URBAN FLOW

"Healthy routing in large scale porous housing structures."

Figure 1 : *AI generated metaphoric illustration of a connection between dwelling and the city ecosystem.*

ABSTRACT

ECOSYSTEM : *"A (biological) community of interacting organisms and their physical environment" - Oxford Languages.*

The city can be viewed as a human centered ecosystem. It consists of complex networks of interaction between its inhabitants, and the physical environment (Bodini et al, 2012). The built- and- natural environment define the cityscape and its borders as the physical setting of the city ecosystem. Like a natural ecosystem the city ecosystem consists of urban flows that take different forms. The movement of people, goods, energy, and information are often mentioned and characterized as crucial to keep the city ecosystem healthy (Bai, 2016). A healthy ecosystem ensures functionality, resilience and vitality.

To maintain a healthy city ecosystem humans are constantly developing our built environment. Urbanists and architects shape the cityscape and optimize the urban flows, enabling mobility, transportation, commerce, communication, waste management and adaptation to changing conditions (Moffat et al, 2008) . However an important part of the city ecosystem is generally overlooked when talking about urban flow. With over 80% of the Dutch built environment consisting of different types of dwelling (CBS, 2024), the biggest urban flow between the dwelling and the city ecosystem is often left unnoticed in regards to how the housing interacts and connects to the cityscape.

This issue became prevalent in recent history, starting in the industrial revolution when technical advancements, the rapid growth of cities and a need to house workers in the city led to the development of larger scale housing projects. In the last decades densification and further upscaling of housing structures due to increasing housing needs, have led to the construccttion of bordered conglomerations of dwellings (Dogan et al, 2020), only accessible through one shared entrance that separates the internal routing in the building from the external urban flow (see figure 2).

However these closed of buildings don't make healthy cities but empty public space (see figure 3). And while we are building higher and denser, housing structures become increasingly more closed off, only increasing the threats to a healthy city ecosystem.

