Rethinking Kållered

From Big Box to a Reuse Hub: A Transformation Journey Toward Sustainability

by Sirma Duztepeliler
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Department Of Architecture And Civil Engineering
Architecture and Planning Beyond Sustainabilty, MPDSD
Master's Thesis In Architecture | Spring, 2024
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Abstract

In the current efforts to meet growing demands, routine practice is turning to the demolition of structurally sound buildings for the construction of new ones, despite conflicting with the United Nations' Sustainable Development Goals. In an ecosystem focused on economic and time efficiency pressures, the reuse of existing infrastructures and materials is often overlooked.

This thesis explores the potential to transform the recently vacated IKEA store in Kållered, Sweden, into a community-focused **"Reuse Hub"** instead of demolishing it. Built in 1972 and after serving for fifty years, the building was slated for demolition to make room for a new shopping center. Challenging this, the study aims to create a model for circular and sustainable economic practices that meet the needs of users at all levels, promoting resource efficiency, waste reduction, and a shift in societal consumption patterns.

As a result of a comprehensive methodology including literature and case study reviews, visits, and discussions with reuse-specialized companies, the project conceptualizes a multifunctional space. It encompasses a large-scale store for reclaimed construction materials, areas for construction businesses with sustainable practices, public workshops, and educational facilities. Various reuse-focused stores for reclaimed items are supported by communal areas such as food services, and seating areas to facilitate social interaction among diverse user groups and transition between spaces.

The key findings demonstrate that the project offers a feasible solution to the issue of reusing large vacant commercial properties. It makes reclaimed materials and items more accessible, proving that reuse practices can become the norm for both individuals and institutions, significantly contributing to a circular economy. The multifunctional approach does not only reuse an existing building but transforms it into a platform for learning and innovation, and a space for societal change.

These findings contribute to the discourse on sustainable development and circular economy practices, providing insights to replicate similar initiatives in other contexts. It highlights an alternative that could significantly reduce the construction sector's environmental impact. Beyond environmental benefits, it also illustrates how sustainable practices in the construction sector can catalyze a wider shift towards sustainability across society.

Keywords: Transformation, Reuse, Overconsumption, Circularity

Acknowledgment

I am deeply thankful to:

- My supervisor, John Helmfridsson, for his guidance and support throughout this thesis process,
- My examiner, Walter Unterrainer, for his teachings throughout my master's program,
- Petter Lodmark from QPG Arkitektur, Stina Moberg from Kikås Bruksbutiken, Stefan Favrin from Copper8, and Victor Meesters from RotorDC, who kindly spared time for me and shared their knowledge during my research,
- My dear colleague Saleh Abdul-Rahman, whose suggestion led me to the building I worked on, and
- My husband, for his unconditional support.

Thank you all for your invaluable help and encouragement.

About The Author

Bachelor

Anadolu University
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Master's

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Studios taken:

- Design and Planning for Social Inclusion
  (Sustainable development project in Miljonprogrammet areas of Gothenburg, integrating social and cultural aspects to technical and environmental aspects.)
- Sustainable Architectural Design
  (Design of a preschool in central Gothenburg based on sustainable design practices and passive strategies.)
- Sustainable Transformation of a Derelict Industrial Building
  (Sustainability focused transformation project of an old factory in Borås)

Work Experience

Various Companies
Istanbul / Turkey
2009- 2016

After completing my bachelor's degree, I worked in various companies and ran my own practice in Istanbul, Turkey, for over six years. In a city like Istanbul, where the construction industry is intense, I had the opportunity to work on a wide range of projects in a short period, including residential buildings, commercial buildings, and public buildings.

Throughout my master's education, I took a path focused on sustainable architectural practices, transformation projects, and reuse. Pursuing a master's degree in sustainability at Chalmers University of Technology has been an mind-opening experience for me. Having experienced a system where the construction frenzy is the norm, I can see the crucial importance of sustainability and the role sustainable architecture practices in shaping a better future and I hope to be a part of changing this perspective in the future.

Reading Instructions

01 Introduction

The introduction section provides general information about the thesis and its framework. Here, you can find the purpose of this thesis, the main question it addresses, and the research methods used.

02 Theory

This section explains the theory behind the study and the research conducted in this field. The concepts discussed here form the foundation of the project's concept.

03 Context

This section provides information about the project area. It includes details about the project's location and the existing building under study.

04 Case Studies

The case studies section highlights exemplary projects and applications that contributed most to the development of the project, selected from many projects examined during the research process. It provides information about these projects and explains their impact on the thesis project.

05 Design

The design section presents the proposed design idea for the thesis project. It includes program development studies, drawings at different scales, and related works of the designed project.

06 Conclusion

This is the section where the results of the study are examined and personal reflections are made.

07 References

All the works cited and referenced in the thesis project are listed here.

08 Appendix

This section contains additional data related to the project design, such as the detailed project program and extra render images, and supplementary visuals of the building's final state.

Glossary

Overconsumption
Overconsumption refers to the excessive use of resources and consumption of goods beyond what is sustainable or necessary for one's needs. It is often driven by consumerism and the pursuit of goods, contributing to a culture of waste and environmental issues (Overconsumption, n.d.).

Circular Economy
The circular economy is a system that aims at eliminating waste and the continuous use of resources through the principles of reuse, repair, refurbishment, and recycling to create a closed-loop system, minimizing the use of resources and the creation of waste, and extend the life cycle of products (Circular Economy, n.d.).

Sustainability / Sustainable Development
Sustainability or sustainable development refers to developing by meeting the needs of the present without compromising the ability of future generations to meet their own needs (Sustainable Development, 2022).

Sustainable Development Goals (SDGs)
In 2015, the 2030 Agenda for Sustainable Development was adopted by the UN Member States. One of the most well-known elements of this was the 17 Sustainable Development Goals (SDGs) which set out various goals that the international community must work together to achieve – ranging from environmental and social to economic issues (Browne, 2022).

Reclamation / Reclaimed Materials
Reclamation is the act of returning something to a former or better state. Reclaimed materials usually refer to materials that have been used before either in buildings, temporary works, or other uses, and are re-used as construction materials without reprocessing. The materials may be altered, re-sized, refinished, or adapted, but they are not reprocessed in any way and remain in their original form (Reclamation, n.d.).

Recycle
The processing of used materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials and energy, and lower greenhouse gas emissions compared to virgin production. Recycled materials are considered to be reprocessed and re-manufactured to form part of a new product (Recycle, n.d.).

Reuse
Reuse is the practice of using an item, whether for its original purpose (conventional reuse) or to fulfill a different function (creative reuse or repurposing). It should be distinguished from recycling, which is the breaking down of used items to make raw materials for the manufacture of new products (Reuse, n.d.).

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01 INTRODUCTION

1.1 Background

Consumption and Construction Sector

In today's world, overconsumption and impulsive buying have become foundational trends within the global culture of consumption. This phenomenon is not limited to perishable goods or fashion but extends to infrastructure and the built environment. The prevailing belief that "new is always better" has triggered a cycle of demolition and reconstruction, contributing significantly to environmental degradation and the unnecessary depletion of natural resources. This cycle leads not only to the wasteful use of materials but also to substantial environmental harm through the generation of construction and demolition waste.

Within this context, the construction industry, a cornerstone of urban development and economic growth, finds itself at the intersection of consumer habits. The demand for new buildings is fueled by society's tendency towards consumption, maintaining the cycle of constructing new structures while adaptable ones are overlooked and demolished. This process often disregards the potential for the reuse of buildings and materials, considered economically and logistically unfeasible in a culture prioritizing rapid consumption and growth. Such practices result in a range of outcomes, from increased material consumption to elevated carbon emissions, positioning the construction industry as a significant contributor to global environmental issues. However, a shift towards reuse and reclamation within the construction sector could offer substantial economic, environmental, and societal benefits, significantly reducing the ecological footprint of construction.

Challenges and Opportunities in Reuse

The concept of reuse here focuses on the adaptive redesign of existing buildings and materials, extending their life cycles and reducing the demand for new resources. The concept of reclamation involves the meticulous removal and processing of materials from buildings slated for demolition, making them ready for reuse. Meanwhile, transformation encompasses the comprehensive redesign of spaces to meet current and future needs, incorporating flexibility, sustainability, and innovation. Collectively, these practices represent a holistic approach to sustainable urban development, supporting circular economy principles by repurposing existing resources.

Today, at the center of this subject, the reclamation process faces numerous logistical and technical challenges (GreenSpec, n.d.). The systematic dismantling of structures is followed by the need to sort, clean, and store materials such as brick, wood, metal, and concrete. Additionally, the logistics of collecting and distributing these materials are complex and costly and the synchronized availability of reclaimed materials for new construction projects poses a significant challenge. Despite their clear environmental and economic advantages, the lack of standardized testing and certification processes to guarantee the quality of materials and structural elements further restricts the adoption of reclaimed materials in the construction industry. The scale of buildings constructed with reclaimed materials is generally limited; larger-scale projects are rare and often hindered by regulatory, logistical, and economic barriers.

Retail Sector and The Case of IKEA Kållered

Once symbols of economic prosperity and convenience, big-box retailers now find themselves grappling with changing consumer preferences, economic shifts, and the undeniable environmental impavcts of their presence. Since 2020, evolving economic trends and consumer habits have led to the unprecedented closure of thousands of stores worldwide, serving as clear evidence of the changing dynamics in the retail sector. Consequently, empty storefronts are left behind, awaiting redirection toward alternative solutions (The Crisis in Retailing, n.d.).

In this context, the reuse of the vacated old IKEA store in Kållered, as the subject of this thesis, acts as a case study for examining the potential for transforming the construction sector and consumer habits. It arose from the need for a new approach to urban development, minimizing the use of new construction materials, reducing carbon emissions associated with construction, and preserving the established urban fabric.

Constructed in 1972 and vacated after nearly 50 years of service, the building's fate reflects the destiny of many large retail spaces in the face of changing economic and consumer conditions. The preliminary decision to demolish the structure for new commercial development underscores the need for alternative approaches that prioritize sustainability over consumption. While constructing a new shopping center may seem to contribute to economic well-being, the risk of encouraging excessive consumption before addressing the genuine social needs of the community is higher.

The decision to demolish the old store in Kållered also contradicts IKEA's commitment to sustainability and its environmental goals. The brand aims to reduce more greenhouse gas emissions than it produces by becoming "climate positive" by 2030 (IKEA, 2023). This demolition decision represents a significant contradiction with IKEA's stated values, showing a preference for traditional, consumption-focused retail management. Alternatively, transforming the Kållered store could have reinforced IKEA's dedication to minimizing waste and promoting a circular economy, thereby strengthening its leadership in sustainable retail.

In this regard, this research discusses the potential of these buildings to be a catalyst for positive social transformation, extending beyond their environmental footprint. It seeks to transform underutilized spaces into vibrant hubs that serve a deeper purpose than mere consumption, ultimately paving the way for a more sustainable and inclusive urban future.

Figure 1. A view of the closed IKEA Kållered store. (Google. 2024. Street view at 57.6038523, 12.0495964. Google Maps)

1.2 Aim

The aim of this thesis is to shift the narrative from traditional architectural consumption to a forward-looking model of sustainability and circular economy. This attempt is not merely about repurposing a structure but symbolizes a broader shift towards community engagement, transforming a once symbol of mass consumerism into a center for circular practices and education.

The selection of the old IKEA store has symbolic importance, representing a turning point from consumption to reuse. This project takes advantage of the building's strategic location and significant size to create a versatile hub and is designed to encompass a wide range of activities under one roof, aiming to foster a sustainable mindset within the community and offer an alternative to the accessibility problem of reusable products. This approach goes beyond preserving physical resources, aiming to demonstrate that economic gain can be achieved through a circular business model.

At the heart of the project's rationale is the recognition of a critical gap in the building practices ecosystem: accessibility to reclaimed construction materials. Despite the growing interest among developers and builders in incorporating reclaimed materials into their projects, logistical challenges and the absence of a centralized, accessible, and permanent source significantly hinder these practices. Moreover, the lack of a center where individuals can find a variety of products ranging from construction materials to everyday items in one accessible location prevents the establishment of reuse habits in the community. The project aims to fill this gap with a comprehensive Reuse Hub concept, offering a large-scale facility for the storage and sale of reclaimed materials and gathering spaces that can offer a variety of products to people. With this, it seeks to facilitate access to reusable materials for both institutional projects and individual needs on every scale.

This study stems from a fundamental question of how can sustainable building practices become the norm rather than the exception. The research journey uncovered the harsh realities of the current environment, where the potential for material reclamation is often lost to demolition due to logistical and coordination challenges. Therefore, the vision for the Reuse Hub leverages the expansive space of the former IKEA store not only to offer a solution to these challenges but also to create a catalyzer that pushes us towards a future where consumption patterns are transformed.

Overall, this thesis serves as evidence of the belief that sustainable practices can and should be integrated into the core of our built environment. Through the transformation of the IKEA store in Kållered into a Reuse Hub, this project advocates for and encourages the integration of economic practices with principles of circularity and demonstrates an alternative approach is possible.

1.3 Research Question

> *"How can the transformation and adaptive reuse of the old IKEA building in Gothenburg's Kållered district contribute to transforming overconsumption, and impulsive consumerism into environmental sustainability, while fostering a sense of community?"*

1.4 Scope

The content of this project encompasses both a vast physical and conceptual area, which requires placing the scope within a certain framework. Primarily, this work is fundamentally an architectural design project focused on a relatively understudied concept. Therefore, it adopts an approach that requires the development of a comprehensive business model framework, yet does not include detailed economic calculations and feasibility analyses. The main objective of the project is to facilitate the transformation of the existing building by creating functions focused on reuse within it and exploring a circular economy solution.

Within this scope, the content of the project includes the possibility of reusing the building and its contained materials, presenting reclaimed materials back to the public, and offering an alternative approach to current consumption habits. Requirements at the urban planning scale, focus on legislation and regulations, economic calculations and cost analyses, construction techniques, and building details are consciously excluded from the project's scope. This exclusion is a necessity to maintain focus on the project's main vision and achieve its overall objectives.

1.5 Methods

Throughout this study, there has been a need for transitions between different methodologies and the blending of various techniques. Theoretical methods such as literature reviews and case studies, along with practical methods like site visits and discussions with different experts, have been applied simultaneously.

Literature Reviews

Literature reviews constitute the first method forming the basis of the thesis. This involves compiling supportive articles and scientific studies that define the main idea of the subject of the thesis. In this thesis, literature reviews have been periodically conducted throughout a significant portion of the design process until its conclusion.

Case Studies

Another comprehensive theoretical method used is case studies. Case studies are an essential part of the architectural design process, relying on the examination of relevant examples. By examining other examples similar to the subject of the study, functions, and design principles are analyzed. In this thesis process, the cases examined have provided insight into approaches to the transformation of large-scale structures and have also contributed significantly to determining functions and content. Sometimes, projects from different fields in case studies can serve as references for various aspects of the study, while other times, these examinations can be conducted directly through visits.

Visits

Visits include visiting reference implementations as well as visiting the project area at different stages of the study and examining it repeatedly. Throughout this thesis process, the project area has been visited at different times. Initially, these visits are crucial for developing our perception and understanding of the building. As the process progresses, different visits help identify various details of the study. Additionally, visits and discussions with officials at the Mölndal Kikås Recycling Center and their affiliated Bruksbutiken (The Thrift Store) have provided valuable information in line with the project's content.

Interviews

Another method that has been equally beneficial as visits is conducting interviews with experts in the field. Accessing relevant individuals can provide very specific information related to the subject of the study. In the research process of this thesis, there have been opportunities to meet with experts from ***Copper8*** in the Netherlands and ***Rotor DC*** in Belgium. Discussions were held with Copper8 representatives regarding the feasibility studies of the Upcycle Mall project planned by The Municipality of Rotterdam (The Upcycle Mall: From Design to Operation 2022). This discussion provided valuable insights into the necessary conditions for such a project, which aligns with the main theme of the thesis. On the other hand, the interview with Rotor DC demonstrated the feasibility of implementing a similar example. This discussion proved the increasing potential of reclaiming and reuse and also as a profitable business model.

A thesis study can only be accomplished through the harmonious use of various methods. While the study subject and content determine the choice of these methods, sometimes an applied method requires the application of another method. What is certain is that this process is often not linear but consists of iterative cycles of progression and regression.

02 THEORY

2.1 Overconsumption

In the contemporary global environment, the challenge of sustaining the health of our planet while meeting the needs and desires of its inhabitants has never been more apparent. At the center of this challenge is the drive for economic growth and the pursuit of a better quality of life leading to consumption patterns that bring our natural resources to the brink of exhaustion. This dynamic, driven by endless demand, casts a significant shadow over efforts to achieve environmental sustainability and social equity. At this critical juncture, the concept of excessive consumption emerges as a significant problem that demands change.

The concept of overconsumption refers to the consumption of resources and products beyond what is sustainable for the environment and society. It is characterized by the rapid depletion of natural resources, significant waste production, and imbalances in global consumption patterns, resulting in evident ecological damage and degradation (Overconsumption (economics), n.d.).

Material use worldwide has increased more than threefold in the last 50 years, continuing at an average annual pace of over 2.3% (United Nations Environment Programme, 2024). This increase is largely due to the expansion of consumption culture in both developed and developing countries. This trend not only points to a concerning level of resource depletion but also highlights inequality in the use of resources. While only 20% of the world's population consumes 80% of its resources, unsuprisingly, wealthier and more developed countries are responsible for most of this. An average person in North America consumes nine times more natural resources than an average person in Africa (Sentient Media, n.d.). The distribution of used resources is unequal, and a large part ends up as waste without being recycled or reused. The built environment and transportation systems are the leading drivers of increasing demand, followed by food and energy systems. Combined, these account for about 90% of global material demand. If this trend continues, resource extraction is projected to increase by 60% by 2060 compared to today (United Nations Environment Programme, 2024).

Sweden has one of the world's most ambitious reduction targets, aiming for net zero emissions by 2045. Although the country's economy is relatively low-carbon, it is still largely linear. According to the Global Circularity Gap report, the amount of new material introduced into the economy each year amounts to 25 tons per person, partly because Sweden has the fourth largest mining output in the world and a vast majority of these extracted resources are exported. More than 96% of the resources used are virgin sources, with 20% consisting of non-recyclable resources. 40% of the total resources are allocated to the construction and infrastructure sector (Circle Economy, 2022).

"Material use worldwide has increased more than threefold in the last 50 years, continuing at an average annual pace of over 2.3%." (United Nations Environment Programme, 2024)

Consequences of Overconsumption

Overconsumption leads to numerous environmental outcomes. It disrupts natural cycles, causing loss of biodiversity, soil degradation, water scarcity, and a decrease in air quality. Moreover, the resulting waste has become a separate global crisis, devastating ecosystems and habitats. This environmental degradation endangers air and water quality, leading to respiratory issues, waterborne diseases, and other health problems in humans. Additionally, the culture of overconsumption is linked to obesity and other diseases arising from sedentary lifestyles promoted by over-nourishing societies and consumer cultures.

One of the most critical impacts of overconsumption is its negative contribution to climate change through consumption-based greenhouse gas emissions. These emissions arise not only from direct consumption but also from the production, transportation, and disposal of goods. Particularly, developed countries have a significant per capita footprint far exceeding that of developing countries.
The consumption-based greenhouse gas emissions of the Swedish population have seen a 29% decrease in per capita emissions from 2008 to 2021, with an annual average of about 8 tons. Approximately 60% of these emissions stem from household consumption, while the remaining 40% are due to public consumption and investments (e.g., in buildings, machines, residences, and valuables) (Naturvårdsverket, n.d.-b).

The Role of Retail in Overconsumption

The retail sector has a unique capacity to influence overconsumption, acting both as a mirror reflecting consumer demands and as a force guiding them. Big-box retail stores and online shopping have made products more accessible than ever, feeding the culture of convenience and instant gratification. This ease of access, combined with aggressive marketing and fast fashion strategies, further fuels consumption.

The rise of e-commerce has added a new dimension to both consumption habits and the retail sector. With wide selections and the convenience of home delivery, online platforms have the potential to reduce the future presence of physical retail. In 2023, a significant percentage of individuals across various age groups in the EU shopped online. 87% of these users were observed to be between the ages of 25-34, highlighting a generational divide where younger consumers are more inclined towards e-commerce compared to older age groups. The majority of purchases involved clothing, shoes, and accessories, followed by restaurants, fast food, or catering services, and cosmetics and beauty products (Eurostat, n.d.).

In Sweden, like many countries worldwide, the e-commerce market has seen considerable expansion over the last decade. Although there is no specific data on the closure of physical stores, the continuous growth of e-commerce suggests the possibility of a decrease in the number of physical retail spaces. This situation also raises the possibility of an increase in the abandonment and closure of existing stores.

On the other hand, in Sweden, there has been an increase in second-hand product sales and reuse-focused circulation on online platforms. Sustainability has become a primary motivation and reason for the increase in second-hand purchases, driven by growing awareness. As the environmental impact of fashion is discussed more frequently, an increasing number of consumers are starting to prefer second-hand and vintage clothing as their chosen mode of fashion consumption. Consumers mostly purchase second-hand clothing, furniture, and household items, with used pet products being among the least preferred (Statista, 2023).

As consumer awareness and interest grow, the reuse market will expand even more rapidly. In this context, meeting some of the increased demand through physical stores can not only mitigate the side effects of online sales, such as shipping and packaging but also revitalize stores left idle by changing trends.

The Role of the Construction Sector

Parallel to the retail sector, the construction industry also plays a significant role in global resource usage and waste production. As cities expand and infrastructure becomes insufficient, the demand for new construction continues to increase. This demand leads to significant extraction of raw materials such as timber, metal, and minerals, as well as energy consumption, contributing to habitat destruction, loss of biodiversity, and greenhouse gas emissions. Another major impact of the construction sector is its place as a significant producer of waste, from demolition to leftovers and unused materials. Construction and demolition waste is responsible for approximately 30% of the total annual waste production worldwide (Breteler, 2022).

In Sweden too, construction and demolition activities contribute significantly to the total waste produced annually, highlighting a global issue as Linnea Alenius mentioned in her thesis: *"There are different reasons why buildings get demolished, but common motives are a desire for higher exploitation, that the existing building is 'too small for the value of the plot' or simply that the building is worn out. "* (Alenius, 2022). It is observed that the potential for higher financial gain without the necessity for the building's deterioration is a sufficient reason for demolition (Alenius, 2022). This choice not only intensifies resource consumption but also overlooks the potential of existing structures and materials to meet the needs of society.

In 2020 in Sweden, excluding mining waste, 35.7 million tons of waste were produced; of this, 14 million tons belonged to the construction sector alone (Naturvårdsverket, n.d.-c). Construction and demolition waste results from demolition and construction engineering works, as well as construction activities from other industries and homes, with a significant portion generated by infrastructure and construction engineering projects. The main types of construction waste include excavated soil, concrete, bricks, asphalt, and similar materials (referred to as mineral construction and demolition waste) (Naturvårdsverket, n.d.-a). The most common treatment of construction and demolition waste is its downcycling as construction material.

