



Designing affordable homes for the middle-income group in Dutch cities.



Content

Introduction

Problem Statement

Partial Solution

Contextualization

Design Objective

Design Vision

Overall Design Question

Thematic Research

Hypothesis

Methodology

Research Structure

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Problem Statement

Partial Solution

Contextualization

Design Objective

Design Vision

Overall Design Question

Thematic Research

Hypothesis

Methodology

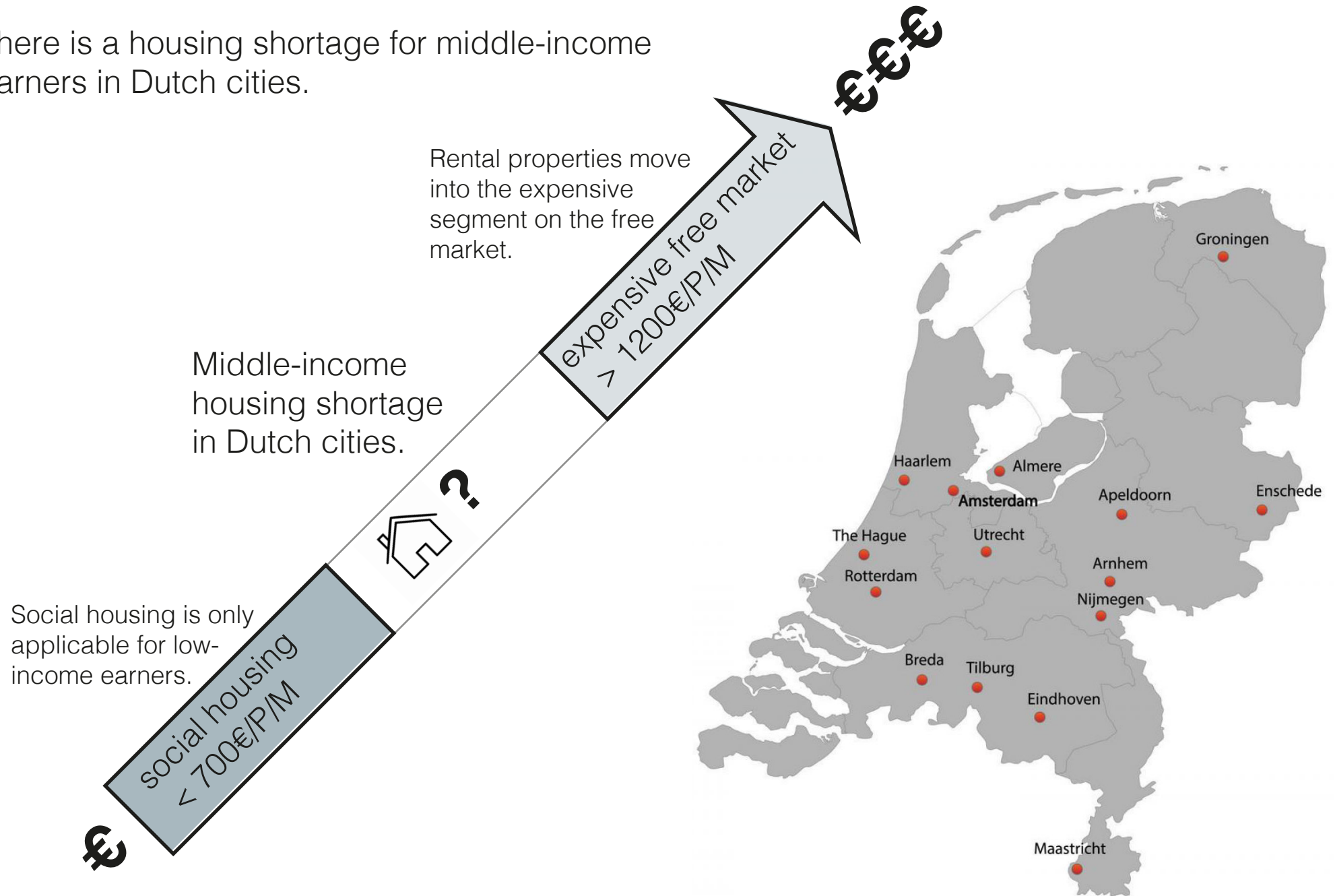
Research Structure

We must create affordable homes for the middle-income group in Dutch cities fast!



