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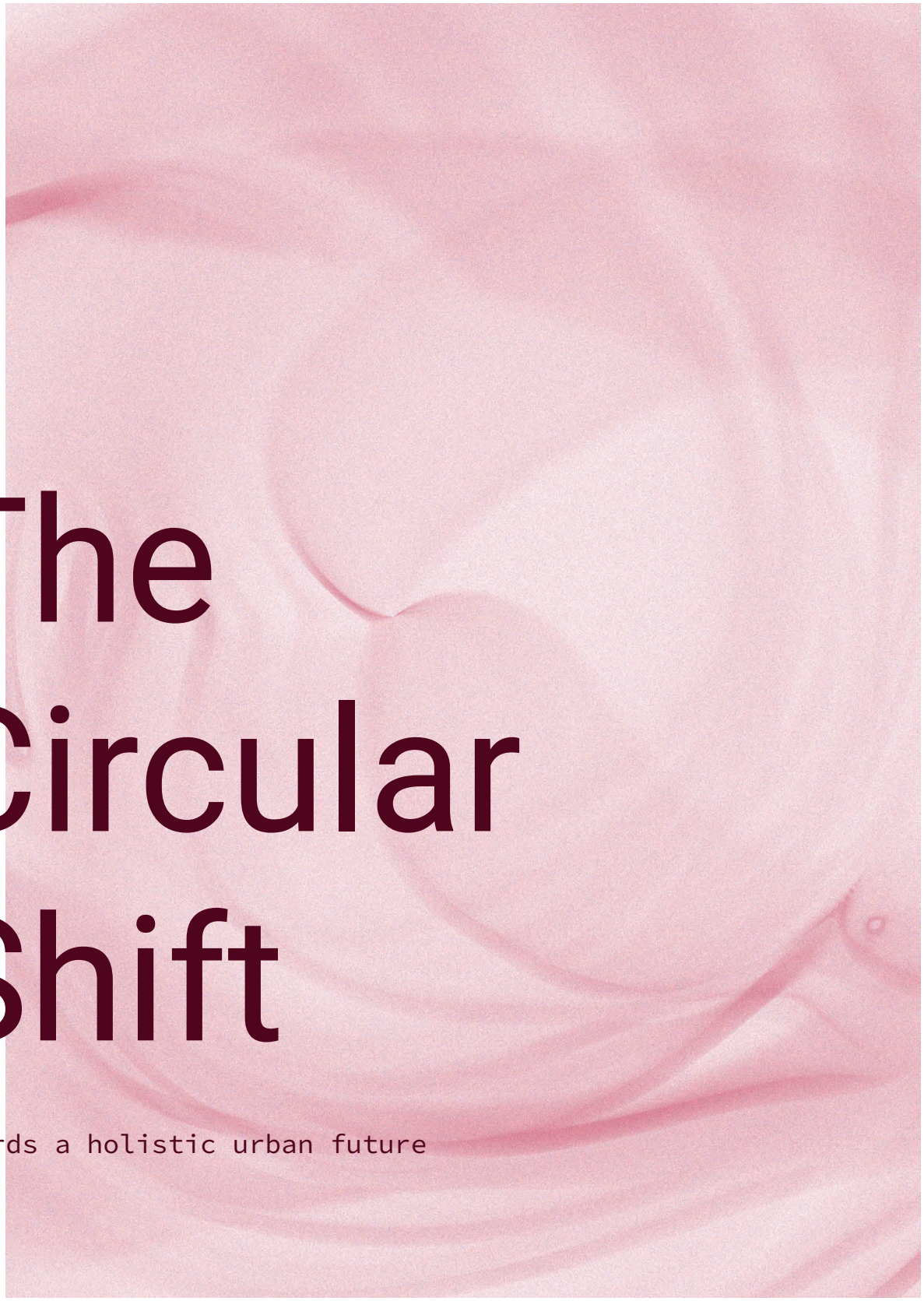

The Circular Shift

Towards a holistic urban future

Aknowledgments

We would like to acknowledge that this project would not have been the same without its key contributors.

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Abstract

Climate change and rapid urbanization demand a fundamental shift in the way we design and transform our urban environments. The building and construction sector remains a major contributor to global carbon emissions (United Nations Environment Programme and Global Alliance for Buildings and Construction, 2025), while demolition-led renewal strategies in socially vulnerable areas often undermine both climate goals and community well-being. This thesis investigates how the Danish social housing area of Toveshøj, located in the Brabrand district of Aarhus, can be transformed into a circular and socially sustainable neighborhood without relying on demolition.

By integrating the theoretical concepts of Circular Economy (CE), Social Sustainability, and Design for Disassembly (DfD), the study proposes a holistic design framework that addresses both environmental and social dimensions of urban transformation. The research identifies the challenges and potentials of the Toveshøj area through spatial, social, and material analysis, revealing opportunities for reuse, micro-climate adaptation, and community-centered public space design.

The resulting design proposal envisions Toveshøj as a regenerative neighborhood, where material flows, social interaction, and ecological resilience are interlinked. New housing typologies, multifunctional public spaces, and enhanced mobility networks are introduced to strengthen neighborhood identity and foster local circular practices. Common areas are reprogrammed to serve as social anchors that support well-being, learning, and biodiversity.

Ultimately, the thesis positions Toveshøj as a pioneering model for circularity at a neighborhood-scale by demonstrating how sustainable transformation can be achieved through inclusive, adaptive, and non-destructive design interventions that benefit both human and non-human life.

Reading guide

This report is divided into 7 Chapters + Appendix

It begins with a ***Prologue***, where introduction, motivation and methods are presented. The second chapter is the ***Theoretical Framework***, which explains the theory behind the key concepts that the report focuses on. The next chapter, ***Analysis***, examines the site and its context. Followed by the ***Reference studies*** chapter, that presents projects which provided inspiration and guidance. The fourth chapter, ***Concept***, outlines the problem statement, design principles, and design strategy. The fifth chapter, ***Presentation***, is where the reader finds our proposal for the transformation of the site. The report concludes with the final chapter, ***Epilogue***, which consists of the final conclusion and reflections, a list of figures, and bibliography.

An ***Appendix*** containing raw data, interview transcripts, and other supplementary information can be found at the end of the report.

The use of AI in this report is described as part of the Reflections section on page 86.

All figures are numbered and referenced in the list of figures. All maps and map diagrams without a north arrow are oriented to true north. The report follows the Harvard reference style, and all references are included in the final chapter.

For optimal understanding and best visual experience, the report should be viewed in two-page format or printed in A4 portrait format on recycled paper.

Terminology

Circular	(refering to Circular Economy) Design that aims to create regenerative, resource-efficient, and resilient urban systems. (own definition)
Linear	(refering to Linear Economy) Design which follows a “take, make, use, dispose” approach. (own definition)
Gellerup	Neighborhood of the Brabrand district in the city of Aarhus, Denmark. The term is also used to refer to the large residential area and housing project of the Gellerup Plan comprising several residential areas including Toveshøj and the Gellerupparken. (own definition)
Design for Disassembly (DfD)	“Design for disassembly (DfD) is a holistic design approach aiming to facilitate the disassembly of products into individual components, enabling them to be reused, reassembled, or recycled in a closed material cycle.” (Nielsen and Guldager Jensen, 2024)
Transformation	“The sum of the comprehensive and integrated approaches, strategies and actions implemented to improve the economic, social, physical and environmental conditions of urban space that experienced collapse and degradation” (Akkar, 2006)

Demolition	A process of demolition that involves forcefully breaking down and removing building elements, typically in a manner that leaves minimal potential for recovering or reusing materials. (own definition)
Retrofitting	“Retrofitting is the act of modifying existing buildings to be more energy-efficient, using any means that weren’t installed during original construction: namely, hardware, utility management tools, renewable energy production methods, and smart technology. It’s a sustainable alternative to demolition and/or building anew.” (Dickinson, 2021)
Reuse	The direct re-utilization of an element without a change of purpose. (own definition)
Repurpose	The direct re-utilization of an element with a change of purpose. (own definition)
Recycle	The reprocessing of discarded waste material in combination with virgin materials to give a new purpose to it and manufacture a new element. (own definition)

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Prologue

FIGURE 1. One of the buildings after demolition in the Gellerupparken development.

01.1 Motivation

The climate is changing, and our planet is warming faster than at any other point in recorded history (United Nations, n.d.). The consequences are increasingly visible - floods, droughts, and rising sea levels - threatening both ecosystems and communities. One of the major contributors to this crisis is the building and construction sector, which accounts for a staggering 34 percent of global CO2 emissions (United Nations Environment Programme and Global Alliance for Buildings and Construction, 2025).

At the same time, rapid urbanization is intensifying these pressures. It is estimated that 70 percent of the world's population will live in cities by 2050 (United Nations, n.d.), placing immense strain on the natural resources, urban infrastructure, and social systems - the way we build and design cannot continue as we have done in the past. Climate change is no longer a future scenario but a pressing reality calling urgent attention. Therefore, it is important for the construction industry to transform in a way that allows it to become a catalyst for change instead of it being the main contributor.

To be a part of this transformation, Denmark is taking significant steps towards a sustainable future. With updated building regulations requiring tighter CO2 emissions per square meter, incorporating Life Cycle Assessment (LCA) and climate impact thresholds (Acembee, 2024), it sets an example of how the construction industry can reduce its environmental footprint. These initiatives indicate a transition towards long-term environmental responsibility, focusing on renovations rather than demolition, and encouraging a more circular approach.

However, due to the social policies such as "No Ghettos in 2030" (Regeringen, 2018), there is a demand for the transformation of the vulnerable residential areas. The practice of tearing down to build new, a trend seen in the redevelopment of these areas, displaces communities and undermines Denmark's climate goals. This increases material waste and emissions, while also having a detrimental impact on the social fabrics of the places affected. It is crucial now more than ever to transition from a linear take-make-break approach to a circular approach to ensure that both the planet and the people are protected.

01.2 Introduction

The growing pressures of Climate Change urge for a fundamental shift in the way we interact with the natural environment and manage Earth's finite resources. While Denmark is often ranked among the global leaders in sustainable development, its patterns of resource consumption remain far from perfect. According to the 2023 Circularity Gap Report, Denmark's current habits around resource consumption pose significant future risks to the climate, biodiversity, and resource availability (Circle Economy Foundation, 2023).

Despite increasing efforts to reuse building materials, demolition continues to take precedence over retrofitting, making the construction sector one of the country's leading producers of waste. Circular Economy (CE) principles are widely regarded as one of the most effective frameworks for addressing this issue. However, CE is still implemented only partially and in relatively few projects. Where it is applied, the focus often remains on the physical aspects – such as material reuse and energy efficiency – while the social dimensions are frequently overlooked. This oversight is particularly relevant in the context of vulnerable residential areas where demolition is not only an environmental concern but also a social one.

FIGURE 2. Map of Vulnerable residential areas and Parallel societies in Denmark as of December 2024.

PARALLEL SOCIETIES ACT

Since 2010, the Danish Ministry of Transport, Building and Housing has been monitoring the development of social housing areas across the country based on socio-economic aspects, such as crime, education, unemployment, and low-income levels.

Neighbourhoods that fulfilled specific criteria (explained in section 03.2) were included in the official ***"ghetto list"*** - a term that was controversial due to its stigmatizing connotations. In response, the Danish government replaced the term in 2021, instead referring to the affected areas as ***"parallel societies"*** and, in more severe cases, ***"transformation areas"*** (BL, 2025).

Figure 2 presents the social housing areas across Denmark that were included in the list of vulnerable residential areas and parallel societies as of December 2024.

GOVERNMENT POLICY AND REDEVELOPMENT

In 2018, as a strategy to transform these “problematic” areas, the Danish government introduced the policy “One Denmark without parallel societies: no ghettos in 2030” (Regeringen, 2018) aimed at reshaping the demographic composition of affected neighbourhoods. Under this law, designated areas must undergo extensive transformation and reduce the percentage of social housing down to 40 percent (Regeringen, 2018). This has led to the loss of thousands of family homes, either through sales, demolitions, or forced evictions.

While the law has led to a reduction in social housing to 40 percent in certain neighbourhoods and lowered the number of parallel societies and vulnerable residential areas since 2010, it has also faced several criticisms - particularly for its racial implications and widespread demolitions, which undermine the climate goals of Denmark.

THE SITE - TOVESHØJ

One of the vulnerable areas facing above mentioned issues - Toveshøj - is located in the Brabrand district of Aarhus, Denmark (Figure 3).

Added to the Parallel society list in 2010 along with Gellerupparken, Toveshøj is on its way for a redevelopment to reduce the social housing to 40 percent.

Considering the urgent need to rethink our resources, particularly in the areas already facing socio-economic challenges, ***this thesis proposes a new visionary concept for transforming Toveshøj Neighborhood, centered around circularity and social sustainability***. A neighbourhood that fosters synergy and collaboration, encompassing circularity extending beyond just the physical environment, to ensure the well-being of both human and non-human life.

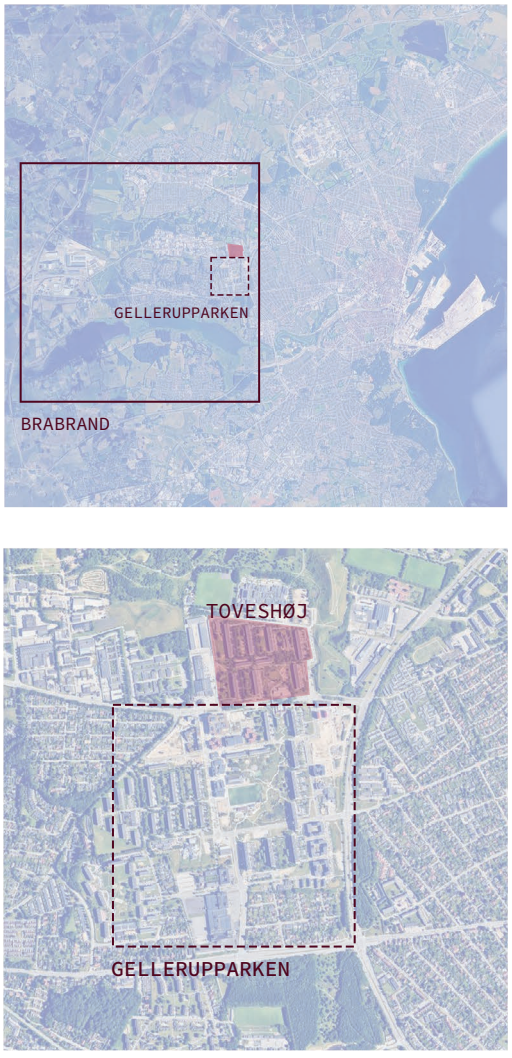

FIGURE 3. Location of Toveshøj within Brabrand district of Aarhus and in relation to Gellerupparken.

FIGURE 4. Toveshøj seen from Blixens building, Gellerupparken.

01.3 Problem

Considering our motivation and arriving at the site made us question it's potential and start wondering about the vision for the future of the place. The problem that has emerged at the beginning of the process and has been modified based on the findings from theory an analysis is the following question:

How can the social housing area of Toveshøj be transformed to create a new circular neighborhood that addresses social challenges and ensures a sustainable future for generations to come?

01.4 Methods

This project initially followed the Integrated Design Process (IDP), a method developed by the Department of Architecture and Design at Aalborg University, Denmark (Ring Hansen and Knudstrup, 2005). The IDP supports a more sustainable approach to architectural and urban design. Although the method does not guarantee a sustainable or aesthetically pleasing outcome, it facilitates the consideration of diverse design parameters necessary for creating sustainable environments (Ring Hansen and Knudstrup, 2005). Throughout the process, the original IDP model was adapted and transformed into a unique process for this thesis (which can be seen in Figure 5).

In this report, the method has been especially useful in developing the theoretical framework and the design strategy, as well as ensuring that the initial problem is addressed and evolves throughout the project.

The theoretical foundation informed the selection of the site. Consequently, all parts of the thesis were subject to continuous re-evaluation at different stages of the process - particularly in the early phases when the final site had not yet been established. Additionally, ***reference studies*** have been collected and analised at different stages of the process and have been combined as a individual chapter at the end of the process.

The IDP process involved 5 stages: Problem, Theoretical framework, Analysis, Concept and Presentation.

In the ***Problem*** phase, the idea for the project was established, together with a draft of the problem statement, which led us to theories that needed to be explored.

The ***Theoretical framework*** was a process of gathering existing knowledge necessary for directing our analysis and building up the design concept. That stage also served as a guideline for site selection.

The ***Analysis*** was where the site-specific information was gathered to establish the needs of the place and its community to inform the design process. At the end of this stage, a more concrete problem statement has been formulated.

The ***Concept*** phase served as a conclusion of principles established through the theoretical framework and analysis, which led to a draft design strategy and design principles.

The ***Sketching*** phase was where the creative ideas and theoretical knowledge were combined to address the many challenges of the site and continuously evolved through a repeated process of sketching. This phase made us revisit and edit some of the previous phases.

Before the Presentation phase began, the ***Synthesis*** was occurring, where the final design started to take shape and concrete design strategy and principles were established.

Lastly, the ***Presentation*** showcases the final design and concludes the design process, proposing solutions to the problem statement.

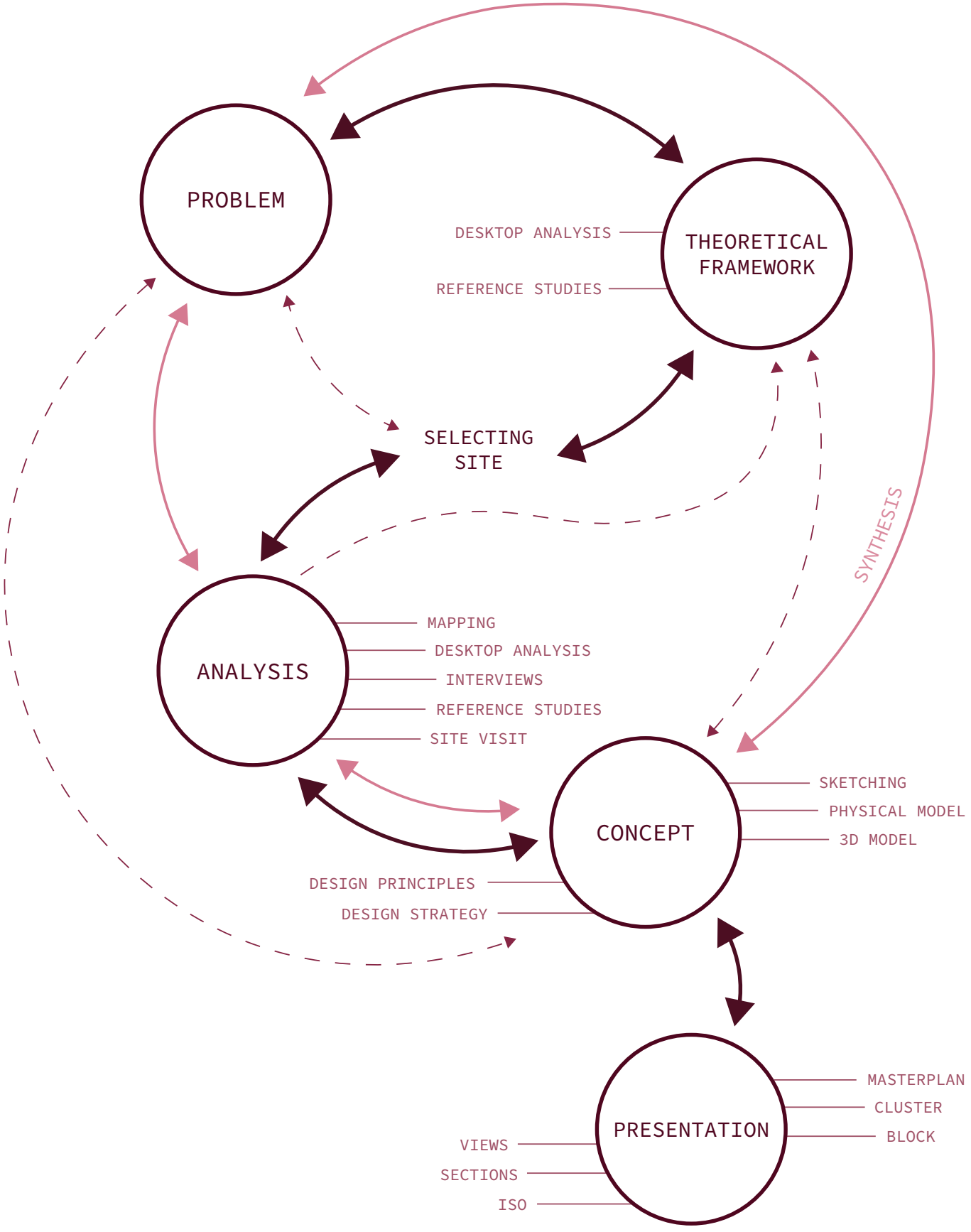

FIGURE 5. The process of the thesis inspired by the IDP model.

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Theoretical Framework

02.1 Circular Economy

The growing urbanization is likely to continue in the upcoming decades and push the consumption of Earth's finite resources even further. As of 2024, in the context of overall economy, global consumption statistics indicated that ***"(...) in just the past six years alone we have consumed over half a trillion tones of materials - nearly as much as the entirety of the 20th century."*** (Circle Economy Foundation, 2024). This reality is concerning not only due to its impact on the trajectory of achieving necessary Sustainable Development Goals and global CO2 emission targets but additionally can cause us to miss out on the great social and environmental benefits of the Circular Economy.

"The construction sector has a large environmental and climate impact: the construction and use of buildings account for 40 percent of the material consumption, 33 percent of water consumption and 40 percent of energy consumption in the EU. This leads to enormous amounts of waste, which in Denmark annually amounts to over 40 percent of total waste generated."

(Ministry of Environment of Denmark, 2021)

In Denmark, although the government's goal is to reduce the environmental impacts of the building sector (Ministry of Environment of Denmark, 2021), the problem is not looking any better. According to the 2023 Circularity Gap Report (Circle Economy Foundation) ***"Denmark's resource consumption is far above the EU and world averages. This is affecting our climate, biodiversity and future access to resources."***. The report speculates that without taking significant steps towards reduction of resource consumption and consumption-related emissions the green transition for Denmark will be impossible (Circle Economy Foundation, 2023).

Circular Economy can aid in reaching the goals that will enable the green transition by not only extending the awareness surrounding the use of resources, but also providing applicable solutions and ways in which cities and neighborhoods can pave a way to a better future.