Despite these challenges, the construction sector also harbors significant opportunities for positive change. Innovations in construction materials, building techniques, and waste management that focus on reusing existing buildings and materials can significantly reduce the sector's environmental impact.

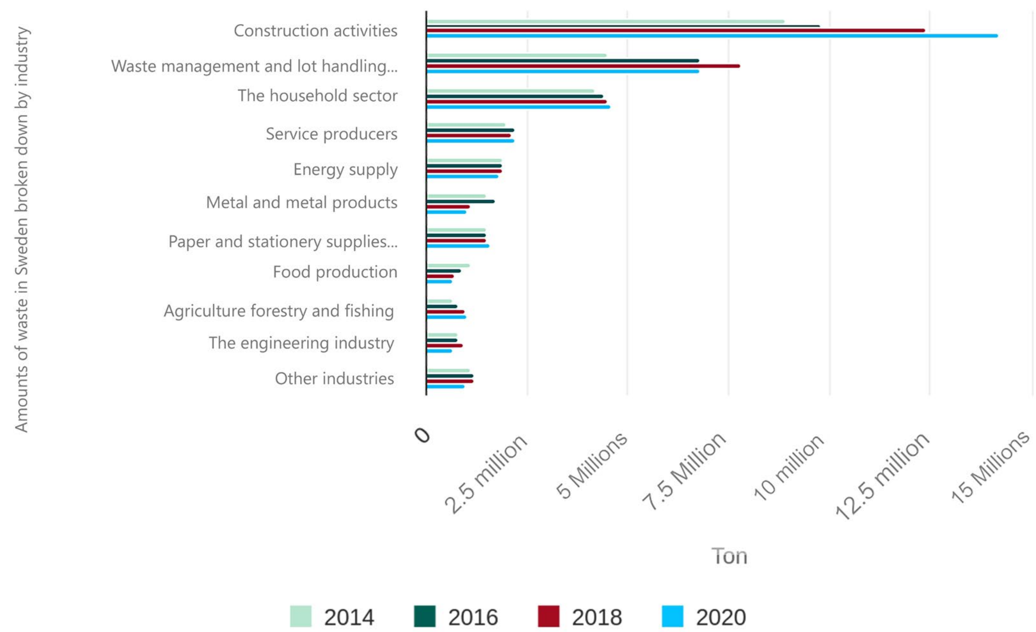


Figure 2. Waste volumes generated by industry in Sweden between 2014 - 2020. Graphic taken from Naturvårdsverket (Avfallsmängder i Sverige. (n.d.). Retrieved from https://www.naturvardsverket.se/data-och-statistik/avfall/avfallsmangder/)

2.2 Circular Economy

From Linear to Circular

Traditionally, the global economy has operated on a linear "take, make, dispose" model, where resources are extracted, transformed into products through production, and eventually discarded back into the ecosystem as waste. This linear economy and the cycle of overconsumption feed into each other, contributing to environmental degradation. In contrast, the circular economy seeks to separate economic activity from the consumption of finite resources and aims to eliminate waste from the system. By creating a closed-loop system through reuse, sharing, repair, refurbishment, remanufacturing, and recycling, it reduces the use of resource inputs and the creation of waste, pollution, and carbon emissions (Circular economy, n.d.).

According to The Circularity Gap Report, published February 2023, the global circularity has shrunk from 9.1% of total material inputs in 2018 to 7.2% in 2023 (CGR 2023, n.d.). *"This isn't simply because we're failing to cycle more,"* it says. *"It's also due to increasing virgin extraction and the fact that we are putting more and more materials into stocks like roads, homes and durable goods."* (World Economic Forum, n.d.-a). The report forecasts that a circular economy could reduce global material extraction by a third.

At the heart of the circular economy are the principles known as the 3Rs: Reduce, Reuse, and Recycle, which were later expanded into a more comprehensive framework. This framework was extended by Cramer (2017) into the 10R principle, encompassing Refuse, Reduce, Renew/Redesign, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover. The R-ladders, originate from the "Ladder of Lansink," a framework for waste management and resource conservation which is introduced by Dutch politician Ad Lansink in 1979. This concept is also referred to as the "Waste Hierarchy" or the "Hierarchy of Waste Management" (Köhrer, 2024). These principles represent a hierarchy and are a common way to discuss or measure circularity. By implementing these principles and separating technical and biological cycles, the circular economy aims to keep products, components, and materials at their highest utility and value at all times.

As mentioned earlier, in Sweden, construction wastes are generally downcycled. This is the least preferred recycling path due to the degradation of materials and the loss of embedded energy (Breteler, 2022). Because the recycling process itself consumes energy and produces emissions, in a circular economy, products are designed to be reused over multiple life cycles instead of being immediately recycled.

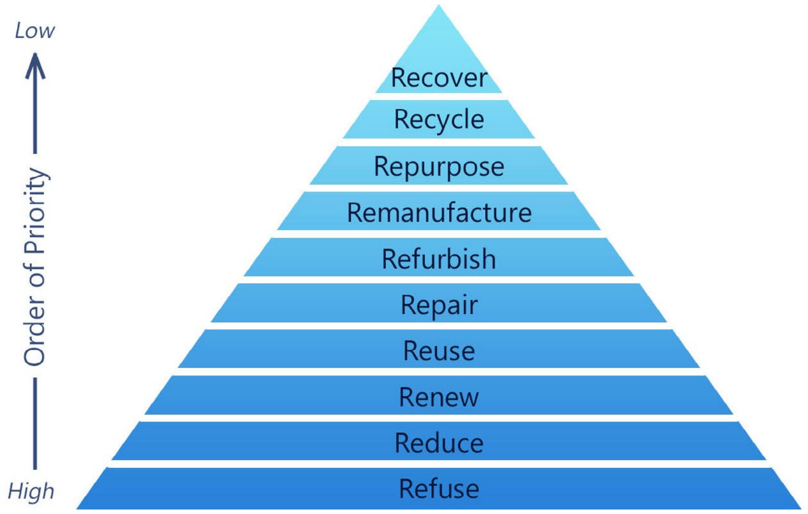


Figure 3. 10R Principles of circular economy. Based on Cramer, 2017.

How Can the Construction Sector Become More Circular?

Europe's intense dependency on imports from outside the European Union and the global scarcity of these materials are making the transition to sustainable raw materials increasingly urgent. Although systems for the reuse of products and materials exist in the construction sector, they are predominantly of low quality (Cramer, 2017). Focusing on more advanced reuse methods and more efficient recycling can facilitate innovative growth and create new employment in the sector, along with enhanced environmental protection. One of the fundamental conditions for achieving this is fostering cross-sector collaboration. Reducing raw material use can only be achieved when different sectors collaborate to offer waste materials and by-products from their production to other sectors as raw materials. Such an approach will not only bring financial value to companies but also increase the visibility and awareness of reuse on a public level.

Sustainability-focused practices in the construction sector should place more focus on reuse and reclamation principles. Efficient implementation of these principles allows for the continued use of existing resources with minimal energy expenditure. Accordingly, the transformation of existing buildings should be prioritized over demolition, and in cases where demolition is unavoidable, deconstruction and material reclamation should take priority. New constructions should also support the use of reclaimed materials, along with designs for recycled material use and efficient energy consumption. By applying the principles of the circular economy more effectively to the design of the built environment, we can create more livable, productive, and functional urban spaces while reducing greenhouse gas emissions. Such a transformation is estimated to reduce the demand for materials and could decrease global CO_2 emissions from building materials by 38% by 2050 (Ellen MacArthur Foundation, n.d.).

Research has shown that in Europe, 10-15% of construction materials are wasted during construction, and 35-40% of offices remain idle even during working hours (First steps towards a circular built environment, n.d.). For the most efficient use of existing and new buildings, current usage and construction methods must be reviewed. Modular and flexible planning of buildings in the design process will provide the opportunity for adaptation to needs that may change in the long term. Similarly, buildings designed to use less energy and be disassembled rather than demolished can conserve resources. Designing multi-functional programs will provide more space alternatives in fewer structures for different time periods. By prioritizing Life Cycle Assessment (LCA), all stages of the life of buildings can be systematically evaluated from the beginning and decisions can be made accordingly at the design stage.

"Research has shown that in Europe, 10-15% of construction materials are wasted during construction, and 35-40% of offices remain idle even during working hours." (First steps towards a circular built environment, n.d.)

Reuse

When most people think of the circular economy, waste management often comes to mind first. However, the circular economy encompasses much more. It fundamentally focuses on preventing materials from becoming waste and delaying this process as much as possible. No material or resource should be seen as waste; they should be reused for as many different purposes as possible.

Reuse is the action of using a previously used item for its original purpose or for a different function. Items are not disintegrated or undergone similar processes, which distinguishes reuse from recycling (Reuse, n.d.). This approach preserves the embedded energy of materials and typically requires less energy compared to recycling. Reuse helps to save time, money, energy, and resources, and can extend the lifespan of existing products before they become waste. This means a significant reduction in carbon emissions associated with material processing. Studies show that reusing a product has the potential to cut down on both CO_2 emissions and the overall carbon footprint by over half when compared to the product's entire life cycle (Reuse, n.d.).

In the context of the construction sector, reuse refers to the practice of using existing materials, components, or entire buildings for new purposes. It covers the reuse of buildings as a structural whole and the use of materials and building elements, ranging from structural to aesthetic elements. Similarly, reclaimed materials are those salvaged from demolished or refurbished areas and reused in new construction projects. These materials are not reprocessed or remanufactured. They can be resized, refinished, cleaned, and used in their original forms. A reclaimed material can also be adapted for a different purpose than its initial use (Sustainable Build, n.d.).

In fact, reclamation is a practice and habit that goes back to human history. Known historically as "spolia," this practice represents people using elements from an older structure in newly constructed buildings for different purposes. Forgotten in recent centuries with the habits of increasing consumption, this approach actually has countless examples worldwide from ancient times (Spolia, n.d.). People using this method were likely unaware of the heritage they were preserving and creating at the time. However, today, this could offer a new option for preserving the character of our architectural heritage and built environments.

Figure 4. An example of spolia. Reuse of ancient building elements centuries later in a village house. Aphrodisias, Aydin, Turkey (Ertuğrul, E. (2021). Ara Güler'in Gözünden Tüm Ayrıntılarıyla Aphrodisias 1958. Retrieved from https://arkeofili.com/ara-gulerin-gozunden-tum-ayrintilariyla-aphrodisias-1958/). Photographer: Ara Güler

Reusability in Construction and Its Challenges

The process of reclaiming existing materials from all kinds of stocks, including buildings, infrastructures, industries, and products, is also known as "Urban Mining." This process positions every built environment as a 'mine' full of valuable materials ready for utilization (Breteler, 2022). The practice of urban mining involves a careful deconstruction of buildings to reclaim products and materials for future use. Unlike demolition, which prioritizes speed and results in significant resource loss, deconstruction adopts a careful approach aimed at preserving the integrity of materials for reuse.

The journey to make reuse a common approach in construction involves overcoming various barriers, including regulatory challenges, market demand for reused materials, and the need for specialized skills in deconstruction. Despite these challenges, the potential benefits of reuse within the construction sector are immense by reducing environmental impact, conserving resources, and offering economic advantages.

The low rates of reuse and recycling in the sector are due to most building components not being designed for disassembly, and the excessive time required for disassembly making it a much more expensive process (GreenSpec, n.d.). The tight timeline of the demolition process and the care required to maintain the integrity of reusable materials significantly limit deconstruction opportunities. Demolition contractors note that deconstruction can take two to ten times longer than demolition work, turning it into a notable economic disadvantage (GreenSpec, n.d.). This challenge is further compounded by a lack of collaboration among stakeholders, including companies dealing with demolition and suppliers of reclaimed products. Additionally, coordination between demolition, material harvesting, and transfer to a new project remains complex. The lack of standardized practices further increases the required cost and time, leading to low demand for reusable products in fast-paced construction environments.

Moreover, negative perceptions and a general lack of awareness among developers and stakeholders about the value and feasibility of reused products pose a significant social barrier. The confusion and wider scope of supply chain and administrative tasks in integrating reuse into a new project can create reluctance to work in this area, ultimately affecting the demand for such materials.

While deconstruction offers an economically attractive alternative due to the potential value of reclaimed products, initial costs can be higher than traditional demolition. However, deconstruction can be economically viable if it can be performed with low-cost labor and if there is an increase in demand for disassembled products. If products are easily disassembled and require little or no modification, reclaimed products can be sold cheaper than new products (Breteler, 2022). The scarcity of standardized practices in the field of deconstruction can keep costs high.

Economic barriers are not the only obstacles to reuse and recycling. Current building regulations and certification systems often lack a regulatory framework that supports the circular economy. In fact, these policies can even hinder the use of reclaimed materials and delay the sector's transition to more sustainable practices without the necessary incentives (Breteler, 2022).

Another factor hindering the adoption of reuse practices in construction is the inconsistency in the quantity and availability of products. This process, which is not as easy as purchasing new materials, makes the integration of these materials into new construction projects difficult. Reclaimed materials have different storage and logistics needs than new materials. Procuring them for a project differs from conventional purchasing processes. Limited storage capacity, inability to easily access deconstructed materials from a location, general reluctance, and inadequacy in maintaining an inventory of these materials further restrict supply, significantly affecting the feasibility of reuse on a large scale.

In the book Solution, Lendager and Pedersen (2020) discuss how they supplied reclaimed materials for their projects, they had to contact various demolition firms, housing associations, and municipalities to find materials from demolition and renovation works, highlighting the time-consuming nature of the process. (Solution, p. 113)

The use of some elements may not be possible due to the inability to certify the performance of the elements. This may require testing in addition to the cost of reusing the products in some cases. Additionally, the reuse potential of building products and elements depends on the design flexibility provided by the reclaimed product. While small-sized building elements have higher possibilities of fitting into different designs, the reuse of elements like windows or prefabricated wall panels of various sizes is directly determinant in the design (GreenSpec, n.d.).

In conclusion, there are still significant barriers to the widespread adoption of reusing building materials. These challenges, particularly the lack of collaboration in deconstruction relationships and the absence of standardization in reuse, continue to complicate the transition to sustainable construction methods. Overcoming these barriers not only brings technological innovations and process improvements but also a cultural shift towards the benefits of reuse.

Figure 5. Pile of reclaimed building materials (Overstreet, K. (2020). Giving demolished building materials a new life through recycling. Retrieved from https://www.archdaily.com/943293/giving-demolished-building-materials-a-new-life-through-recycling).

Overcoming the Barriers to Reuse

To ease the reuse of building products, a coordinated approach involving policy reform, industry collaboration, and education is essential to address the barriers mentioned. Some actions that can be taken include:

- Initiatives aimed at encouraging collaboration among deconstruction companies can simplify the process for architects and building companies, making the supply of reusable products more accessible.
- Technological support for the standardization of inventory, dismantling, and certification procedures could reduce costs and accelerate the reuse process.
- Financial incentives, such as tax deductions or subsidies for projects using reclaimed materials, could be provided.
- Educating the public about the benefits and feasibility of reuse, along with showcasing successful implementation examples, can help change perceptions and develop a culture that values sustainability and innovation.
- Additionally, creating a clear regulatory framework that supports the circular economy, especially encouraging the reuse of construction materials, is crucial.

Why Circular Economy and Reuse

Overconsumption of sources leads to the continuous extraction of raw materials, causing resource depletion and habitat destruction, threatening biodiversity and disrupting the ecosystem. The production and transportation of new materials or the disposal of construction waste generate pollution, contributing to environmental degradation and health issues. This cycle results in high greenhouse gas emissions, followed by climate change and warming globally.

The construction sector consumes a significant amount of energy and natural resources and has substantial concrete costs related to material production, manufacturing, and transportation. Using reclaimed materials can reduce these environmental impacts, unnecessary new material production, and waste, potentially saving up to 95% of total costs (Sustainable Build, n.d.).

This emphasizes the importance to reduce dependence on limited raw materials. Redirecting construction materials from waste streams for reuse in nearby projects is a critical requirement for a circular economy. There's a significant amount of construction waste with high reuse potential. Regardless of the distance, reclaimed materials sourced from an existing building are almost always the most environmentally friendly option compared to supplying new materials (Sustainable Build, n.d.).

The circular economy and the reuse sector can also increase employment and social awareness. Engaging more people in these practices increases their visibility. Lendager and Pedersen (2020) illustrate this point in their book Solution, where they report findings from their research across various sectors they worked with. Their work revealed a rise in knowledge and a keen interest in collaborative efforts within reuse. Moreover, the book states that just one of their projects created 18 new job sources, more than half of which were in other companies they collaborated with (p. 220). This example alone demonstrates how the synergies created can provide a significant return.

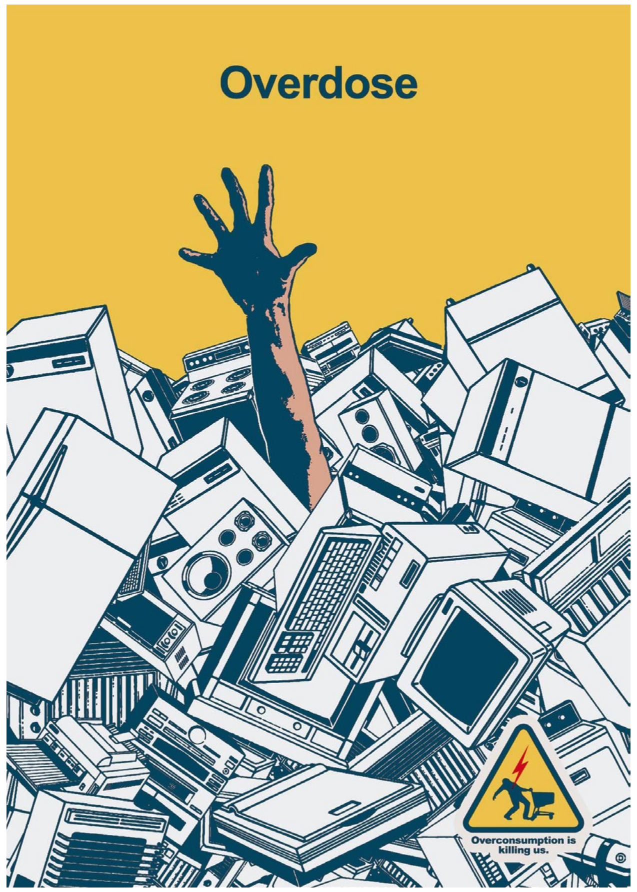


Figure 6. The illustration "Overconsumption" by Christopher Dombres (Dombres, C. (2024). Overconsumption. Retrieved from https://www.flickr.com/photos/christopherdombres/23265152514/)

In summary, transitioning to a more circular economy could enhance competitiveness, innovation, and employment growth. Redesigning materials and products for circular use will also increase innovation across different sectors, reducing our resource consumption in every area.

What Can We Do?

Today, the most common place to source typical reclaimed materials is directly from a demolition project. The number of specialized deconstruction companies doing these projects is also increasing. However, the variety and limited quantity of materials available from these projects often prevent the operations from scaling up. Therefore, the amount of reclaimed materials used in medium and large-scale projects remains significantly lower compared to smaller-scale projects (Sustainable Build, n.d.). Cross-industry collaboration is essential as a practice of circular economy. It is crucial to transfer the production, material, and sales surpluses of industrial production and wholesale companies to the reuse sector. This not only increases economic gains across different sectors but also minimizes material loss in the system. Reclaimed materials can be used in larger-scale projects, potentially becoming a norm in the sector. Increased demand in the sector would lead to standardization and development across all areas. Therefore, facilitating access to reclaimed materials should be a priority in this field.

Lendager and Pedersen (2020), focusing on this issue, mention that although the process of supplying reusable materials was time-consuming, it also revealed a surprising amount of waste just sitting there waiting to be revalued. Over time, they formed numerous strong collaborations with different stakeholders, now enabling them to approach material circulation more strategically and organized. (p. 113)

2.3 Circular Hubs as an Alternative

Some recent studies on reuse have a focus on how reclaimed materials can be more efficiently stored and made available for use. However, these studies generally consider existing construction waste as the primary source of materials, without incorporating production waste, defective products, by-products, and surplus materials from other sectors.

Construction Hub Model

Research conducted by the Dutch Organization for Applied Scientific Research (TNO) in the Netherlands, highlights the logistical advantages of establishing a construction hub outside city centers. These centers serve as central locations where new construction products are stored, sorted, and prepared for delivery to sites in packages ready for daily use. This model not only reduces the need for on-site storage but also optimizes the supply chain, leading to a reported 40% increase in specific site process efficiency and a significant decrease in travel movements and CO_2 emissions. Integrating a circular dimension into these hubs is anticipated to further enhance their potential impacts, allowing efficient management of both new and reusable products (Breteler, 2022).

Material Hub Model

Maria Karamanou (2019) offers an in-depth study on the practicalities and effects of implementing a material hub as a circular waste management strategy, particularly in the context of Haarlem municipality in the Netherlands. Karamanou's findings emphasize the critical role material centers can play in achieving circularity in waste management. Despite the financial and circular advantages, she highlights the substantial initial investment and effort required to establish a material center. Additionally, the model suggests that only a limited amount of reclaimed materials would be stored at the material center, seeing challenges in its primary function as a storage facility.

Types of Circular Hubs by Context

Another exploratory study in the Netherlands examines various models for circular hubs, each designed to address different aspects of the construction waste problem. Köhrer (2024) utilizes a comprehensive methodology, benefiting from interviews with a wide range of stakeholders, including representatives from circular material centers, architects, and experts in circular economy and construction logistics.

The thesis concludes that circular material hubs are effective in making secondary building components more accessible for reuse, thereby playing a significant role in advancing circularity in the construction industry. However, it also highlights significant challenges that need to be addressed to enhance the system's efficiency and impact. These include previously seen problems such as overcoming regulatory and cost barriers, ensuring a consistent supply of materials, and the need for collaboration among all stakeholders involved in the circular construction process (Köhrer, 2024).

Nieuwhoff (2022) takes another approach in his work by attempting to define the typologies of different types of construction material hubs. The categorized typologies are as follows:

- *Circular Craft Center:* This typology includes local networks such as recycling centers, second-hand stores, and workshops that can increase community participation and awareness in promoting circular practices.
- *Circular Multi-modal Construction Material Center:* A large-scale typology with the capacity to collect, separate, and transform both mass and non-mass waste into secondary materials and features multi-modal transportation options. It also acts as a logistics center providing temporary storage for materials and supporting a circular supply chain for construction projects.

● *Circular Construction Material Center:* Similar to the multi-modal center but specifically focused on non-mass waste, this typology operates as a marketplace for secondary materials, directly supplying reused materials to construction projects to support circular construction practices.
● *Circular Raw Construction Material Center:* This typology primarily deals with transforming mass construction and demolition materials into raw construction materials. It has a central role in reusing bulk materials and facilitating the production and logistics of circular materials.