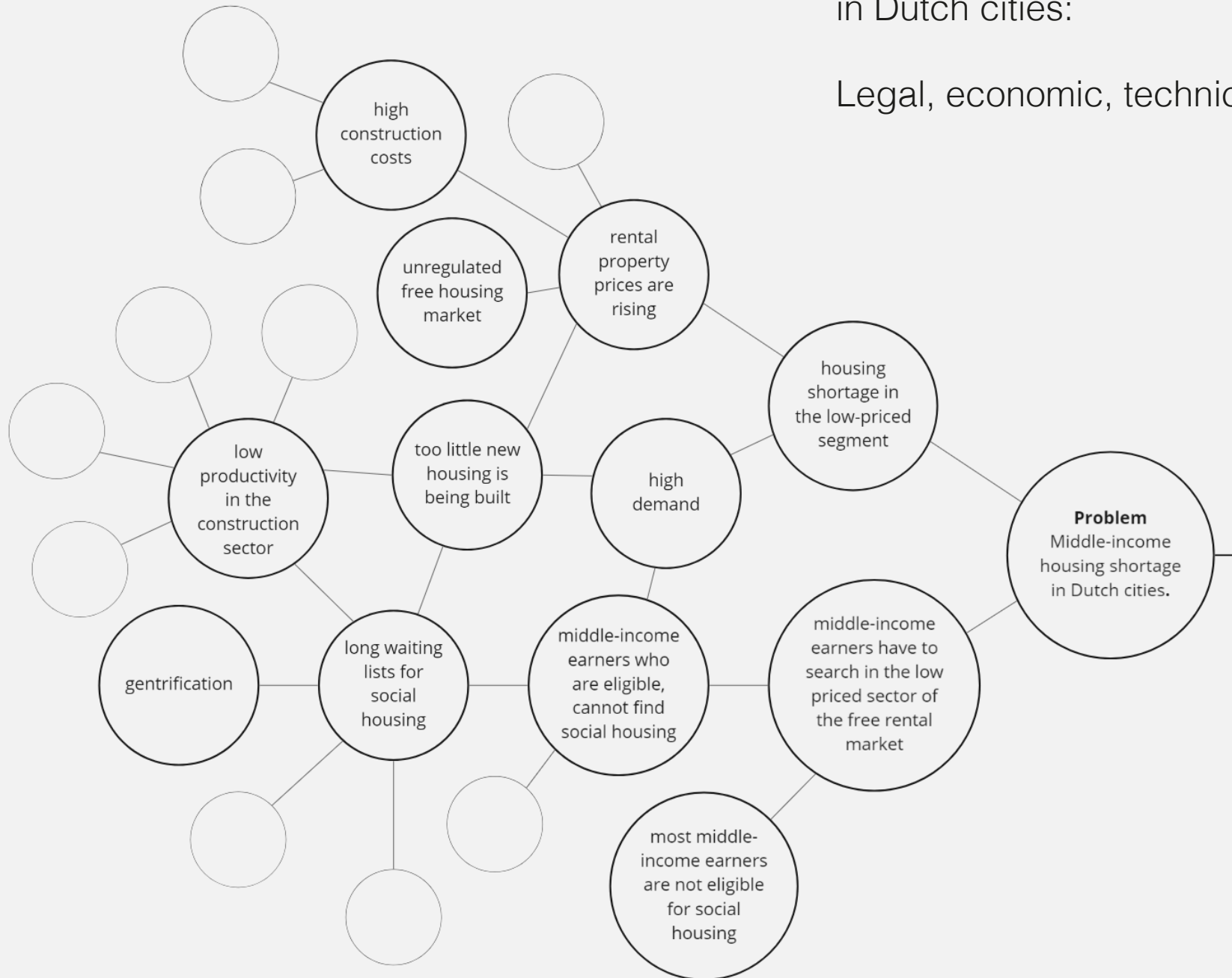
Problem Statement

There is a housing shortage for middle-income earners in Dutch cities.