Despite the fact that the concept of Circular Economy has been gaining extensive interest on a global scale and stakeholders are aware of the need to shift from the linear economy towards "closing the loop" of consumption, the aspirations are not yet translating into actions of measurable impact (Circle Economy Foundation, 2023). The issue might be the lack of common direction between different sectors of the built environment, overwhelming pressures of the economy or lack of universal guidance. The fact remains that "Although we in Denmark have been working with circular economy in construction for a number of years, we are far from implementing the principles of circular economy across all construction functions." (Realdania, 2023).

WHAT IS CIRCULAR ECONOMY?

To the present-day cities are still mostly operating according to a global economic system based on the Linear Economy that is 'take-make-dispose' (Ellen MacArthur Foundation, 2017). This type of economy leads to higher consumption of goods and resources and lower focus on reuse and repair.

Speaking in the context of the global scale a growing population, especially in urban areas, and a rising percentage of the middle class in the last decades have led to an increase in demand and pressures on consumption of resources and urban infrastructure (Ellen MacArthur Foundation, 2017). This combined with a lack of holistic approach to urban management has led to continuous creation of waste and negative environmental impact (Ellen MacArthur Foundation, 2017).

As an “opposing force” to this trend, an idea of ***Circular Economy*** emerged, and it encouraged the shift from the “take-make-use-dispose-pollute” model into a “make-use-reuse-remake-recycle” mindset (Figure 6).

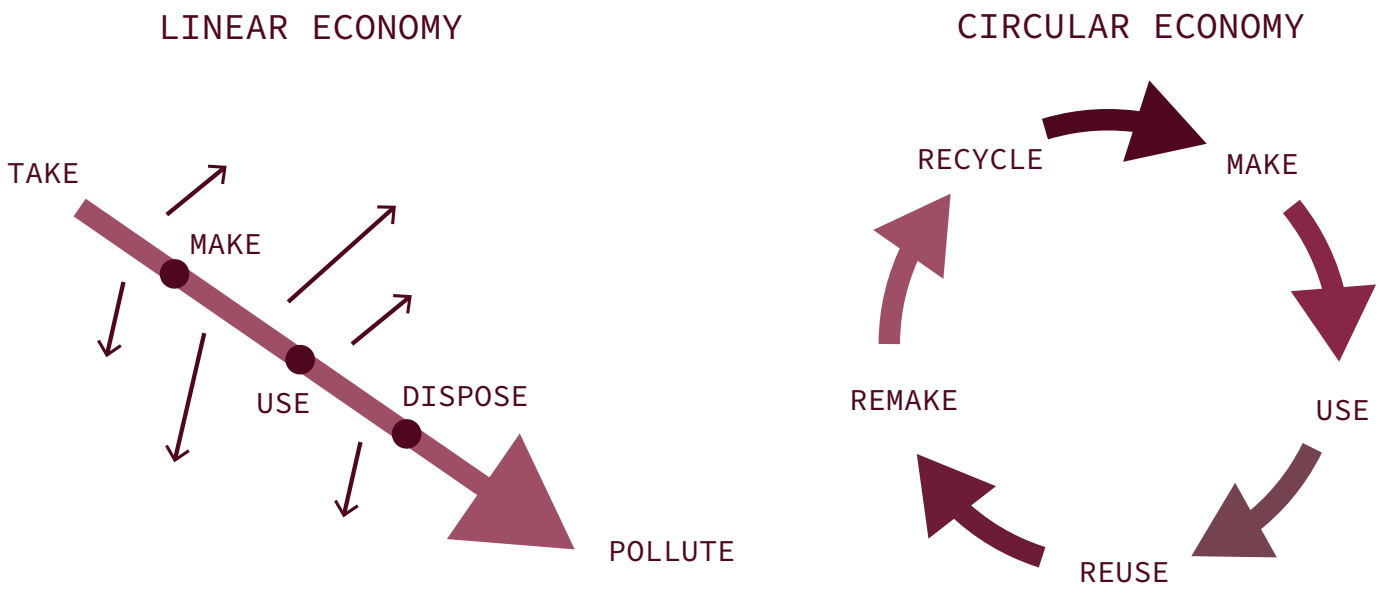


FIGURE 6. Linear vs. circular economy (based on Weetman, 2021).

Circular Economy, as opposed to the Linear Economy, focuses on ***sustainability rather than profitability***. The main principle of the Circular Economy is to extend the life cycle of products and materials to reduce waste and pollution. It includes minimizing the loss of energy needed to produce new materials. As defined by the European Parliament (2023) ***“The Circular Economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.”***.

It all comes down to replicating the systems that are embedded in nature. According to ARUP, one of the leading companies specializing in sustainable development ***“If we move to a regenerative model, we begin to emulate natural systems. There is no waste in nature. When a leaf falls from a tree it feeds the forest. For billions of years, natural systems have regenerated themselves. Waste is a human invention.”*** (ARUP, 2023).

The origin of CE cannot be traced to a specific author or date; however, it has been estimated that the concept has been evolving since the 1970s, borrowing from different schools of thought and explored from different points of view (Wautelet, 2018). According to Ellen MacArthur foundation, an NGO established with the aim to accelerate the transition towards the Circular Economy, the principles of CE are:

- **Eliminate waste and pollution**
- **Circulate products and materials**
- **Regenerate nature**

(Nielsen and Guldager Jensen, 2024)

Although the main goal of CE is overcoming the contradiction between economic and environmental prosperity by better management of resources (Ellen MacArthur Foundation, 2016), CE offers a vision of the future that expands beyond just production and waste management habits. It proposes a new way of respecting and utilizing what is already “there”, reusing and sharing our finite resources for the better good of the communities and the planet. Currently, circular thinking has been expanding and addresses all the aspects of sustainability: environmental, social and economic (Figure 7).

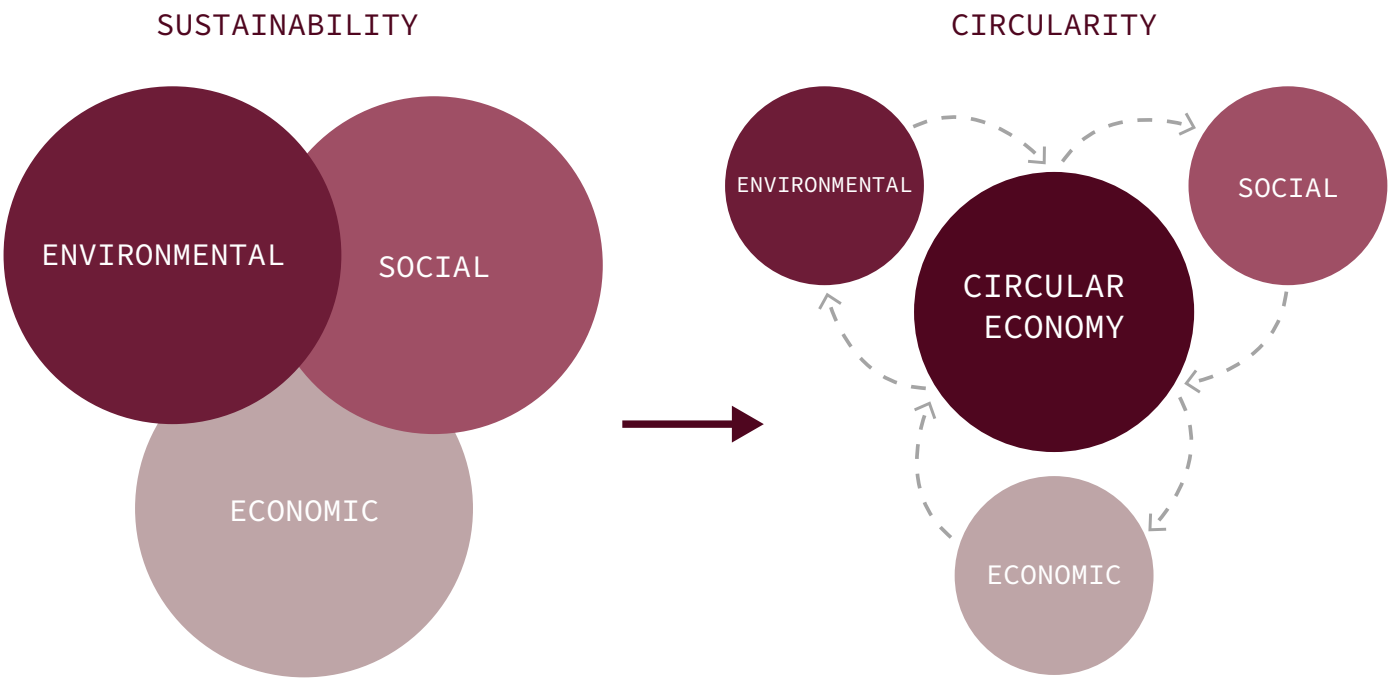


FIGURE 7. Comparison of the 3 sustainability pillars and the pillars affected by Circular Economy, reveals that sustainability can shift into circularity as it involves the same core values.

Although the economic part of Circular Economy is impossible to ignore it will not be the focus of this thesis due to the complicated nature of our site and the economic and political pressures that affect it. These deserve a separate extensive attention that would be challenging to cover in this academic paper. Therefore, the thesis will focus on the environmental and social benefits of designing with the use of CE principles.

“To date, research has tended to focus primarily on the macro-scale (cities or eco-parks) and the micro-scale (manufactured products or construction materials). Nevertheless, the often-neglected built environment is also expected to play a crucial role in the transition towards a CE due to its high contribution to various environmental burdens.”

(Appendino et al., 2021).

Therefore, there is a missing semi-macro scale that refers to the neighborhoods and how the systems that occur in the neighbourhoods can support the transition towards CE.

Figure 8 illustrates the concept of the Circular Economy and its potential implementation to an urban scale. The diagram is based on the CE theory, highlighted by its 3 principles and all the external factors leading to it. The lower section of the diagram extends the principles of circularity to an urban scale with domains such as energy, water, economy, infrastructure, and social life.

The principles of the CE theory can ideally form a compelling framework for sustainable development. However, its true potential would be recognized in the way it is translated into the spatial and social dimensions in the built environment and not just in managing material flow. This is where we see the correlation between the two theories, which is further discussed in the section 02.3.

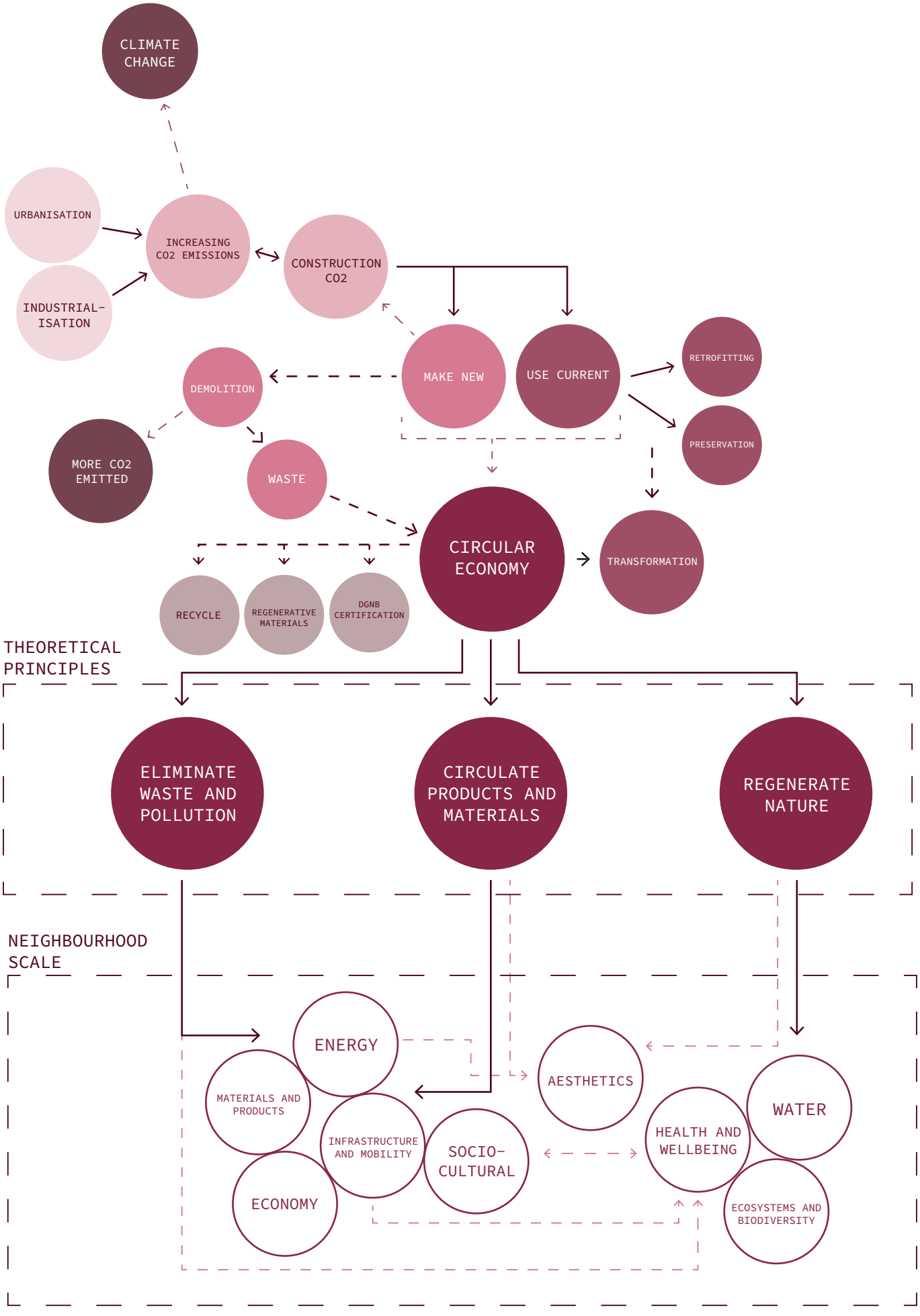


FIGURE 8. Diagram showing the path of Circular Economy and the potential for it's implementation on a neighbourhood scale.

02.2 Social Sustainability

As famously stated by Jan Gehl, sustainable urban development is only possible is we focus on the people living in cities first (Almusaed and Almssad, 2020).

“A human being can build high-rise buildings with green roofs, green walls, and high-energy efficiency, but that does not necessarily mean that the cities are pleasant to live in.”

(Gehl, 1984 and Gehl, 2010 cited in Almusaed and Almssad, 2020)

The same applies to implementation of Circular Economy, without taking care of the social fabric and ensuring that the circular solutions are adapted towards the needs of the local socio-economic context, the CE will only be a glorified “catch phrase” that describes a mediocre development. The people drive the circular system, but this can only happen if their environment supports their well-being and quality of life, allowing them to focus on other important aspects of urban life.

Following this way of thinking it is extremely important that in the path towards introducing the principles of CE in a neighborhood context we pay careful attention to the social aspects. In sustainability, it is all an intertwined loop - the social, economic and environmental - a symbiosis where one will not flourish without the other.

As stated in the paper by Ly and Cope (2023) “A healthy society is a fundamental condition for the economy and the ecosystem to thrive” and in order to ensure Social Sustainability according to Nilsson et al. (2024) all of the four prevalent categories need to be adressed: Social Capital, Well-being, Participation and influence, and Equity (Figure 9).

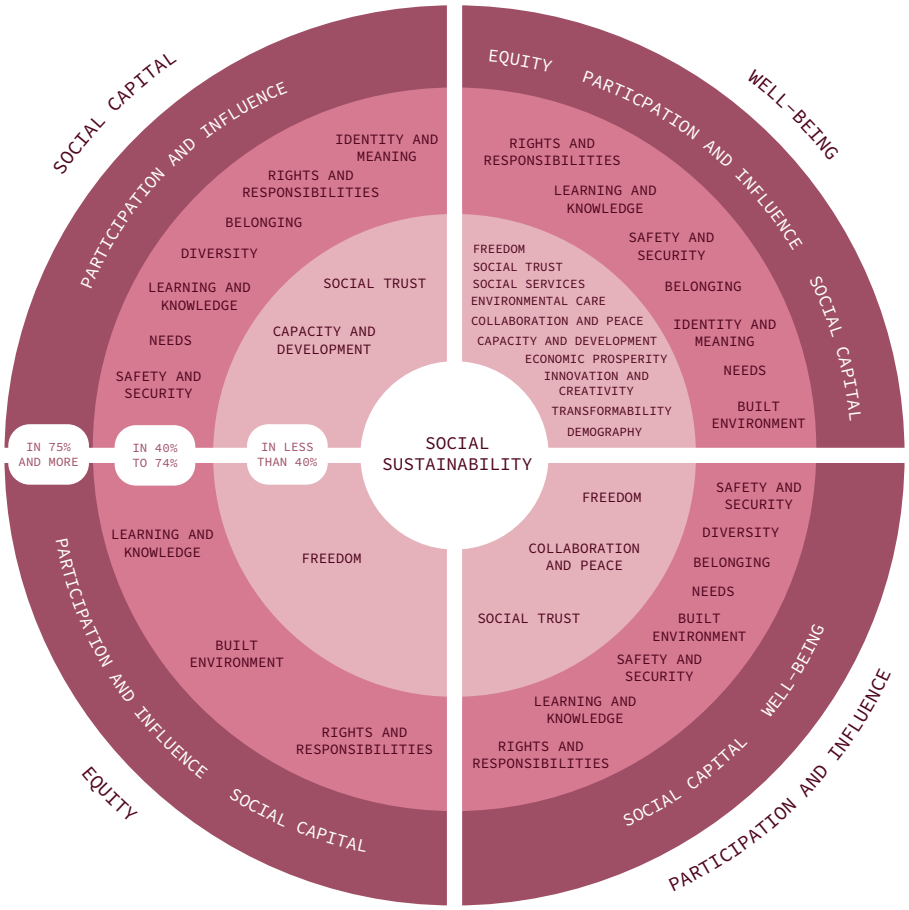


FIGURE 9. Social sustainability diagram based on Nilsson et al., 2024.

“The urban area is the territory where the interaction between space and the person takes place, where the person’s spatial behavior is formed, and this largely depends on how the person relates to this place, whether it is emotionally attractive to him.”

(Almusaed and Almssad, 2020)

It is, therefore, not only about design and the quality of the built environment itself that determines whether an urban area will satisfy the needs of current and future generations, but also the impact it makes on the life of people that live there, the connection they feel to the spaces and the connections they form within their community. This is what makes a city grow from just buildings, parks, fences and abandoned corners into hubs of social life, integration and interpersonal relationships (Almusaed and Almssad, 2020).

In areas deemed by the Danish government as “parallel societies”, such as Gellerupparken and Toveshøj, the social aspects of the design are ever more important. In the spirit of Social Sustainability “Every effort should be made to integrate all groups, irrespective of their social and economic situation, age, gender, cultural background, and physical skills, and find a place for them in urban public spaces.“ (Almusaed and Almssad, 2020). In the context of “vulnerable residential areas” the political pressures make it a more common practice to displace the people from these social housing areas instead of creating public urban spaces for them. While deep-rooted systemic issues make it difficult to change the government’s approach to addressing “parallel societies,” there are steps we can take to ensure that the new development, with 40 percent social housing, provides a welcoming environment where everyone has the opportunity to be part of the community.

02.3 Combined theory

Although there has been increasing progress towards implementing CE into urban environments, the current strategies are insufficient for achieving sustainability targets and reducing the Danish building sector's impact on the use of resources. The failure to implement the Circular Economy on the city scale might be connected to the focus on the physical aspects of reducing the use of resources and a limited level of addressing the social movement that needs to occur to change the societal consumption patterns.

Circular Economy (CE) and ***Social Sustainability*** share a common focus - creating long-term, resilient systems that benefit the planet and its people. This suggests a potential connection between the CE and Social Sustainability. The diagram below illustrates possible commonalities between the two concepts.

The overall vision is to enable circular behaviors by designing spaces that allow consumers to reuse, repair, share, recycle, lease, and otherwise support circularity and sustainability. For example, designing infrastructure focusing on circularity can encourage shared mobility, promote healthy eating habits, support locally generated green energy, and integrate culturally embedded forms of reuse and repair. Additionally, environmental regeneration - through water management and biodiversity restoration - improves ecological health and human well-being. Including aesthetics, health, and socio-cultural dimensions in the diagram highlights the broader societal benefits of circular design: it fosters identity, inclusivity, and a sense of belonging.

The diagram in Figure 10, provides a possible collaboration connecting circular strategies and the broader urban and social sustainability goals. It strengthens the idea that integration of social dimensions is equally essential for a successful circular transition. A socially sustainable Circular Neighbourhood not only closes material loops but also strengthens the social fabric of communities, making cities and societies more resilient, fair, and livable. This approach is essential for rethinking how we build and inhabit our cities in a climate-conscious, resource-efficient, and socially inclusive manner.

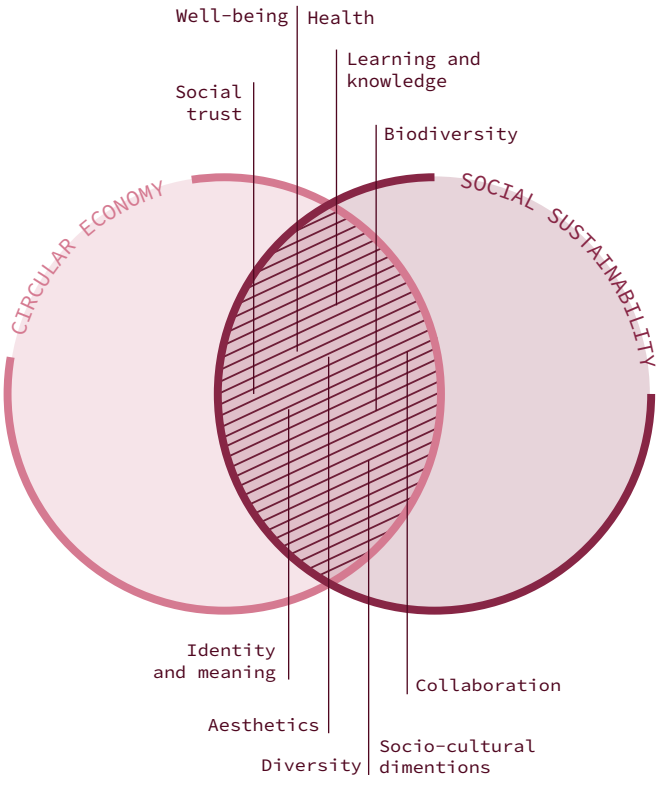


FIGURE 10. Potential connections between Circular Economy and Social Sustainability.

02.4 Materials

Within the construction industry, building materials play a prime role in the functionality of structures/spaces. Over the years, the environmental consequences of our material choices have become increasingly apparent, highlighting the urgent need to rethink our choice of material. “We need to look beyond the immediate performance and cost of materials and consider their long-term impact on the environment, society, and future generations” (Marwala, 2024). By integrating sustainability in material production and its use, we can lessen the adverse effects of resource depletion, pollution, and waste and become responsible socially and environmentally.