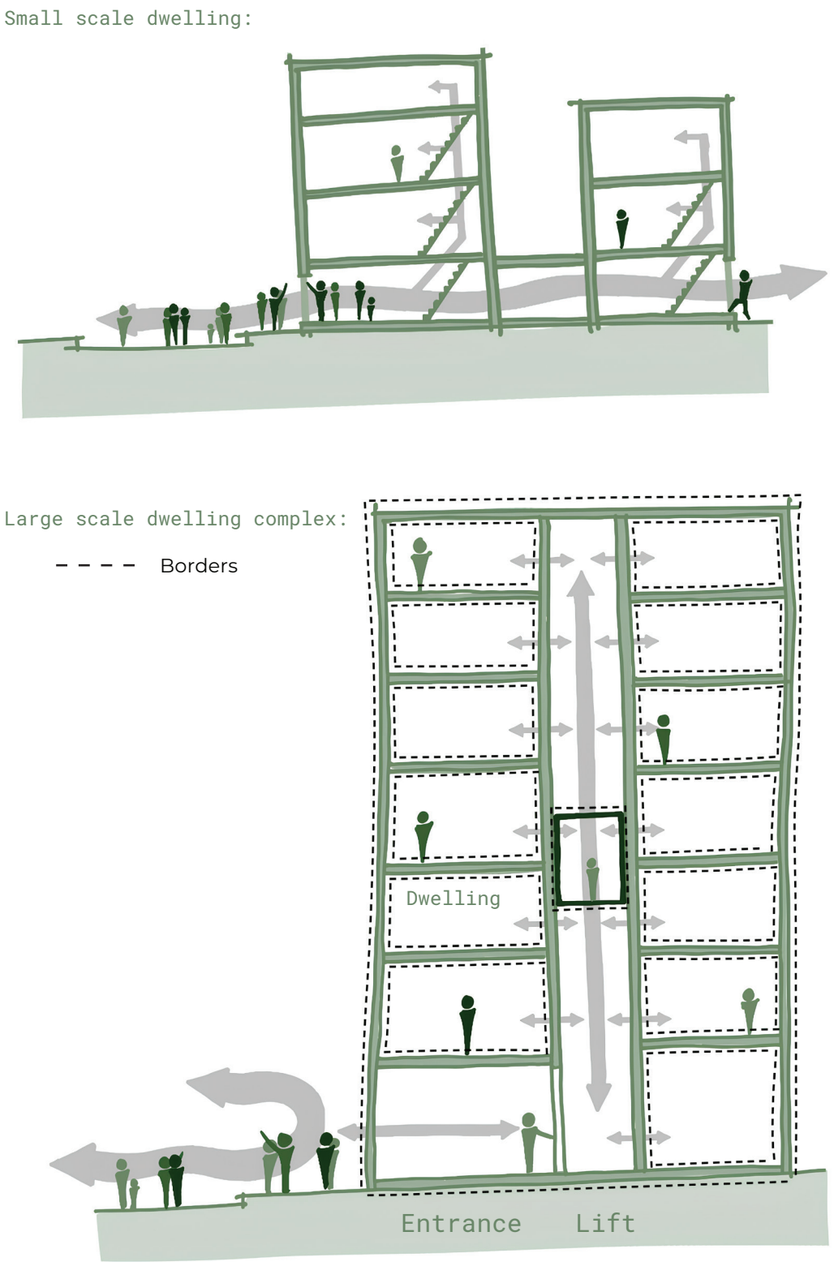

Figure 2 : *Illustation of smale scale dwelling integrated in the city ecosystem and connected to the urban flow. Versus large scale dwelling seperated from the city ecosystem and disconnected from the urban flow by multiple borders.*

Amsterdam is a prime example of a city where this challenge materializes in a paradox: People come to the city to live in a highly urban environment that encapsulates the identity of Amsterdam, but end up living in generic dwellings set in building blocks that turn their back on the city fabric and urban flow. This shows that the process of dwelling development in Amsterdam requires a greater focus on the position of the dwelling in the city ecosystem and the urban flow between them.

Figure 2 : *Pictures taken at the zuid-as in Amsterdam. Where the aim is to create a high density urban environment, closed of dwelling structures with a single entrance (right) create an empty city (left) where no interaction or urban flow takes place.*

Research Question & Methodology

KEYWORDS : *dwelling - urban flow - city ecosytem- porosity, routing - healthy - connection - scale*

To research the position of the dwelling in the city ecosystem and urban flow a framework of research questions and methods is set up. The final aim of this research is to deliver a conceptual design proposal to the municipality of Amsterdam that addresses the issue of interruptions in urban flow created by “closed off” housing structures. A possible solution lies in opening up the building to the surrounding cityscape creating a porous structure. Porosity is a well defined subject in the field of urbanism. Jane Jacob’s (1961) theory of small blocks shows the importance of movement and choosing a route through the city fabric, and how a porous city fabric facilitates this. The term is mostly used on an urban scale, however it could be interesting to apply these principles to a housing structure considering their increasing scale. To explore this issue and the impact of porous buildings and routing design as a possible solution, a research question has been drawn up:

“How can porosity create healthy routing through large-scale housing structures and integrate the dwelling into the city’s fabric to preserve the urban flow of Amsterdam?”

To unravel this question, sub questions and a methodology have been set up to organize and strategize the research. The methodology will consist of five components: **Group research** , consisting of historical and morphological research, is done to create a contextual framework of Amsterdam. Historical research into urban and architectural development of the city will help to determine relevancy of all research. Morphological research will help to understand the existing cityscape, its challenges related to urban flows, and suggest interesting case studies.

A **literature study** in the fields of architecture and urbanism establishes a theoretical framework and creates a database of urban flows and related existing design principles and concepts for routing in housing structures. Then several **case studies** into existing housing structures or housing concepts will analyze how the urban flows and design principles found in the literature are currently being applied.

To find a conclusion in the literature and case studies **qualitative analyses** will be made of the design principles and case study projects. A concluding list of qualities, faults and possibilities can be used in **research by design** to experiment with these qualities, faults and possibilities during short design sprints followed by reflection and re-iteration. The methods and expected findings are expanded on per sub question.

