A social practice consists of three types of elements—materials, competences, and meanings—which are actively combined and integrated into a practice. We use social practice theory to identify examples of materials, meanings, and competences that are important for waste to become a resource when building a house. The empirical data discussed in this paper comes from the personal experiences of the team building the tiny house, notes and observations made during construction, footage, and the analysis of video material from engaging with visitors and participants.

PROCESS

The research process consisted of a series of activities, workshops, dialogues, and reflections that materialized into a physical design object: a tiny house. The project was initiated and led by a team consisting of three women (two of whom are design researchers and coauthors of the paper) with the support of a professional female carpenter (also a coauthor of this paper). Throughout the process, the team invited women and non-binary people to take part in building workshops, reflections, and discussions.

During the first year of the project, the team began the building process in a museum as a living part of an exhibition (Schaeffer et al., 2022). Later, the house was transported 30 km to be exhibited outside of a shopping mall for reused materials. The audiences at the two different sites both interacted with the tiny house team members during opening hours—while they were working on the house—and participated in open workshops.

The majority of the materials used for building were either discarded or from secondhand sources. The sourcing work was a continuous process, and the discarded and/or secondhand materials became central to the process because they forged connections between various people and the building team in unconventional ways. We will present the sourcing process in four phases: 1) gathering, 2) organizing and cleaning, 3) modifying, and 4) learning.

Sourcing and gathering

To avoid buying new materials meant spending a substantial amount of time searching for materials from alternative sources. The team searched for websites, industries, and private persons who either wanted to sell or discard leftover materials. With no personal connections in the construction sector,

this meant spending time calling and sending emails to different people and companies, hoping for positive responses. Thus, how we managed our time was crucial to the project (Kosmack Vaara, 2017; Kosmack Vaara & Akner Koler, 2021).

Let us describe a typical scenario when sourcing materials: A member from the tiny house team spots a large pile of materials next to or in the garbage container of a hardware store. She goes to the front desk and asks for permission to collect the “waste.” Shortly thereafter, the team picks up a trailer, loads the discarded material for free, drives it to the museum, unloads it, and stores it in the museum area (Video 1).



VIDEO 1. This video clip shows the process of collecting discarded material: from finding and piling bowed and crooked materials onto a trailer to storing and organizing the materials in the exhibition space. **To watch the video, click on the picture or [here](#).**

Since the team did not know whether and when they would find materials, they collected items whenever they came across something that might have become useful. Thus, a large quantity of materials was gathered before starting the building process to ensure that there would be enough resources. Discarded materials were found in different shapes and dimensions but only in limited amounts for each kind, a phenomenon that guided the construction process. For example, the walls were built with varying thicknesses because the design had to be adapted to the varying dimensions of the sourced lumber.

Organizing and cleaning

Most of the gathered materials were stored in the exhibition area at the museum. The museum space was limited, so it had to be rearranged and cleaned when materials were added to leave room for construction activities. The organization process also included moving the collected materials between different places, since storage was distributed among several locations (as seen in Video 1). Many times, different people (initially not part of the project) would help carry and organize the materials (Video 1).

Sawdust, small pieces of wood, dust, and leaves came with the materials—which had been stored outside—and accumulated in the exhibition area, requiring cleaning on a regular basis. In spite of this, insect-related problems still occurred (Schaeffer et al., 2022).

Modifying

As described earlier, some of the gathered materials had been discarded due to defects—for example, twisted and bowed wood planks that were no longer suited for standard use in construction. Working with these types of resources required a different approach compared to buying new, standard goods. The materials came in various qualities and shapes, and the team had to adapt them by, for example,

ripping them to the right dimensions before they could be used. Through processing the materials, the team members practiced using tools in both conventional and new ways, as shown in Video 2.



VIDEO 2. In this video clip, we see that assembling wood planks with nonstandard shapes is more than just assembly. It demands adapting the material, which is a great occasion to become acquainted with different ways of using modern tools. Here, we see a member using the miter saw as a plane. **To watch the video, click on the picture or [here](#).**

In many cases, the planks and lumber were twisted, and the team had to work together to attempt to straighten them. The technique used to straighten lumber involved using a wood lever, adjusting body positions to pull and push, and using screws to force the material into place (Video 3).



VIDEO 3. In this video clip, we can see different techniques and collaborative tasks in which one person supports the material using different body postures while the other handles the tool. **To watch the video, click on the picture or [here](#).**

As the project progressed, the team had to work with an increasingly challenging structure in which only a few parts were parallel or symmetric due to the materials not being straight/standard. This was

particularly problematic when working on the roof and using nonflexible materials, such as metal (Video 4).



VIDEO 4. This video clip shows the slight adjustments that were needed for the materials, illustrating that working with discarded materials is not as controlled and predictable as when the materials are straight/standard. **To watch the video, click on the picture or [here](#).**

Learning

During the building process, the team acquired knowledge through its interactions with discarded materials. The machines used for adapting the lumber were loud, difficult to handle, and could slip easily if not held properly.