The energy consumed and emissions produced throughout a material’s extraction, manufacture, use, and disposal is the environmental footprint of that material. The materials that are high in their embodied energy significantly contribute to climate change and environmental degradation. For example, steel and cement, both widely used in construction, are responsible for approximately 16 percent of global greenhouse gas emissions (Center on Global Energy Policy, 2023).

Therefore, it is important that we reduce the need for virgin materials and seek alternative materials and methods (reuse, upcycle, recycle) that have a lower impact on the planet and contribute to its well-being.

Figure 11 illustrates material flow of both the renewable (bio-based) materials and the finite materials. Today, most of the finite resources end up in landfills after consumption, resulting in excessive waste and feeding the ongoing demand for virgin materials. A continuation in this trend will result in the depletion of the planet’s finite resources while simultaneously causing severe environmental damage to our planet and its ecosystems.

Therefore, it is important to keep the existing sources in use as long as possible through maintenance, reuse, remanufacturing, or recycling. On the other hand, choosing renewable materials could be a great alternative, as these naturally decompose and reintegrate into the biosphere, rather than contributing to waste.

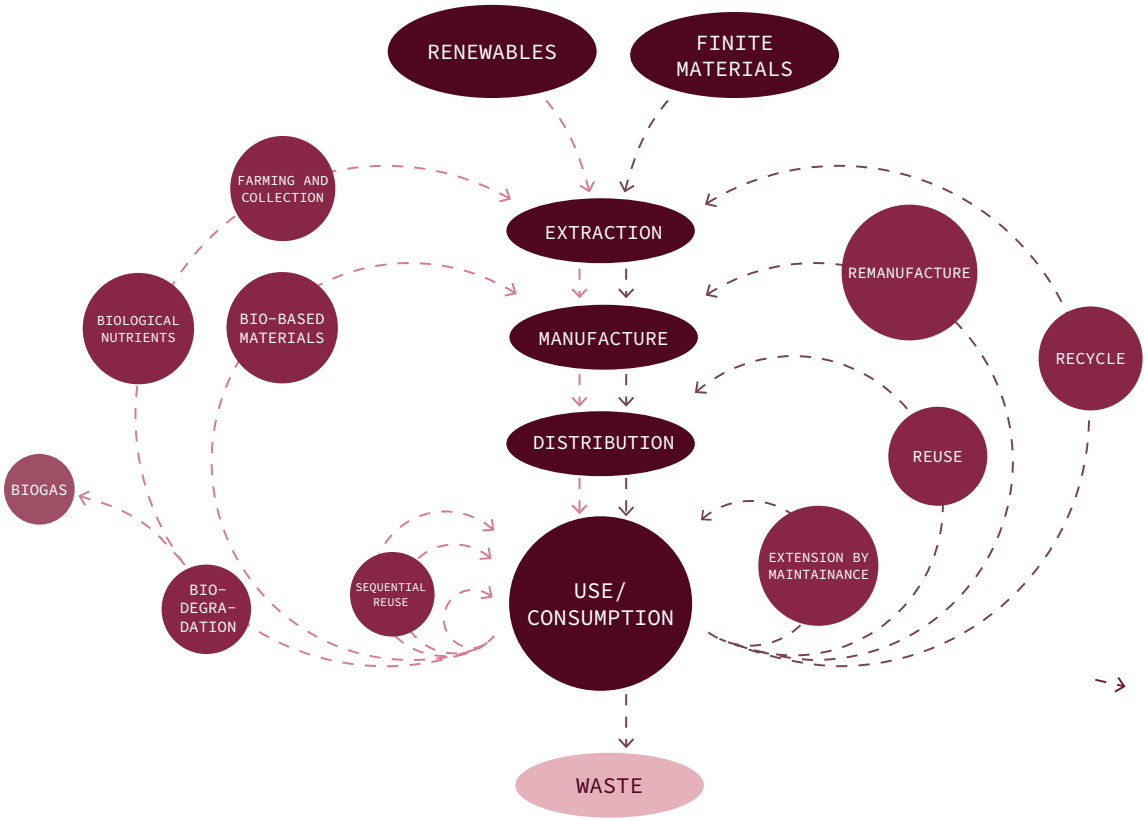


FIGURE 11. Material flow diagram based on Butterfly diagram from Ellen MacArthur Foundation.

02.5 Design for disassembly

DfD can be applied at different scales, from the micro-scale (eg. consumer products), all the way up to the macro-scale (eg. buildings). There is a wide range of ways in which a product or a building can become capable of being disassembled. All it takes is extra attention put towards the binding of any two elements, ensuring that the bond is reversible without damaging any of the two parts so that it can follow the process presented in Figure 12 (Nielsen and Guldager Jensen, 2024). “The novelty of the underlying idea is that the building is not a permanent structure but should be perceived as a temporary compilation of building materials.” (Nielsen and Guldager Jensen, 2024).

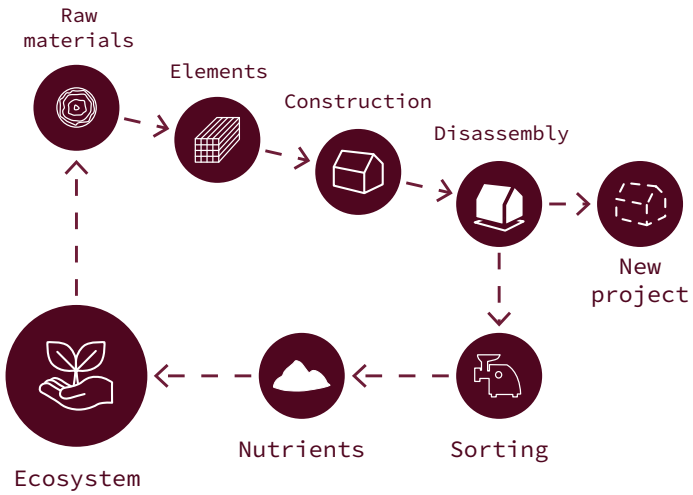
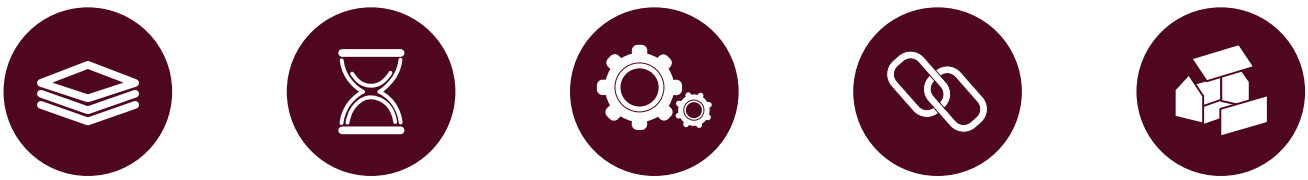


FIGURE 12. Design for disassembly (DfD) process (based on Nielsen and Guldager Jensen, 2024).

Compared to other smaller consumer products industries, the construction sector is still in initial phases of implementing DfD. This is largely due to the scale of the elements and structures. However, some guidance is available, like the 5 principles to consider when designing for disassembly (Figure 13) (Nielsen and Guldager Jensen, 2024).

In implementing DfD at an urban neighborhood scale it is therefore extremely important to refine how we design the buildings and everything around then. Urban furniture and elements of public spaces should be designed in a way that takes into account the full life cycle of the materials, to ensure that they are valuable not only when the serve the public but also after their use purpose ends.

5 principles
to consider when designing for disassembly



Materials

Use materials that are:
- of high quality
- non-toxic
- pure and recyclable

Service life

Make structures that are:
- flexible
- long-lasting
- easy to preserve

Standards

Make structures where elements can be:
- easily replaces
- prefabricated
- made into components

Connections

Make connections that are:
- reversible
- easy to access
- not binders or dissolvable binders

Deconstruction

Make plans for deconstruction that include:
- simple guidance
- safety measures
- consideration of surrounding area

FIGURE 13. 5 principles of DfD (based on Nielsen and Guldager Jensen, 2024).

02.6 Conclusion

This chapter has outlined the concepts of the Circular Economy, Social Sustainability, and Design for Disassembly. While each of the concepts contributes individually to valuable insights, there is a greater holistic approach to sustainable development in their integration. This approach encourages a development that not only focuses on the material and its flows but at the same time also prioritizes community well-being, spatial adaptability, and long-term environmental stewardship.

In the section Combined Theory, we see the intersection of the two concepts CE and Social Sustainability. Circular strategies cannot be effective without thoughtful design interventions aligned with the social realities. Addressing climate change without attending to those it affects most, the people, can lead to superficial solutions that are not sustainable in the long run.

The concept of DfD, while not exclusively mentioned in the combined theory, is a prime enabler and an integrated part of the Circular Economy. It is key to reduce demolition waste as it allows buildings to be dismantled without damage, enabling components to be reused, repurposed, or recycled. By early integration and consideration of materials in use, we can design for disassembly and adaptability, making the built environment a reservoir of materials rather than a source of waste.

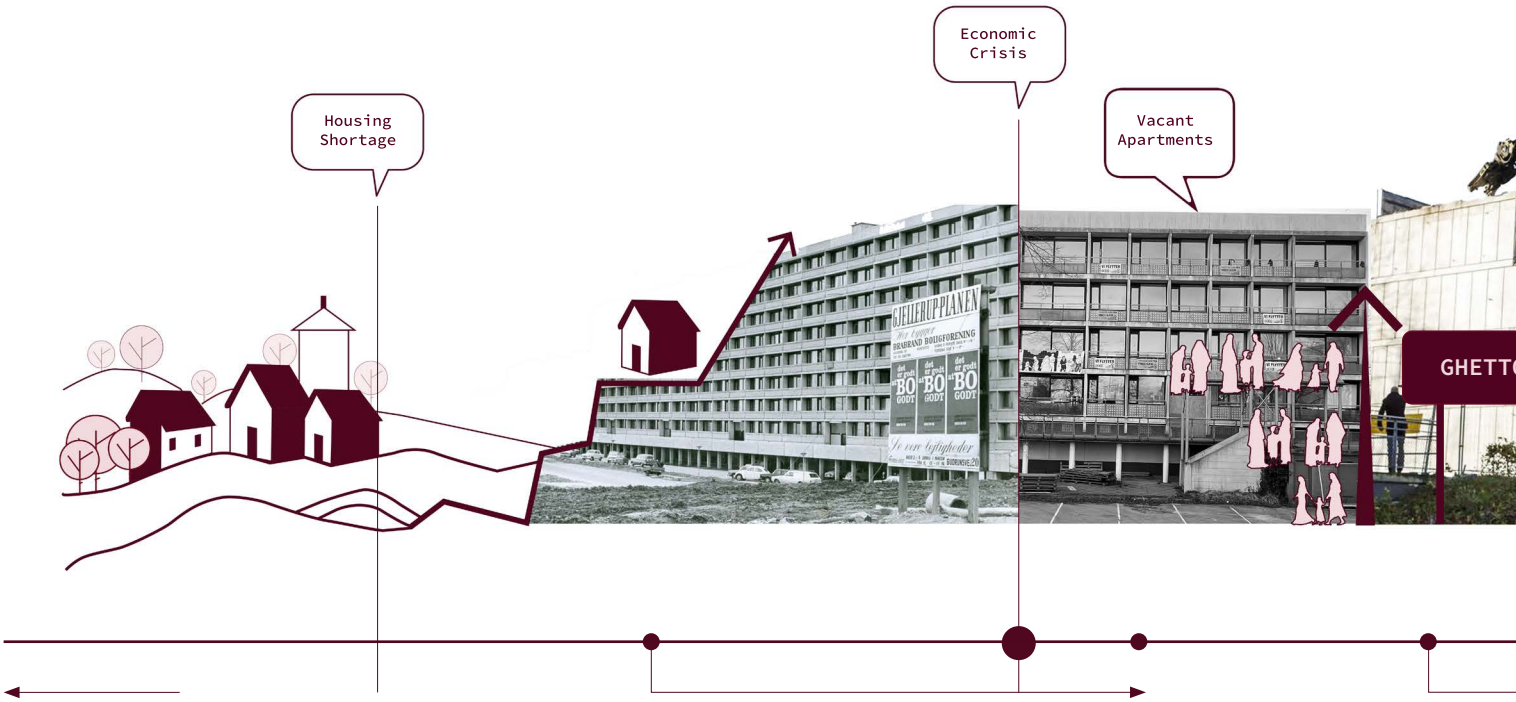
As this thesis will explore further, the neighbourhood scale presents a critical yet underexplored opportunity for implementing circular and socially sustainable practices. At this intermediate scale, urban design can have the greatest potential to close material loops, foster meaningful community interactions, and ensure adaptable and regenerative environments for present and future generations.

03

Analysis

03.1 History

For years, Gellerup and Toveshøj have been regarded as one of Denmark's most socially challenged urban housing areas and it has been included in the Danish government's yearly "List of ghetto areas" since 2010 (Social-og Boligministeriet, 2024). As a result of which Gellerup today is undergoing a radical change to transform it from a socially disadvantaged residential area into an attractive district.



PRE 1960'S

Gellerup was a small village consisting of few farms and houses (Aarhus Wiki Contributors, 2022)

LATE 1960'S

Housing shortage emerged in Denmark

1968-1972

Gellerup Plan

Denmark's largest housing estate with 1824 homes in Gelleruparken (Brabrand Housing Association, 2013) and 624 homes in Toveshøj (Brabrand Housing Association, 2013) was built as the first part of the large-scale construction project. It was built by architects Knud Blach Petersen and Mogens Harbo who were influenced by modernism and functionalism.

1970

Economic Crisis and Emerging Challenges

Construction problems arose in several buildings and the area came to be criticized as boring, irrelevant and monotonous. The middle-class residents moved out of the area as they preferred private housing, and it became difficult to rent out the apartments.

FIGURE 14. History timeline collage.

1980S-1990S

Social Issues and Demographic Shift

The vacant apartments were rented to families with social problems in collaboration with the municipality. The resident composition of the area gradually changed, and the area became primarily inhabited by immigrants and refugees acquiring a profile characterized by social problems and crime.

2010

Ghetto List and Comprehensive Plan

Gellerup and Toveshøj were added to the list of the major vulnerable areas published by the Danish government. A redevelopment plan was launched to transform Gelleruppark-en and Toveshøj into an attractive district that is integrated with Aarhus, the physical work for which began in 2013.

2018

New policy proposal

One Denmark without parallel societies: no ghettos in 2030" (Regeringen, 2018). Several new policies appeared, one of them was reducing the number of non-profit housings in the "ghettos" to a maximum of 40% of the area's total housing stock.

TODAY

As of today, several buildings were and are being demolished, while few were transformed. Many people were evicted from their houses and new housing is being constructed. Projects such as - the boulevard, Blixens, Library, and youth housing have been completed. A new school and a new neighborhood are under construction.

NEXT STEP

Development of Toveshøj

03.2 Context

Social housing is the dominant housing type in Denmark constituting approximately 20 percent of Denmark's total housing stock, housing nearly 1 million people (BL - Danmarks Almene Boliger, n.d.). It is run on a non-profit basis where resident democracy is central. This type of housing offers good quality housing at a reasonable rent and is managed by a housing association under a special set of rules. Since the monitoring of social housing areas across the country was undertaken, many social housings were classified into several categories based on certain criteria, as shown in Figure 15.

SELECTION CRITERIA

The criteria for classifying vulnerable residential areas have evolved under different governments. According to 2018 criteria, a vulnerable residential area is defined as a public residential area with at least 1,000 residents that meets at least two of the following four criteria:

- ***Employment and Education***
  more than 40 percent of the residents aged between 18-64 are unemployed or educated
- ***Criminal Convictions***
  number of convicted residents convicted of violating the Criminal Code, the Weapons Act or the Act on Euphoriant Drugs is 3 times more than national average
- ***Level of education***
  more than 60 percent of the residents aged between 30-59 have only primary education
- ***Income Levels***
  the average income of taxpayer residents aged between 15-64 is less than 55 percent of the average gross income of the region

(BL - Danmarks Almene Boliger, n.d.)

The following figure presents the different categories under which public housing areas are currently categorized as part of the parallel society legislation.

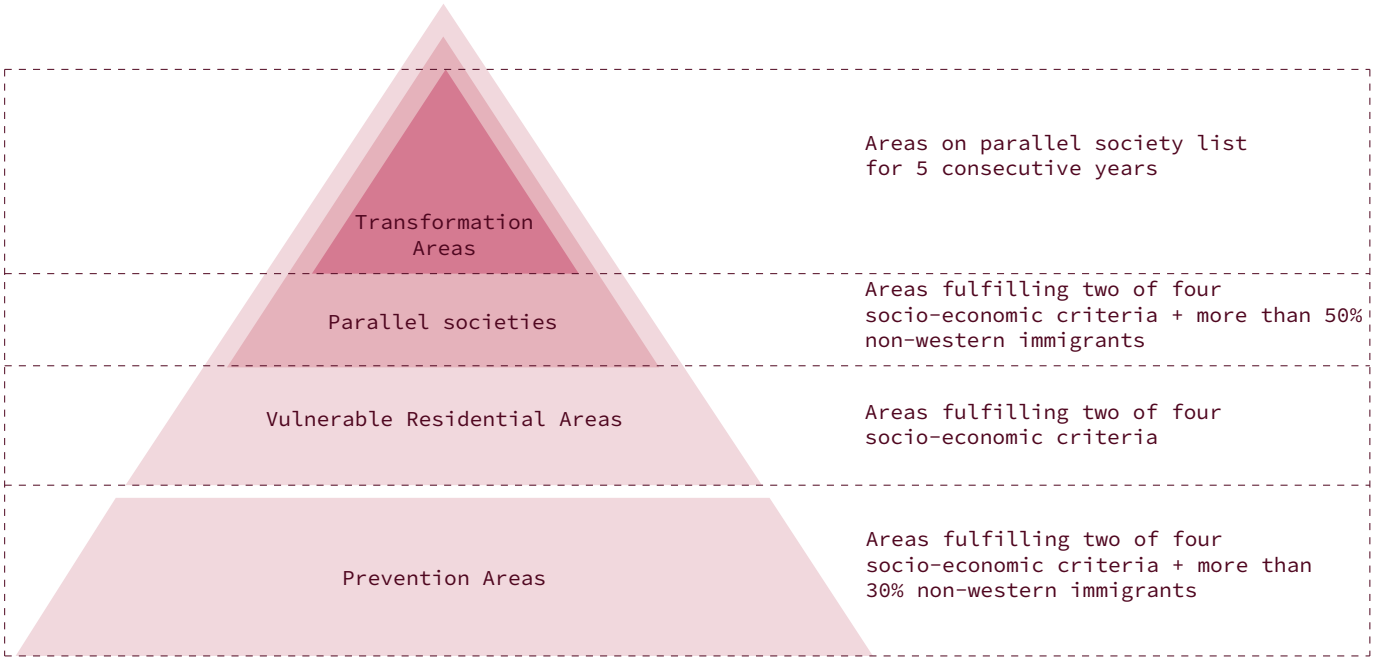


FIGURE 15. Different categories of social housing.

EXITING THE LIST

To reverse the development of the parallel society, the municipalities need to adopt the following tools as a part of the parallel society agreement.

1. Extensive physical change and reduction of proportion of social housing
2. Stricter rental regulations
3. To increase security through strengthened police efforts
4. Initiatives for social integration

(Regeringen, 2018).

A follow-up evaluation led by BUILD department of Aalborg University (Bech-Danielsen et al., 2022) examined the significance of physical efforts in the 15 transformation areas designated as “hard ghettos” under the 2018 Parallel Society Agreement. The evaluation has been done under the overarching themes of ***urban isolation***, ***scale***, ***one-sided housing offers***, and ***weakly programmed outdoor spaces*** (Bech-Danielsen et al., 2022).

The evaluation revealed the combination of different strategies, including selective demolition, renovation, diversifying types of ownership through sales, new construction, and more, which have been employed across developments in order to tackle the various challenges. Ringparken in Slagelse and Mjølnerparken in Copenhagen are two examples that successfully exited the parallel society list in 2022 and 2023, respectively, and give insights into the strategies that can potentially be applied to the case of Toveshøj.

RINGPARKEN

The development plan was implemented to transform the neighborhood, aiming to reduce the social housing to 40 percent. The plan aims to transform Ringparken into 3 diverse urban neighborhoods to attract different types of residents and to establish better and more natural connections with the surrounding city (Trafik-, Bygge- og Boligstyrelsen, 2019).

What sets it apart is the way it plans to transform/adapt the existing buildings to reduce the overall scale, as represented in Figure 16, while simultaneously balancing it with the new construction.

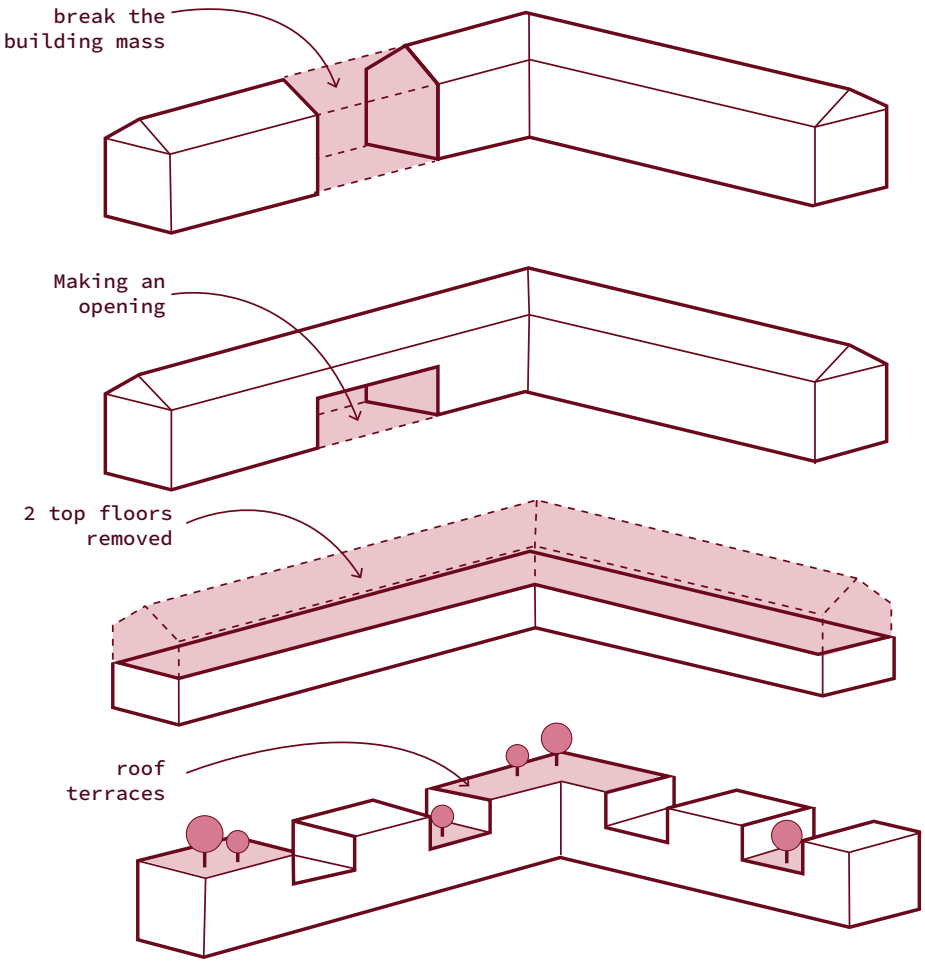


FIGURE 16. Building transformation strategy, Ringparken

MJØLNERPARKEN

The vision of the development plan for this area was to establish better connections with Nørrebro and to provide more security and better housing conditions. Figure 17 illustrates that the development plan was based on transforming the existing buildings while changing their functions and character (KHS Arkitekter, 2021).