Multiple issues cause the housing shortage for middle-income earners in Dutch cities:

Legal, economic, technical



Partial solution

Increasing the supply of affordable homes in Dutch cities.

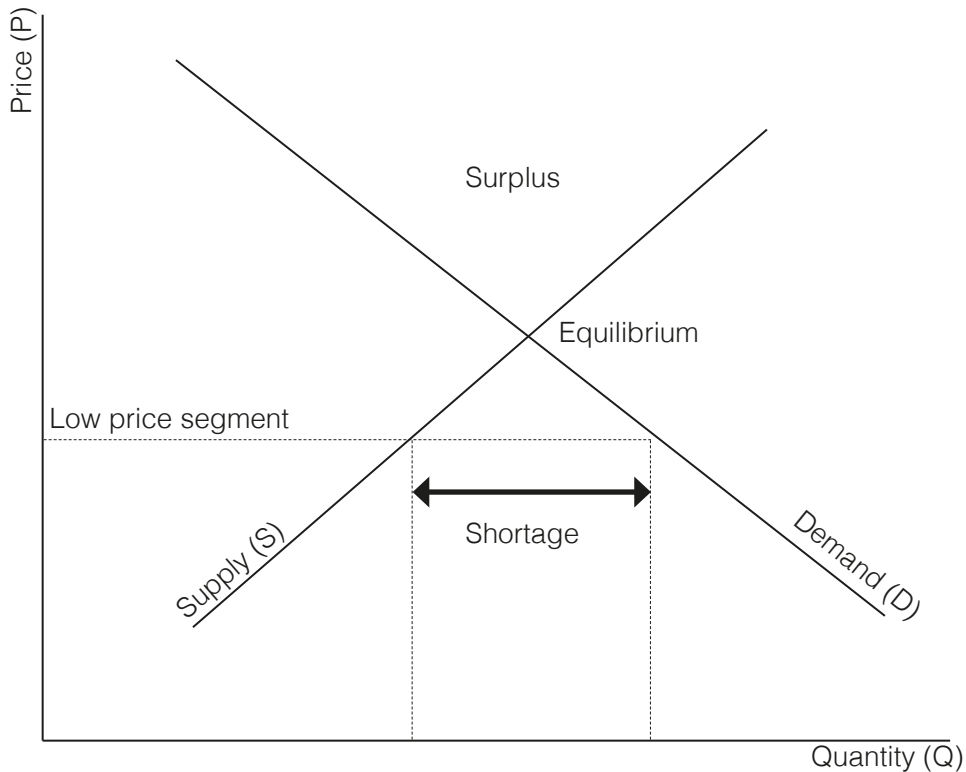


Fig. 1 High housing demand and low housing supply in the low cost sector of the free market in Dutch cities lead to a housing shortage for the middle income group.