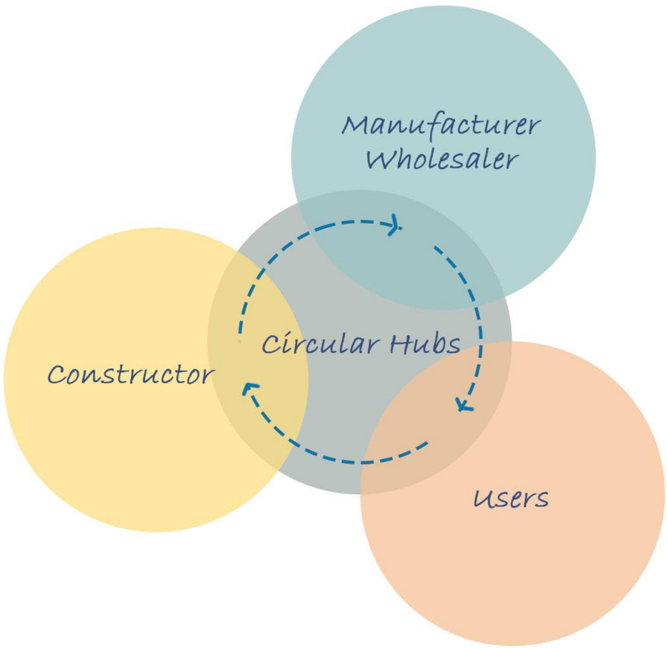
Nieuwhoff's (2022) thesis underscores the crucial role of material centers in transitioning to a sustainable and circular construction sector. By defining typologies, it examines the factors leading to their emergence and how they can meet needs at various scales.

Insights and Reflections

These studies reinforce the necessity of collaboration of different sectors for the continuity of material resources when establishing such a center. Especially, collaborations with manufacturers and wholesalers can facilitate the inclusion of surplus, defective materials, and some production remnants into the reuse cycle within such a center. This can extend the life cycle of a larger quantity and variety of products.

Keeping these products within the usage cycle offers significant advantages both economically and environmentally for producers and users alike. Including surplus products in the reuse concept can ensure a large volume of product continuity and address the bulk material needs of development companies. Such a Reuse Hub would become the easiest meeting point for all parties involved.

Beside this, these studies provide clearer insights into what sizes and capacities of centers are needed for various requirements. Additionally, they address that, to support the establishment and operational costs of such a center, either public-private sector collaboration is required or resource can be created by providing space for different related business lines in a multi-functional design.



03 CONTEXT

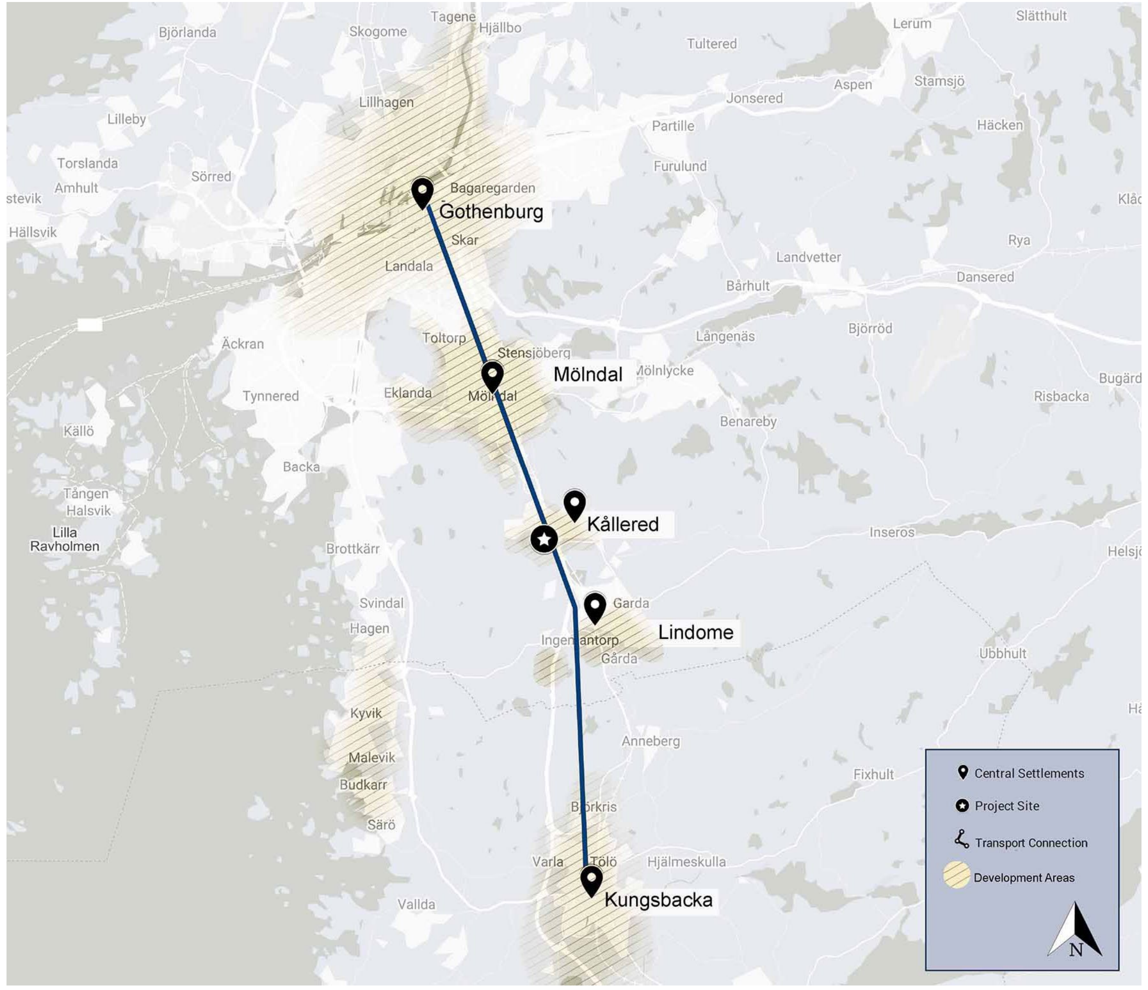
3.1 Site Selection

The selection of this building and concept was driven by considerations such as the building's well-known presence, accessibility, adaptability, and strategic location, all of which align with the project's objectives of creating a dynamic and impactful space.

Well-Known Presence and Accessibility: The region where the building is located has a long-standing name as a shopping area, well-known and frequented by the public. This offers a solid foundation for any new venture in the area. Additionally, the building has enhanced accessibility by its proximity to various transportation facilities, making it easily reachable by both commercial companies and individuals at the same time.

Former Use and Spaciousness: The building's previous function as a large store presents distinct advantages for repurposing. Its spacious layout provides sufficient space to accommodate a wide variety of functions, aligning well with the project's vision of creating a multifunctional space. This adaptability allows for the integration of diverse activities and services with great flexibility within the same location.

Strategic Location: Situated in an area with easy access to multiple transportation options, including active logistics transportation lines, the project area holds strategic significance. This location not only eases logistical operations but also positions the region as a potential hub for innovation in logistics and industry.



3.2 The Story of IKEA

Beyond being the transformation of an old IKEA store, the project has strong connections with both the values that the brand defends and develops and the issues for which it is criticized. Therefore, the background of the brand constitutes an important basis for the project.

History

IKEA, founded in 1943 by Ingvar Kamprad, began as a modest mail-order business that initially specialized in selling a range of household goods such as watches, picture frames, pens, jewelry, and stockings. The name "IKEA" itself is an acronym derived from Ingvar Kamprad's initials, combined with those of Elmtaryd, the family farm where he grew up, and Agunnaryd, his local village. The business's early years were marked by its limited offerings, mainly unrelated to furniture (IKEA, 2023).

However, it wasn't until 1948 that IKEA expanded its product range to include furniture, marking a turning point in the company's trajectory. Kamprad's revolutionary concept focused on affordability, offering budget-friendly yet socially acceptable stylish furniture. The release of the first IKEA catalog in 1950 became an iconic move in the brand's history. In 1956, IKEA's journey into self-assembly and flat-pack solutions began as a response to shipping damage, cost reduction, and space-saving challenges, initiated by its founder Ingvar Kamprad and designer Gillis Lundgren. This was achieved by removing the legs of the LÖVET table and laying the foundation for the concept of self-assembly (IKEA, 2023).

In 1958, the first IKEA store was opened in Älmhult, Sweden, which later revolutionized the shopping experience by introducing in-store restaurants and cafes. It created a store concept that allowed people to explore decorating scenes and try out products. This was followed by the introduction of core values such as quality, functionality, and the brand's low prices. In 1995, IKEA launched the PS collection, which played a key role in developing the "Democratic Design" concept. This concept consolidated the values of good design, functionality, quality, and low prices, and later incorporated sustainability as a significant component (IKEA, 2023).

In 2018, IKEA set ambitious goals to become climate-positive by 2030, further aligning its values with sustainability and innovation.

Figure 7. Ingvar Kamprad in front of the first IKEA store in Älmhult (Världens första IKEA varuhus kommer till - ikea museum. (2023). Retrieved from https://ikeamuseum.com/sv/utforska/berattelsen-om-ikea/det-forsta-ikea-varuhuset/).

Strategies for Success

IKEA's success has been attributed to its commitment to providing quality and affordable stylish furniture for the masses. The company's ability to minimize packaging and maximize the number of items shipped simultaneously has been effective in keeping costs low. IKEA operates with strategies such as bulk purchasing (IKEA Museum, n.d.-a), and investments in factories in regions such as the Eastern Block and Asian countries with lower production costs (IKEA Museum, n.d.-b). Over the years, the company has harnessed innovative technologies and design strategies, including automation and efficient store designs, to reduce the required workforce. Simultaneously, by continuously analyzing user and customer behaviors, it has developed strategies to not only enhance product diversity but also encourage customers to shop for extended periods and make more purchases. Store layouts, the introduction of restaurants, and the iconic blue shopping bag have consistently been designed with this goal in mind (Senmannes, n.d.).

Figure 8. The famous blue bag, Frakta (Historien om en älskad IKEA Kasse - Ikea Museum. (2024). Retrieved from https://ikeamuseum.com/sv/utforska/berattelsen-om-ikea/alskade-kasse/).

Sustainability and Criticisms

Despite its extraordinary success, IKEA has faced various criticisms over the years. Critics have drawn attention to issues such as promoting impulsive shopping and overconsumption, unsustainable wood sourcing from forests (Milmo, 2021), product safety concerns, and the impact of large IKEA stores on local communities (Wikipedia contributors, n.d., "Store size, construction, and openings"). This has raised questions about the alignment of IKEA's values and sustainability commitments with the environmental impact of constructing and operating its extensive stores.

Recently, to emphasize its commitment to sustainability and circularity, IKEA introduced second-hand furniture corners in its stores, allowing customers to return furniture they no longer need (IKEA, n.d.). Here, IKEA refurbishes items in good condition and resells them at affordable prices, while furniture in poor condition is either repurposed in new production or responsibly recycled. Such strategic applications toward sustainability align more closely with the architectural principles of adaptive reuse over demolishing existing structures. As IKEA strives to become a climate-positive brand, the notion of adaptive reuse holds the potential for synergy, complementing the company's core ideals. By applying a similar approach to its existing building stock, IKEA can maintain consistency in its brand values while exploring innovative ways to balance these principles with the demands of growth.

3.3 Location

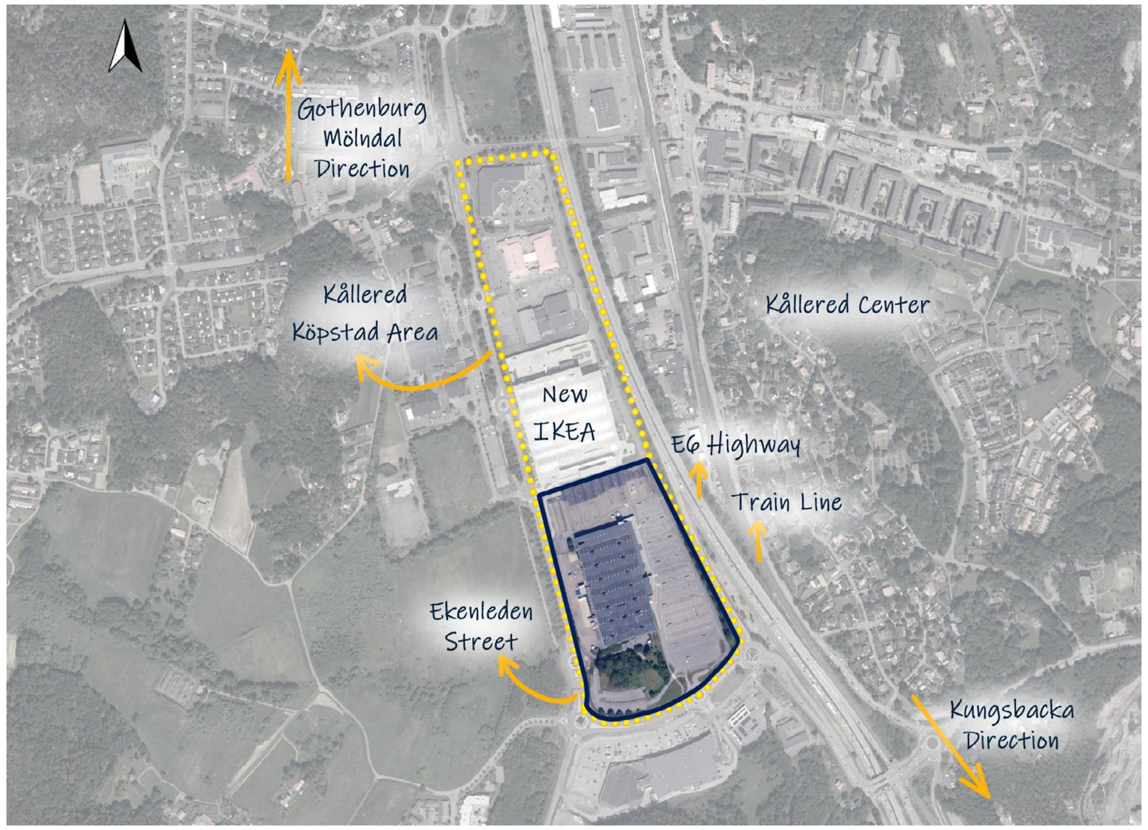
The project site is the recently vacated IKEA store in Kållered, located at the Mölndal Municipality. Mölndal, neighboring Gothenburg at the south, is a region with a rich history dating back to the 1400s. With a population of approximately 70,000, it stands as Västra Götaland Region's third largest municipality. Rooted in the Industrial Revolution, Mölndal's history is marked by its evolution from water-powered industries to a vibrant industrial hub embracing diverse sectors like healthcare, research, and information technology.

At the south of Mölndal center, located along key transportation routes, including the main railway line between Gothenburg and Malmö, and major highway E6/E20, Kållered has a strategic location in the region's connectivity and accessibility. In addition to commuter trains, several bus routes and bicycle paths are enhancing transportation options in the area (Mölndals Stad, 2016).

Kållered boasts both natural and urban amenities, with a mixture of residential and commercial spaces. The district's western part, where the project site is also located, is known for its shopping center housing brands such as IKEA, Coop, and others. Kållered Köpstad is a well-known shopping area in the entire Gothenburg region and was established in 1972 with IKEA as the first brand to build in the area (Mölndals Stad, 2016). Over the years, it has grown rapidly with more stores and brands.

Recently, IKEA completed the construction of a new, larger store and moved there, and plans to continue the development of the area (INGKA, 2023). According to initial plans, IKEA aims to demolish its old building in this area, replacing it with a larger shopping mall that spreads over a broader area with an increased volume(Mölndals Stad, 2016).

Mölndal Municipality's development plans for Kållered include residential densification and repurposing vacant spaces for this aim. Infrastructure plans, such as the reconfiguration of Ekenleden into a main artery and expanded public transportation, complement these plans, aiming to elevate Kållered's importance in the region(Mölndals Stad, 2016).



3.4 Site Analysis

The subject of this project is a building that was constructed as the seventh IKEA store globally in 1972 and served for 50 years in the Kållered Köpstad area. The structure is a hangar-type building, approximately 8.5 meters in height, constructed from prefabricated concrete elements.

The site covers more than 90,000 m² and has a strategic location. To the east, it is bordered by the E6/E20 highway, while Ekenleden Street runs along its west and south sides. Additionally, there is an internal road providing access from the north.

There are three main entrances to the site: the west and north entrances are ideal for access from Gothenburg and Kållered, while the south entrance is particularly suitable for logistics traffic due to its direct connection to the main artery and higher traffic density. All entrances are designed to accommodate both pedestrian and vehicle access. Near the west and south entrances are bus stops and a pedestrian and bicycle path parallel to Ekenleden Street. The newly constructed bus stop on the west side serves as the closest public transportation point to the building.

The train station is located to the north, near the center of Kållered, and within walking distance. Considering these factors, it can be concluded that public transport and pedestrian traffic will mainly approach the site from the north, making the northern entrances more suitable. The southern entrance, with less pedestrian traffic, seems ideal for commercial purposes.

To the east of the E6/E20 highway and the south side of Ekenleden, the area is predominantly residential. The western part of the site is currently used as agricultural land but is expected to develop into a mixed-use area in the future. In the northeast corner of the site, between the highway and the train line, lies an industrial area.

Topographically, the area consists of a flat surface made up predominantly of large parking lots. The elevation decreases from south to north. A green hill located south of the building and a road constructed with a corresponding slope largely cover the southern facade. This hill also hosts a parking lot built for IKEA employees, which is accessible from the southern entrance. Another characteristic feature of the area is the rows of trees along Ekenleden, which are protected. Due to the proximity to the E6/E20 highway, the average noise level in the area exceeds 65dB, which should be evaluated in terms of quality of life and environmental impact.

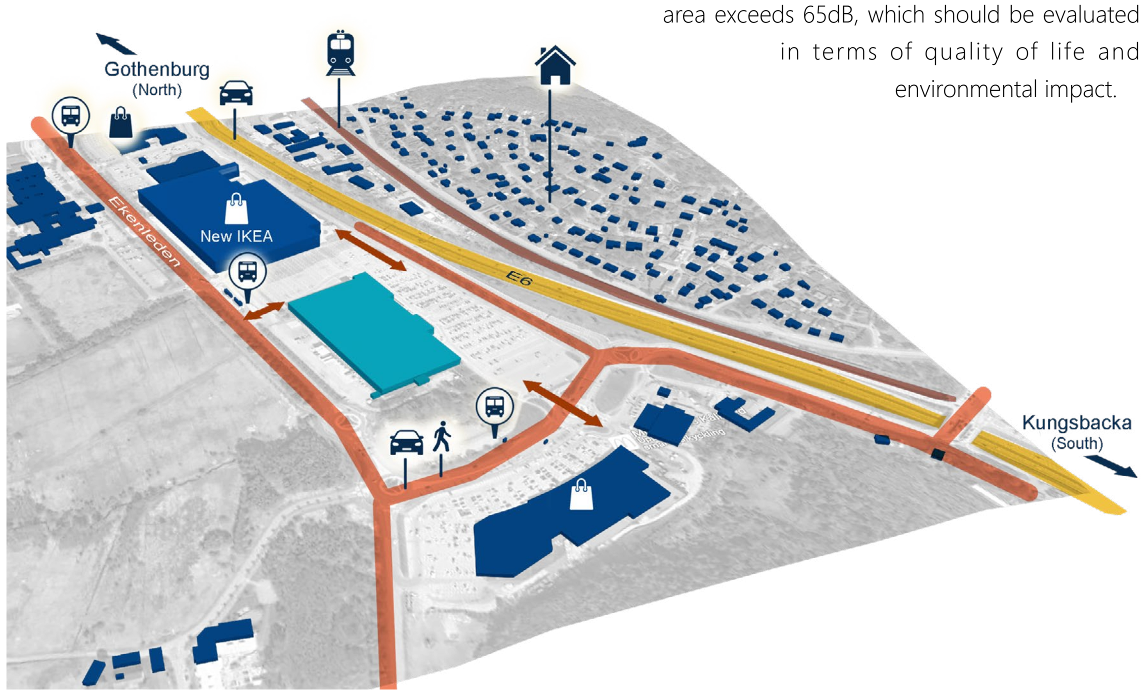
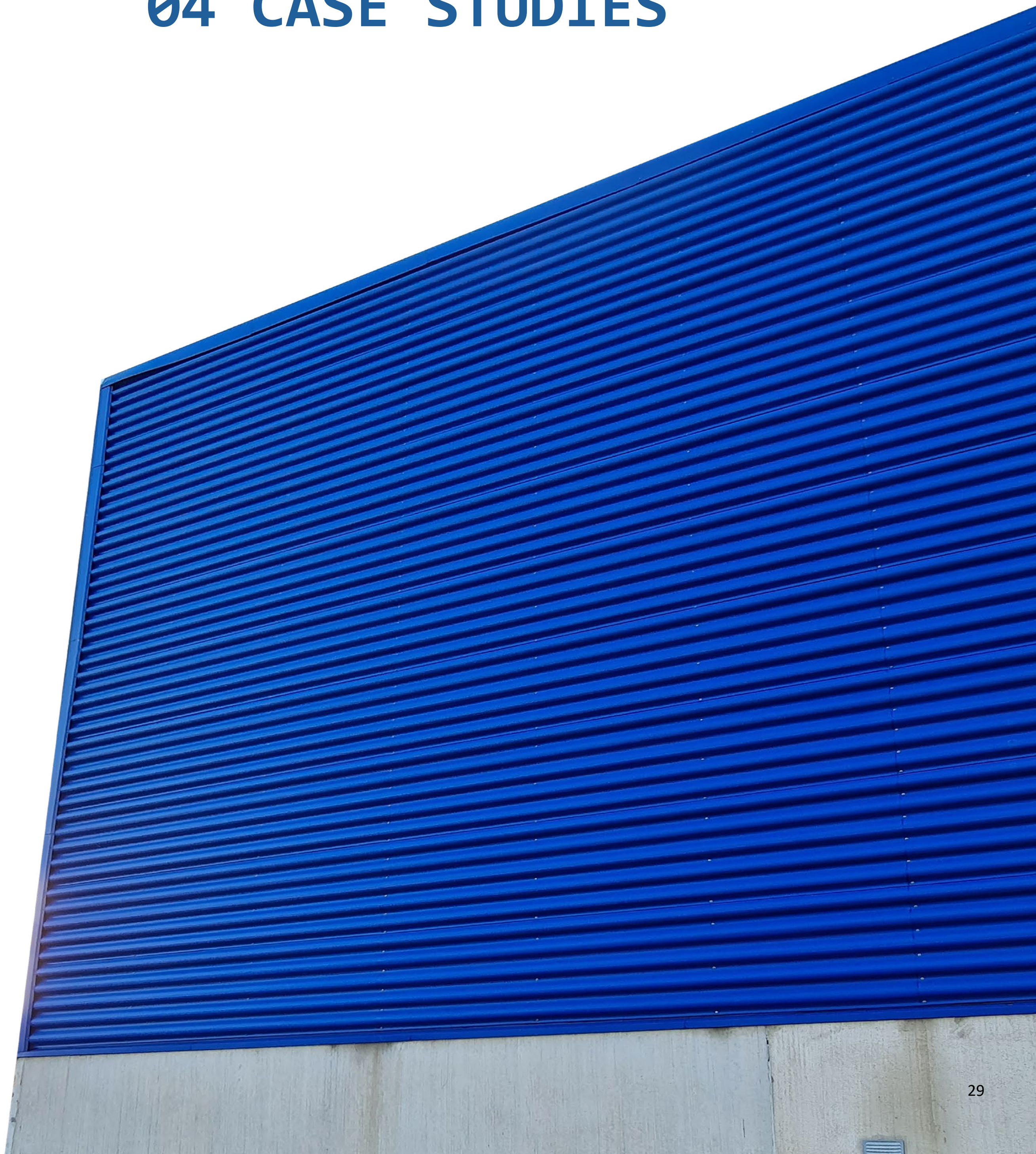


Figure 9. Aerial view of the building from 2018. With permission of Powerphoto.nu (Powerphoto.nu . (2018). Powerphoto.nu 2018-06-26 11 kållered. Retrieved from https://www.youtube.com/watch?v=mo5NclRM1bA).