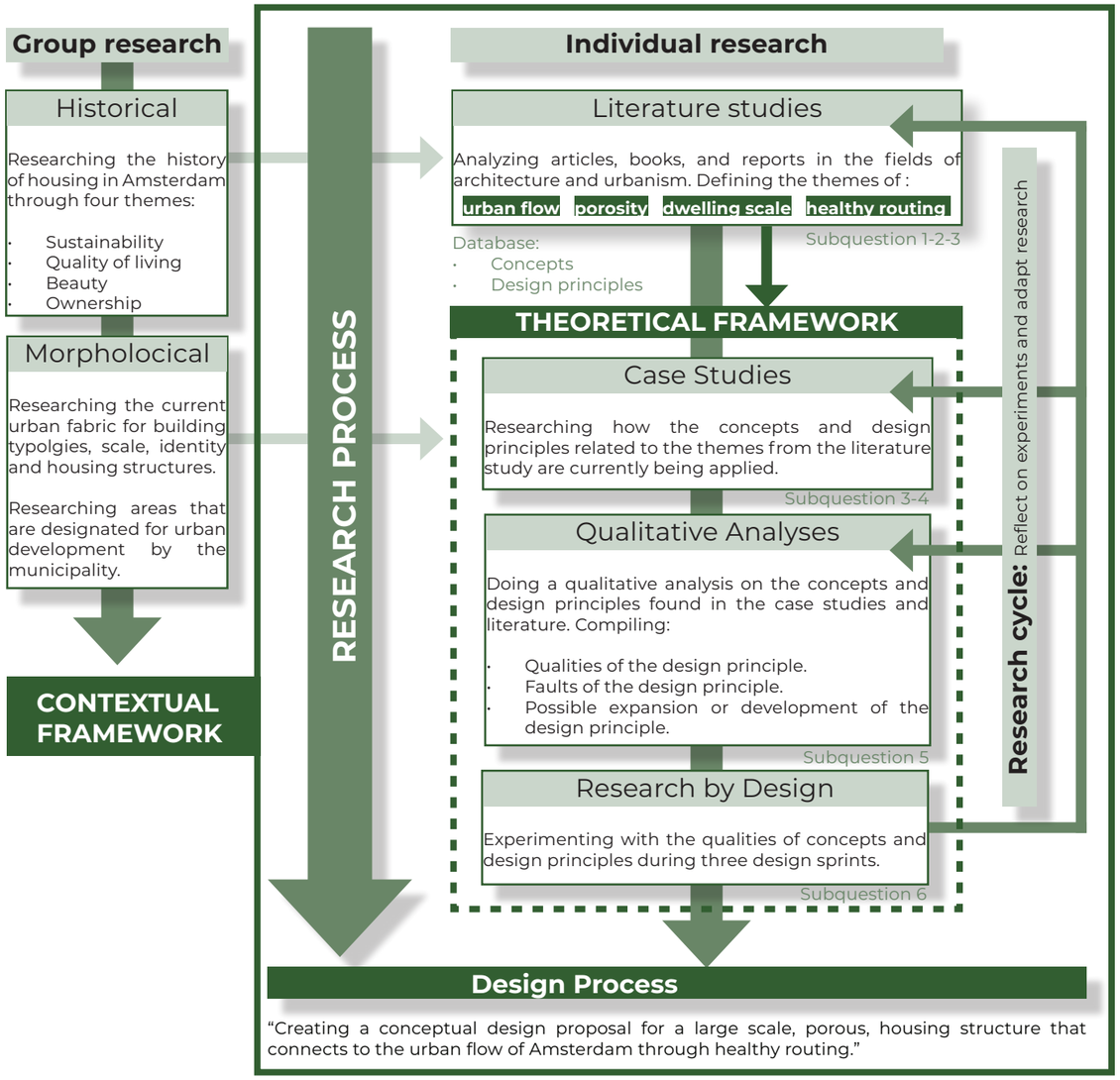

Figure 4 : *Research diagram.*

Sub Questions & Methods

1]. What are the urban flows that exist between a dwelling and the city ecosystem?

2]. How does scale in housing structures impact the urban flow between dwelling and the city ecosystem?