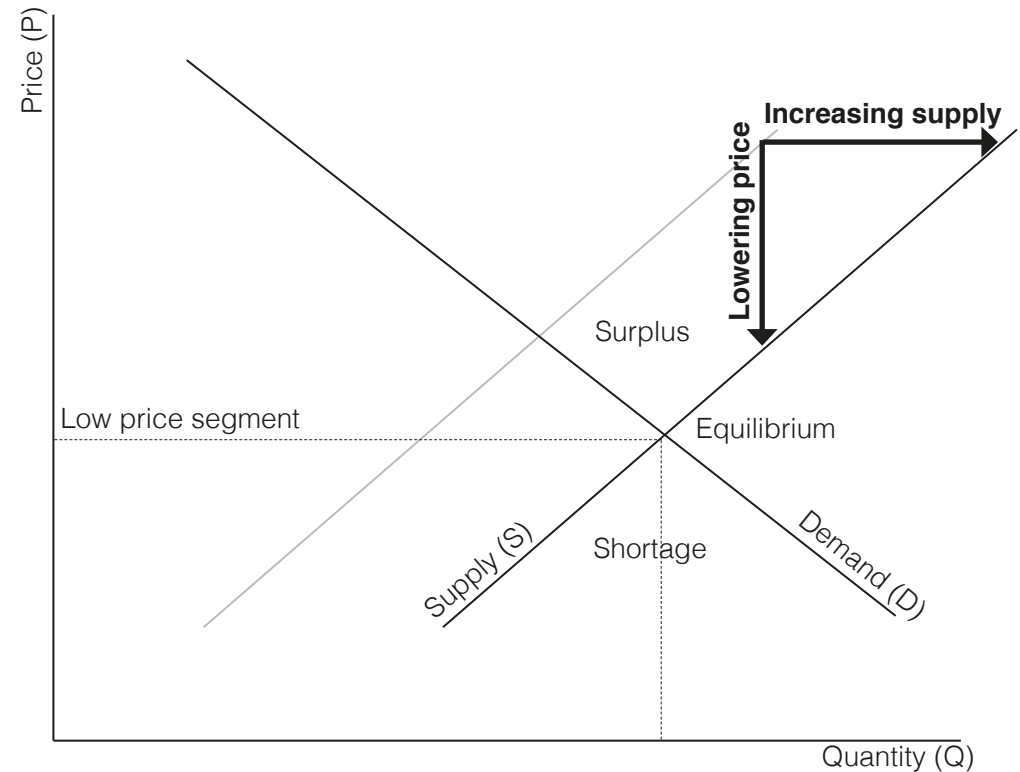
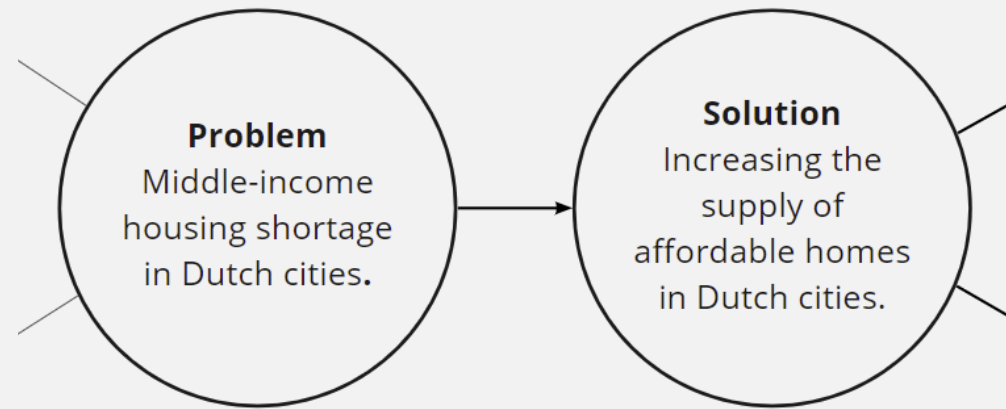
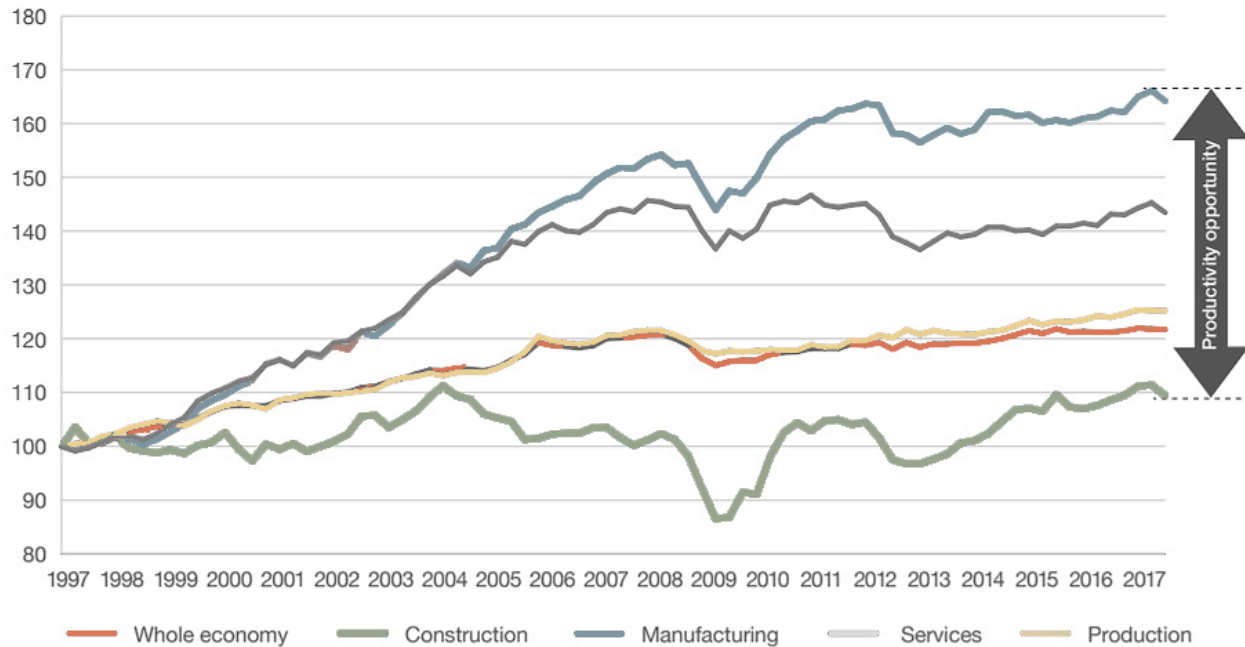