A notable initiative is the introduction of a waste management and upcycling station and the emphasis on minimal demolition.

FIGURE 17. Transformation of Mjølnerparken, Copenhagen.

CONCLUSION

The neighbourhoods that underwent or are undergoing transformation under the Parallel Society Agreement follow a structured approach, combining physical transformation with regulatory and social measures. While these initiatives are showing positive development to address crime, urban isolation, education and employment, they fall short on a holistic approach for a sustainable urban development that fully addresses global climate challenges. There is a need for greater emphasis on long-term environmental sustainability to ensure inclusive and resilient urban futures.

03.3 Comprehensive plan

The comprehensive plan for Gellerup and Toveshøj was developed by the Brabrand Association and Aarhus Municipality to transform this socially disadvantaged residential area into an attractive district (Aarhus Kommune and Brabrand Boligforening, 2007) focusing on physical, social, and economic revitalization.

The plan incorporated a massive physical transformation of the area to break social segregation and to improve its reputation. It included, among other things, the establishment of the city street, offices, business facilities, new neighborhoods and new housing types (Aarhus Kommune and Brabrand Boligforening, 2007). This meant that several apartment buildings had to be demolished, while a few were renovated as shown in Figure 18.

Key goals of the comprehensive plan:

- ***Urban Transformation***
  - Establishment of new functional anchors to attract people from all over the city
  - New connections between the functional anchors and the city street to bind them all together
- ***Social and economic integration***
  - Crime prevention by the renovation of outdoor areas and improvements to the lighting, thinning vegetation etc. to increase safety
  - Opening of schools and nursing homes for education and employment
- ***Housing and resident composition***
  - Establishment of new neighborhoods and ownership forms to attract diverse residents
  - New housing types
  - Sale of public housing
- ***Security Guarantee***

Gellerup's transformation plan has received several criticisms, particularly for its demolitions. The Academy Council urges Aarhus Municipality to rethink its approach surrounding demolition and further writes that

"(...) even in buildings such as Gellerupplanen, there are inner qualities. There are great resources hidden in structures and materials, and transformations can bring back functionality, reintroduce the human scale and create enriching residential and commercial areas. Concrete construction has become synonymous with embedded CO2, so that is also why we must preserve as much as possible - for the sake of the planet and posterity"

(Academy Council, 2024)

Academy council emphasizes the need for climate conscious development and thinking of sustainable solutions that benefit both the planet and the future generations.

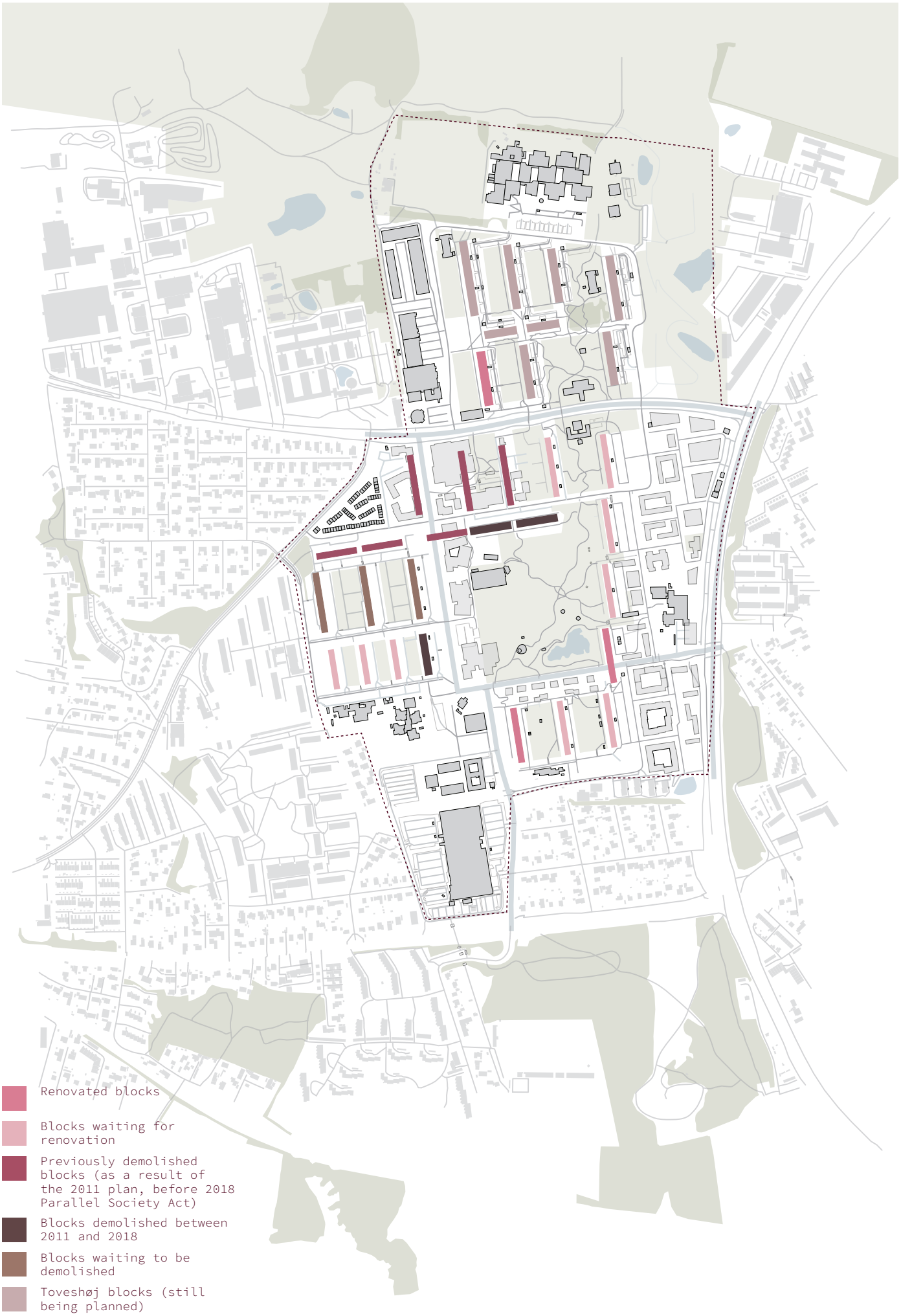


FIGURE 18. Transformation map for Gellerupparken and Toveshøj

Scale 1:10000

03.4 Legibility

The following analysis is carried out to examine the imageability of the site (Toveshøj) and its surrounding urban environment, particularly Gellerup Park's ongoing transformation. It is based on Lynch's way of classifying the contents of the city, and categorising them into 5 types of elements: ***paths, edges, districts, nodes, and landmarks*** (Lynch, 1960). This is represented in Figure 19 for the neighborhood of Gellerup.

PATHS

Gellerup is located west of Aaby Ringvej (Ring 2), while the southern boundary is defined by the major highway, Silkeborgvej. Edwin Rahrs Vej serves as a key arterial road, that divides Toveshøj and Gellerupparken. As part of the recent Gellerup development plan, Karen Blixen's Vej has been introduced as an active urban corridor with diverse activities/ functions along its edges.

EDGES

The area of Toveshøj is predominantly residential, characterized by monofunctional and somewhat monotonous edge conditions. In contrast, the vision for Karen Blixen's vej in Gellerupparken promotes a vibrant, mixed-use environment with street-facing functions contributing to a dynamic public realm.

DISTRICTS

To address the large-scale of the existing urban form, new neighborhoods are being introduced, incorporating varied housing typologies and ownership forms to foster greater social diversity.

NODES

A series of strategic nodes have emerged as a part of the redevelopment in Gellerupparken, including the golden gate and the pedestrian bridge linking Toveshøj and Gellerupparknen.

LANDMARKS

Bazar Vest (Toveshøj) and City Vest (Gellerupparken) have served as key commercial landmarks within the district historically. More recently, new developments such as the Blixen's and the library have begun to establish themselves as urban focal points in the area. The city park connecting Gellerupparken and Toveshøj serves as an attraction for people in and outside of Gellerup.

In conclusion, these elements help shape the mental image of Gellerup. While historically Gellerup's image has been associated with large, uniform housing blocks, the ongoing transformation aims to change the monotonous character through the introduction of mixed used developments and new construction. The success of this transformation depends on its ability to well integrate community and in creating a sustainable ecosystem, that looks beyond aesthetics.

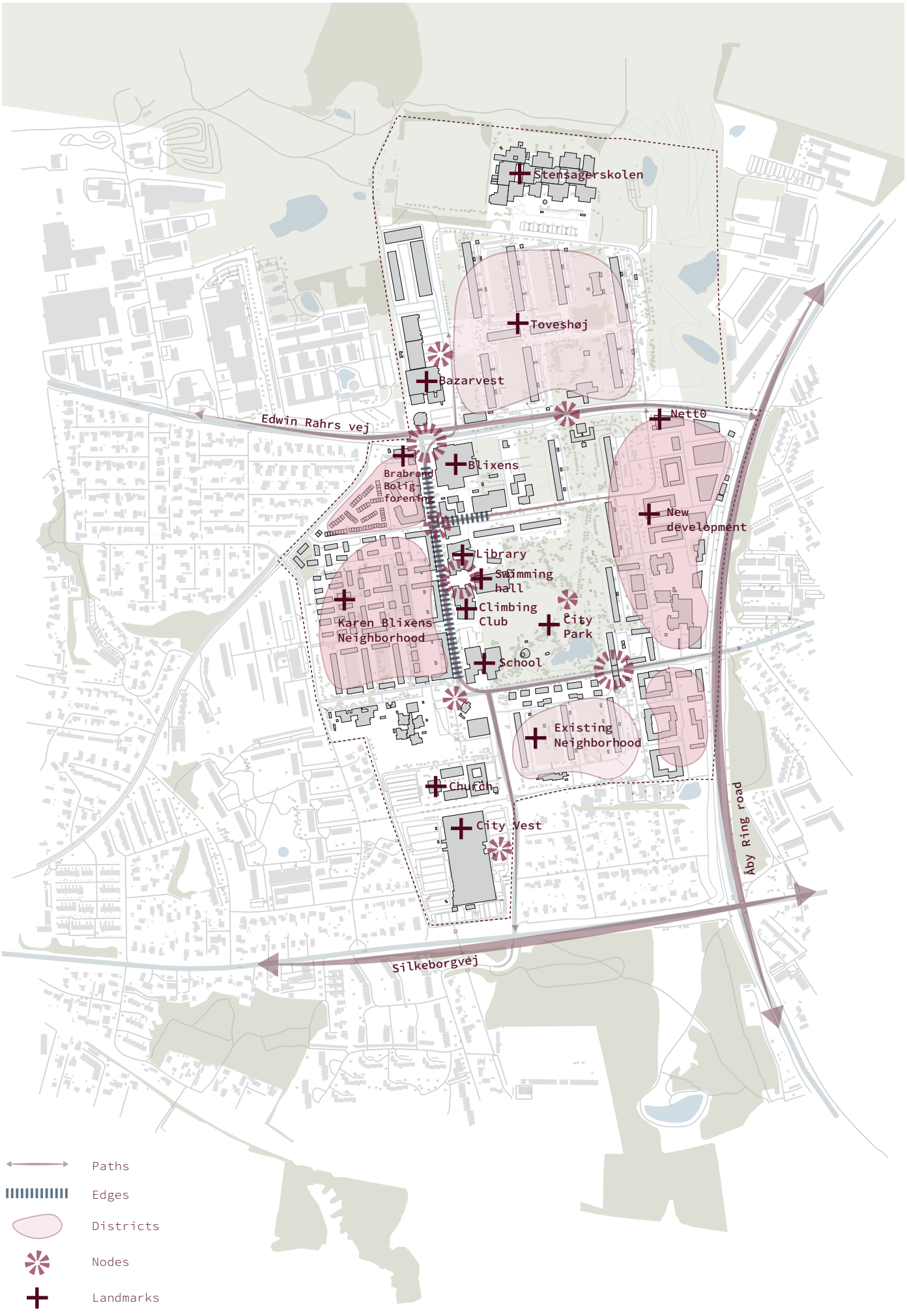


FIGURE 19. Legibility map.

Scale 1:10000

03.5 Infrastructure

BUILT VS OPEN

The map in Figure 20 presents the distribution of built spaces within the area. The large apartment blocks are separated by expansive open spaces from plinth to plinth. This enhances the large scale and openness of the area, lacking the feeling of enclosure and privacy between the houses.

The open spaces of the neighborhood consist of the large green lawns between the buildings and a city park that connects Toveshøj and Gellerupparken (Figure 21). The green lawns are criticized for being poorly programmed (Bech-Danielsen et al., 2022). They were intended as common areas for everyone, but often end up empty and lifeless as it is not clear to the individual user of how to use the space. In other words, no one feels responsible for this space and hence it's only the maintenance workers and robotic land mowers looking after it.

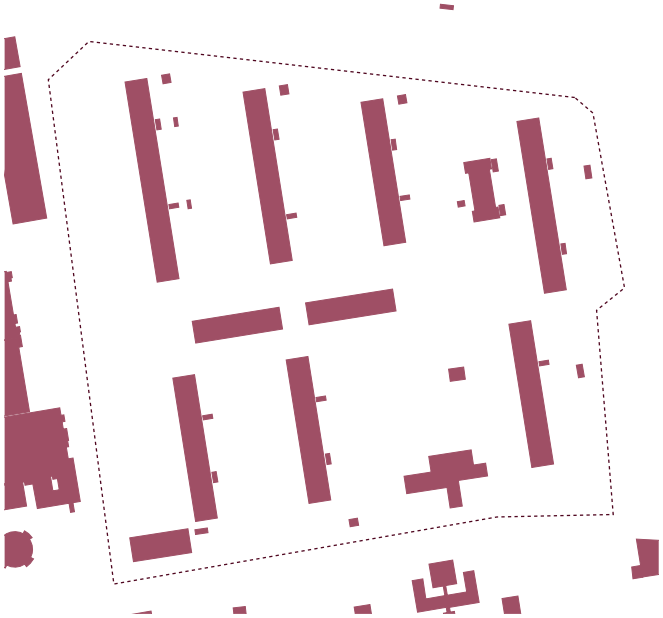


FIGURE 20. Built areas in Toveshøj - showing the repetitiveness and lack of diversity.

Scale 1:6000

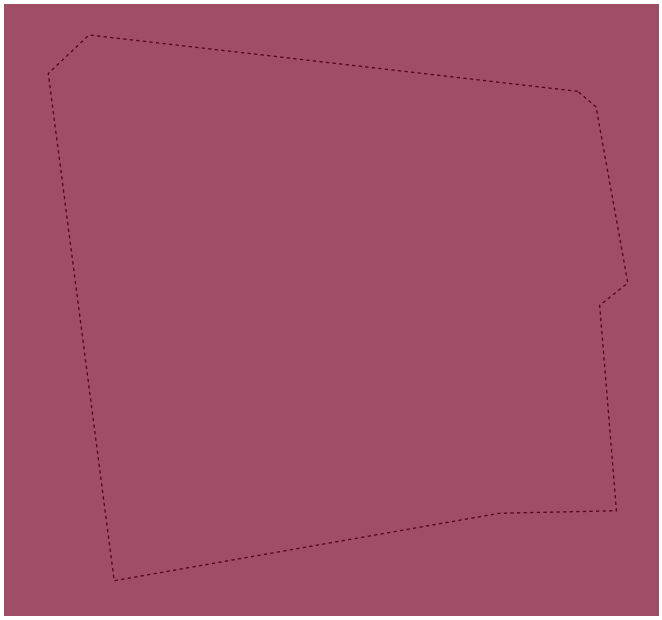


FIGURE 21. Open areas in Toveshøj - showing the vastness of the open spaces between the buildings.

Scale 1:6000

Additionally, the neighborhood consists exclusively of 4-storey, mostly identical apartment blocks with unattractive parking areas if front of each one (Figure 22). This contributes not only to the monotonous physical appearance but also to a lack of experiential diversity.

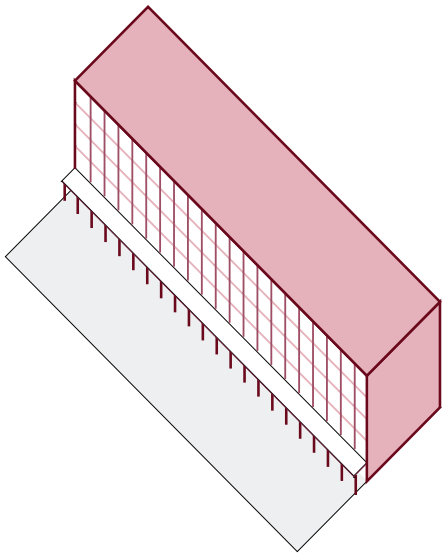


FIGURE 22. Building typology.

MOBILITY

The mapping of the sustainable mobility connections allows for better understanding of the missing links (Figure 23). A number of connections can be identified, including a ring road with cycle lanes wrapping around the site and two major shared mobility routes connecting the site East-West and North-South. However, there is a number of connections that remain unlinked. For example, the connections between parking roads and cyclable lanes, which undermines the mobility experience. Cyclist often have to drive near block entry points in order to avoid dismounting their bike to go down the stairs. These inconveniences could be improved by creating better links between parking routes to create a network for cycling.

The bus stops located close to the site offer residents access to further areas of Gellerup and Aarhus. Buses number 4A, 15, 35 and 43 can take residents all the way from outskirts of Brabrand to the centre of Aarhus.

FIGURE 23. Existing sustainable mobility network.

03.6 Demography

The graph in Figure 24 represents the demographic and socio-economic data of Gellerup over the years. Gellerup transitioned from being classified as a “ghetto”, to a “hard ghetto”, and later to a “parallel society”. A notable trend is the significant drop of residents from 7191 to 4432. This decline can be linked to the development plan of Gellerup which led to the displacement of multiple households.

The percentage of non-western immigrants also dropped from 83.7 percent to 72.7 percent in 2024. However, this figure remains well above the 50 percent limit set by the criteria (presented in section 03.2). Additionally, the percentage of residents outside the labor market and crime rate have both decreased, though the latter remains above national average. The decline in crime can been a result of increased police presence and stricter laws.

Overall, Gellerup is experiencing positive changes in employment, education, income levels and crime rates. It is however difficult to know whether the improvement is due to the 2010 plan or whether it is the result of the intensive non-profit housing reduction policy in 2018, or a combination of both. Despite the progress, the data suggests that Gellerup is unlikely to be removed from the list in the near future, particularly given the persistently high percentage of non-western immigrants, even as the total population continues to drop.

Although Gellerup is evolving, there is uncertainty on the improvement of the social situation for the residents (the remaining and the displaced ones). Ultimately, it is important to consider the lived experiences of residents and the impacts of the new design on social cohesion and wellbeing.

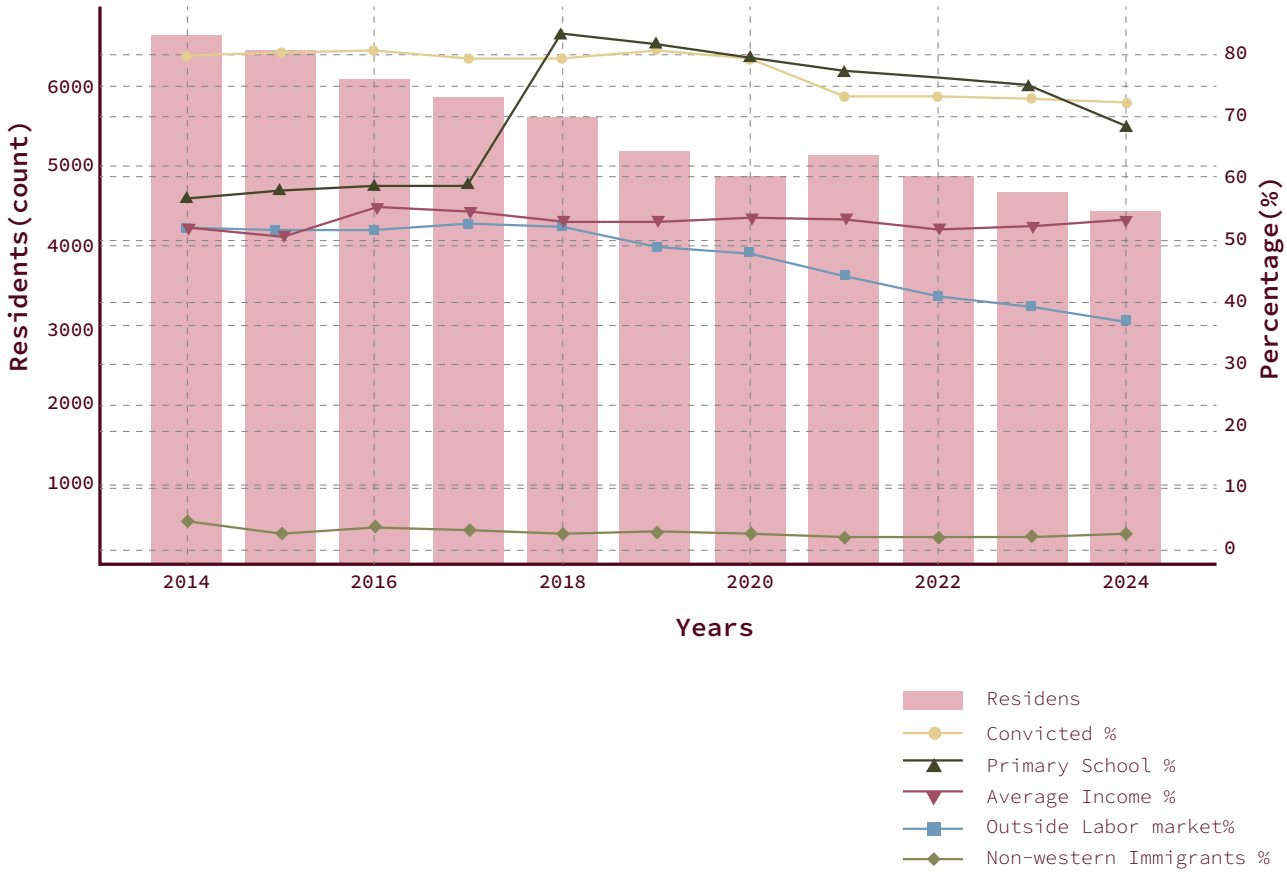


FIGURE 24. Statistics of Gellerup (based on data that can be seen in Appendix A).