Figure 10. Current view of the east (entrance) facade, 2023.

Figure 11. Current view of the north facade, 2023.

04 CASE STUDIES



Throughout the project research, numerous case studies were examined in a broad context. It is possible to collect some examples that had the most significant impact on the shaping of the project in three main categories. The first category consists of Transformation Projects, which serve as a reference in determining the program and concept. Others are examples that serve as a guide in elaborating the defined concept. These can also be classified as Material-focused and Community-focused Reuse Centers.

4.1 Transformation Projects

LocHal | | Tilburg (NL)

The importance of examining large-scale projects as a guide became clear at the beginning of case studies. LocHal is an ideal example of this in terms of its size, building type, and design strategies.
Located in Tilburg, Netherlands, the LocHal Public Library is the conversion of a former locomotive hangar into a public library and cultural center by Civic Architects. The facility, which has an area of 11,200 m², includes many functions such as public library services, common work areas, art organizations, food and beverage services, and event areas. In addition to public events, the building also houses spaces referred to as "laboratories" where visitors can learn new skills. The project is also part of a larger redevelopment program, transforming 75 hectares of former railway land into a mixed-use district centered around the library (Civic Architects, n.d.).

The structure measures 90 x 60 meters and is 15 meters high, preserving the original dimensions of the hangar. The entrance hall was designed as a covered city square with large multifunctional tables and a coffee bar. This area also turns into a seating arrangement where large groups can be hosted for events (Civic Architects, n.d.).

Covering a total area of 4,125 m², a series of large textile screens were designed to flexibly divide the space for different activities. These movable screens help manage space acoustically and can be reconfigured to suit a variety of needs, from collaborative work spaces to creating semi-private auditoriums (Civic Architects, n.d.).

Detailedly designed heating areas warm visitors only in important contact areas. This prevents the need to heat the entire building, making it possible to maintain the building as a single large usable volume instead of adding closed volumes (Civic Architects, n.d.).

The project's concept, consisting of a main function supplemented by complementary functions, illustrates how multifunctionality can be achieved in projects of this scale. It has transformed an idle building through a library concept into a multi-purpose center that is actively used for most of the day. The positive impact of this on societal habits also affected this project's approach.

Additionally, the building's hangar-type structure, similar to the building topic of the project, and the sustainable solutions implemented in the project also served as a reference for this project.

Key Features:
- Shift in societal habits
- Referencing building type
- Multifunctional design

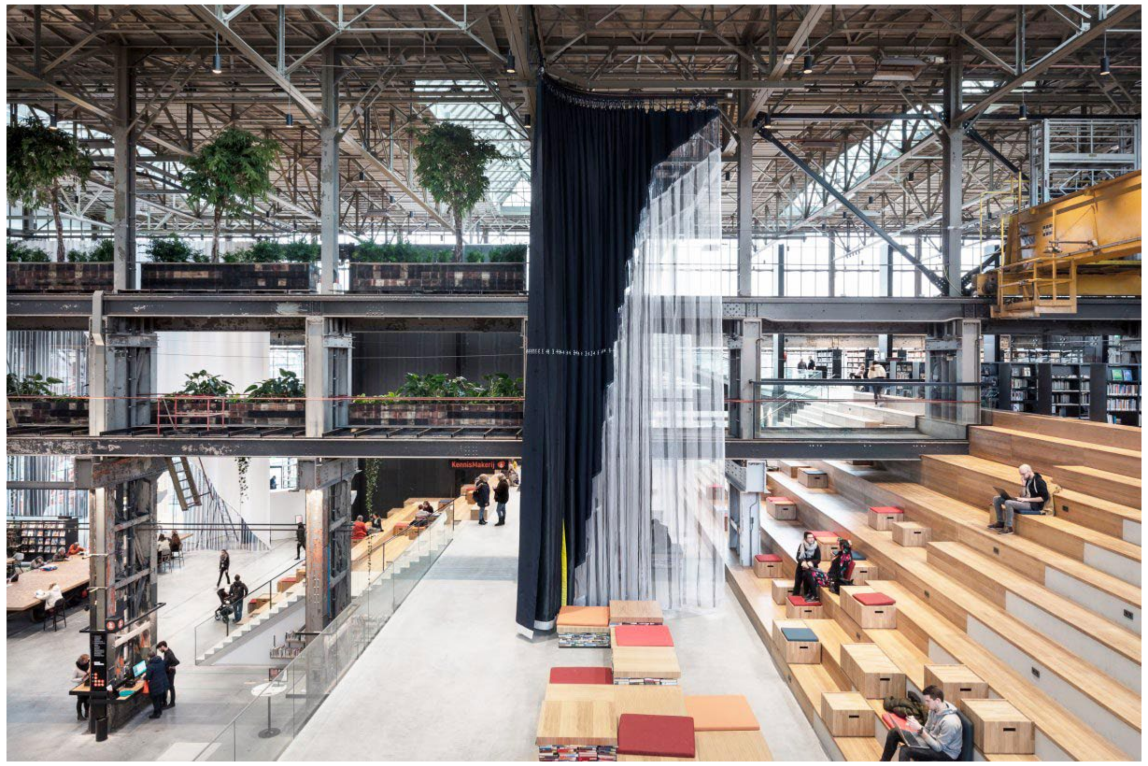


Figure 12. View of the seating stairs with mobile curtains that divides the area according to useage. Photographer: Stijn Bollaert (Bollaert, S. (n.d.). Retrieved from https://www.wijzijntilburg.nl/lochal-in-de-race-voor-de-architectuurprijs-van-nederland/6-civic-architects-lochal-tilburg-copyright-stijn-bollaert/)

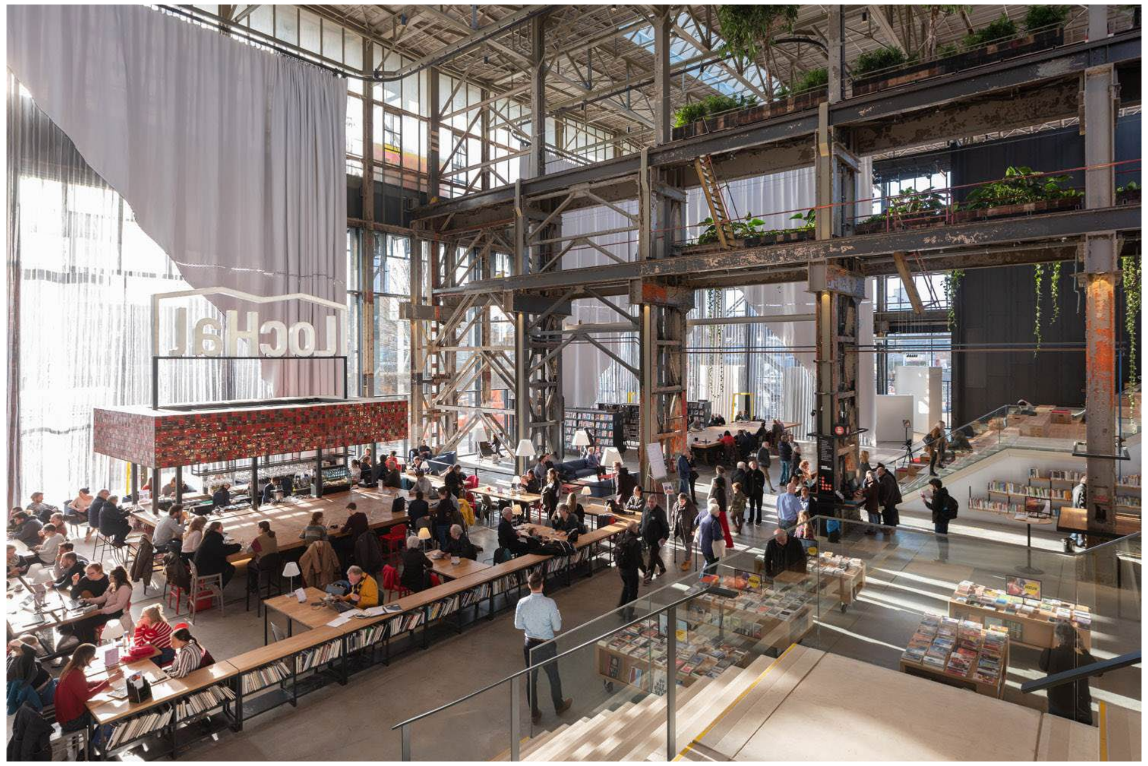


Figure 13. The cafe area of the library by the entrance hall with mobile curtains. Photographer: Ossip Architectuurfotografie (Ossip Architectuurfotografie. (n.d.). Lochal Public Library. Retrieved from https://www.mecanoo.nl/Projects/project/221/LocHal-Library?t=0)

MALHA | Tadu Arquitetura | São Cristóvão (BR)

The MALHA project, by Tadu Arquitetura, is located in São Cristóvão, Brazil, and covers an area of 2000 m². MALHA is designed as a multifunctional platform for the fashion industry, serving as an intersection for creators, entrepreneurs, producers, suppliers, and consumers (Tavares Duayer Arquitetura, n.d.).

The initiative strongly emphasizes sustainability, adopting new consumption practices, and addressing environmental concerns. MALHA is set up in an existing warehouse, chosen for its open-plan layout with a 9-meter ceiling height, and translucent tiles that enable the entry of daylight, making it an ideal venue for its intended use (Tavares Duayer Arquitetura, n.d.).

The project houses various facilities designed to support its community and functions. These include small offices for residents, a photographic studio, a sewing studio, a showroom, a natural food restaurant, a shared kitchen, administrative areas, a multipurpose room, a co-working space, and an auditorium. This diverse range of facilities supports the project's goal to serve as a dynamic co-working and cultural hub (Tavares Duayer Arquitetura, n.d.).

Another significant aspect of the project is the reuse of old shipping containers as the primary construction elements. This choice also creates modularity and eases the distribution of the spaces across the building. They are placed to create common areas in between for multiple uses such as parades, markets, debates, and film screenings (Tavares Duayer Arquitetura, n.d.).

The interior of the containers is adapted for various uses including offices, meeting rooms, and pop-up stores. The choice of materials considers sustainability by using low environmental impact and cost-effective materials such as plywood, metallic tiles, and translucent tiles applied to the internal facades (Tavares Duayer Arquitetura, n.d.).

Despite its relatively small size compared to the size of this thesis project, MALHA represents an ideal example of its conceptual approach. In line with its main concept, the project aims to offer an alternative to common consumption habits from the perspective of the fashion industry. Other key aspects of the building include its hangar-like structure and a multifunctional design centered around a main theme. Moreover, the use of reclaimed materials in the design of the spaces was another reference. The fact that the sharing of common areas and resources is the focus of the design positions this project as a valuable reference.

Key Features:
- Shift in societal habits
- Referencing building type
- Reclaimed material use

Figure 14. A view of the units of stores and offices. Photographer: Ilana Bessler (MALHA / Tadu Arquitetura" 07 Aug 2017. ArchDaily. Accessed 20 May 2024. <https://www.archdaily.com/877147/malha-tavares-duayer-arquitetura> ISSN 0719-8884)

Figure 15. A view from a working space showing the material reuse. Photographer: Ilana Bessler (MALHA / Tadu Arquitetura" 07 Aug 2017. ArchDaily. Accessed 20 May 2024. <https://www.archdaily.com/877147/malha-tavares-duayer-arquitetura> ISSN 0719-8884)

4.2 Material-focused Reuse Centers

The reclaimed material centers mentioned below have been key references in the development of the project's building materials program. These facilities are generally focused on the sale of reclaimed construction materials, addressing varying customer profiles. Among the insights gained from these references in the project's development are identifying reclaimable material types and ratios, methods for storing and selling these materials, processes they undergo before sale, and the complementary spaces required for them. Additionally, the methods of materials supply and the economic functions and feasibility of these centers were other insights gained.

Rotor DC | Brussels (BE)

Rotor DC is a Brussels-based cooperative specializing in the reuse of construction materials. Founded in 2016 and operated by its employees, the company focuses on dismantling, processing, and trading salvaged building components. It is a part of Rotor, a non-profit design practice that has been documenting and mapping sources of second-hand materials for a long time. Their research revealed that the majority of these sources had a product range addressing the rural market within a limited framework. Focusing on building components saved from urban demolition sites, the organization is a good example of how a regional ecosystem for large-scale reuse of materials can be created. The organization can offer a wide range of products in bulk quantities and they can also provide services such as repairing lighting fixtures, reprocessing wood, and cleaning furniture and tiles in their workshops. Overall, Rotor DC serves as an excellent reference demonstrating that the demand for sustainable construction practices can be met with existing materials (Rotor DC, n.d.).

Key Features:
- Reclaimed material use
- Diverse product range
- Can provide large quantities
- Proof of demand from construction sector
- Hosting supplementary services

Figure 16. Reclaimed doors in Rotor facilities.(Rotor DC: reuse made easy. (n.d.). Retrieved from https://rotordb.org/en/projects/rotor-dc-reuse-made-easy)

Figure 17. Reclaimed sanitary elements in Rotor facilities. (Rotor DC: reuse made easy. (n.d.). Retrieved from https://rotordb.org/en/projects/rotor-dc-reuse-made-easy)

Malmö Återbyggdepå | Malmö (SE)

Malmö Återbyggdepå (Malmö Rebuilding Depot), operated jointly by Sysav, a recycling company and the Municipality of Malmö, focuses on the sale of used and excess construction materials. Its product range is extensive but primarily can cater to individual or small-scale renovation projects. The material source is based on a donation system. The organization also provides services for cleaning and processing reclaimed bricks (Malmö återbyggdepå, 2020). Malmö Återbyggdepå has been a particularly useful example to see the product diversity of reclaimable construction materials. Besides, it also serves as a good example of collaboration between a private company and a public institution in this field as a feasible operational model.

Key Features:
- Reclaimed material use
- Diverse product range
- Hosting supplementary services
- Can provide small quantities

Figure 18. A view of the reclaimed windows from the store. (Fönster. (n.d.). Retrieved from https://www.malmoabd.se/dorr-fonster/fonster)

Kikås Återvinningscentral Bruksbutiken | Mölndal (SE)

Kikås Återvinningscentral, one of the recycling centers within the Municipality of Mölndal, hosts a newly established reuse center called Bruksbutiken (Bruksbutiken på återbruket kikås, n.d.). While primarily selling construction and garden materials in small quantities, they also accept donations spanning a broader range of products that they redirect to partner organizations and businesses. Additionally, they also have a wood workshop in their facilities. The visit and discussions with the authorities provided valuable information about the requirements for the operation of a similar recycling center.

Key Features:
- Shift in societal habits
- Reclaimed material use
- Can provide small quantities

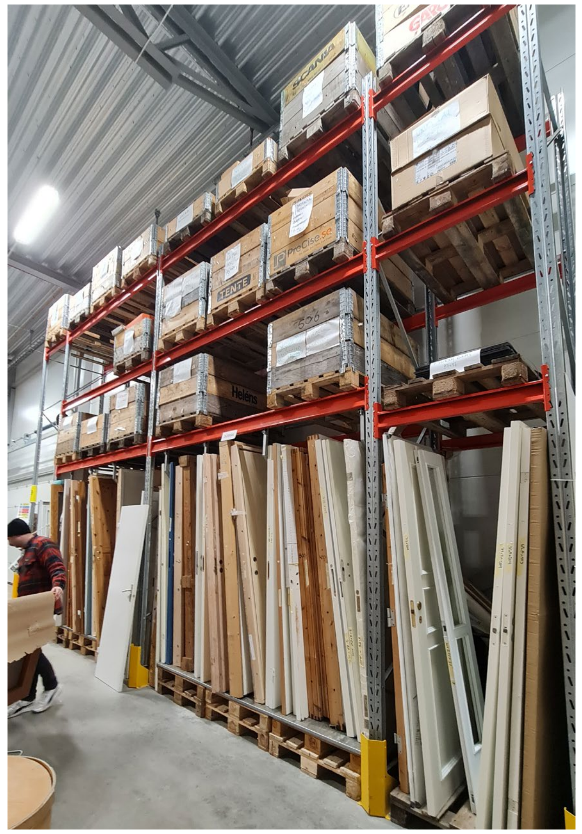


Figure 19. A view of reclaimed doors and other materials from the store. Own photo.

Fabege Återbrukshubb | Solna (SE)

Figure 20. A view of the furnitures from the hub. (Fabege Först Med Fullskalig Återbrukshubb. (n.d.). Retrieved from https://www.fabege.se/om-fabege/pressrum/) pressmeddelanden/2023/fabege-forst-med-fullskalig-aterbrukshubb/)

Fabege is a property developer company operating in the Stockholm region. Engaged in large-scale projects, the company is also part of the "Återhus" research project focusing on the reclamation and reuse of building elements (Hållbarhetshuset, n.d-c). Aiming to halve its carbon footprint by 2030, the company established a 2,000 m² Reuse Hub in Solna Business Park in 2023 to temporarily store recycled materials. Aimed at increasing the usage of recycled materials to at least 20% in its projects, Fabege hopes to eliminate the difficulty of synchronizing demand and supply of recycled materials. The facility conducts quality control, inventory management, environmental savings calculation, cleaning, and packaging of all materials (Cirkulärt byggande och återbruk, n.d.-a). With these practices, the facility serves as a more professional approach to the reuse center notion. Besides, the fact that a company has established such a system for itself in order to progress in the field of circular construction proves the demand potential in this field.

Key Features:
- Reclaimed material use
- Proof of demand from construction sector

Figure 21. A view of the furnitures from the hub. (Fabege Först Med Fullskalig Återbrukshubb. (n.d.). Retrieved from https://www.fabege.se/om-fabege/pressrum/ pressmeddelanden/2023/fabege-forst-med-fullskalig-aterbrukshubb/)

4.3 Community-focused Reuse Centers

The reuse centers mentioned in this section have been a reference in the development of the project's functions related to consumer products. The main feature of these references is that they directly involve the public in the notion of reuse. They constitute ideal examples as they contribute to changing social habits and increasing their awareness at the public level for circularity to become a norm.

Retuna Återbruksgalleria | Eskilstuna (SE)

ReTuna Återbruksgalleria is a shopping center with a wide variety of stores and products, focusing on reuse and recycling. Established in 2015 at the ReTuna Recycling Center in Eskilstuna, the center is a pioneering example that embraces the principles of circular economy in shopping. Old items are given new life through repair and recycling methods. Everything sold is recycled, reused, or produced sustainably. The center is managed by the municipal company Eskilstuna Energi och Miljö (EEM) together with Retuna Återvinningscentral and their main source of products is donations from visitors to the warehouse. Toys, furniture, clothing, home decor, and technology items are then evaluated, refurbished, and distributed to stores within the shopping center. These stores, rented out to individuals, also have work spaces where artisans can refurbish their products (Historien om retuna, n.d.).

Beyond being a marketplace, ReTuna serves as an educational center, with a Folk High School offering programs and workshops, and an organic café (Historien om retuna, n.d.). The key feature of this project is its ability to prove the feasibility of sustainable retailing while also serving as a social hub that gathers the community around the principles of reuse and resource consciousness, presenting a new approach to the concept of shopping centers.

Key Features:
- Shift in societal habits
- Reclaimed material use
- Hosting supplementary services
- Diverse product range
- Proof of demand from community

Figure 22. View from the entrance hall of Retuna. Photographer: Lina Östling (Ladda Ner Pressfoton. (n.d.). Retrieved from https://www.retuna.se/om-oss/press/pressfoton)

Buurman | (NL & BE)

"Buurman is a circular hardware store and educational wood workshop." (Buurman, n.d) The organization is mainly focused on the reuse of wood materials and educating the community. With facilities in Rotterdam, Utrecht, and Antwerp, and plans to expand to The Hague by 2024, they serve both as a material store and workshop space for public use. Buurman's educational activities include workshops in furniture making for both beginners and advanced learners, and utilizing recycled materials (Buurman Rotterdam Circulaire Winkel en Houtwerkplaats., n.d.). They source materials particularly from construction sites, museums, and demolition projects and operate under a "social franchise" model as they call, with a non-profit and non top-down approach to conventional one (Buurman, n.d). Their locations are mostly centrally located, making them easily accessible to the public.

Buurman not only sell reclaimed materials but also teach practical skills and promote environmental consciousness. By involving diverse groups ranging from local residents to professionals, they managed to become an attractive community hub around the circularity and reuse notions.

Key Features:
- Shift in societal habits
- Reclaimed material use
- Proof of demand from community

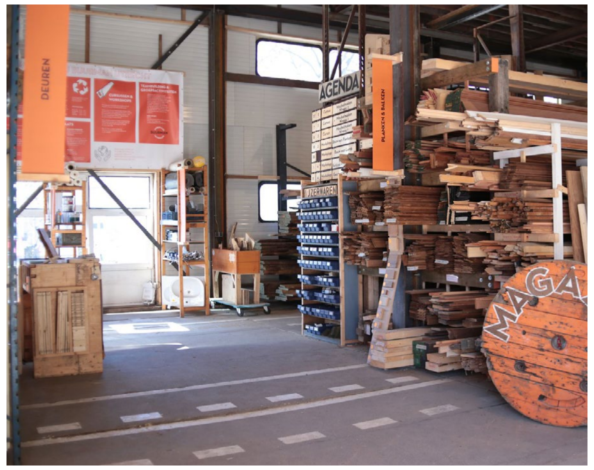


Figure 23. A view from their Utrecht facilities (Buurman Utrecht. (n.d.). Retrieved May 20, 2024, from https://www.buurmanutrecht.com/).