Fig. 2 The demand will not change. To counteract the housing shortage, we have to increase the supply of affordable homes for middle-income earners in Dutch cities!

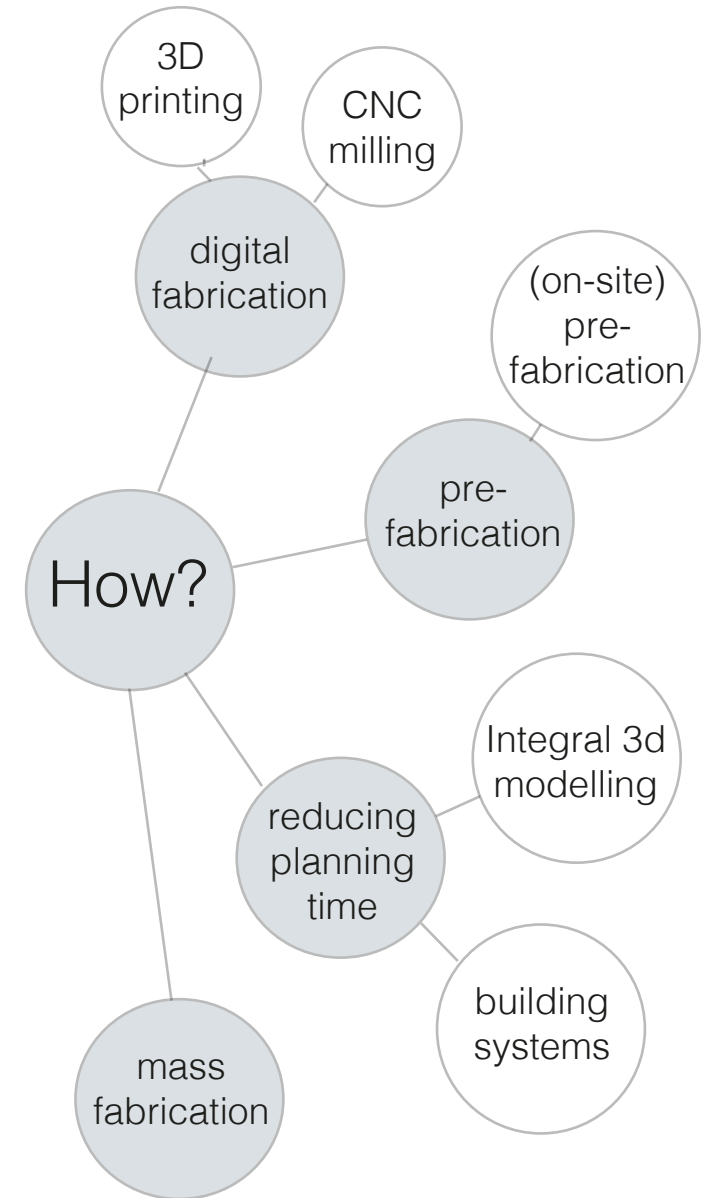


How can we increase the supply of affordable homes in Dutch cities?