VIDEO 5. In this video clip, we can see that handling different types of machines for the first time—such as the nail gun and circular saw—generated a feeling of insecurity. We also see the process of inviting other women and non-binary persons to workshops. **To watch the video, click on the picture or [here](#).**

Sometimes, the material would get stuck in the table saw or be pushed backward due to unevenness in the twisted materials. However, using the machines and tools on a regular basis, the team members learned to pay attention to feedback from the tools and interpret machine signals, adapting their approaches in different situations. What seemed intimidating and scary in the beginning soon felt more manageable, and the members of the tiny-house team were becoming autonomous, which was the goal of the process. The members shared their newly acquired knowledge with each other and organized workshops where other women and non-binary persons with little or no previous experience in building or handling tools were invited to participate, as seen in Video 5.

RESULTS

The narratives that emerge from the presented activities connect people, materials, and tools in different practices. Here, we use the elements of the social practice theory (competence, material and meaning) to understand and discuss the practices of transforming waste into resources.

Competence

Compared to the contemporary practice of building, which involves planning and purchasing all the materials needed, working with discarded materials demonstrates another type of timeline and organization. Activities of gathering, organizing, cleaning, modifying, and learning were performed on a recurring basis, which required more time and additional competence than the contemporary practice of building. For example, the team developed competence connected to getting in touch with people and asking for help, handling different tools, and learning how to modify and use the waste materials. In the activity of using these materials, the team members developed new competences related to how to collaborate and use their bodies as resources.

Material

Preparing and modifying the waste materials required different tools and machines. Machines such as the table saw and being able to handle them became especially important. (A table saw would not have been required if the materials had come in the necessary dimensions from the beginning.) Working with discarded materials contributed to opening up the process and creating a learning space where failure was allowed. The materials being already classified as waste lowered the threshold for participation, as there was nothing to lose / the material could not be spoiled. This opened up the opportunity for non-experienced builders to participate.

Meaning

The meaning element points to the norms of who is usually holding the tools and who has the knowledge. If people get involved in the building process and acquire competence in handling tools, this will most probably have an impact on their role as residents, as they will gain a broader repertoire of skills to modify and maintain their homes, as well as increase their confidence in general.

Norms around materials and activities unfold in what is considered useful, fresh, beautiful, ugly, etc., and how we manage time. For example, in our process, we showed that materials classified as waste can constitute resources. However, this transformation requires time. We also draw parallels to cleaning, a cyclic activity that is constantly ongoing and never finished. It is an activity that does not obviously lead forward but becomes increasingly important in the sustainable practice of sourcing waste and secondhand materials.

DISCUSSION

The goal of our work was to explore sustainability through staging a tiny-house project on a 1:1 scale. We were inspired by queer and feminist theory in the ways they show us how we can challenge and articulate the normative ways of building houses and working with sustainability. These theories prompted us to open up the process and involve people, materials, and tools that are usually not part

of the conventional building process. We aim to continue learning about and applying these theories in our future work.

Through the lens of social practice theory, we see that our approach changed the organization and pace of building, materials used, skills required, and who, when, and how people were involved in the project.

The activities around sourcing and handling discarded materials proved to be crucial in the practices of transforming waste into resources. Through social practice theory, we see how competences, materials, and meanings change when the practice of sourcing and handling materials changes (from conventional to a nonstandard way of building). Activities such as gathering, cleaning, and adapting are brought from low-status tasks to essential phases. Collaboration, the use of the body, and other people's time and energy also become important in transforming waste into resources.

Building a full-scale tiny house using defective materials following construction standards is a challenging task. Here, we do not argue that the resulting tiny house is a sustainable house; rather, we look at how waste can become a platform that invites a diverse group of people and materials to interact. Waste materials are discarded by professionals who want to build efficiently; however, we see other possibilities for using them:

- Daring to participate: waste is the best resource for learning, as it lowers the threshold for and opens up participation for non-experienced builders.
- Learning: activities of modifying and using waste materials provide opportunities for learning and developing confidence and trust in one's own abilities.
- Well-being: in the activities of sourcing and handling waste materials lies a layer of embodied participation, in which the use of a variety of movements can contribute to sustaining human ability.
- Sensibilization: by interacting with discarded material, people become aware of the vulnerability of our production chain, which is unable to manage nonstandard products.

CONCLUSION

The sustainable aspect of this project was not limited to reusing materials in itself but explored how this can be accomplished in a more systematic, consistent, and inclusive way. The activities of gathering and organizing happened in parallel with designing and building the tiny house, meaning that the construction evolved according to the available resources.

By working with discarded materials, we discovered how waste can become a resource both for the structure being built and for the purpose of learning and developing skills and abilities. Throughout the different stages of building, the tiny house formed a platform for involving persons who were usually not included in shaping our built environment and houses. The people enrolled in the project were invited to impact the life cycle of construction products by adapting discarded materials. Through the methods showcased, this project contributed by reimplementing a more resilient approach to the construction process in which products, wastes, and consumers all became resources.

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