Figure 24. A view from their Utrecht workshop (Buurman Utrecht. (n.d.). Retrieved May 20, 2024, from https://www.buurmanutrecht.com/).

05 DESIGN

5.1 Structure of The Building

The subject of this project consists of an original main building measuring 169 by 97 meters and additional steel structured blocks added over time. It covers an area of 30,000 m² on two floors in total and is surrounded by a parking lot exceeding 40,000 m². The active use of the building until recent times emphasizes that its layers and structural elements are probably in relatively good condition.

The existing structure of the main building is made up of prefabricated reinforced concrete columns and beams, arranged according to a 6-meter grid. While these columns repeat at 12-meter intervals on the ground floor, on the second floor, some columns do not continue, and the spacing increases to 24 meters. The roof features reinforced concrete roof beams placed according to the same grid, spanning 24 meters. Inside, the height from the ground level to the underside of the roof beam is 6.55 meters. In areas with an intermediate floor slab, the height from the ground to the top of the slab is 3.8 meters, and from there to the roof beam, it is 2.75 meters. There is a gallery void on the intermediate floor, covering almost 8,000 m². Initial assessments suggest that these floor heights will be insufficient for most of the planned functions, requiring the partial removal of the intermediate floor slabs. The intermediate floor is made up of prefabricated hollow concrete blocks which make it easy to remove, and reuse. Walls are also originally made up of prefabricated concrete blocks and characteristic blue corrugated steel cladding seems to be added later.

The existing column system's wide spacing and the intermediate floor's prefabricated structure provide the necessary flexibility for functions. All these conditions increase the chance of reusing the dismantled materials.

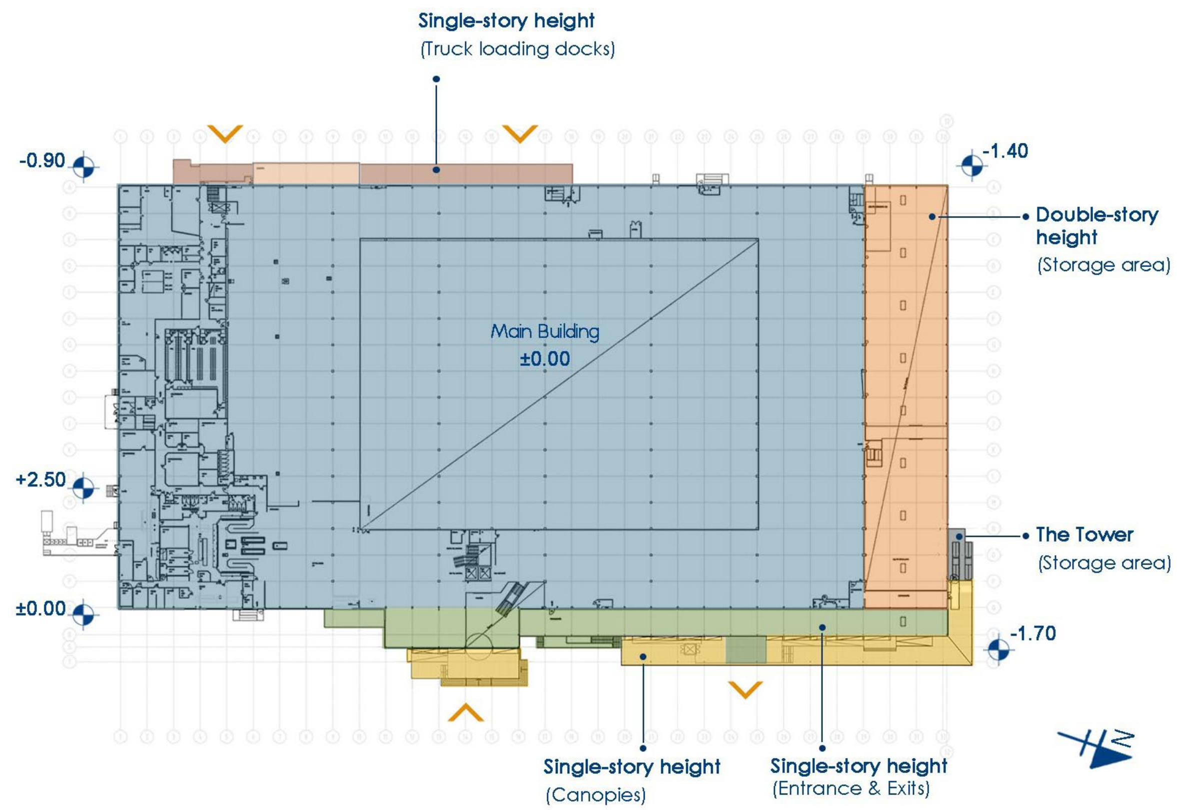


Figure 25. Main block with extensions and elevation differences. Underlay drawing: QPG Arkitektur

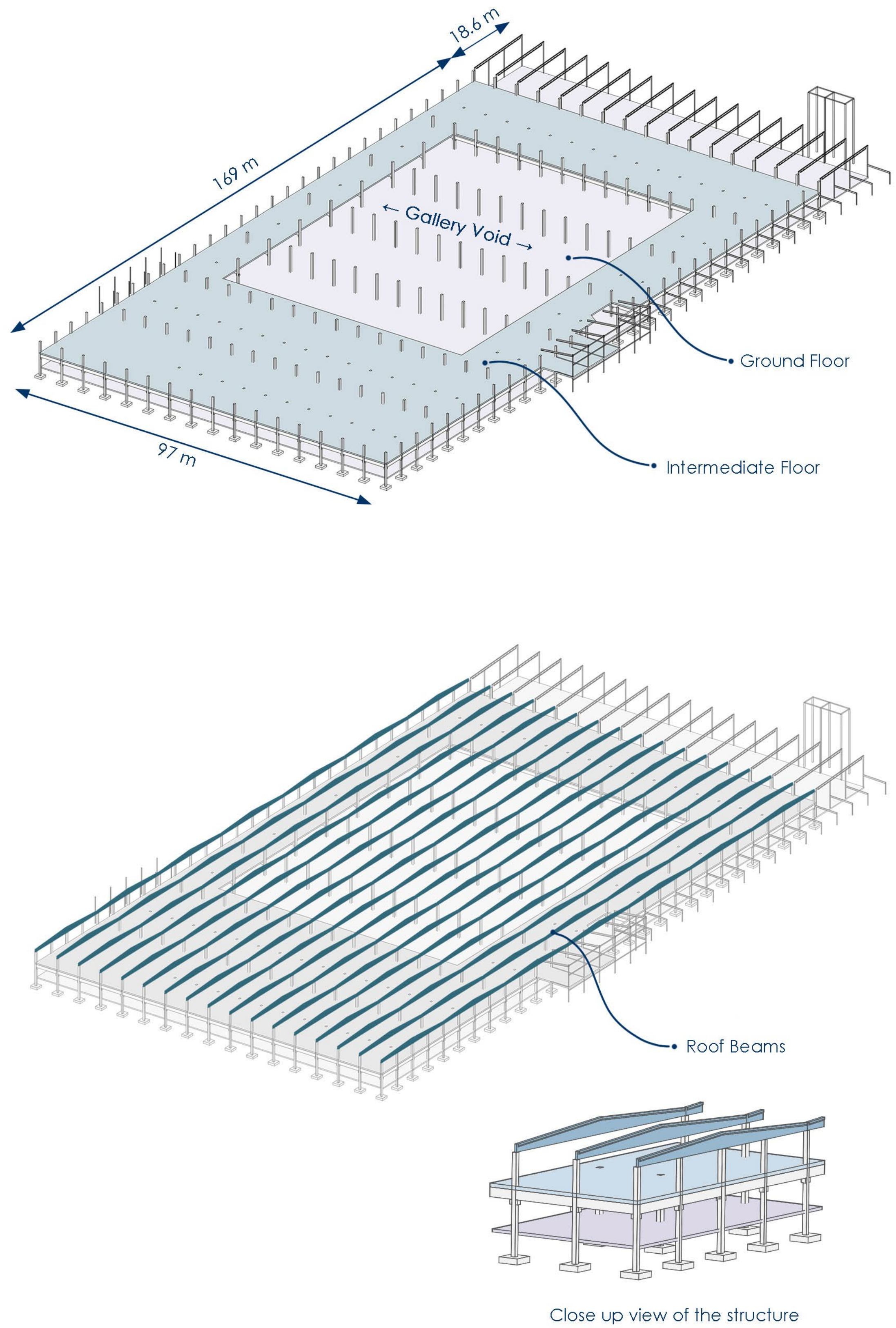


Figure 26. Structural elements of the existing building.

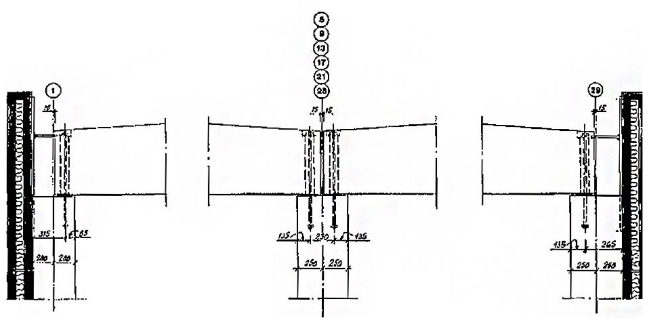
Materials

The building's prefabricated elements offer a high potential for reuse. On facades, large portions of the second-floor level are covered with blue corrugated steel plates. Most of the extensions added to the building over time are also covered with the same material. These extensions, added over time to meet technical needs, generally have varying heights and an irregular appearance.

On the east facade, the aluminum panels of the entrance canopy, which was once yellow, has been painted gray since the store closed. The highest number of windows is also found on this facade. While it may not be feasible to reuse these windows as a whole with their frames, there is a high potential for reusing the glass panels by reframing them.

The hollow floor slabs and reinforced concrete beams forming the intermediate level are also prefabricated elements, making them highly suitable for reuse in different areas and projects. The modular dimensions of the floor slabs also allow for resizing. Similarly, this applies to the roof trusses and plates, which are in excellent condition and can be reused in another project.

Due to the building's large volume, any potential materials to be extracted could be significant in terms of both area and volume. Therefore, in such a scenario, there is the potential to feed large-scale new projects with materials. Such buildings are not uncommon. It is possible to see many abandoned or slated-for-demolition structures of similar size and structure, especially in large cities. Therefore, this building serves as a good example that can demonstrate how such structures can have a significant resource potential.



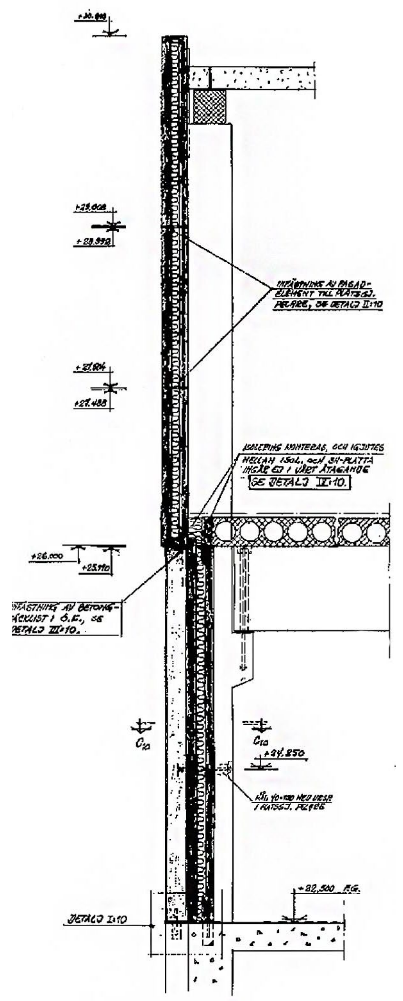


Figure 27. Original roof and detail drawings of the existing building, taken from Mölndal Municipality.

Figure 28. Main types of materials on the existing building.

5.2 Program Development

Summary of Findings

The findings obtained from the research can be summarized as follows:

The planned demolition of a structurally sound building for a large shopping center by a sustainability-focused brand has led to the exploration of alternative models.

Difficulty accessing reuse concepts in society is evident. Discovered projects are mostly small-scaled and accessibility challenges often require people to visit multiple locations to meet various needs from reusable products.

Difficulty in obtaining sufficient materials limits reuse for developers in the construction sector. This leads to inefficiencies in searching, managing inventories, assessing suitability, and storage space.
Renovation and individual home construction face similar challenges, potentially discouraging reuse for individuals.

Individuals require specific materials in smaller quantities, while construction companies need larger amounts.

Based on these findings, it has become evident that both individuals and companies need easier access to reclaimed materials. Could these materials be obtained as easily as buying a new product from a store? Considering the size of the building, these questions led to the idea of creating a Reuse Hub that is easily accessible and serves a wide range of users. A center of this size could be a platform that provides both individuals and large companies with easy access to the materials and goods they need and offers other functions that can create a common synergy.

What Can Be Reclaimed?

For the development of the project's program, it was first necessary to determine and classify what could be reclaimed. Seeing the breadth of the scope of this once again proved the scale of loss of resources we are facing. Despite a wide variety of products and materials that could be reclaimed and reused, as seen from reference research, no example of a center capable of offering such a broad spectrum of product variety was seen. Therefore, a detailed classification and user profile determination study was conducted, moving from the general classification to the details.

Accordingly, the classification has been divided into two main categories: "**Consumer Products"** and **"Building Resources"** and the functions have been defined in line with the needs that arise in connection with these two categories. The Consumer Products category covers all of the everyday products and materials for individual use and required areas for these, while the Building Resources encompasses areas related to the reuse of all scales of reclaimable building materials and structural elements.

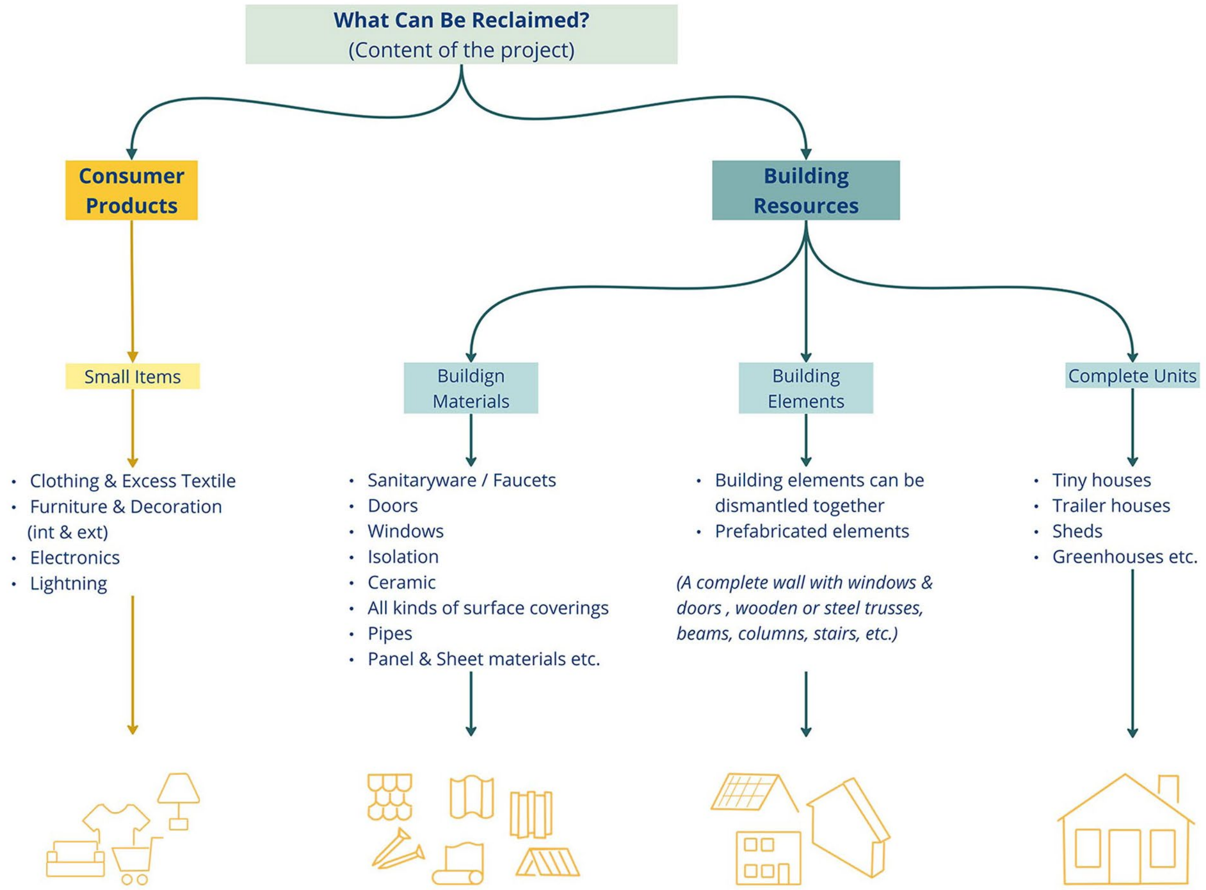


Figure 29. Step 1: General classification of reusable resources.

In addition, a more detailed classification of reusable materials was required. This was made to determine how much space the program would require based on the variety and ratio of materials that could be

GOODS

Clothing & Excess Textile (Remake)
Shoes & Accessories
Decoration (Interior & Exterior)
Glassware
Kitchenware
Electronics
Lightning (Housing)
Books
Sports equipment

FURNITURE - Residential Furnitures (smaller amounts)

House furnitures
Bathroom cabinets
Kitchen blocks
Home textile (Carpets, Curtains, etc.)
Garden furniture

MATERIALS

Plaster Boards
Wood
Tiles
Metal
Ceramic & Stone
Isolation & Rolled Materials
Plastic
Components
Technical Components

FURNITURE - Commercial Furnitures (bigger amounts)

Office furnitures
Office carpets
Blinders, sun screens
Industrial kitchen units

ELEMENTS

Intact roof truss (Prefabricated)
Prefabricated wall blocks & structural frames
Brick wall blocks
Sandwich wall panels
Fences
Entrance/canopy covers
Stairs (Small sizes)

BLOCKS

Greenhouse units
Modular Tiny house/cabin (Construction and sale)
Shipping containers (Second hand)

Figure 30. Step 2: Detailed classification of reusable products.

Building Material Type	Content	*Estimated Space Ratio in Warehouse
Plaster Boards	*Wall boards, Ceiling boards (with accessories & profiles etc.)*	5%
Wood	*Panel / Sheet (all types and uses), Blocks / Studs, Cladding (interior & exterior), Structural (big blocks), Flooring (indoor & outdoor), Wood pallets*	25%
Tiles	*Brick tiles & cladding bricks, Concrete tiles/ bricks/ stones, Roof tiles, Shingles*	15%
Metal	*Sheet metal (roof & facade), Pillars & Studs, Profiles, Rolled wires / fencing, Rebar & Reinforcement*	10%
Ceramic & Stone	*Ceramic tiles (interior & exterior), Marble plates, Stone tiles, Glass tiles, Pebble*	15%
Isolation & Rolled Materials	*Board isolation, Rolled isolation, Carpets (rolled & tiles), Vinyl (rolled & tiles), Cork*	5%
Plastic	*Plastic sheets (roofing & plates), Rolled materials (plastic curtains, tarpaulin, pvc advertising banners etc.)*	3%
Components	*Doors, Windows, Bathroom Fixtures (Toilet seats, Sinks, Faucets, Bathtubs & Showers, Blenders), Kitchen Fixtures (Sinks, Faucets, Industrial units, Cupboard units)*	15%
Technical Components	*Electrical (Cables, Sockets, Lighting fixtures - commercial, indoor & outdoor), Plumbing (Underfloor heating, Radiator, Drainage, Plumbing pipes), Heating & Ventilation (Radiators, Heating units, Ventilation pipes, Ceiling fans etc.)*	5%
Other	*Hardware and accessories, Mortar, Cement*	2%
TOTAL		100%

**Estimated ratios in this area are hypothetical values based on the results of examining the space allocated for product types in the stores of large retailers selling first-hand materials and the product range and quantities of companies selling reclaimed materials. No official study has been found in this field.*

Figure 31. Step 3: Detailed classification of reusable construction materials.

obtained.

This broad scope required research into how the project could be operated and its economic feasibility. It specifically requires a regular and sufficient supply of construction materials. At this point, the necessity of collaboration with other sectors emerges. It is common for material manufacturers and wholesalers in many fields to have surplus or leftover materials. Instead of these materials becoming waste, repurposing them in this center could ensure a regular and substantial supply of certain construction materials. Additionally, recycling centers are also working to separate and repurpose products left to them that have reuse potential. For these products, which many recycling centers redirect to other organizations due to limited resources, this center could be an excellent destination.

Considering the building is private property and taking reference companies into account, it was proposed that the project could be managed by a legal entity, and the possible economic benefits were taken into account in this regard while determining the functions during program detailing. Another potential alternative considered is a collaboration between a legal entity and a public institution, given the large scale of the project.

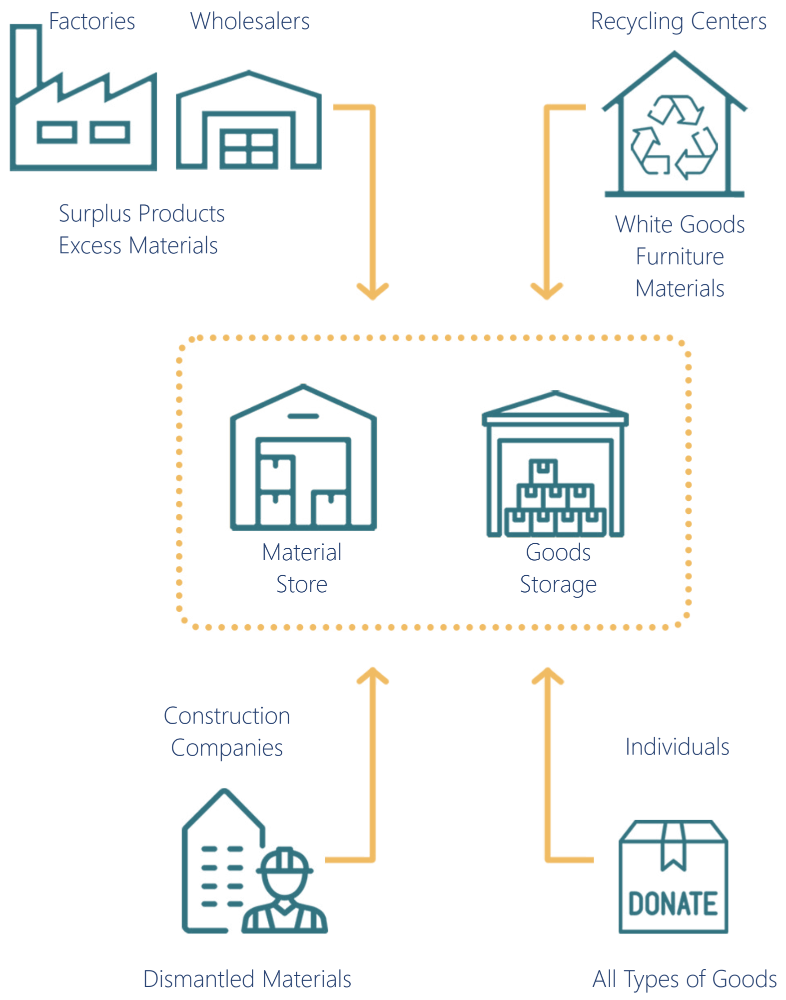


Figure 32. Diagram showing the material supply sources.