Methods:
Subquestion 1 and 2 will be answered by doing a literature study. Through analyzing articles, books, and reports in the fields of architecture and urbanism the concepts of the city ecosystem, urban flow and dwelling scale will be framed in relation to the city of Amsterdam. This will also help to identify which flows exist between the dwelling and the city fabric, resulting in a database of existing flows that can be used to test proposals or experiments in the design phase.

The literature study will also dive into the impact of scale on urban flow to discover where and when the upscaling of housing structures became an issue. How did the buildings change morphologically, what impact did this have on routing and flows in and around the building. Setting this historical framework will help solidify why designing healthy routing is a pressing issue of the present and future.

3]. What is urban porosity and how can it be applied on a building scale?

4]. What are the existing types and concepts of routing and routing design principles in large scale housing structures and how do they connect to the urban flow?

Methods:
Subquestion 3 and 4 will be answered by a combination of literature and case studies. From literature typologies, principles, theories and concepts of routing design and urban porosity will be compiled, creating an understanding of the relationship between routing design within housing structures and the integration of dwellings into the urban fabric. It will also explore the term urban porosity and what it means to open up the city fabric or a building block, compiling different strategies to achieve porosity and their effect on both building and cityscape. To research the practical application case studies will be done.

The main focus will be on large scale housing structures, but other building typologies could also give an insight in the design of routing and porosity for different purposes, and thus different flows through a building. The casestudie will be an analysis of the following themes:

- Urban flows around and throughout the building.
- Application of porosity on the urban and building scale.
- Scale of the dwelling and the structure that houses it.
- Healthy routing within the (housing) structure.

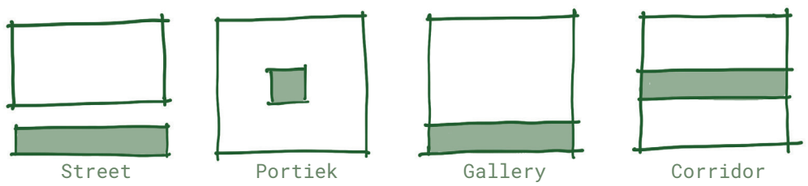

Figure 5 : *Example of acces routing typologies in housing structures. found in literature review (Reniers et al, 2023).*

Figure 6 : *Example of a casestudy project for the theme porosity: Habitat 67 designed by Moshe Safdie.*

Sub Questions & Methods

5]. What are the qualities, faults and possibilities within the set framework of routing design principles, concepts and theories found in the literature and case studies?

6]. How can these principles and concepts be used, combined or expanded on, to design healthy routing in large scale housing structures through porosity?

Methods

Subquestion 5 will be answered through a qualitative analysis on the findings of the literature and case studies. The analysis will be divided in three criteria:

- Qualities of the design principle.
- Faults of the design principle.
- Possible expansion or development of the design principle.

The criteria will be tested on the three themes from the case study; routing, connection, urban flow and porosity. The qualitative analysis will set a design framework for research by design and eventually the design proposal.

Subquestion 6 will be answered through research by design. Parallel to research methods above, three design sprints will provide the opportunity to experiment with the findings of the research.

- Sprint 1: design the optimal internal routing for a housing structure
- Sprint 2: design the optimal connections between a housing structure and the city fabric.
- Sprint 3: design a porous housing structure to interact with the existing urban flow.

The aim for each sprint is to design a concept for a large-scale housing structure, optimized by using and combining the qualities of different design principles that were found in the qualitative analysis. Because it is not possible to design the optimal solution, each design will have its flaws, but also qualities. By reflecting on the design experiment new questions and conclusions will occur. This will help guide the research and provide new insights and new avenues to explore.

Conclusion

In conclusion, the research delves into the dynamics of urban flow within the context of large-scale housing structures, exploring the role of porous building design in integrating dwellings into the broader city fabric and improving the health of the urban ecosystem. The contextual framework sets up a design challenge in the city of Amsterdam that will further tackle the question: “How can porosity create healthy routing through large-scale housing structures and integrate the dwelling into the city’s fabric to preserve the urban flow of Amsterdam?”

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