03.7 Microclimate

SUN & SHADE

Figure 25 shows the shade analysis for June, September, and December at various times of the day. In summer, the open green spaces receive ample sunlight, creating warm, inviting outdoor areas and supporting plant growth. In winter, however, these spaces are mostly shaded by surrounding buildings.Currently, west-facing homes experience excessive heat gain due to large windows, leading to an uncomfortable indoor climate. This highlights the potential for redesigning the west façade to improve indoor cooling.

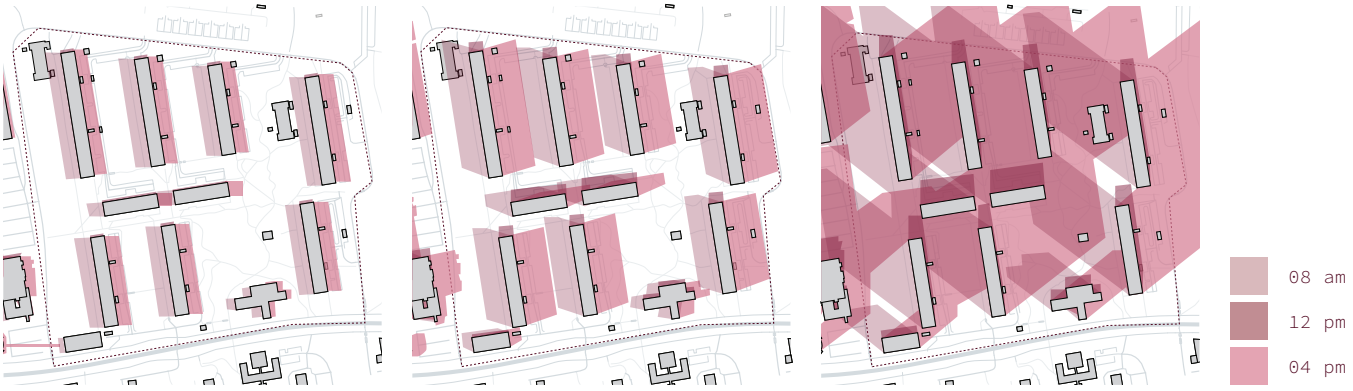


FIGURE 25. Shade analysis (From left: June, September and December).

WATER

The site does not face major water issues, with the only concern being water accumulation during extreme rain events. This typically occurs in low-lying areas such as parking lots and green spaces. To address this, the use of permeable surfaces and additional rain gardens should be considered to manage excess water during heavy or prolonged rainfall.

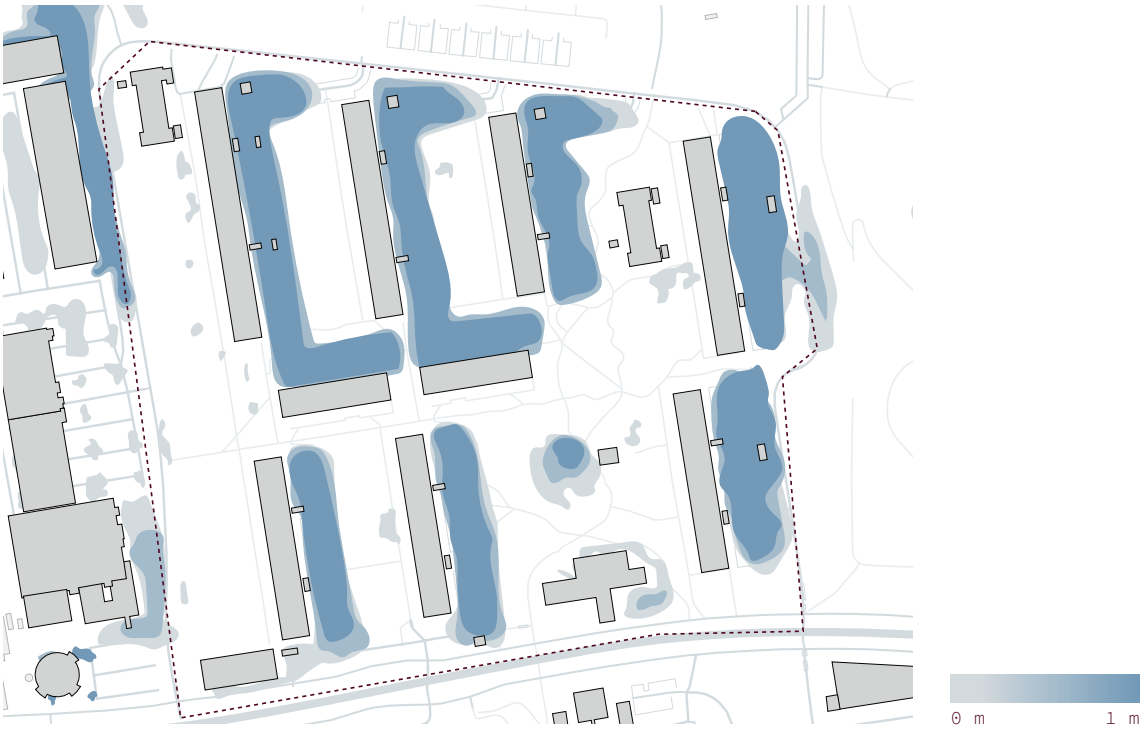


FIGURE 26. Flooding risk within Toveshøj.

03.8 Section

The section gives an indication of the different levels present at the site. While walking around the Toveshøj area, one can encounter a pattern where the terrain rises near the building blocks, then descends where the parking is located, and rises again where the green open areas are placed.

The two sections also clearly highlight the repetitiveness of the buildings and the lack of diversity in terms of the buildings, infrastructure, landscape and the green open spaces, which can be the cause of the feeling of anonymousness and the lack of identity experienced in the area.

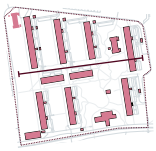


FIGURE 27. Indicative section showing the differences of levels across the site.

FIGURE 28. Collage section showing the monotonous character of the site.

03.9 Materials on site

This section is dedicated to showcasing the material character of the existing site. Due to the transformative nature of the project, it is important for the project to respect the existing character and use of materials, while also introducing new materials that can enhance the visual identity of the area.

As the focus of the project is circular transformation, it is also essential that the materials currently present on the site are identified and considered for further reuse.

FIGURE 29. Materials on site.

03.10 Conclusion

The analysis of Gellerup and Toveshøj reveals a neighbourhood in an ongoing transformation, both physically and socially. Built as Denmark's largest social housing area, the neighbourhood currently struggles with its monotonous appearance, social challenges, and negative public perception.

The comprehensive plan showcases the municipality's attempts to reverse the negative development by enhancing connections and introducing diversity, followed by extensive demolitions for new construction in Gellerupparken. The same can be seen in the legibility analysis (pages 44-45). New developments have taken place, and the efforts seem to be going as planned by the municipality. While sustainability has been taken care of on the building level, the neighbourhood level lacks a holistic strategy to make this area truly resilient and regenerative.

Ultimately, as part of the Parallel society agreement, the neighbourhood of Toveshøj also needs to bring down the percentage of social housing to a maximum of 40 percent and deal with the similar challenges as Gellerupparken. How can that be done with minimal or no demolition while addressing social challenges? The transformation needs to go beyond the aesthetics of the physical renewal, embracing the values of a holistic sustainable approach and community well-being on a neighbourhood scale.

From the analysis of the built and open spaces and sections, there is enormous potential in rethinking the large green spaces and redefining them as smaller, more private spaces that offer greater programming. Micro-climate analysis presents an opportunity to improve indoor climate conditions of the existing buildings and program the outdoor spaces. The study of the existing materials on site helps us consider their reuse while carefully introducing new materials that will help enhance the visual identity of the neighbourhood.

Thus, by integrating the knowledge gained from the theoretical framework and the information gathered from the analysis, the area can evolve into a circular and socially inclusive neighbourhood that does not rely on demolition as its primary tool for renewal but embraces transformation through a sensitive, regenerative design.

04

Reference Studies

04.1 Buiksloterham, Amsterdam

In 2021, a case study by Appendino et al. Reviewed four urban neighbourhoods in Europe redesigned with “circularity” in mind (Figure 31). One of these neighbourhoods has become widely known for transforming a once disconnected post-industrial area into an “innovating kind of urban planning” (studioninedots, no date).

Similar to Gellerup and Toveshøj, Buiksloterham challenges related to physical and social disconnection from the old city center and problems related to the identity of the place. Scattered property ownership and elevated levels of pollution significantly increased the cost for any potential development in the area. Instead of treating it as a disadvantage, the authorities of Amsterdam decided that Buiksloterham would be a perfect “test-site” for implementation for new clean technologies and a “hub for closure of urban material cycles” (Metabolic, 2014).

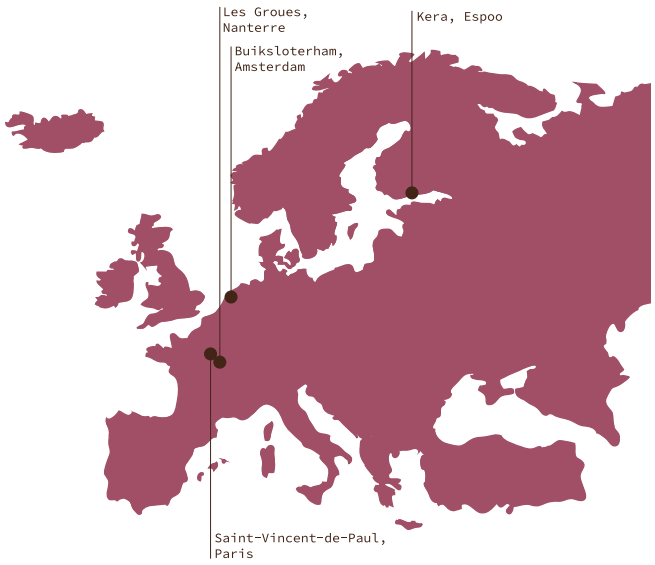


FIGURE 30. Case studies included in Appendino et al. (2021) - major circular neighbourhood projects in Europe.

Key strategies and outcomes include:

- Almost all buildings comply with the ***Circular Building Standard***, initially a voluntary guideline but widely adopted due to tax incentives for developers.
- Circular approaches reduced total energy demand by 70 percent, allowing the neighbourhood to become ***fully energy self-sufficient***.
- A ***Design for Disassembly*** strategy involves digitally registering all building materials in material passports. This has enabled efficient material recovery and storage at a local urban mining facility, reducing material demand by 25 percent over the past decade.
- ***Recycling rates approach 100 percent***, packaging use has been minimized, and organic waste nutrients are recovered, contributing to a closed-loop system.
- Larger buildings provide ***shared facilities*** for household items like tools, reducing the need for individual consumption and lowering waste generation.

04.2 UN17 Village, Ørestad

Designed to align with all 17 of the UN's Sustainable Development Goals (UN17 Village, n.d.), UN17 Village presents a model for urban development that prioritizes the needs of the inhabitants, creating thriving communities alongside greater balance with the environment.

The project believes that a space where community and neighbourliness thrive can contribute to solving many societal problems (UN17 Village, n.d). It uses a holistic method to address sustainability, broadly divided into six overarching themes (Figure 30) (UN17 Village, n.d).

Project's main implementations:

- Using ***Building Materials*** with less CO2 impact (FutureCem from Aalborg Portland) and recycled materials (aluminum).
- O***ptimal resource utilization*** through solar panel installation generates significant electricity savings for residents (UN17 Village, n.d).
- ***Biodiversity*** is promoted with native landscaping and dim lighting that protects wildlife.
- ***Rainwater harvesting*** supports courtyard gardens.
- Rooftop greenhouses allow residents to grow vegetables and participate in ***healthy-eating*** workshops.
- The development encourages active lifestyles with excellent ***cycling infrastructure, communal dining, and shared leisure spaces for community interaction***

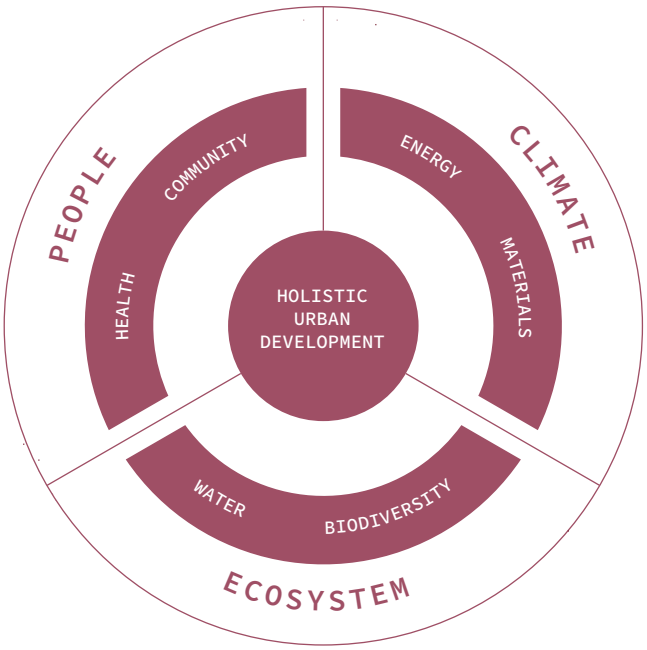


FIGURE 31. UN17 Village sustainability approach.

04.3 TaiSugar Circular Village

TaiSugar Circular Village (TCV) is the first residential project in Taiwan (e-architect, 2024) to fully integrate circularity ideologies and foster a value-oriented community. The development comprises three housing blocks, a Circular demo house (C-house), and an eco-house(E-house). It accommodates 351 rental homes organized around an urban farm, eco-pond, and waste management area while also addressing the basic needs of its residents (e-architect, 2024).

The C-House provides shared facilities for residents, including a launderette, gym, library, tool store, and café. In the center, a small gabled volume, or the E-House, contains a communal kitchen where residents can cook using produce from the surrounding farm.

TCV's circular design emphasizes modularization and service-oriented appliance supply. The buildings are designed in six layers: foundation, structure, façade, system, partition, and appliances to allow for isolated repairs without compromising other components (e-architect, 2024). Each block is designed with prefabricated modules (to reduce onsite waste material), upcycled materials, material passports and a plan for its own deconstruction. The blocks overlook the courtyard and surrounding landscape and are finished with gridded metal balconies assembled with nuts and bolts to enable easy disassembly in the future.

Furthermore, the installation of solar panels on the roof of each block has resulted in approximately 50 percent less energy use than predicted in 2022 (e-architect, 2024).

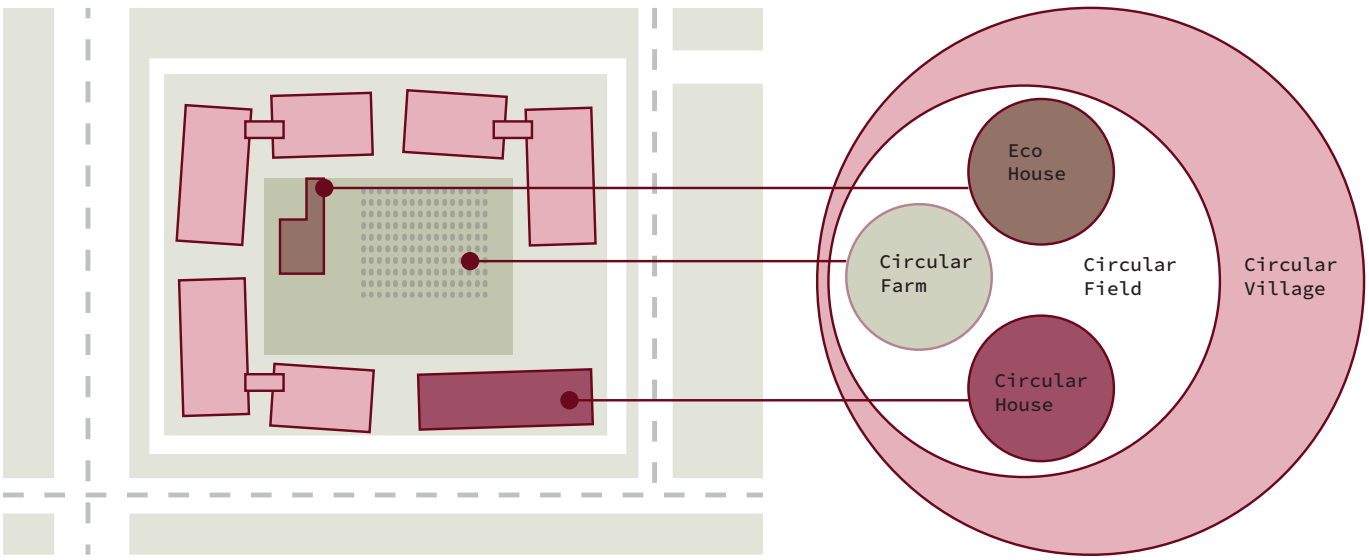


FIGURE 32. Concept diagram TaiSugar Circular Village.

04.4 Conclusion

The 3 case studies are leading examples of the application of CE principles with their innovative initiatives. Buiksloterham demonstrates examples of how CE principles can be effectively applied at the neighbourhood scale through innovative policies, strategic reuse of materials, and community-focused design. The success of the project is an example how circular urban planning can reduce resource consumption, promote social cohesion, and enhance environmental performance.

Similarly, projects like UN17 Village in Demark and TaiSugar Village in Taiwan demonstrate that sustainability demands a holistic approach that extends beyond environmentally friendly buildings. We need to look beyond sustainability and work towards creating a thriving ecosystem. Such an approach also creates awareness of climate issues among the people who are ready to take care of the planet. Ultimately, the goal is to create spaces people cherish and are motivated to take care of in the future.

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Concept

05.1 Design strategy

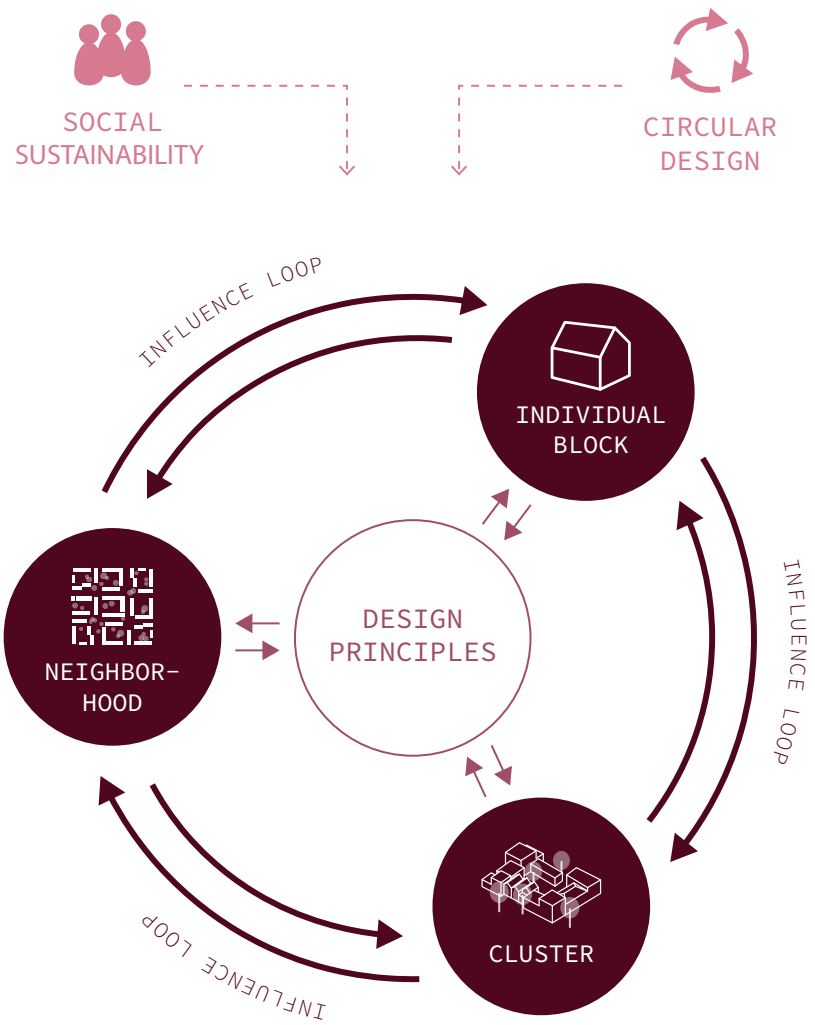


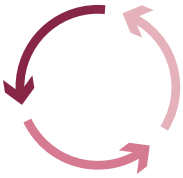
FIGURE 33. Design strategy diagram.

The design strategy is the framework that guides the design process. The design feeds off of design principles in order to ensure sustainable design at all scales: individual block, cluster and neighbourhood (Figure 33). It presents a “loop of influence” where design decisions made for the individual block feed the design decisions for the cluster, and the neighbourhoods, and the process continues when the design of the neighbourhood affects the design of the individual cluster and so on.

The process is closely related to the IDP model where design is not a linear sequence of decisions but a complex network that has no clear beginning or an end. The whole process is also greatly influenced by the theory which is the focus of this thesis: Circular design and social sustainability.

The purpose of the process is to ensure that the decisions made for the final design embrace the circular spirit to the greatest extent possible and lead to a design that is a visionary concept for livable and regenerative neighborhoods.