The Program

Alongside an extensive research process, the next stage involved identifying all possible functions within the building, all user profiles, all potential traffic flow, logistics, and equipment needs. At the end of this process, a program covering more than the total area of 23,500 m² was established. Since a portion of the designated areas require a double-story height, some parts of the intermediate floor had to be removed, resulting in a reduction in the existing total building area.

While determining the program, it was studied how the products, and materials previously categorized as the *Consumer Products* and *Building Resources* would arrive at this center and what kind of facilities would be needed to deliver them back to users again. According to this, determined functions classified into two main categories as **Main Functions** and **Complementary Functions.**

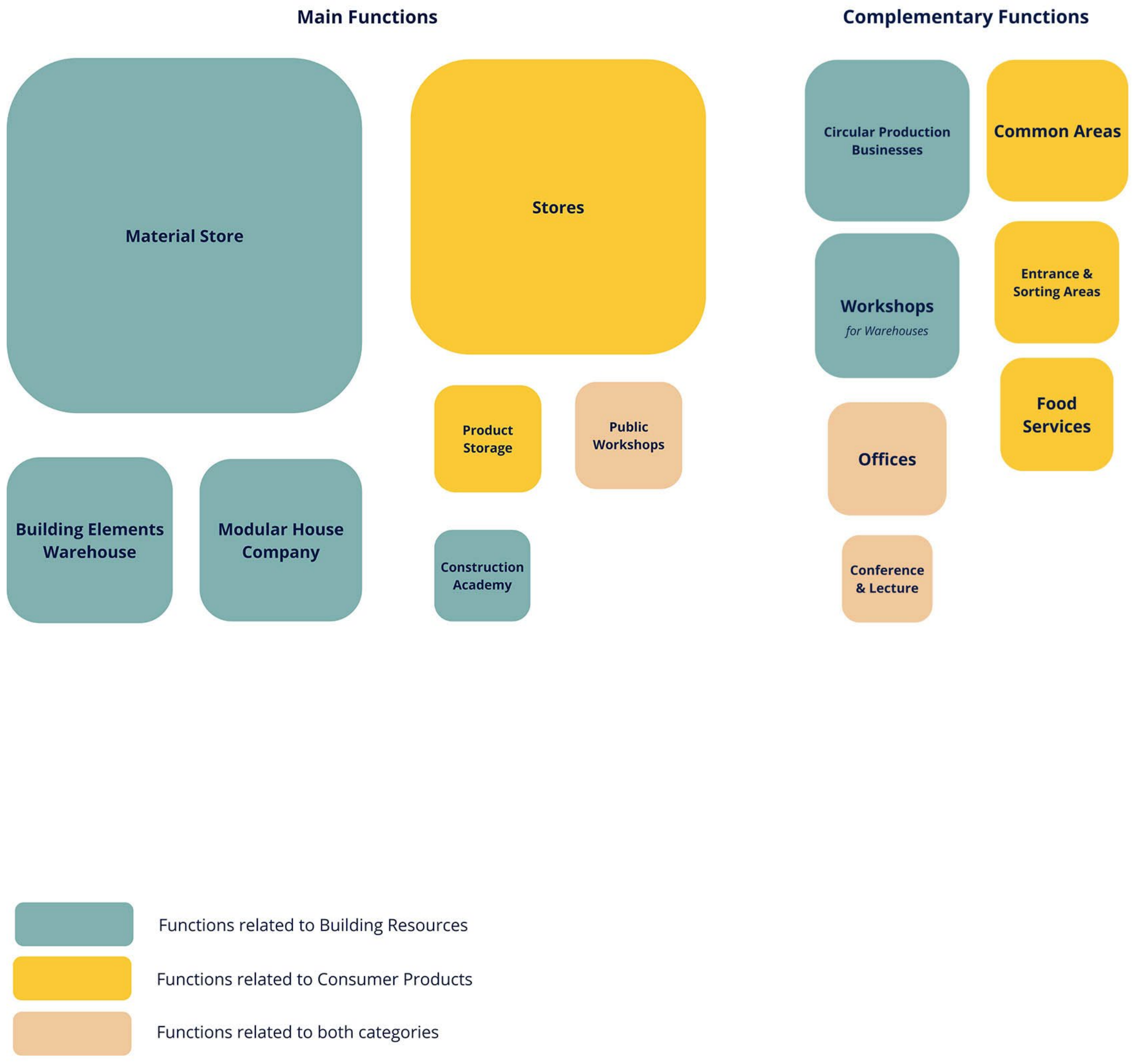


Figure 33. Categorization of the determined functions in the project.

The functions related to the Consumer Products category generally cover spaces associated with the delivery of these products and small-scale materials primarily to individual users. These include stores, and common spaces like dining and event areas, as well as storage and sorting areas necessary for receiving the consumer products.

The functions related to the Building Resources category involve spaces needed for handling larger scale and bulk quantities of reclaimed construction materials and products for both individual and corporate users. These areas include the material store, functions like the modular house company supporting the business concept, and needed workshop areas.

The functions related to both categories include additional areas necessary for the operation of these functions and educational areas directly interacting with both categories. These encompass management offices as well as public workshops for production and hobby, and conference rooms.

The next stage in the program development process followed by determining the flow of movement within the spaces, defining the user profiles and the connection and interaction between all. As a result of the studies conducted, it has been determined that access areas need to be effectively separated according to needs. Within individual access, a business-focused access point is also required. Additionally, there should be entrances accessible to both individuals and employees, as well as those only for employees.

While areas accessed by individuals need to accommodate public transportation, cars, and bicycles, areas accessed by employees need to allow access for heavy vehicles such as trucks.

The research also indicated that equipment like forklifts and pallet jacks will be necessary for heavy tasks both inside and outside the building, and their access areas have been designated as well.

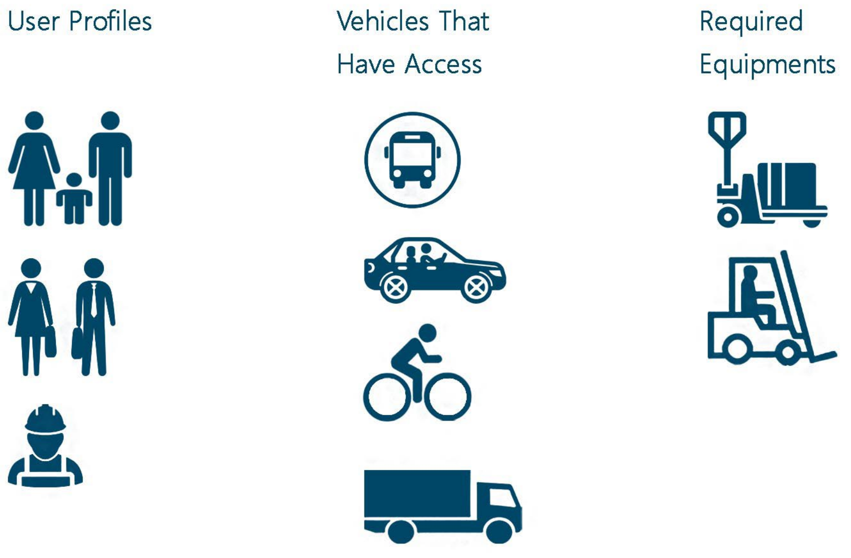


Figure 34. Icons representing the defined type of user profiles, vehicles that will have access and equipments that will be used in and outside of the building.

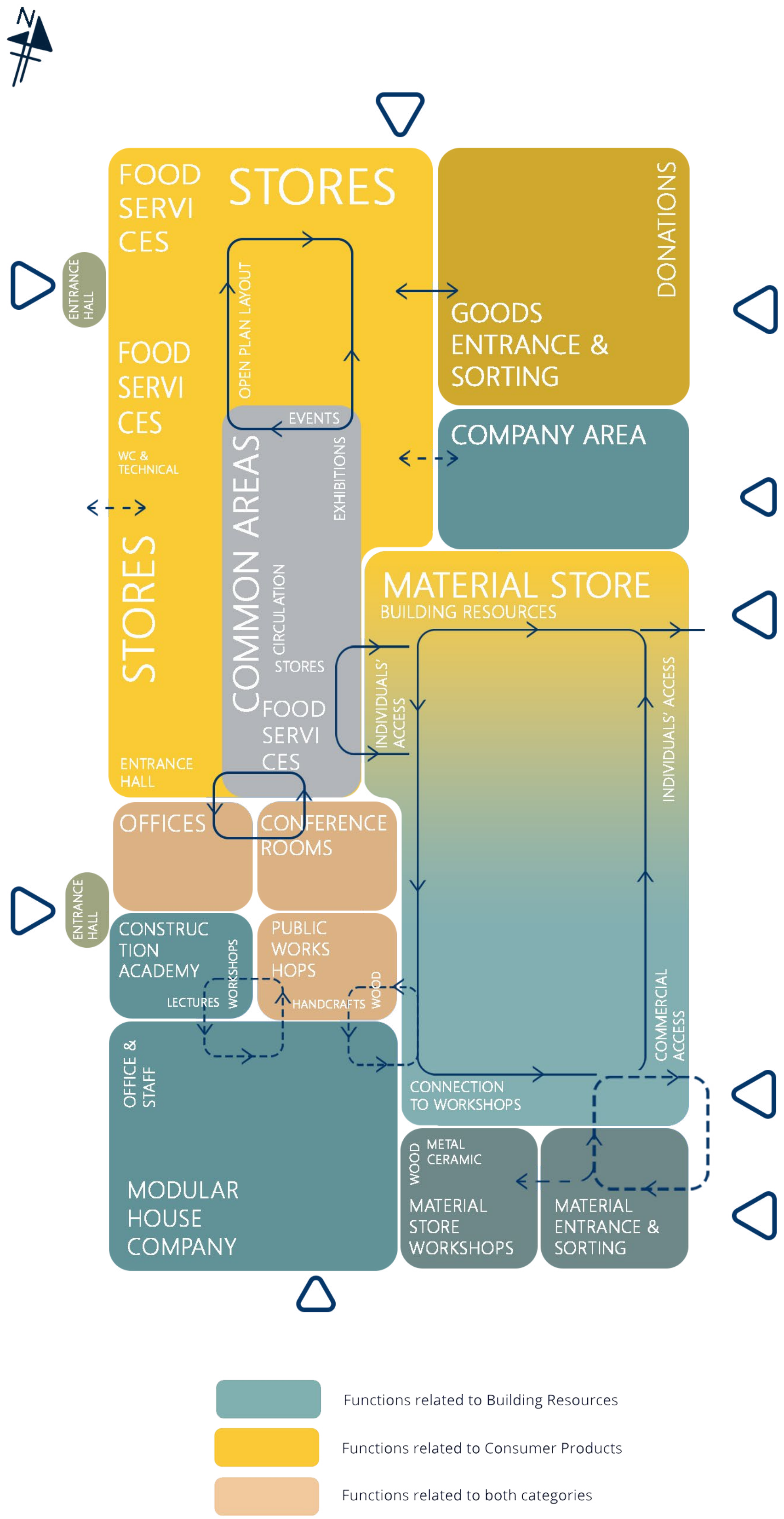


Figure 35. Bubble diagram showing relations between defined functions.

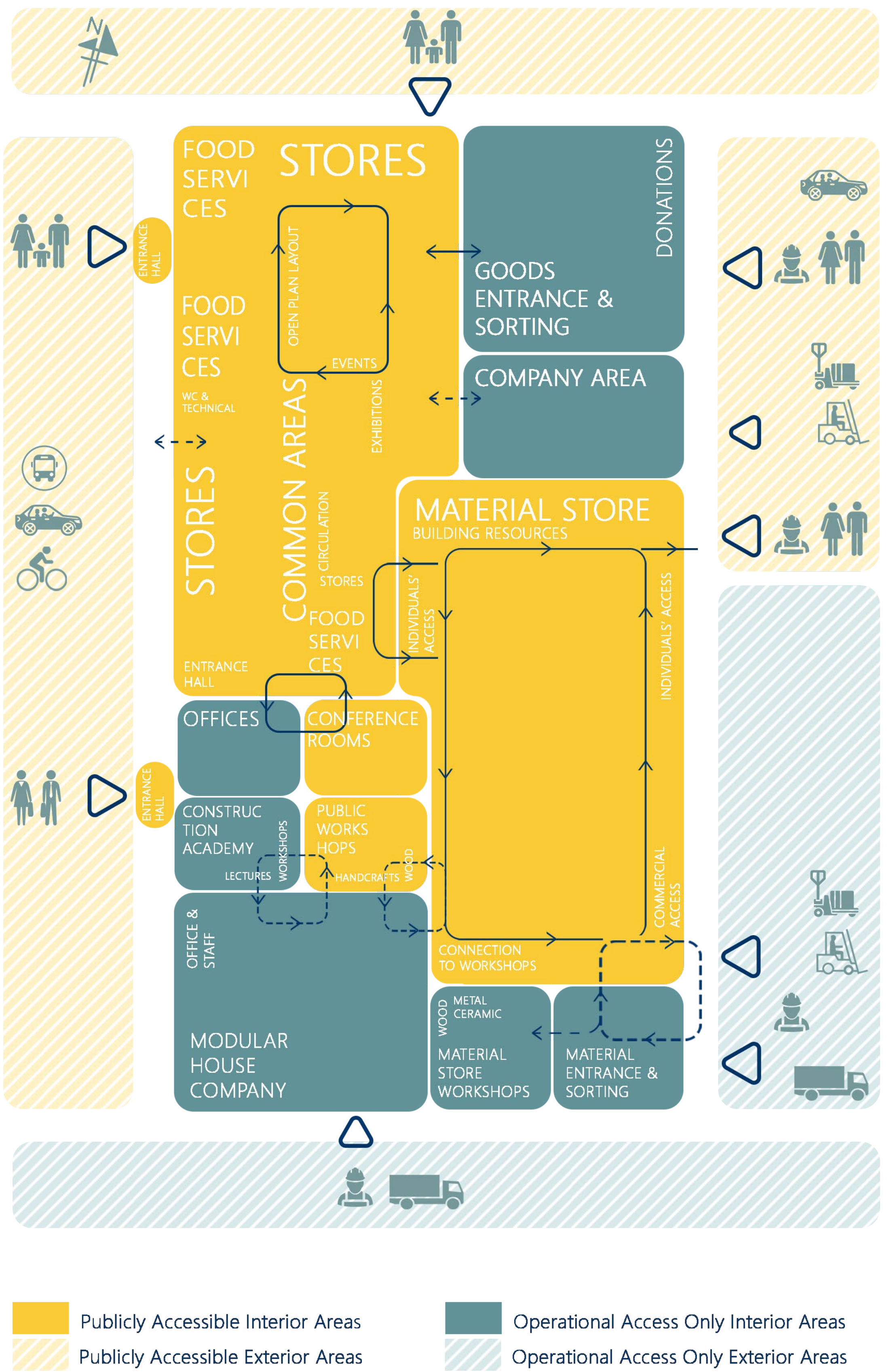


Figure 36. Bubble diagram showing access areas of different user profiles and vehicles.

5.3 Design Proposal

The defined program has been placed within the building according to these strategies:

1. Change of Main Entrance: Considering Ekenleden Street becoming a main artery in future urban plans, the main entrance direction is now designated towards the western facade.

2. Separation of Traffic and Access: Recognizing the necessity of separated traffic and access based on user profiles and functional needs, the south entrance, due to its proximity to the highway, is designated for large vehicles, with the advantage of the parking area on the eastern side.

3. New Road to The South: To enhance traffic circulation within the site, a new side road connecting to the southern entrance from Ekenleden Street will be opened, facilitating uninterrupted traffic flow and accessibility to this facade.

4. Zoning of Function Groups: Function groups have been strategically placed within the building, with consumer-related areas situated in the northwest half and those related to building resources in the southeast half, aligning with the varying user profile accesses to the building.

5. Entrance Placements: In terms of entrance placements, the building features two entrances on the west facade, with one closer to business spaces and the other to stores. Additionally, a third entrance on the north facade is designated for easier access to public transportation and parking, while the east facade is dedicated to logistic operations, including pickup and drop-off zones for products, as well as areas for truck loading and unloading.

6. Floor Heights: The planning within the building was significantly influenced by existing floor heights. Areas requiring high ceiling heights were placed together, allowing for a more efficient extraction from the intermediate floor slabs. Stores could be positioned between these existing floor heights. The existing gallery void in the middle of the building served to minimize flooring removal while serving as a central intersection point between the two primary function groups.

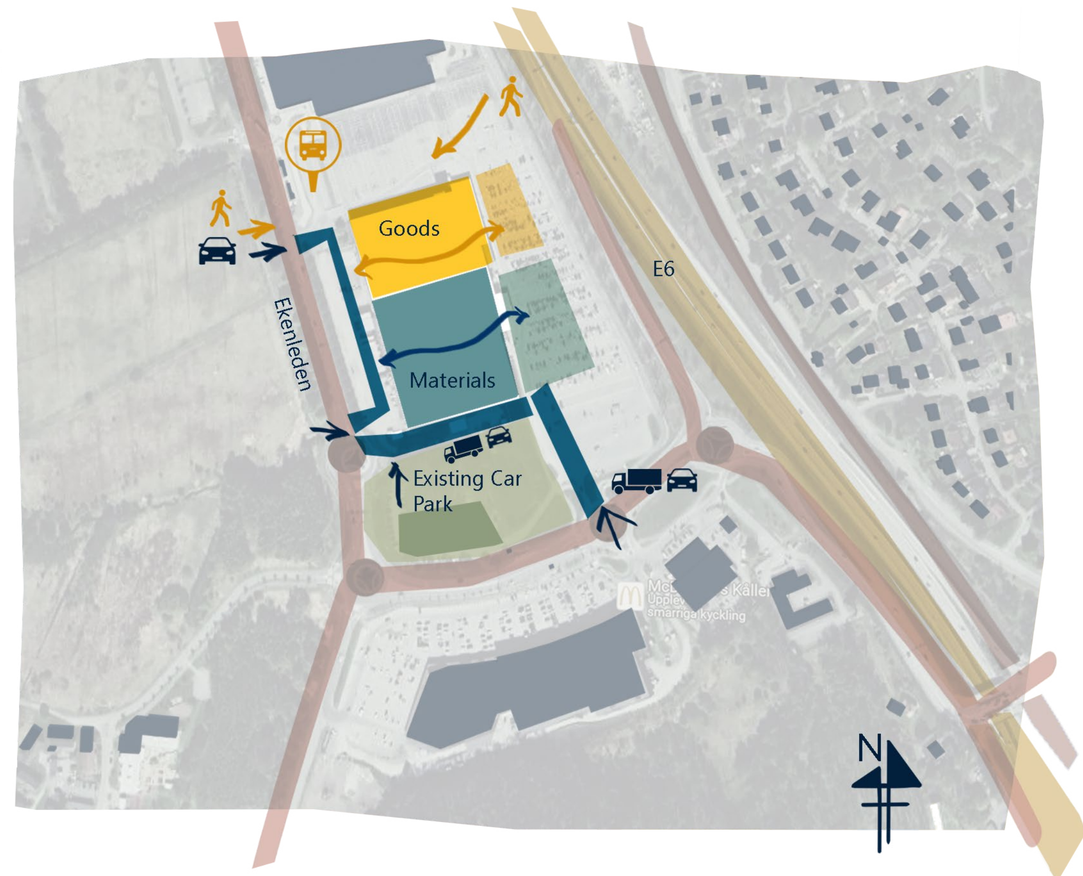
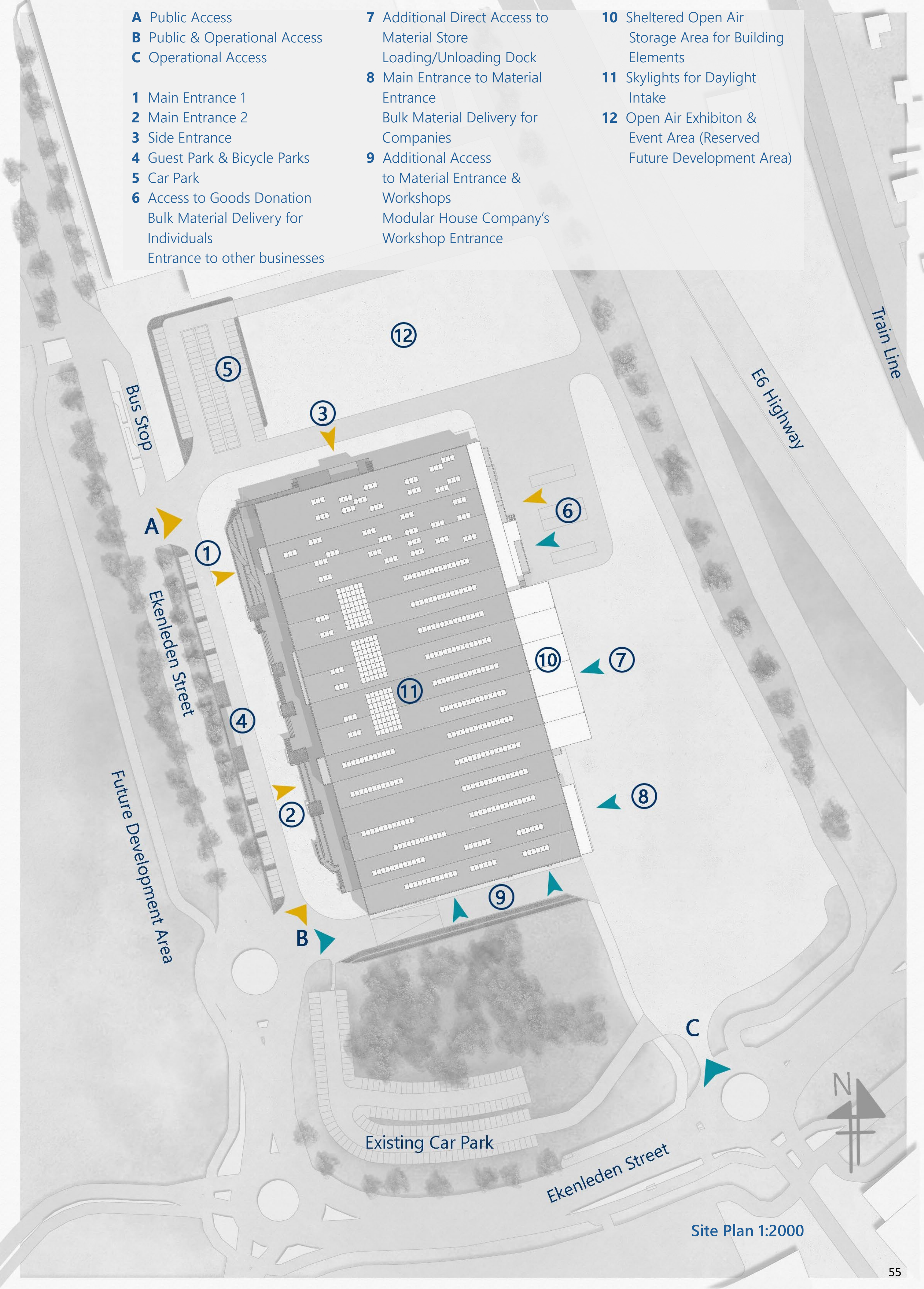


Figure 37. Design strategies shown on site.

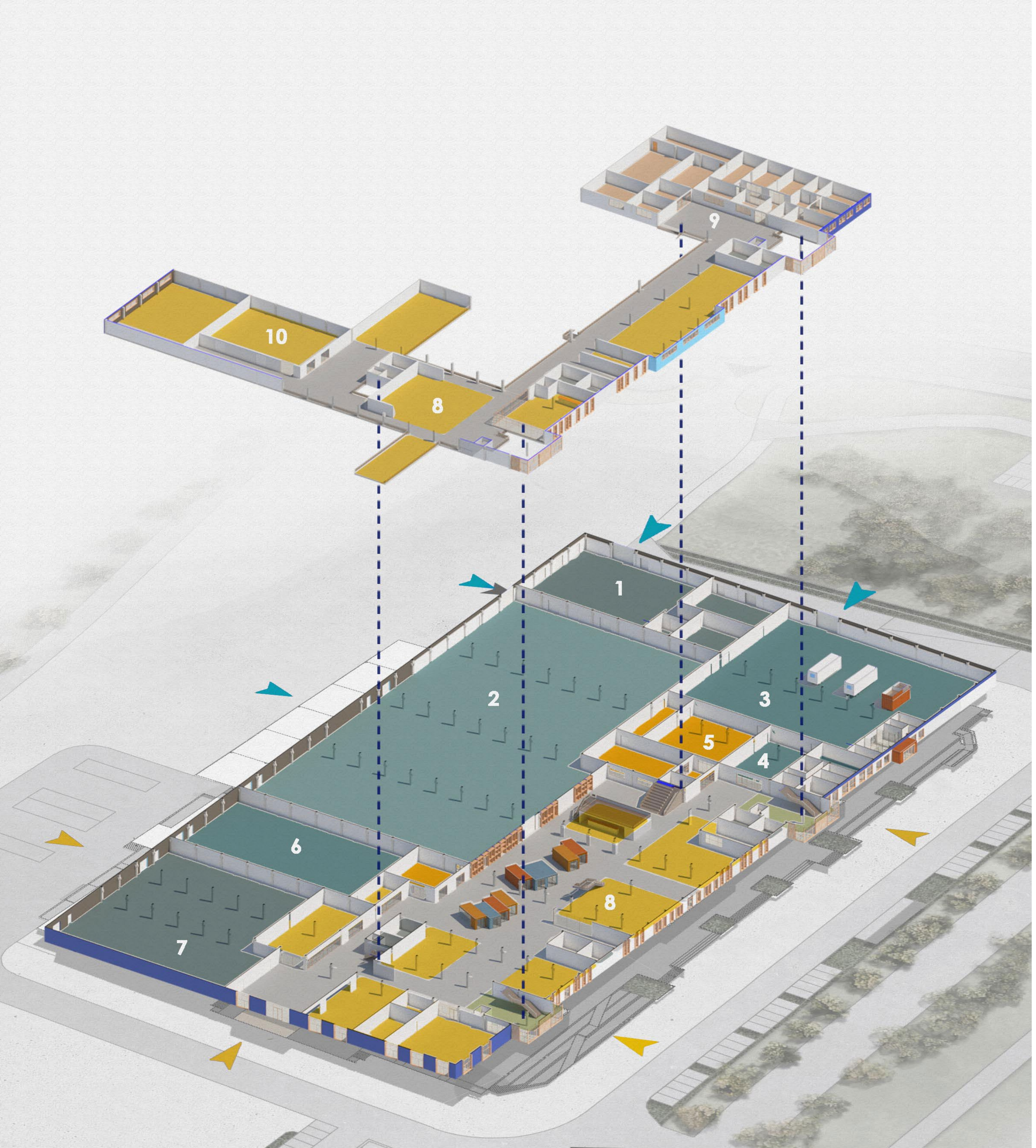
Site Plan

A Public Access
B Public & Operational Access
C Operational Access

1 Main Entrance 1
2 Main Entrance 2
3 Side Entrance
4 Guest Park & Bicycle Parks
5 Car Park
6 Access to Goods Donation
Bulk Material Delivery for Individuals
Entrance to other businesses
7 Additional Direct Access to Material Store
Loading/Unloading Dock
8 Main Entrance to Material Entrance
Bulk Material Delivery for Companies
9 Additional Access to Material Entrance & Workshops
Modular House Company's Workshop Entrance
10 Sheltered Open Air Storage Area for Building Elements
11 Skylights for Daylight Intake
12 Open Air Exhibiton & Event Area (Reserved Future Development Area)

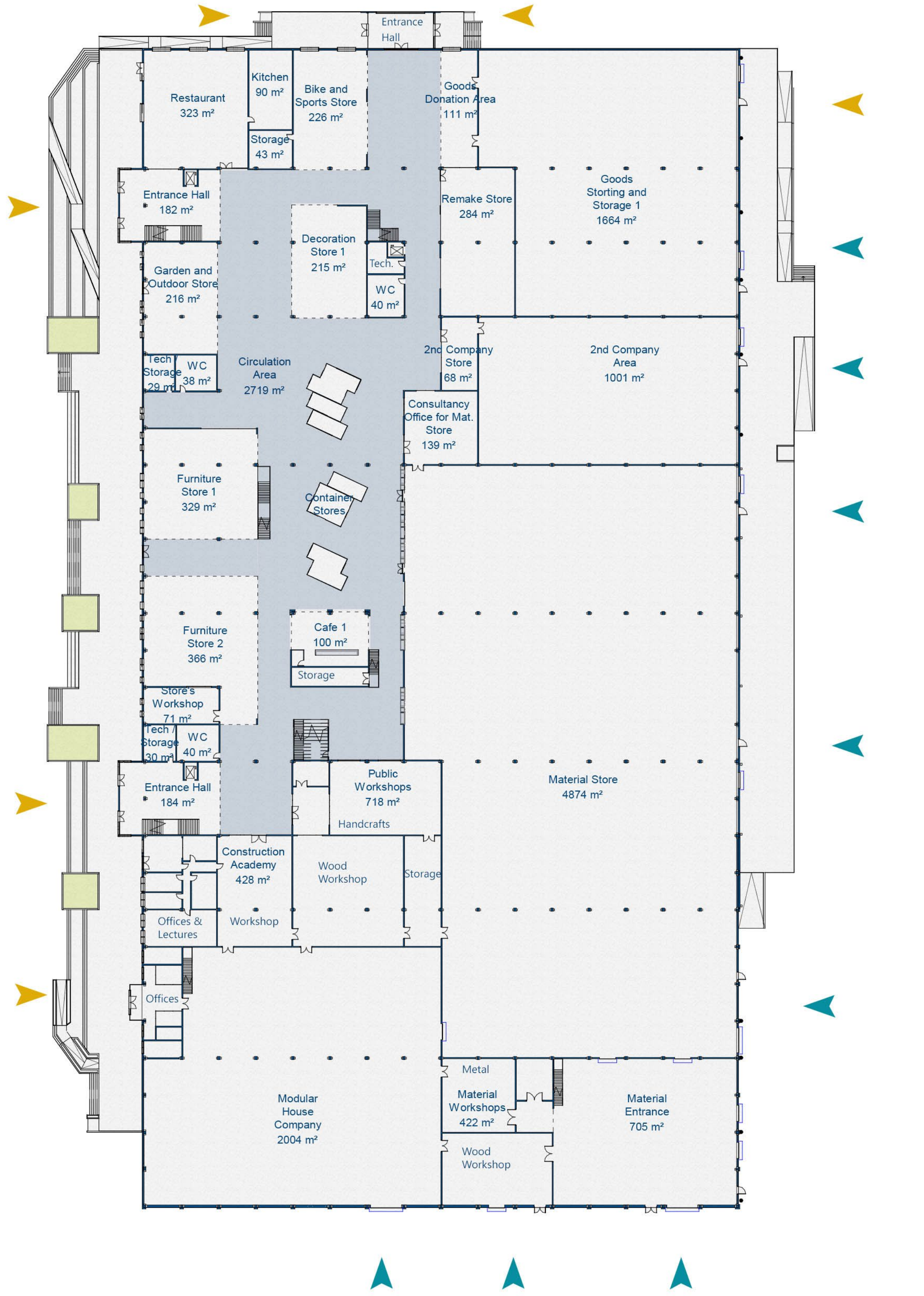


Floor Plans in Perspective View

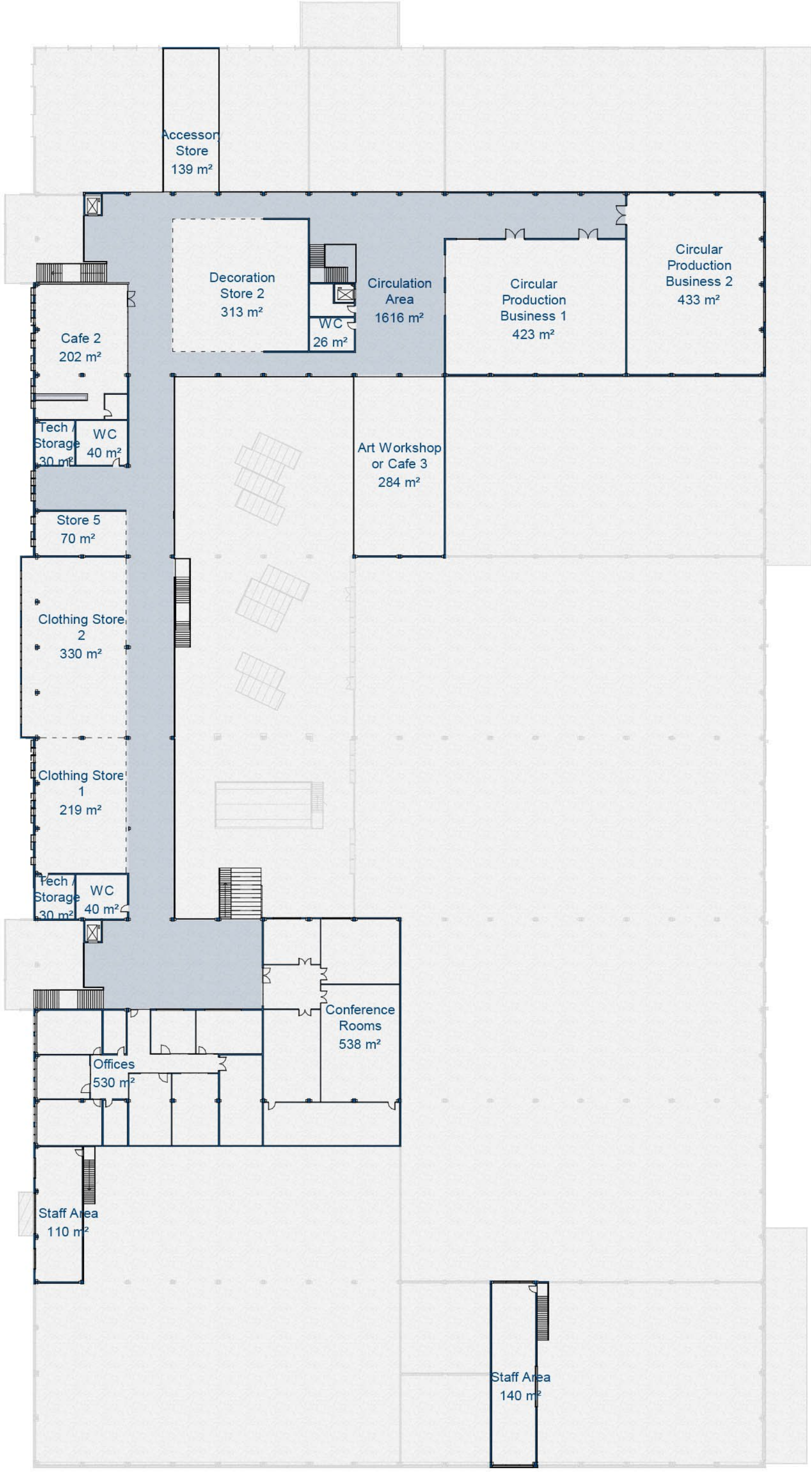


1 Material Entrance & Workshops
2 Material Store
3 Modular House Company
4 Construction Academy
5 Public Workshops
6 Company Area With Workshop
7 Goods Sorting & Storage
8 Modular House Company
9 Offices & Conference Rooms
10 Company Areas

Floor Plans



Ground Floor Plan 1:1000



Second Floor Plan 1:1000

Plan Close-ups

Fig. A - Restaurant

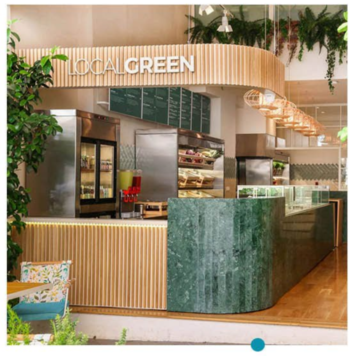


Fig. B - Bike & Sports Store

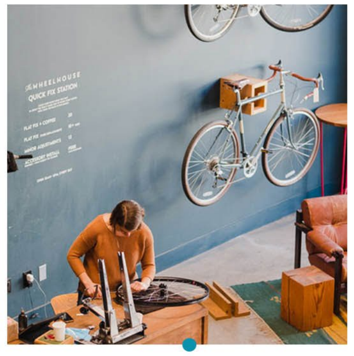
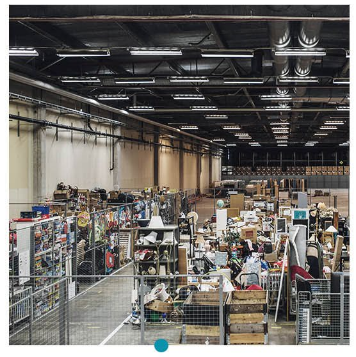
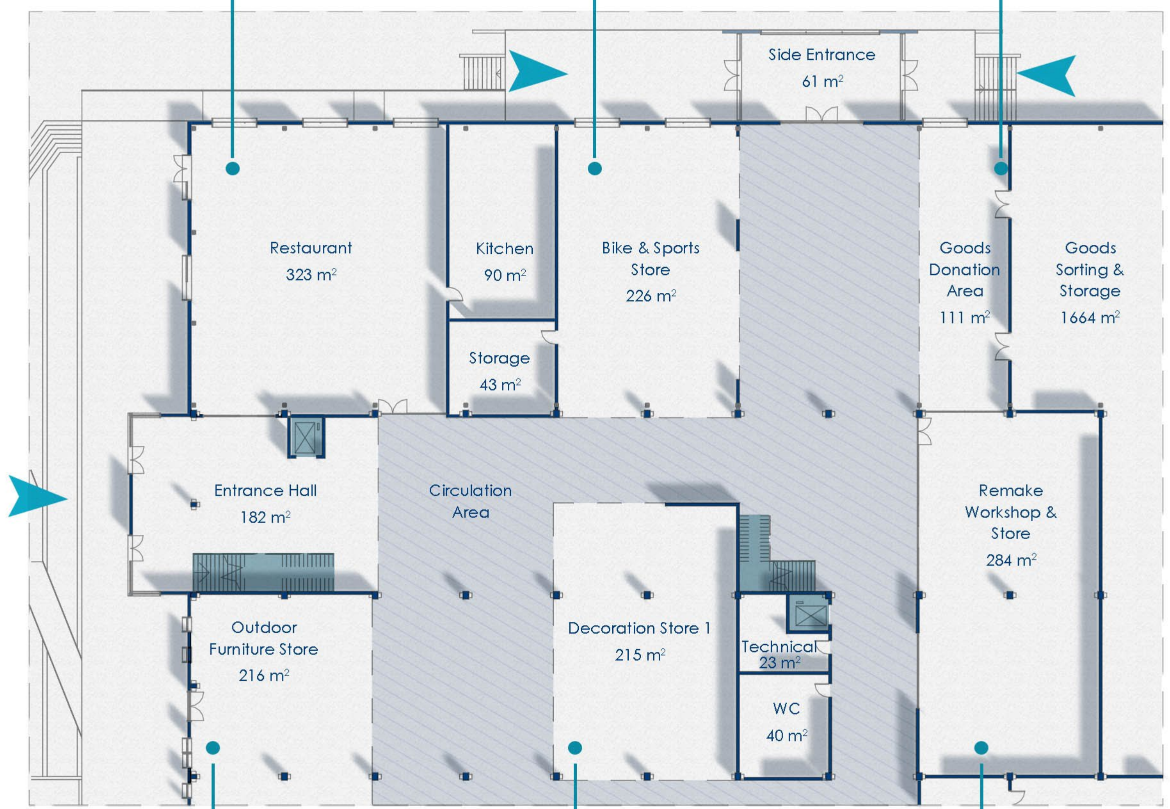
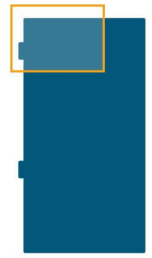


Fig. C - Good Sorting Area







Ground Floor 1:500

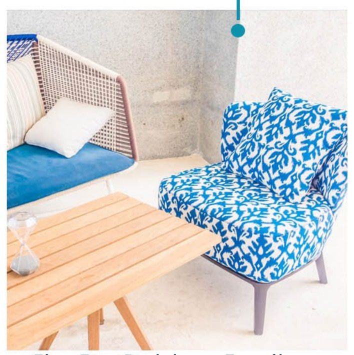


Fig. D - Outdoor Furniture Store

Fig. E - Decoration Store

Fig. F - Remake Workshop & Store

Sources of images can be found in the Reference List.

Fig. G - Furniture Store

Fig. H - Cafe

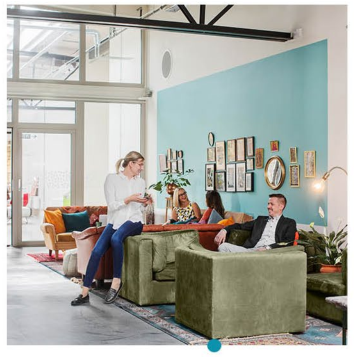
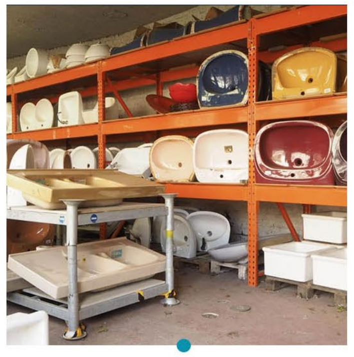
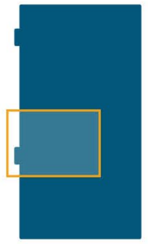
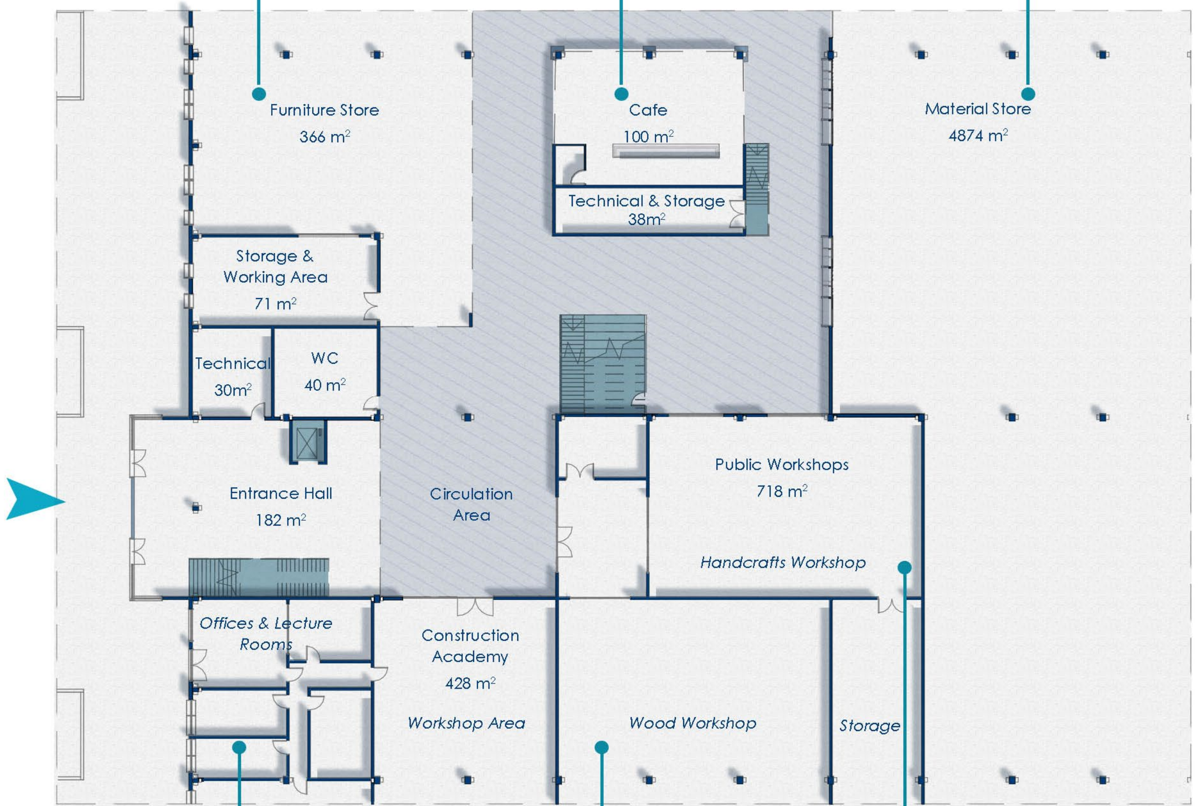


Fig. I - Material Store







Ground Floor 1:500

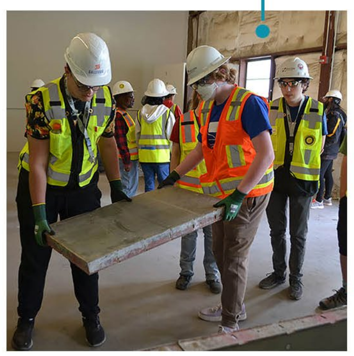


Fig. J - Construction

Fig. K - Public Workshops (Wood)

Fig. L - Public Workshops (Handcraft)

Sources of images can be found in the Reference List.