05.2 Design principles



CLOSING THE LOOP

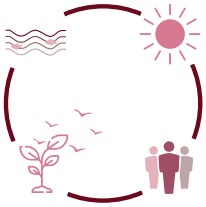
- DESIGN FOR DISASSEMBLY (DFD)
- REUSE OF GREYWATER, RAINWATER AND ORGANIC WASTE
- RECYCLING AND UPCYCLING

DIVERSIFICATION

- HOUSING TYPES
- OWNERSHIP TYPES
- DIFFERENT FUNCTIONS
- HUMAN SCALE

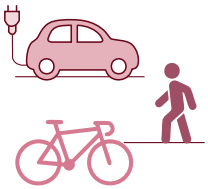
GREEN ENERGY

- LOCAL ENERGY PRODUCTION
- REDUCING ENERGY WASTE
- RESPONDING TO MICROCLIMATE



ECOSYSTEM AND BIODIVERSITY

- GREEN INFRASTRUCTURE
- URBAN FARMING
- PERMEABLE SURFACES



MOBILITY AND INFRASTRUCTURE

- SHARED TRANSPORT
- PROMOTING WALKING AND CYCLING
- SHARED MAINTNANCE SHEDS AND TOOLS
- BETTER CYCLING CONNECTIONS

SOCIO-CULTURAL AND HEALTH

- AGE-DIVERSE FUNCTIONS
- SPACES INSPIRED BY CULTURE
- EDUCATIONAL SPACES
- SAFETY

90

Presentation

06.1 Masterplan

The masterplan in Figure 34 outlines the overall design strategy for the transformation of Toveshøj Neighbourhood. The plan primarily represents the correlation of the site and its surrounding context, ensuring seamless integration with nearby key features identified through legibility analysis. The new network of connections makes the site accessible and discoverable for residents and visitors.

The plan fosters interaction through layered spatial experiences with a new network of paths, enhancing connections within the site and a revitalized main street. Central to the proposal are an upcycling park, diversified housing options, and activated public spaces.

Shared amenities and communal spaces- particularly the courtyards between the old and new buildings become central to social life and support various activities for diverse age groups.

Infrastructure such as shared sheds, stormwater systems, and solar installations further reinforces the neighborhood's self-sufficiency and environmental resilience.

The design strategy is further explained by breaking it into the six design principles.

FIGURE 34. Masterplan, scale 1:2000 @A3

CLOSING THE LOOP

- The Upcycling Park enables the sharing of materials and resources, and learn about upcycling through workshops
- Common areas with shared utilities such as laundry, fitness, recreation for kids, tools, and more are available for residents to reduce the need for individual consumption.
- Greywater treatment systems and rainwater harvesting are implemented to support sustainable reuse for irrigation of non-edible plants, and toilet flushing
- Rainwater ponds, enhanced by solar-powered filtration and rainwater collection on the roof, can be used for watering plants, toilet flushing, laundry, cooling systems, and washing vehicles

DIVERSIFICATION

- A mix of housing types- including retrofitted existing block, new apartments, and townhouses- allows for a wider variety of households to reside and find a home depending on their preference.
- The addition of new functions allows more small businesses to move into the area, making it vibrant where services and amenities are closer to all residents.
- The courtyards diversify outdoor space for multiple uses, from leisure, play, relaxing, gardening, cycle repair, outdoor dining, fitness, to learning about nature.

GREEN ENERGY

- Solar panels on rooftops generate electricity to be locally used, reducing residents' electricity bills to some degree.
- Good-quality insulation with bio-based materials is ensured in new buildings to maintain stable and comfortable indoor temperatures and reduce heat demand in winter.
- External façade treatment to the existing building- including angled green wall on the west façade- will improve the micro-climate and encourage passive cooling

ECOSYSTEM AND BIODIVERSITY

- Enhancing biodiversity enriches the atmosphere and sensory experience of the courtyards, where flowers, fruit trees and bushes, growing herms fill the surroundings with different aromas
- Local plants give shelter to a variety of insects and small animals, and repel those more unwelcome visitors like moths, mosquitoes, etc.
- The rainwater collection pond is a stormwater management strategy to store excess rainwater, allowing it to percolate into the ground slowly, thus preventing floods during heavy rains.

← MASTERPLAN

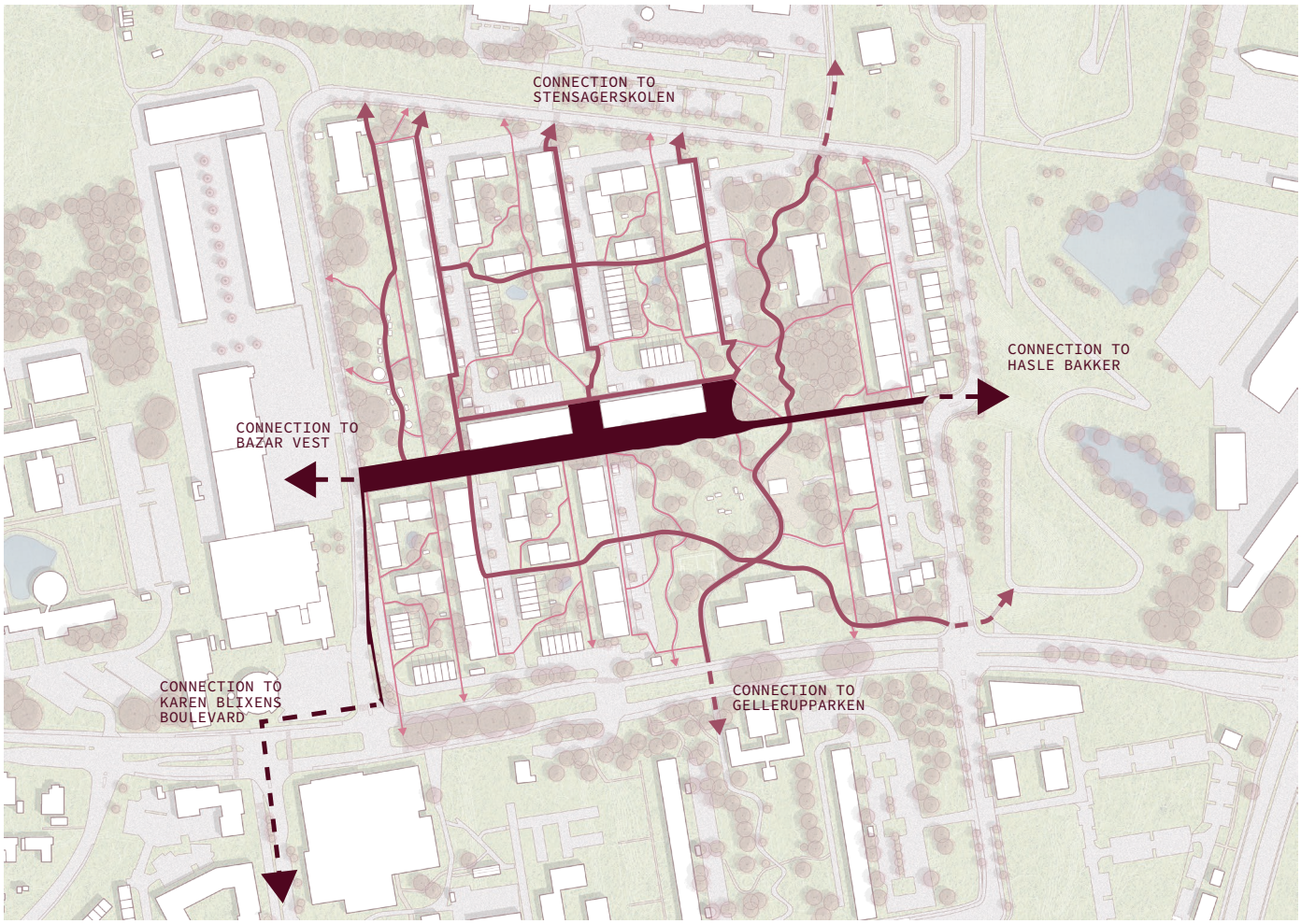
MOBILITY AND INFRASTRUCTURE

- New network of shared paths gives cyclists and pedestrians an easier way to get around the site
- Added bicycle parking, both open and covered, improves the convenience of owning a bicycle, and sheds with repair tools make it easier to fix or modify them at any time
- Natural paths of different widths guide mobility hierarchy, where cycling and walking is more convenient than owning a car
- Added crossings provide residents with a better connection to surrounding locations

SOCIO-CULTURAL AND HEALTH

- Shared courtyards give people a chance to meet their immediate neighbours and share their resources with them.
- Accessible green spaces and walkable environments promote physical activity and time outdoors.
- Integrated sports, fitness, and recreation facilities contribute to a healthier, more socially connected community.

06.2 Mobility



Primary path - main street
Shared between pedestrian and bicycle

Secondary paths
Shared between pedestrian and bicycle

Tertiary paths
Pedestrian only

FIGURE 35. New mobility network map diagram.

Scale 1:5000

The map diagram represents new connections introduced as part of the new masterplan design. The new ***main street***, serving as a primary path, connects East and West, improving pedestrian and cycle flow and providing a clearer connection to Bazar Vest. The street continues south through the development, creating a more direct link to the Gellerupparken development and its amenities.

The network of curving paths connects the entire site. ***Secondary paths*** link the main street to individual courtyards, allowing easy access for pedestrians and cyclists. These paths also improve access to Stensager School, located north of the site, and the eastern entrance to Hasle Bakker.

Tertiary paths serve as pedestrian linkages for convenience and to encourage exploration among trees, flower bushes, and small rainwater collection ponds.

06.3 Functions

FIGURE 36. New functions map diagram.

Scale 1:5000

Diversification of functions aims to support the emergence of more local businesses in the area, making it easier for residents to access necessary services and facilities, and help Toveshøj become an independent neighbourhood by promoting a more unique, circular mindset of collaboration and flexibility.

The main street will introduce a number of mixed-use buildings with rentable spaces for local businesses, as well as space for fitness, wellness, and activities for the elderly. More educational facilities will be established to allow local children to receive their education within their own neighbourhood, eliminating the need to spend hours commuting to school each day (see Appendix E, page 107).

Additionally, more co-working and flexible spaces with everyday amenities will be made available in shared buildings within the courtyards and on the ground floors of some existing buildings. The aim of these functions is to encourages residents to connect and share common resources, while also saving money and time that would otherwise be spent on the repair or replacement of items such as washing machines, tools, and fitness equipment, or on travel to other areas where these amenities are available.

06.4 Upcycling park

FIGURE 37. View of the upcycling park.

The view captures the entrance to the upcycling park. To the right is a circular shed made from reused wood that serves as a workshop space (for upcycling activities) or for socializing. Further along the path, sheds of varying sizes are visible for the collection and exchange of reusable items such as clothes, home furniture, electronics, and much more.

The installation on the left made of waste tyres illustrates how adults and children can create playful art using recycled materials, thereby raising environmental awareness among children and educating them from a young age.

The park is envisioned as more than just an upcycling station. It is designed as a multifunctional green space that promotes sustainability, creativity, and community interaction.

Additionally, the park's strategic location along the site's entrance is to send a strong message that: "In this neighbourhood, nothing is waste."

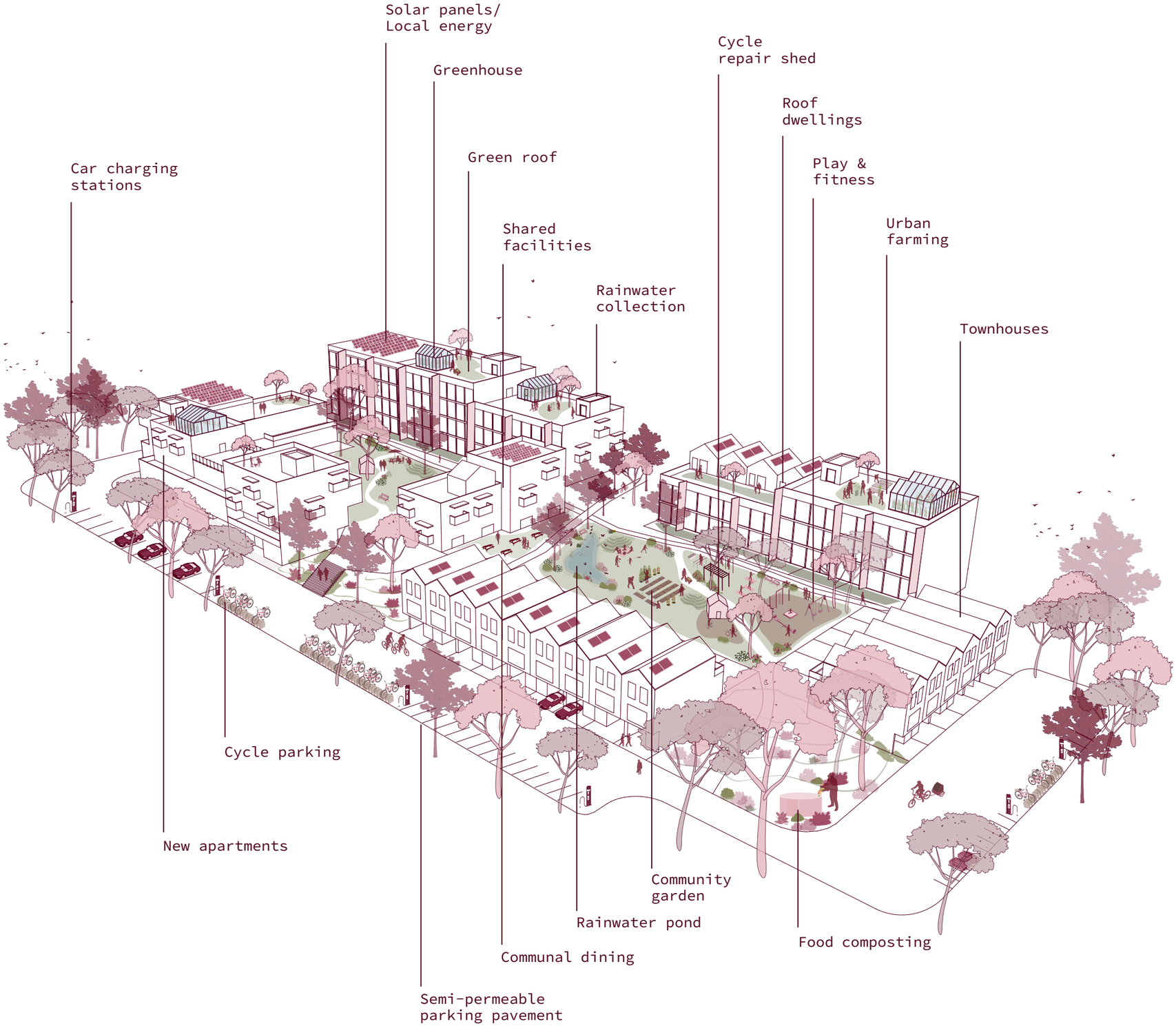


FIGURE 38. Example of a cluster.

06.5 Cluster

The isometric view of cluster, as shown in Figure 38, illustrates an exemplary approach cluster design. It showcases ***diversification*** in building types, including row houses and new apartments, alongside the transformation of the existing building, creating multilevel terraces. The terraces serve multiple purposes, including ***green roofs*** for recreation and environmental purposes, space for greenhouses to support ***local food production*** and installation of solar panels to provide decentralized ***renewable energy*** production.

The row houses are strategically aligned along the existing road. No additional parking spaces have been introduced for the new apartments, to promote sustainable practices such as carpooling and the use of green transportation. Furthermore, the pavement in the parking areas have been replaced with semi-permeable surface to enhance storm water filtration.

At the heart of the cluster is a communal building offering shared amenities on the ground floor, including a laundry facility, community kitchen and dining area. The upper levels are designed for activities and co-working spaces. This space as well as the guest apartments on the ground floor of the existing buildings, can be rented by friends and family. The community kitchen is a place where the residents can gather for communal meals or festive events, bringing the entire cluster together.

The courtyard is programmed such that it can cater to various activities for all age groups, featuring a community garden, play area for the children, outdoor gym to promote health and wellness. Additionally, a pond has been introduced, which serves both as a recreational feature and to collect rainwater.

In essence, the programming and design of the cluster is thought to encourage residents to interact more, share more and get to know each other better.

06.6 Main street

FIGURE 39. View of the Main street.

In this view of the main street, the two existing buildings have been renovated into mixed-use buildings. The buildings incorporate different functions, such as café, grocery store, secondhand shop, badminton court and businesses to promote engagement with the people and create a vibrant atmosphere.

The paving utilizes concrete salvaged from the demolitions, and integrates various other leftover materials like bricks, tiles and stones to highlight that nothing is truly waste. The patterned tiles is an effort to integrate non-western culture, helping the residents feel a sense of belonging to the area.

The street furniture and landscaping invite lingering and socializing, making the space more than just a passageway. The main street connected to the entrance square is designed to be a adaptable space that can be used in different ways to host community events and bringing the entire neighbourhood together.

FIGURE 40. Section showing the lack of programming of existing green open space in between the buildings.

Scale 1:500

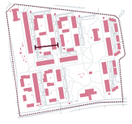


FIGURE 41. Section showing new courtyards with programming in the context of new and existing buildings.

Scale 1:500

The improvement of the courtyard space will come from the more intentional enclosure of the area with new buildings. Planned activities will be combined with flexible open spaces where children can play, residents can enjoy a picnic, or organize a morning yoga class, etc. Equipment for these activities, as well as tools for bike repairs and other materials, can be stored in a shared shed at the centre of the courtyard.

By lowering the existing blocks and adding new builidngs with lower elevations, the space will gain a more human scale, making those who use it feel calmer and as if they are in a peaceful area with a greater sense of privacy. Everyone will have equal access to the courtyard, ensuring that all residents feel welcome. Private gardens can either open up to the courtyard or be separated by low fencing, depending on the preferences of the residents.

The entire courtyard will gain aesthetic and experiential value through diverse planting - trees, fruit bushes, flowers, etc. Additionally, the rainwater pond will add a unique sensory experience and allow residents to collect water for gardening and plant care.

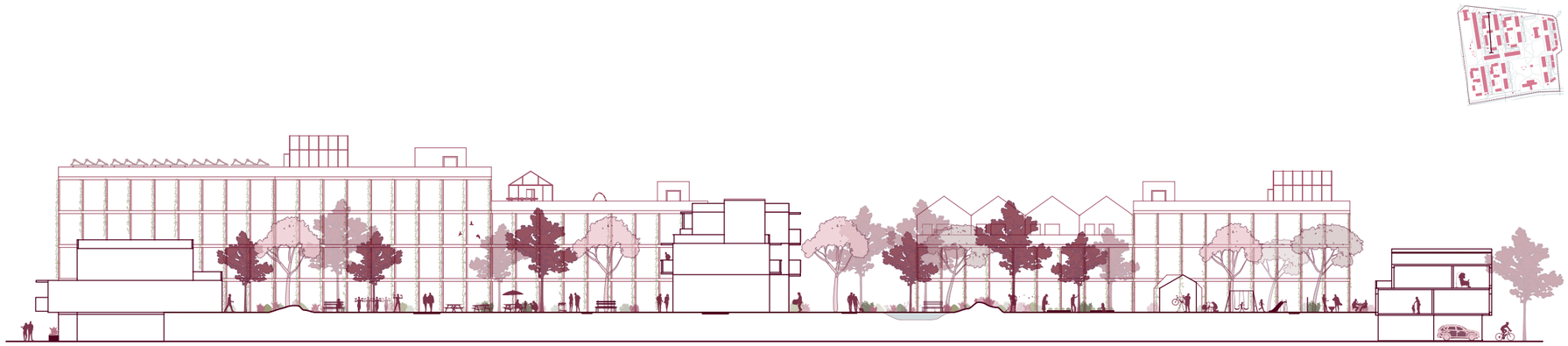


FIGURE 42. Longitudinal section showing exemplary range of activities accross two neighbouring courtyards.

Scale 1:500

06.7 Sections

The sections present in more detail the exemplary atmosphere of the new courtyards and compare them to the existing oversized ones. They also convey a story of shared experiences among the buildings—where people can meet their neighbours and participate in various activities without wasting time, money, or materials.

The new courtyard aims to help people feel part of a community without feeling exposed or restricted. The diversity of activities welcomes a diversity of people. It fosters a sense of belonging while encouraging residents to learn how to share with others and grow from those interactions. The courtyards will become the heart of the site—places where collaboration flourishes and new community bonds are formed.

The section is the clearest representation of how “breaking up” the existing buildings, diversifying their roofscapes, and introducing new housing types transforms a once homogenous neighbourhood into a more attractive and engaging place. The area shifts from a repetitive landscape into a human-scale, biodiverse refuge from the more rigid and robust spaces of the surrounding neighbourhood.

06.8 Block

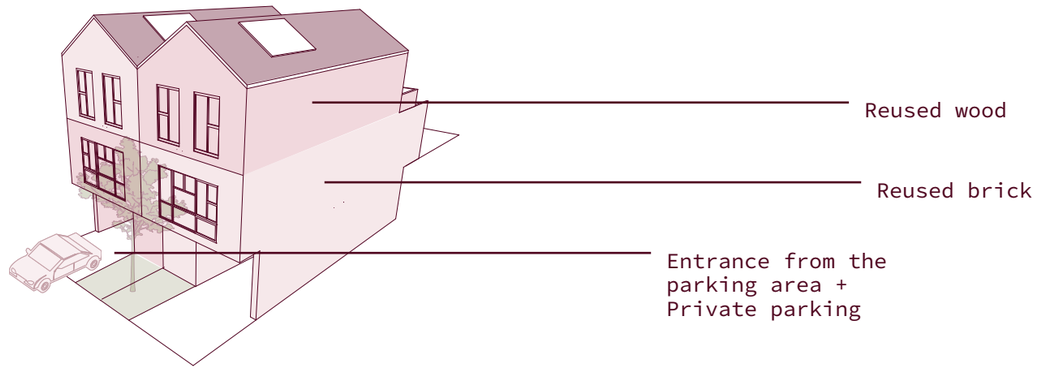
TOWNHOUSES

Strategically aligned with the existing road network, the introduction of townhouses diversifies the type of dwelling and ownership in the neighbourhood. These units (basement + 2 levels) provide ***independent living options*** while still allowing residents to feel they ***belong to the bigger community***.

They are designed to be identical and ***constructed using prefabricated units*** to avoid onsite waste of materials. The principles of design for disassembly are also considered to allow the house to be dismantled in the future and reuse its materials.

Interior renovations are guided by a ***conscious selection of materials*** and products from companies prioritizing green agendas. Materials such as reused wood and bricks have been chosen for the exterior.

The lower level has ***direct access from the road*** and accommodates a space for car parking. The ***private gardens*** on level 1 open up to the bigger common courtyard of the cluster. Meanwhile, the ***balcony*** on level 2 provides an additional visual connection to communal outdoor spaces.



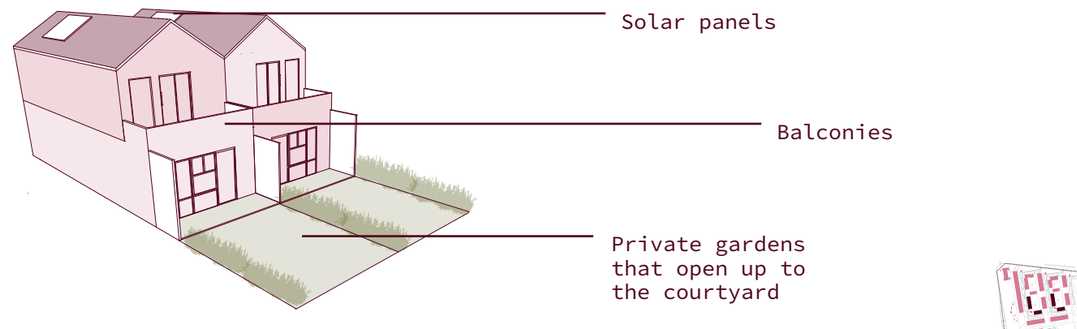


FIGURE 43. Specification of the townhouse (front and back).

NEW APARTMENT BLOCKS

The new apartment blocks contribute similarly to the diversity of housing types and ownership in the neighborhood as the townhouses do. These blocks mainly consist of apartments ranging from 70 to 100 sqm, reflecting the neighborhood's demand and needs (Appendix E, page 105).

In both the townhouses and the new apartment block typologies, the integration of modular construction, disassembly principles, and sustainable materials forms a consistent and future-oriented design strategy – one that supports environmental resilience while enhancing the quality of everyday life.

Material selection for the interiors aligns with sustainable practices, featuring eco-conscious products and finishes. Reused bricks and timber continue the architectural language of the neighborhood while supporting circular construction goals.

The ***common rooftops*** provide residents of the new block with ample space for c***ommunity activities*** such as communal dining, urban farming, and special events. The placement of greenhouses enables year-round gardening and the cultivation of crops that require specific conditions.

Additional features of the block include ***solar panels***, ***private balconies***, easy access to the ***shared courtyard***, and convenient proximity to the central building, which houses shared facilities and co-working spaces.

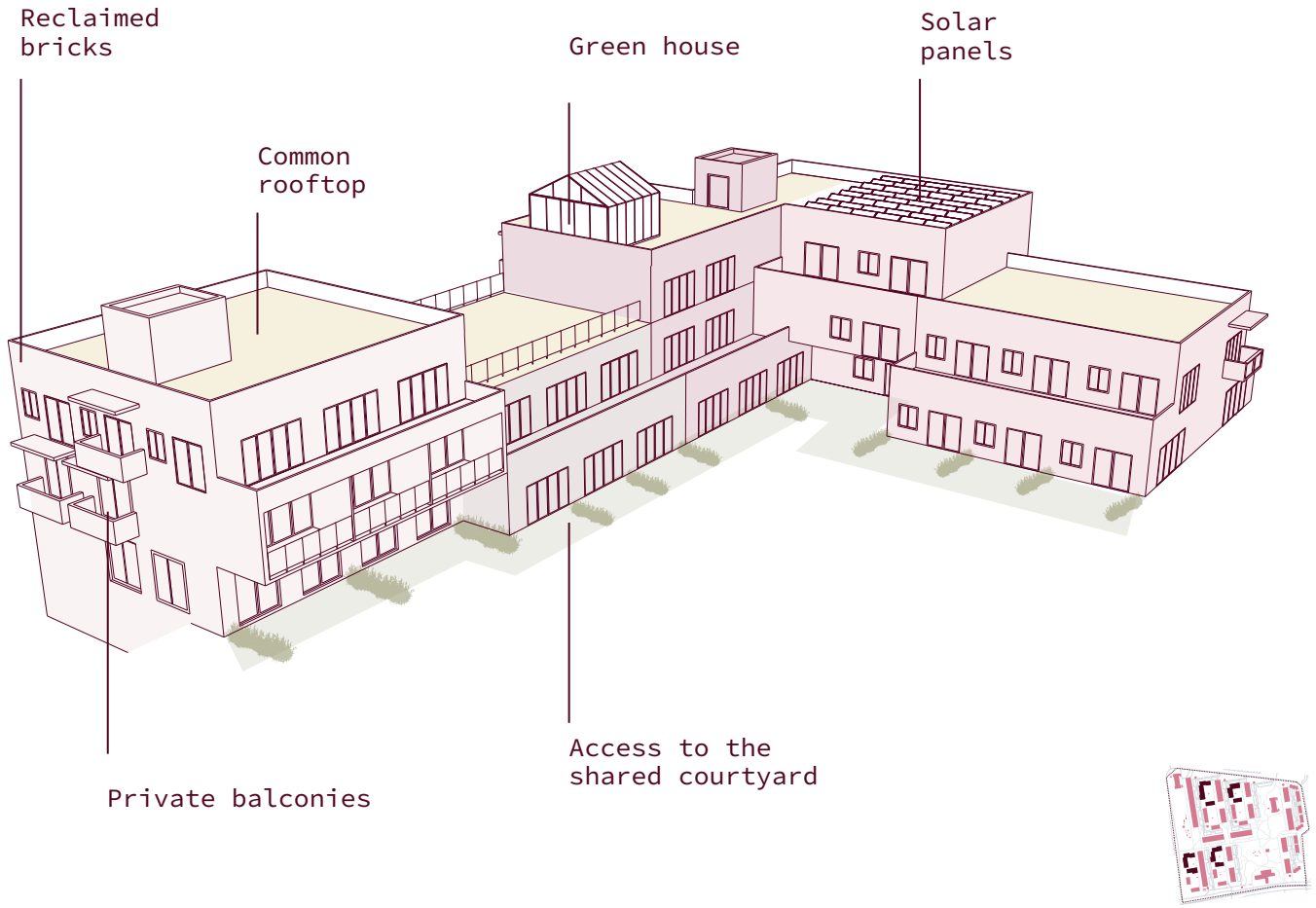


FIGURE 44. Specification of the new apartment block (view from the courtyard).

EXISTING BLOCKS

The existing apartments are reimagined by modifying their volumes, as seen in Figure 45. Selectively removing a few floor units helps break the vast scale of these structures, introducing a more human-scale and creating different levels for terraces. These ***terraces***, as illustrated in Figure 46, can be adapted for different social and communal purposes. For example, urban farming, dining space, and green terraces unite the community while promoting healthy eating habits. This initiative, where the residents learn, grow, consume, and be responsible for their food systems, highlights the first principle of closing the loop on a building scale- food is produced and consumed. The resulting organic waste is used as compost to produce new food. Similarly, the installation of ***solar panels*** is another example of closing the loop where the locally produced energy fulfills the electricity needs of the buildings.

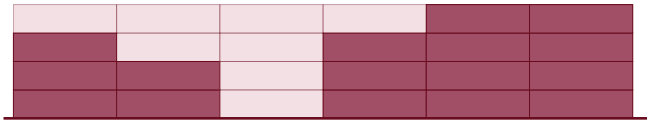


FIGURE 45. Exemplary modification of the volumes in the existing building block.

Interior renovations are guided by a conscious selection of materials and products from companies prioritizing green agendas. On the exterior, metal railings salvaged from the demolished floor units are repurposed as ***green walls***. This installation responds to the micro-climatic conditions, providing shade and natural cooling in summer, thereby reducing heat gain.

Furthermore, a few areas on the ground floor of the building have been allocated to ***communal amenities***, including fitness, a children's play area, and other activities.

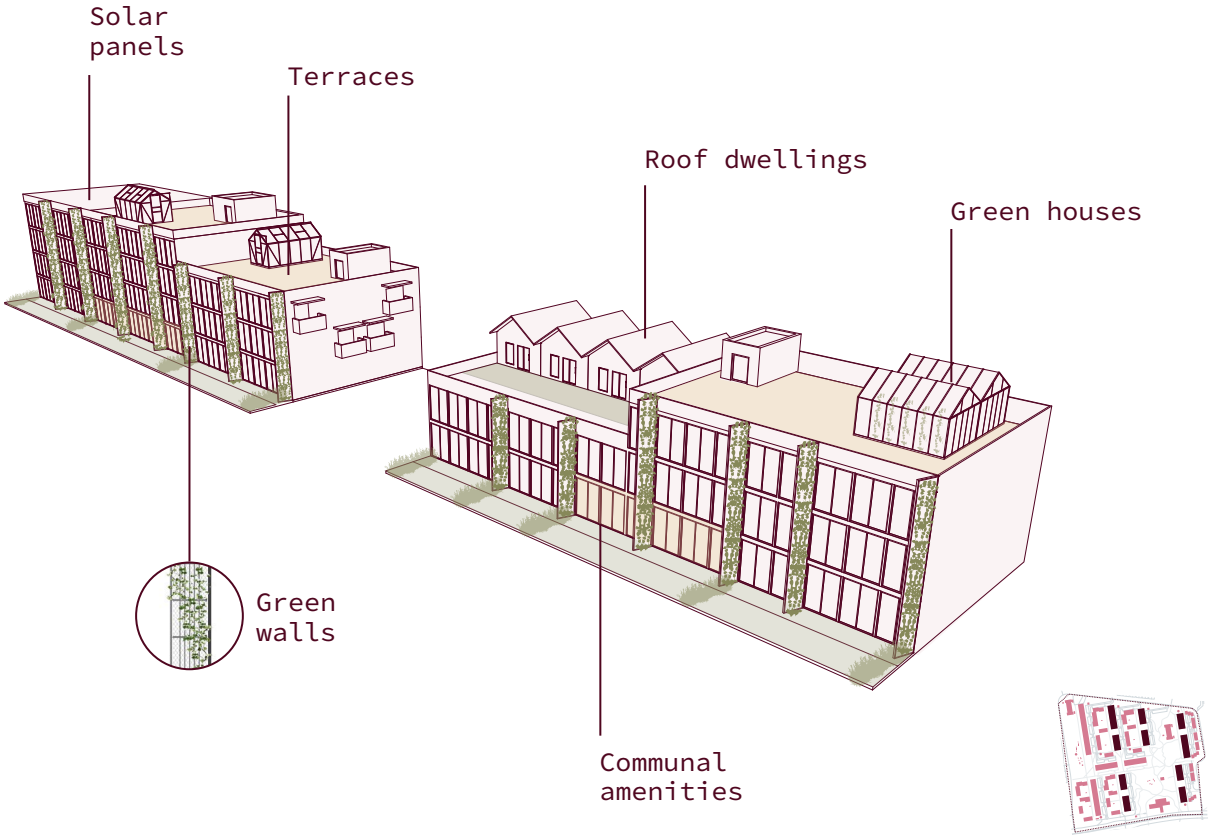


FIGURE 46. Specification of the modifcations made to the existing apartment block (view from the courtyard).

06.9 DfD

To ensure that circularity is maintained from the moment the buildings are erected until the end of their life cycle, the principles of DfD must be followed. These principles will be particularly applied to the new buildings. The three different building types - the townhouses, the new apartment blocks, and the retrofitted existing blocks - will all adopt the DfD mindset.

In the existing buildings, all added elements such as the pergolas with climbing plants, rooftop greenhouses, and rooftop furniture must meet a minimum standard for disassembly. This means that as many elements as possible should be designed to be taken apart and reused when they are no longer in use.

For the new buildings, the standard will apply to the entire structure. This is why some level of repetition in the design of the apartment blocks and the individual townhouses is evident in the project. This repetition facilitates the use of modular building parts that can be replicated and disassembled, making it easier to construct more housing in the future.

DfD ensures that, in addition to incorporating reused materials, bio-based materials starting their life cycle can also be reused at the end of the building's life. To make this possible, materials must be of high quality - "The process of choosing materials within this design method revolves around questions such as: what happens to a component at the end of its life? How can it be reused, or could it be returned to the supplier? There is software that could help make this evaluation, by generating Life Cycle Assessment (LCA) of specific input materials." (Cutieru, 2020).

Even more crucial principle of DfD is that the materials must be assembled using bonding methods that can be dismantled or dissolved without damaging the materials. "The focus should be on mechanical joinery, using bolted, screwed or nailed connections, as opposed to non-removable, chemical ones such as binders, sealers, glues or welding, which would make the material difficult to separate and recycle." (Cutieru, 2020)

Implementing Design for Disassembly across all building types ensures that circularity remains a central strategy from construction through to end-of-life. By using modular, high-quality, and easily separable materials, the project supports long-term sustainability and adaptability in the built environment.

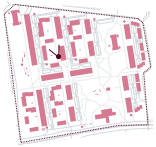
06.10 Courtyard

The view captures the atmosphere of the cluster, with the courtyard being the heart of it. Programmed with diverse functions, offering something for everyone - from gardening and casual strolls, to playing and socializing.

The rainwater collection pond serves as an ecological and social feature, inviting people to sit around it. A variety of native plants have been introduced to attract biodiversity, but also to contribute to a calming sensory experience.

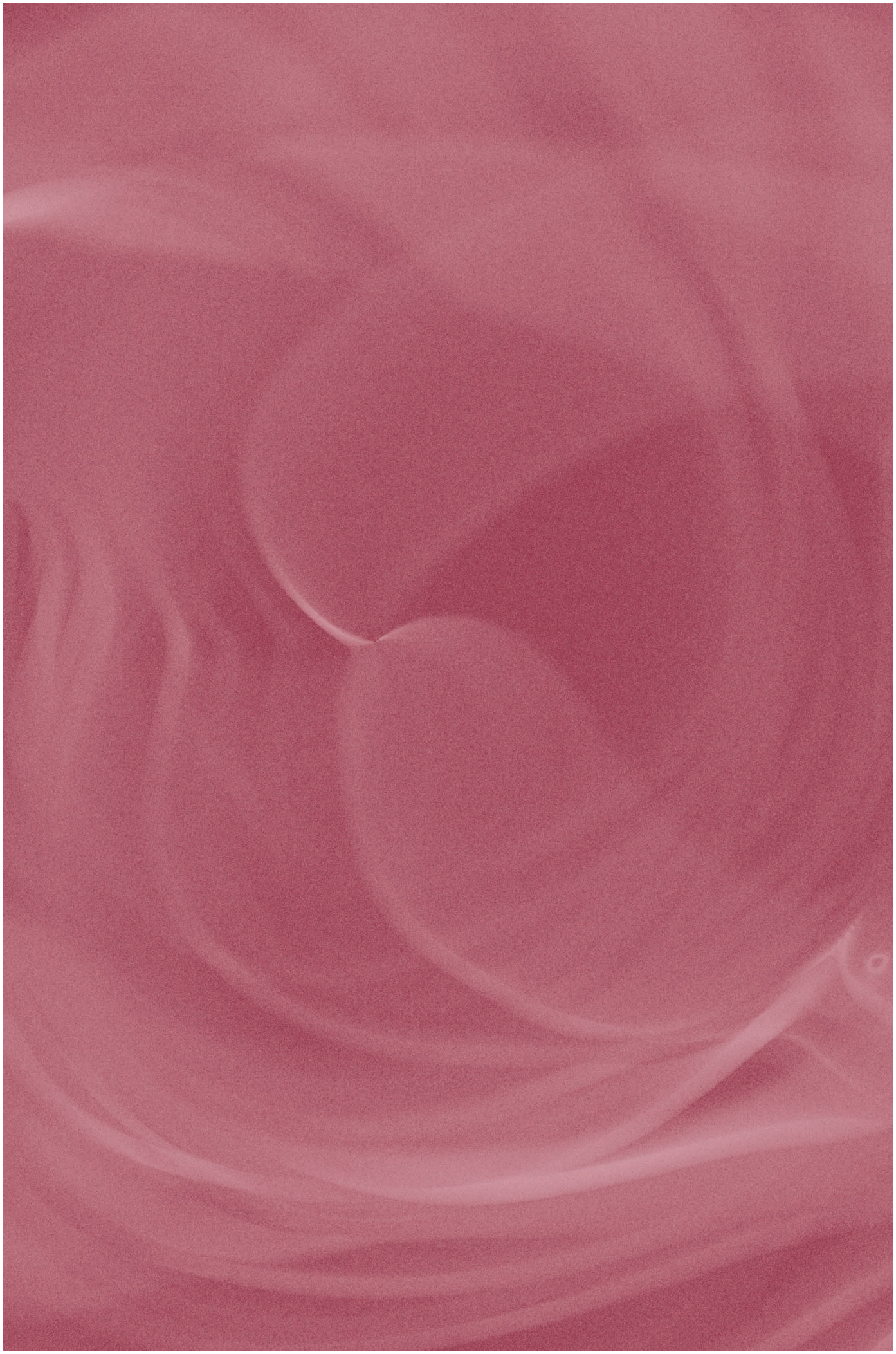
FIGURE 47. Atmosphere of cluster.

The different activities and the shared spaces in the community building support casual encounters and deepen bonds among the residents. The courtyard functions as a community anchor, where every day functions unfold.



07

Epilogue



07.1 Conclusion

How can the social housing area of Toveshøj be transformed to create a new circular neighborhood that addresses social challenges and ensures a sustainable future for generations to come?

The design for the transformation of Toveshøj presents an ambitious yet holistic vision for a more circular movement within the built environment and the life lived within it. Rooted in the concepts of CE, Social Sustainability, and DfD, the design prioritizes not only physical renewal but also the social fabric of the neighborhood.

The report thus extends its focus beyond materials in construction to include factors such as the design of common areas that encourage social interaction, healthy lifestyles, and support for local ecosystems. Common areas are intentionally programmed zones for interaction, sharing, learning, and well-being.

The design principles guide interventions across multiple scales- from building to neighborhood, ensuring coherence, adaptability, and long-term sustainability. Residents are encouraged to engage with the material flows around them, from food production to energy use and material reuse—creating resource awareness.

The introduction of new housing typologies, an enhanced mobility network, and multifunctional public spaces blend harmoniously with the existing urban context. The neighbourhood's identity is strengthened through its shared spaces, which strengthen community bonds and neighbourliness and local resource circulation. From the upcycling park to the multifunctional terraces, modular construction, and courtyards that act as social anchors, every element serves a purpose beyond aesthetics.

In summary, the design vision proposed in this thesis is not just about the spatial transformation of Toveshøj, but rather about a holistic shift - one that positions Toveshøj as a leading example in reimagining the future of urban neighbourhoods through a circular approach that benefits both human and non-human life. Therefore, ***in Toveshøj, design is not only about shaping spaces but about shaping new ways of living— together and sustainably.***

07.2 Reflections

PROCESS

The Integrated Design Process (IDP) used in this thesis allowed for continuous research and analysis that evolved up until the end of the project. Due to the lack of a specific site at the beginning, the process was even less linear than the standard IDP. When a potential site emerged, we considered its characteristics against the theoretical aims of our thesis. This, in turn, affected our design intentions and informed the theoretical part, which evolved each time a new potential site was explored.

Once the final site was selected, the same process continued - this time with more detailed analysis - where the findings influenced what became most relevant in the theoretical section of the report. This is why the reader may find various pieces of information in the Appendix that remain relevant to the design process and its reflections, even though they receive less attention in the main body of the report.

For example, the interviews with professionals from the area are not heavily utilized in the report, but they formed the foundation of our understanding of the site and its context. These interviews provided a more personal narrative of the development plans, political tensions, and uncertainties - insights shared directly by the people who live and work there every day.

POLITICAL TENSION AND UNCERTAINTY OF THE AREA

Since the area of Toveshøj still lacks concrete development plans and the plans for Gellerupparken are continuously evolving, there is a high level of uncertainty surrounding the future vision for the area and what it will ultimately become. Although our project does not address all aspects necessary to determine full feasibility in a real-life context, our aim from the beginning was to inspire circular change in the Toveshøj area and to redirect the future redevelopment of vulnerable residential areas toward a more sustainable approach - guided by the principles of the Circular Economy and Social Sustainability.

We are fully aware, however, that the planning process - particularly in such areas - is highly complex and influenced by far more than the aspirations of the designer. For example, the current political tensions, intensified by governmental decisions, ongoing lawsuits, and uncertainties surrounding EU rulings, are affecting both the economic and social objectives of the design. This means that, given the real-life constraints and tensions, our project may not be entirely feasible. Still, we believe that some of the ideas proposed can contribute to and inspire future design strategies for the area.

ECONOMIC SUSTAINABILITY

Although we do not focus on economic aspects in this thesis, we acknowledge that, due to the complexity of the site and the uncertainty associated with political tensions, the economic dimension is an integral part of circularity. It is essential because it engages all actors involved - regardless of whether environmental benefits are a primary concern for them (Nielsen and Guldager Jensen, 2024). Economic sustainability also plays a crucial role in determining the overall success of a place and its long-term resilience.

If we had more time, we would have liked to explore the economic potential of circular development, especially in a complex case such as Toveshøj.

TIME CONSTRAINTS

The lengthy process of selecting the site impacted the amount of time we had available for other aspects of the thesis. Additionally, the thesis is an academic project with inherent time constraints and limitations in terms of the scope that can realistically be covered.

Although we would have liked to include elements such as Life Cycle Assessment (LCA) calculations, a discussion of economic sustainability, and a more detailed design proposal, we recognized that this would be an unrealistic goal for a group of two. Many of these aspects were also new to us and would have required significant additional time to research and understand thoroughly.

Nevertheless, we believe that the thesis provides sufficient coverage of the key elements necessary to convey our understanding of the site and our intentions for its future development.

TECHNICAL ASPECTS

In a real-life project, successful implementation would require collaboration with different specialized consultants. As designers, there are limitations on how far we can go with technicality, and we are only thinking in terms of concepts and strategies.

Experts also have access to more specific databases that are not available to us as students. This reflection is particularly to highlight the importance of interdisciplinary collaboration in turning our design visions into functional reality, as we were in some situations not sure of how a particular idea would work when implemented in real-life.

INDIRECT CONTACT WITH THE USERS

Due to language and cultural barriers, it was difficult to engage directly with the many residents of the neighbourhood, particularly those from non-western backgrounds. Thus, we had to rely on secondary sources, including interviews with a Municipality representative and a local activist, as well as information gathered from the internet. This meant that direct user involvement in the project was limited, which affected our ability to fully understand the residents' lived experiences, needs, and perspectives.

USE OF AI

AI was used as a support tool in the project, not as a replacement for our critical thinking and creative decision-making. Specifically, AI was used in the following ways:

- Grammar and spelling correction, to improve clarity and our unconscious errors.
- Paraphrasing and editing, to enhance readability. In some cases, it was a very helpful tool to help us get our point across in a better way.
- Summarizing long documents, particularly during our research phase, which also made us use our time more efficiently.
- Generating citations and avoiding plagiarism with tools like Grammarly that helped in ensuring proper credits are given to the original sources while producing original work.

- Translating Danish documents to English
- Generate Graphs. For example, the graph in the Statistics of Gellerup/Demography section was generated with the help of AI based on the data we provided.

While it has helped us in a range of tasks, the output was always reviewed, fact-checked, and aligned with the intended purpose.