Fig. M - Modular House Company

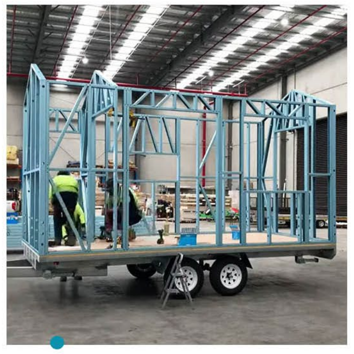
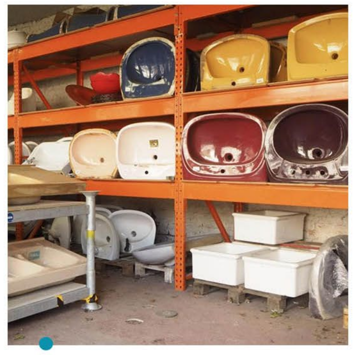
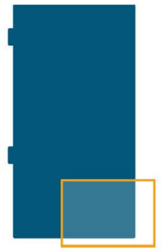


Fig. N - Material Store





Ground Floor 1:500

Fig. O - Material Workshops

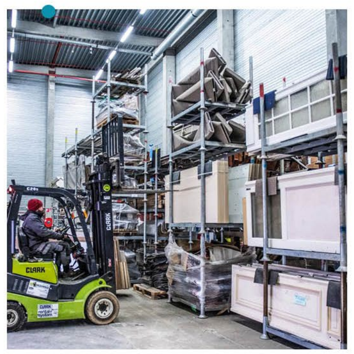
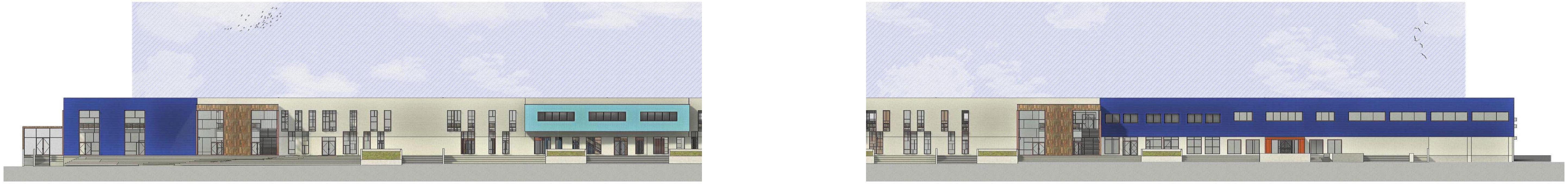


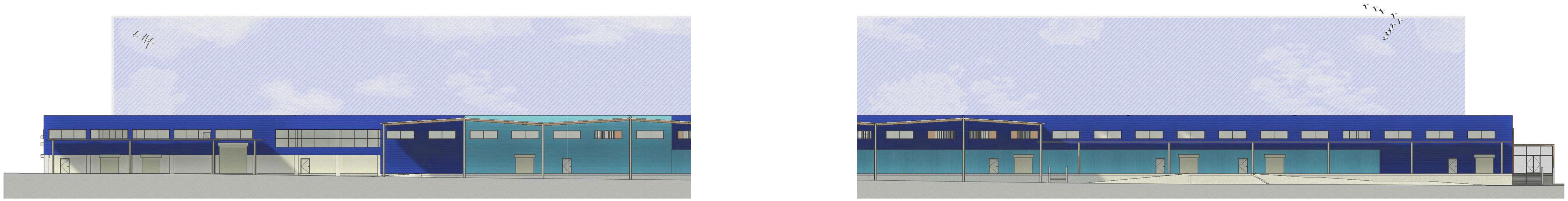
Fig. P - Material Entrance & Sorting

Sources of images can be found in the Reference List.

Elevations

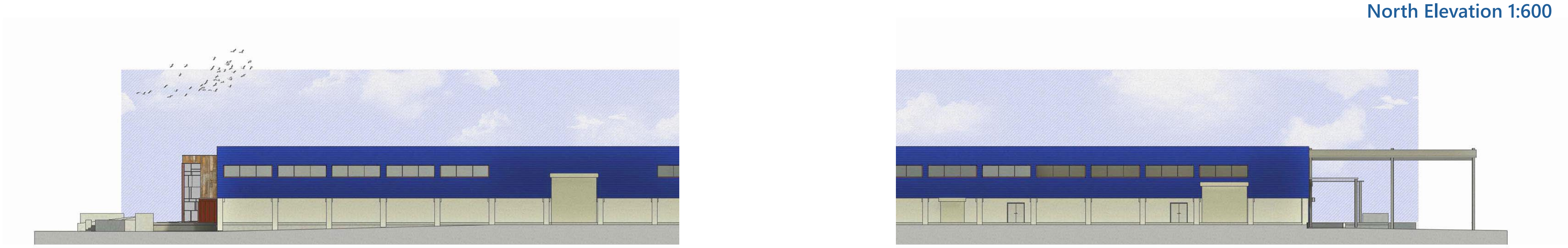


West Elevation 1:600



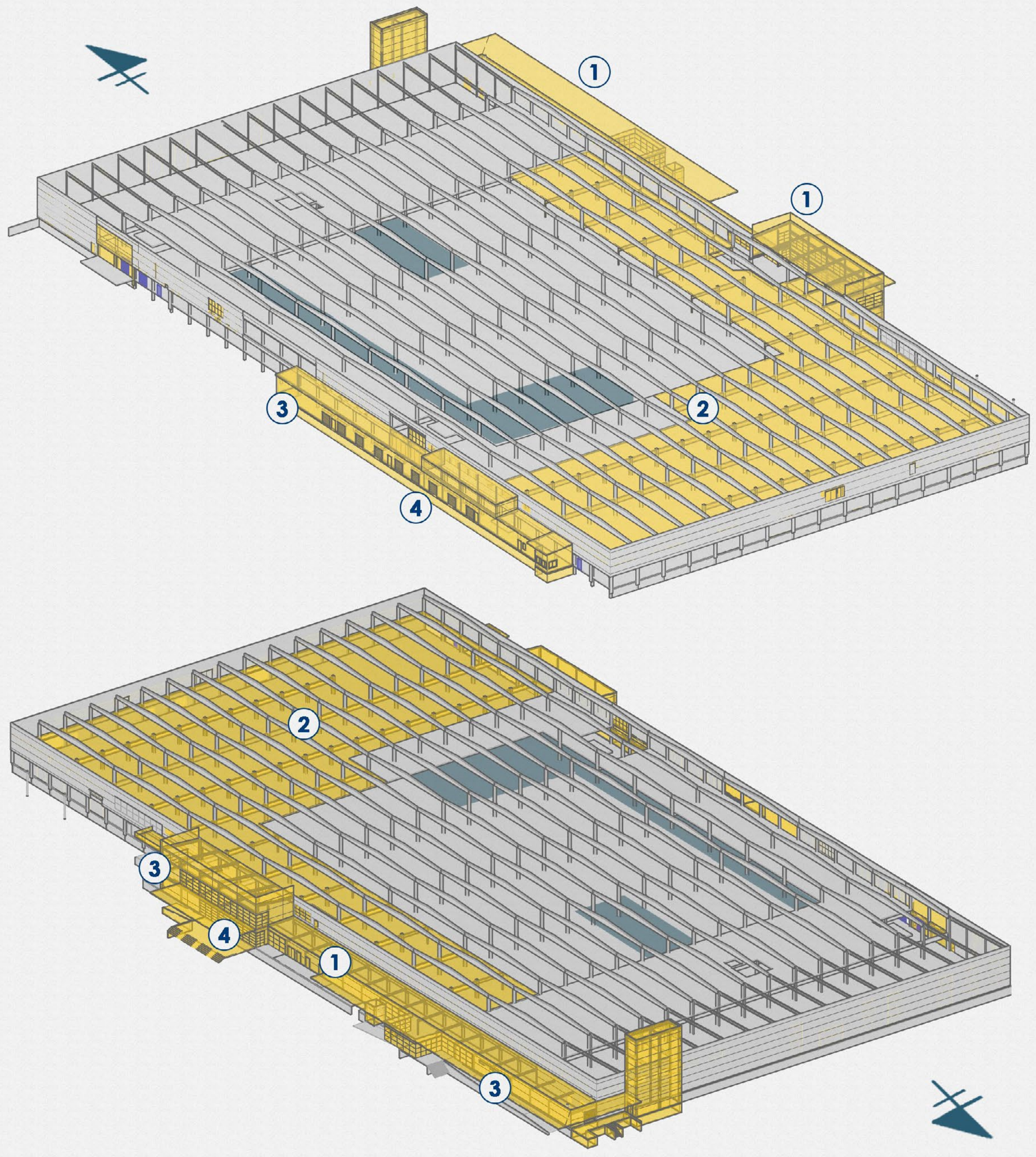
East Elevation 1:600

North Elevation 1:600



South Elevation 1:600

5.4 Material Reuse



	Removed	Reused
(1) Roofs	Galvanized Steel / 2000 m²	None
(2) Floors	Hollow Precast Slab / 6300 m²	1400 m²
(3) Walls	Galvanized Steel / 850 m²	850 m²
(4) Windows & Doors	Curtain Wall Glass Panels / 350 m²	350 m²
	Hinged Windows / 102 m²	100 m²
	Rolling Doors / 11pcs	10 pcs

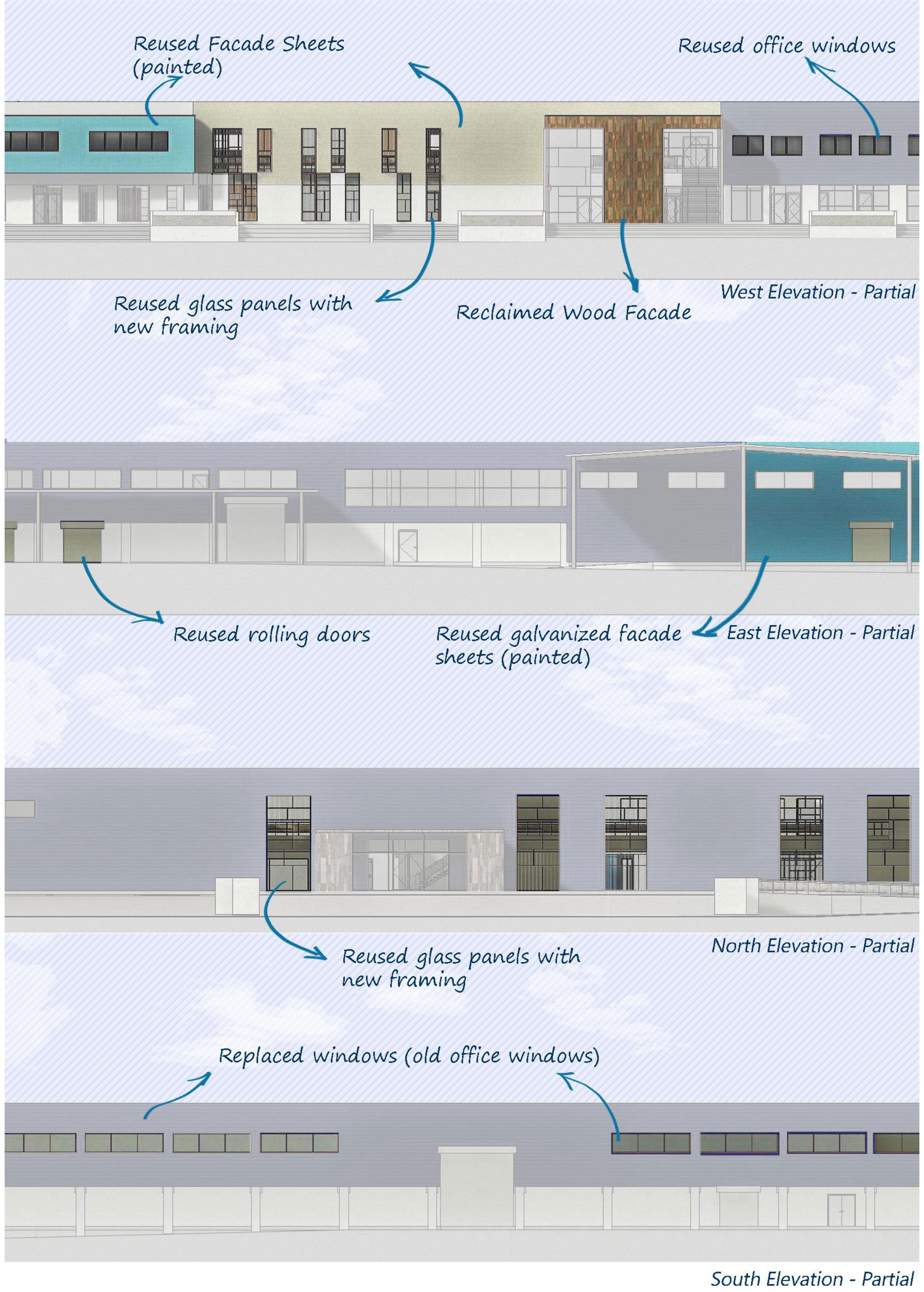


Figure 38. View from the main entrance.

Figure 39. View of the material arrival area.

Figure 40. View of the central area from ground floor.

Figure 41. View of the central area from second floor.

06 CONCLUSION

6.1 Conclusion

We have brought the resources of our planet to the point of depletion. One of the triggering factors of this situation is our global consumption habits. In this direction, the building subject to this study is also set to be demolished to replace it for a new one (Mölndals Stad, 2016). Therefore, this work focuses not only on transforming an existing structure but also emphasizes reuse as an alternative method for resource conservation. During this process, the effects of overconsumption, the role of reuse in the circular economy, and the potential of circular hubs in the construction industry were explored.

It is clear that excessive consumption causes significant challenges to environmental sustainability and social equity. Rapid depletion of natural resources, excessive waste production, and the uneven distribution of resource use are driving us towards an irreversible point globally. Despite ongoing transformation projects worldwide, demolitions of buildings deemed unworthy of preservation continue. Studies reveal that the amount of resources lost through demolition processes far exceeds estimates. A similar situation is observed in Sweden, where the construction sector is one of the leading sectors in waste production (Naturvårdsverket, n.d.-c). Although the role of recycling in the sector is increasing, it still entails energy consumption, and the potential uses of resources and materials are diminishing.

In this context, reuse emerges as a promising strategy to reduce resource extraction, minimize waste formation, and lower carbon emissions. Despite obstacles such as regulatory restrictions and logistical challenges, the increasing demand is also increasing studies on the development of reuse practices. In addition to the obvious environmental impact of this concept, it has also been seen that it can provide economic returns in projects and as a business model. Examples like Rotor DC and Retuna have demonstrated that such initiatives can rapidly develop into a growing economic system. It has been observed that a reuse center has the potential to accommodate circular economy-focused technological developments and new business models and create new employment opportunities (Lendager & Pederrsen, 2020).

Research on circular hubs as an alternative model for material management in the construction industry shows that these centers can offer a good solution in the field of reuse. Such centers have the potential to optimize the reuse of construction materials, streamline supply chains, and reduce environmental impacts. The existence of centralized facilities for the classification, storage, and distribution of reclaimed materials can support the scaling of reuse initiatives. These centers, although requiring investment, regulatory support, and coordination, will be critically important in enhancing circularity in the construction sector. Examples like Retuna in Eskilstuna and Buurman in the Netherlands prove the societal acceptance of reuse. As Retuna grows and the number of Buurman centers increases, these centers not only prove the viability of reuse but also the societal demand for re-purposing. Particularly, enhancing the accessibility and visibility of these centers can help make reuse a norm in society.

In conclusion, findings demonstrate that the potential of reuse centers can facilitate a transition to a more sustainable and resilient production and consumption system. Achieving this, however, depends on collective action, innovative solutions, and a shared commitment.

6.2 Discussions

The overarching conclusion that can be drawn from this study is that there is a general issue of accessibility and the resultant coordination problems in sectoral reuse. While the construction sector heavily focuses on deconstruction and recycled materials, significant potentials in other sectors like manufacturing and retail are often overlooked. This situation prevents the opportunity to repurpose a wider range of materials.

The potential for reuse extends from everyday items to industrial production residues, from large structural components to various construction materials. However, recognizing this potential fully requires resolving fundamental issues of access and coordination. The presence of centralized facilities for reclaimed materials could offer a common platform where donors of the products and those in need can meet. Such centers could create an ideal system in terms of accessibility, potentially increasing both the quantity of materials and the demand.

In this context, the transition to a circular economy should not be limited to technological solutions alone. This process, which requires a cultural and societal transformation, necessitates a fundamental change in our consumption habits. Enhancing recycling and reuse in the construction industry and transforming existing buildings could be different alternatives to current practices. However, realizing this potential requires widespread societal acceptance and comprehensive policy reforms.

In conclusion, this thesis shows that we need to think more deeply about the sustainability and environmental impacts of our consumption and critically evaluate them. This change will be possible not only with the increase in circular hubs and reuse practices but also with the policies supporting these practices and the adoption of these new approaches. For individuals and societies, this is both an urgent and inevitable call for review.

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List of References For Images in Plan Close-ups

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Fig. B
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Fig. C & G & H & L
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Fig. D
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Fig. J
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Fig. K
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08 APPENDIX

Detailed Project Program

Main Functions	Complementary Functions
Material Store: This is where various reclaimed building materials are sorted, cleaned, packaged, and made available for sale. Customers can browse and select items themselves or request delivery. Separate entrances are provided for individual and commercial deliveries and donations.	Material Entrance & Sorting Area: This is the area where obtained materials are initially unloaded, categorized, and directed to the store or workshops as needed. Workshops: Some reclaimed construction materials may not be immediately ready for sale. Workshops will be for cleaning, resizing, repairing, and packaging reclaimed materials, including metal, wood, and ceramics.
Building Elements Storing Area: This will be a sheltered, outdoor area for storing large building elements like wooden roof trusses or bulk materials.	
Modular House Company: This will be a company specialized in constructing small building units using reclaimed materials, offering various options like tiny houses, cabins, container houses, and greenhouse units.	Workshops & Offices: This business area will have its own office and workshop spaces. These spaces have direct outdoor access and can easily connect to other areas like the Material Store, Construction Academy, and Public Workshop.
Construction Academy: This will be an educational center dedicated to training skilled workers and technicians in the dismantling and reuse of reclaimed materials, offering both theoretical and practical training.	Workshops & Offices: This area includes offices, classrooms, and workshop spaces, accessible from both inside and outside the building. There will be opportunities for workshops, exhibitions, and training programs for visitors.
Public Workshops: Open to individuals lacking space or equipment at home, these workshops will offer areas for various works. Users will be able to work on different materials they purchase or bring with them. They can rent workspace and equipment, or a membership system could be established.	• Wood Workshop: For small-scale woodworking and furniture projects. • Handcrafts Workshop: For sewing, handcrafts, art, and hobby projects. • Painting Workshop: For small-scale painting projects of objects and furniture. These areas will also be able to host various courses and events, and public exhibitions can be organized to showcase the works created in these workshops.
Product Storage: This area will serve as a storage space for consumer products before they are distributed to store owners. It will house all products collected from donations and other sources, providing a centralized location for sorting.	Product Entrance & Sorting Area: Products received from donations are sorted and grouped here before being transferred to the storage area. There will be delivery areas both within the building and outside accessible to vehicles.
Stores: The building houses various stores for donated consumer products, offering workshop spaces and additional storage facilities. These stores can be rented by individuals. Artisans can repurpose products and also offer small public workshops here. While these areas are defined according to product types, they will be minimally partitioned to allow free navigation, flexibility, and adaptability to changing needs.	Possible store options for these areas: • *1 Remake Shop* • *1 Bike & Sports Equipment Shop* • *1 Electronic Shop* • *2 Clothing Shops* • *1 Accessory Shop* • *2 Decoration Shops (Lighting, Home Textile & Glassware)* • *4 Furniture Shops (Garden Furniture, Bathroom & Kitchen Cabinets, Home Furniture Shops)* • *1 Organic Food Shop* • *1 Book Shop*

Other Complementary Functions	
Circular Production Businesses: This general definition is for business spaces aligned with the project's concept, fostering a synergic environment and supporting the economic sustainability of the project.	Workplace with Workshop: One large space with a workshop for medium-scale production. Possible business options for this area: • Sustainable Furniture Manufacturing • Recycled Material Production • Upcycled Home Goods Production • Green Technology Prototyping/Innovation etc. Workplace Without Workshop: Two more spaces for small to medium-scale productions without workshops are considered in the project. They are primarily for small to medium-scale productions, supporting businesses that require less space and equipment. Possible business options for these areas: • Artists & artisans producing goods from waste materials • Food waste to organic material production • 3D printing with recycled, scrap plastic, etc.
Conference & Lecture Spaces: This area will feature rooms for conferences and seminars for rent, along with a common foyer area. They can be ideal for collaborations with educational institutions and various sectors and become a regular training area focused on sustainability and circularity.	Minimum three rooms (flexible divisions): • *1 room for 30 people* • *1 room for 50 people* • *1 room for 100 people*

Food Services: Dining facilities for visitors and employees, including cafes and a restaurant. They will be areas for eating and relaxation, and to meet the needs of both visitors and employees.	Minimum three spaces (flexible divisions): • 2 Cafes • 1 Restaurant *(With potential for communal cooking or workshops)*
Offices: The offices are primarily for building and warehouse management, potentially available for rent to startups and companies depending on future changes.	
Common Areas: The common areas define circulation spaces within the building, facilitating movement, displays, and communal activities, suitable for exhibitions and events.	Estimated 10-15% of the total area allocated for circulation, common areas, and unforeseen needs.

Additional Visuals of the Design Proposal

Figure 42. General overview of the west and north entrances.

Figure 43. View of the goods donation entrance and bulk material delivery area for individuals on the northeast corner.

Figure 44. View of the new road and the south facade.

Figure 45. View from the material store.

Current Status of the Building

When the work on this project first began, the decision to demolish the building had already been approved. Unfortunately, the demolition took place shortly before the completion of this thesis. The following images are some that I came across and took during this process, highlighting the significant loss of material resources due to the demolition. The only consoling aspect is that some of the intermediate floor slabs were removed to be reused in another new construction project. Although the exact quantity is unknown, this fact supports this thesis's argument for the increasing demand for reuse.

Images of the intermediate slabs dismantled to be reused. Images are taken from the Lendager Group's Instagram account with permission. Photographer: Nicholas Duxbury Ransome.