07.3 List of figures

List of Figures

07.4 Bibliography

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Appendix

AALBORG UNIVERSITET

THESIS TITLE PAGE

This form must be submitted for all theses written in programs under the Study Board of Architecture and Design, and it should be placed at the beginning of the appendix section of the assignment.

A printed copy of the form must be submitted along with the printed copy of the thesis.

The information given in this form must also be available in PURE.

(All fields must be filled out)

Program: **Architecture** ☐ **Industrial Design** ☐ **Urban Design** ☒
This thesis was written by (full name):
Divya Mundada
Tessa Patrycja Rozek
Title of the thesis: The Circular Shift - Towards a holistic urban future
Supervisor´s name: Ida Sofie Gøtzsche Lange
Submission date/year: 28th May 2025
Is the project confidential? **Yes** ☐ **No** ☒
External collaboration* **Yes** ☐ **No** ☒
External collaboration partner (name of company/organization):
Contact at external collaboration partner (title, name og email):

What is an external collaboration? Read more here.

(B) Statistics of Gellerup

The following table presents the key statistics for the Gellerup-Toveshøj area, including data from 2014-2024. This information is sourced from the survey documents of parallel societies made by the Danish Government. The columns highlight various social and economic indicators (demographics, employment, education, and income levels)that contribute to their classification as parallel society.

Gellerup-Toveshøj	Residents (1000+)	Non-Western Immigrants >50%	Outside labor market >40%	Convicted >2.70%	Primary School >50%	Avaerage Income <55%
2014	6652	80	52.3	4.76	57.1	52.1
2015	6464	80.6	51.9	2.89	58.4	51.1
2016	6097	80.8	52	3.95	59.2	55.7
2017	5874	79.6	52.9	3.43	59.5	55
2018	5614	79.4	52.5	2.93	83.6	53.4
2019	5191	80.8	49.3	2.96	82	53.5
2020	4865	79.3	48.3	2.97	80	53.9
2021	5135	73.6	44.7	2.25	77.6	53.9
2022	4887	73.5	41.4	2	76.6	52.1
2023	4695	73.3	39.7	2.21	75.4	52.5
2024	4432	72.7	37.6	2.55	68.8	53.7

Table Sources:

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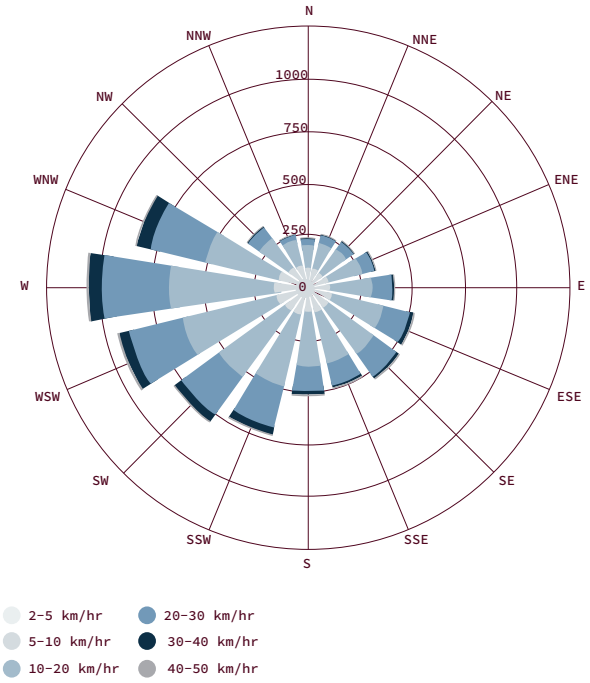
- Social-og Boligministeriet (2024): Liste over parallelsamfund pr. 1. december 2024

(C) Wind analysis

WIND

The Windrose diagram represents the distribution of wind speed and direction. From the diagram, we see that the dominant wind comes from the west and the west-southwest directions, while winds from the east and southeast are infrequent.



Aarhus wind rose (meteoblue, 2025).

(D) SWOT Analysis

STRENGHTS

- Proximity to the new amenities in Gellerupparken
- Plenty of green spaces
- Existing buildings in good condition

WEAKNESSES

- Weak East-West connection of the site
- Homogenous demography
- Image of the neighbourhood - “parallel society”
- Monotonous physical appearence
- Lack of human scale
- Lack of experiential diversity

OPPORTUNITIES

- Well programmed outdoor spaces
- Transform/repurpose existing buildings
- Introduce different housing typoligies

THREATS

- Ghetto law - reducing social housing to 40% which often results in extensive demolition
- Image of the area
- Socio-economic issues

(E) Interviews

HEIDI MILAN BILENBERG, AARHUS MUNICIPALITY

Q: Is sustainability a big focus of the transformation of Gellerup?

Don't know enough about it yet. We have different laws and politics, saying that we should reuse as much concrete as we can. Some of the big concrete slabs are being used in different places, but I don't know how much and how much percentage is wasted.

Q: Do you know why they demolished the specific buildings? Was it because of the quality of the buildings or political reasons?

Several factors influenced the decision on which tower block to demolish. The goal was to reduce social housing to 40%, which could be achieved by densifying the area, transforming existing buildings, or removing some. The focus was on creating larger development opportunities for builders, aiming to establish a new quarter in Gellerupparken. Additionally, some tower blocks were in poor condition, and challenging resident demographics may have influenced the decisions about which blocks to target for demolition.

Q: What about the residents who were in those blocks?

Everybody is guaranteed a new place to live. The people have been moved to different parts of the city, not just to the same one area. Because then it would just be like moving the problem to somewhere else. Some of them can even come back and live in Gellerup Parken, then they have to either have a job or be under education.

Q: What about Toveshøj?

Toveshøj is facing changes due to its 40% social housing quota. Although a nice green park was developed there years ago, the challenge now is how to meet that quota. Options like demolishing or transforming the existing tower blocks haven't worked because developers are reluctant to buy them with existing problematic residents. Selling to students or seniors wouldn't help either, as many still rely on benefits. The aim is to encourage self-sufficiency in the community. The problem with renovation is that it will be too expensive to live in it; maybe it could be a better business case to tear it all down.

Q: Are there demolished materials stored in material banks for reuse?

I think all the big demolition companies do that today. They take it down. They don't just tear it down. They take it down, and then they reuse whatever they can. I think they use as much as they can because new ground material is so expensive, and if you are building roads, for instance, you can break it down into gravel, and you can build roads with that and some of the most enormous slabs you can maybe build into buildings. I think it's becoming a big industry right now to find out how much to reuse and save money, not just to be sustainable, but also to save resources.

Q: How are you dealing with the social problems in the area?

Gellerup is one of the largest areas where the comprehensive plan included physical and social plans. You cannot just work with one. They both go hand in hand. If you only work with buildings, maybe you don't change the people here, and vice versa. You have to work with both sides. Today, this is one of the poorer areas in all of Denmark, where there is worse health too, so we must raise it individually and area-wise as a part of the city, so both can grow.

Q: How many Danes live in the area?

Around 25% of ethnic Danes live in the area.

Q: Different vision of Gellerup without political influence?

If I were in charge, we wouldn't demolish as many blocks because, according to the master plan that started in 2007, everything was going reasonably, and then the law came in 2018 to reduce it by 40%. We had to change a lot of things, which made collaboration with the residents very difficult. We were already on our way, doing well, getting jobs, learning the language, improving the area, and everything, and now they wanted to demolish more blocks. But we are also seeing that even though we said we wouldn't just remove the problem, we have done that, we have removed lots of people who have not been helped enough socially and moved to other parts of the city. ***So, essentially, we have just removed the problem to cure Gellerup.***

Q: When do you think the transformation will be complete?

It ***will take another 10 years for complete transformation***. We are also planning the demolition of City west and building more apartments there. It was like the crown jewel of Gellerup and people visited to see it, even from Germany. It was one of the 1st indoor malls with 67 shops and today there are only 7 shops.

Q: Major challenges during the transformation?

Getting people to invest in gellerup has been hard and especially investing in the long-term solutions. The displacement of bigger families has also been a challenge. ***The developers don't want are not interested in building bigger homes, because there is more business in building smaller ones. So now we are making a new problem where big chunk of the city where nobody over 30 lives. So that is not very socially sustainable.***
But maybe with all the new amenities like the swimming pool, shopping, schools and new housing, it has become an attractive district. But lots of Danish people have lots of prejudices about moving in these places. But we still don't know what to do in Toveshøj. Some will say it is going to be a better case of tearing and make it a better area and a better business case. ***Environmental sustainability is important, but I think social politics will overrule this area.***

MARIANNE STENBERG, BRABRAND BOLIGFORENING

Q: Can you tell us more about Toveshøj as of today and what the future plans are for it?

...(Gellerup's history)....***We need a mixed community where people from diverse backgrounds coexist***, working and interacting, especially in schools. That's why we're currently implementing transformation plans—to attract new residents and open up the area. Some of the buildings are currently planned for demolition. The residents living in these buildings will be relocated to another area in Aarhus. Afterward, we will construct new buildings, such as single-family homes for families with children. Our goal is to create a mixed community in the area. That's the short story.

Q: What is the condition of the buildings as it stands today?

We had a report conducted by a firm called Ramboll. They have completed several reports assessing the technical condition of the concrete and the buildings, and the results are very positive. T***he structures are not in need of demolition; they are not in poor condition like buildings that are 50 years old might be. That is not the case here.***
There are issues with the toilets, which are outdated and need replacement. Additionally, updating the facade and windows will improve indoor climate and aesthetics. ***Overall, we need new toilets and facilities, along with better windows and facades.***

Q: When the buildings were demolished in Gellerupparken, what was done with the materials? Was it saved or reused?

Some of it was reused. It was completely crushed and then used for construction of roads. And, then the other element of concrete is being reused in a project in the Technical Institute in Denmark. Making a kind of different attempts to see if they can reuse these elements from the roof and from the walls directly into new buildings.

Q: What is the occupation percentage in Toveshøj currently? Are people leaving?

People were moving out of their flats. Many flats are empty because when there are plans for changes, people worry about what will happen to their homes. They wonder if their building will be demolished or if they will have to move somewhere else.

Q: Is there public participation in the development plan, especially involving residents from diverse backgrounds? How is community input considered regarding the functions and use of the site?

The tenants in Gellerupparken choose members for a board and they have been following the projects from the start, participating in weekly meetings and so on. They also participate in, choosing the kitchen and colors and so on.

Q: What is the vision for Toveshøj's transformation, and what are the current challenges that you face in this area?

..... bring it down to 40%. We have about 600 flats and need to demolish three blocks, totaling 200 flats. ***Currently, there are nine blocks, but the specific blocks to be removed haven't been determined due to a disagreement between the municipality and the housing organization***..... The municipality of Aarhus aims to create visible transformations, making it clear that changes are happening as you drive by. However, we haven't reached a conclusion yet, and the ***municipality may want to reduce the number of flats to more than 200.***
The national legislation says we have to go to 40%. So, 200 flats are enough, and we don't want to lose more than 200. The municipality always wants to bring down more flats

and then rebuild new houses for families with children. A single house that you can go around, and it has a garden and a fence. And it has a garden for the children. You know? A typical Danish one-family house.

Q: Are there many Danish people living today?

No. I don’t have the exact percentage, but I think it’s primarily Somali people and Arab people.

Q: Could you, if we can ask you, in the future plan of Toveshøj, apart from achieving a diversity of apartment and housing types, what else do you imagine would be a nice function that is needed in this space?

I think that the transformation of the infrastructure could be beneficial as well. For example, you could build a road that goes from east to west. This would open up the area. New infrastructure could include a variety of housing types. We’re looking to attract more Danish residents and create a balanced community with a mix of employed individuals, reflecting the diversity of Aarhus.

In the planning of Toveshøj, a lot of focus is on the area in front of Bazar Vest. On the right, there are primarily parking lots, while on the left is a road with auto garages where cars can be repaired. Across from the garages, there’s a large green lane serving as a barrier. The municipality has granted these garages special permissions, meaning no new houses can be built in the area unless the garages are closed.

Q:. From a sustainability point of view how do you think the project is going so far, and how could it be better maybe?

You could stop demolishing the blocks and instead renovate them. That would be a far better solution. The project is not too far along, so we have planned ways to improve it and reuse materials in a circular economy. We’re not there yet, but we intend to implement these ideas.

HELLE HANSEN, ACTIVIST , ALMEN MODSTAND

Q: Can you tell us a little about yourself?

A: I am a volunteer at Gellerup and have lived here for 52 years. I am 60 years old today and like the head of the local board for the people who live in Gellerup. The board consists of 13 residents from Gellerupparken. I am actively involved in various initiatives within the community. Additionally, I am also involved in court cases against the government related to the parallel law, where we are trying to get a conviction that classifies the law as racist.

Q: Can you tell us what the people's experiences were like during all this, the things that are happening? And what do you think would be a better suggestion by the government than demolition and evictions?

A: In Gellerup, we began planning for changes as early as 2005, leading to a political agreement in 2009 that aimed for 30% non-profit housing by 2030. This plan included the development of private housing, shops, and infrastructure, as the area was previously entirely residential before. The majority of residents supported this proposal, also because it included plans for a mosque.
In 2014, we started demolishing old blocks to make way for new developments, including a collegium for youth. Although renovations began in 2016-2017, progress was slow, and only two blocks have been fully renovated so far.
However, in 2018, the government introduced a parallel law that unexpectedly impacted our plans, as Gellerup was added to the list. The municipality decided to tear down seven additional blocks, despite our belief that only two or three were necessary. The law which is stupid; we only needed to tear down two or three blocks, maybe, but the municipalities wanted to tear down seven blocks in Gellerup. And so that started in 2022. They began to evict the people who lived in the blocks.

Q: Would you say the blocks were in good condition and did not need to be demolished?

Yes, ***they could stand for another hundred years***, but politics played a role in wanting to tear down the ghetto for profit by building new private housing. Initially, there was a proposal to renovate a few blocks and sell them as private housing, but that plan changed.
Residents of the seven blocks were told they would be relocated and could not return to Gellerup because of the new rules. Many were sad, and while some could afford to move elsewhere, many did not have the means to do so. Eventually, they learned they could stay if they wished. The eviction process took over two to three years, and many left. ***There have been concerns about the quality of renovations that have happened before.*** We are starting a new renovation, hoping it will be better than the previous one.

Q: What would you say would be a better way to renovate the buildings?

A: I have a five-room flat, but after renovations, one large bathroom

was replaced with a tiny toilet. ***The renovation materials were poor, and new ground-floor apartments are too big and expensive for renters. Initially, there were only five types of apartments, ranging from 100to 200 square meters. We need more options in the 60 to 80 square meter range to improve the mix.***

Q: Do you know which buildings will be demolished in Toveshøj?

A: It's not decided yet because of the court case that's going on; they haven't had any meetings with the mayor. And we have a new Mayor for Aarhus, so everything is on hold.

They are supposed to tear down 200 apartments. But I am aware that the board has chosen 2 blocks they would prefer to tear down, but they are waiting to hear from the court case. If the law turns out to be illegal, they cannot tear down the buildings.

Q: Does the building have an elevator?

A: Only one block that has been renovated has an elevator, specifically, only one stairway. But they plan to get that when they renovate the others.

Q: What are People's expectations for the Toveshøj transformation?

I am not sure; it's not a big area. They could have more shops, but they made a Netto recently. ***In the beginning, they planned to have elderly homes, and something to do with health, and learn how to take care of themselves. But they built close to Globus 1.***

Q: How is community life?

A: ***Many nationalities formed their groups because they speak different languages***. Ten years ago, there was a house of clubs where they did a lot of activities. But it closed in 2009, and many clubs disappeared in the area. And then came the coronavirus. So, it all stopped. ***Old people don't mingle as much; young people try to come out.***

ANNETTE S. CHRISTIANSEN, REPRESENTATIVE OF TOVESHØJ

Q: Can you tell us a little about yourself and your involvement in the community?

I'm involved with a nature club for children that explores the outdoors with a local organization. I also support football clubs and many families that face economic challenges. Additionally, I work with refugee organizations to help them access resources—for example, sometimes I find materials or services for a reduced price, like 1,000 kroner, and help connect these families to the right support systems.

Q: What are some of the challenges of this area?

This municipality is particularly difficult for children. They go to 29 different schools. Additionally, the children who are five years old must take a speaking test to enter kindergarten. Surprisingly, this requirement only applies to specific groups and not to the Danish children. ***If they don't pass the test, they can't go to the local school or any free school options. This system costs a lot—10 million a year.*** Many children must go to a different school in Aarhus and face challenges getting back home. Parents often have to help with transportation.
It would be better to have free school options for everyone. Right now, if you have a child here, they can't start kindergarten locally and must go elsewhere. This is frustrating because it leaves kids feeling alone, relying on their parents for rides. It's a situation that doesn't happen in other parts of Denmark, just here.

Q: You mentioned land issues and construction projects—can you elaborate on that?

The area where the city park was constructed belonged to Toveshøj, but the municipality just took it from us without asking. We have meetings and other stuff in the community building. That's the problem. My work is to put this together and help them economically find the right solutions.
We agree that Blocks x and x could be demolished to allow for new construction. We also own the adjacent hills, so together, they make a bigger space for construction. We can sell the place and use the money to renovate the other buildings, but the municipality wants more. So, there has been an ongoing argument between us. ***We believe that the new construction is made to invite more rich people, more ethnic Danes, but this, according to us, is very racist.***

Q: Do a lot of people use this area between the buildings?

They use it to drink coffee, grill, and eat together. On either side of the city park, there is a play area for big and small children, so they don't clash. The balconies, facing these courtyards(west)are very warm due to a lot of heat gain.

Q: Are there any issues with recent renovations in the housing blocks?

The renovations made in block A21 included some questionable design ***choices, such as a toilet with a large window and no cover that allows people to look in. Another example is the façade, which obstructs the opening of the windows, and lastly, there is a commercial space provided without any provision for a toilet.***

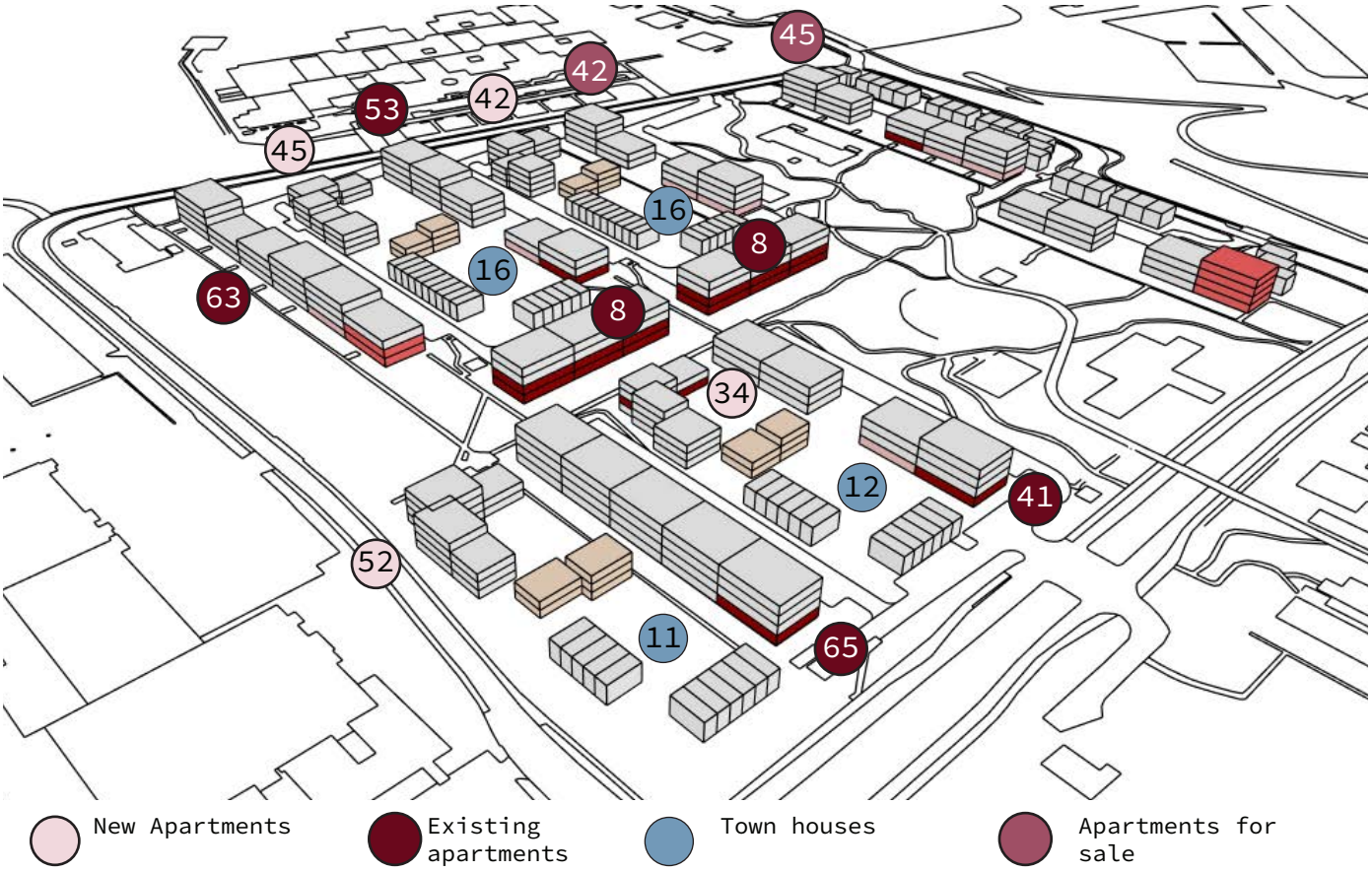
Q: Has the area around Block XX been considered for new development?

We wanted to sell the land in front of Block xx to make money, but according to the law, ***we cannot build on it as it is in close proximity to the car wash area on the other side of the road.***

Q: What about the safety concerns in this area?

Earlier, the place was a bit unsafe, but with the installation of the cameras, things have gotten under control.

(F) Calculations



Type of Housing	Nos
Existing Apartments	238
Town Houses	80
New Apartments	173
Apartments for sale	117
Total	624

CALCULATIONS FOR REDUCTION OF SOCIAL HOUSING TO 40%

The new construction, modification in the existing structures, and sale of apartments, the total number of housing units in Toveshøj adds up to 624.
To follow the law, to reduce the social housing to 40%, the maximum number of social housing units that can exist is 40% of 624= 249.6

The calculation of the apartments in the existing structures is based on on-site observations. The area of the row houses has been determined by taking the average size of row houses in the surrounding areas of Toveshøj. The new apartment blocks consist of homes ranging from 70 to 100 square meters. This decision was influenced by a comment from Marianne, who works at Brabrand Boligforening. She indicated that there is a need for more apartments within this size range.