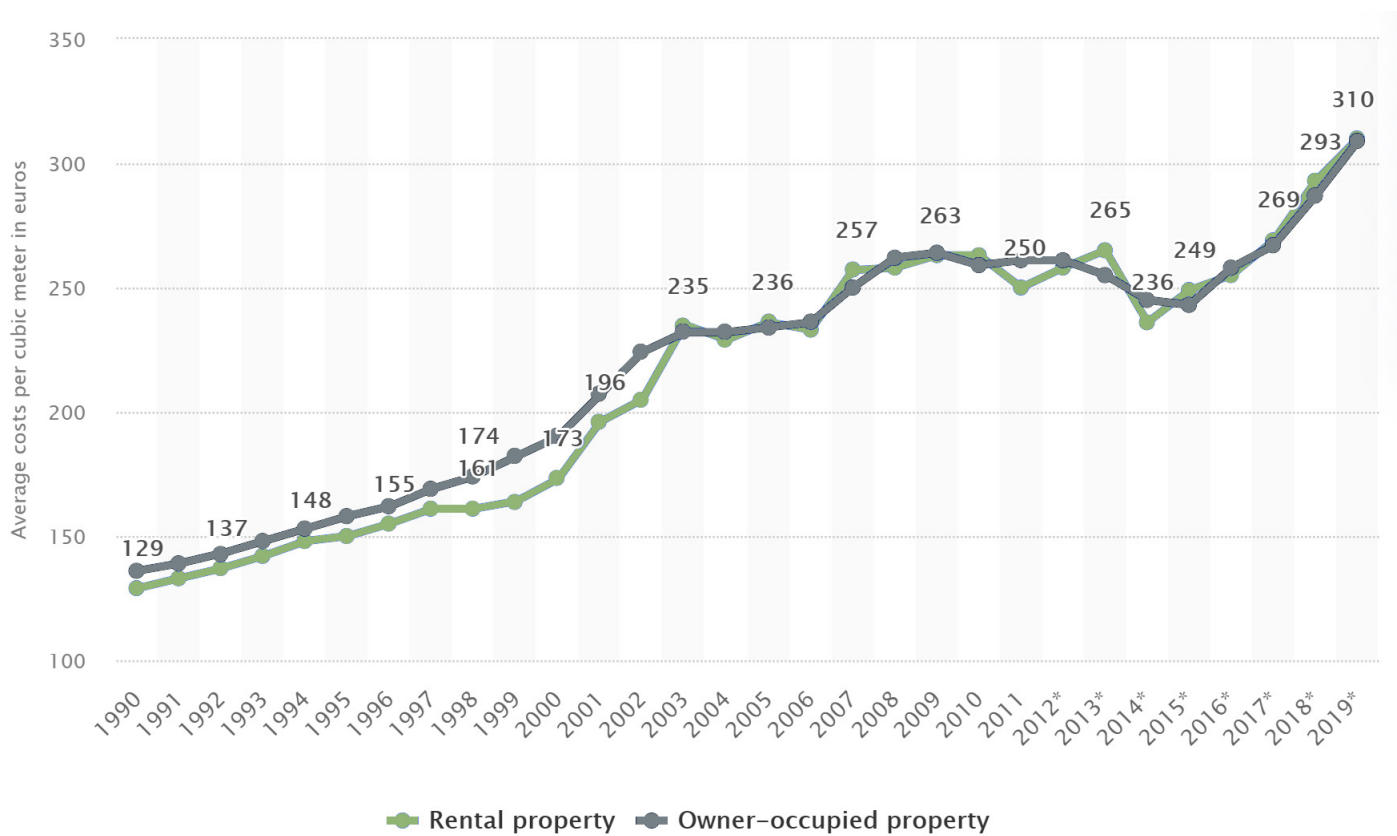
We must increase the productivity in the construction sector.



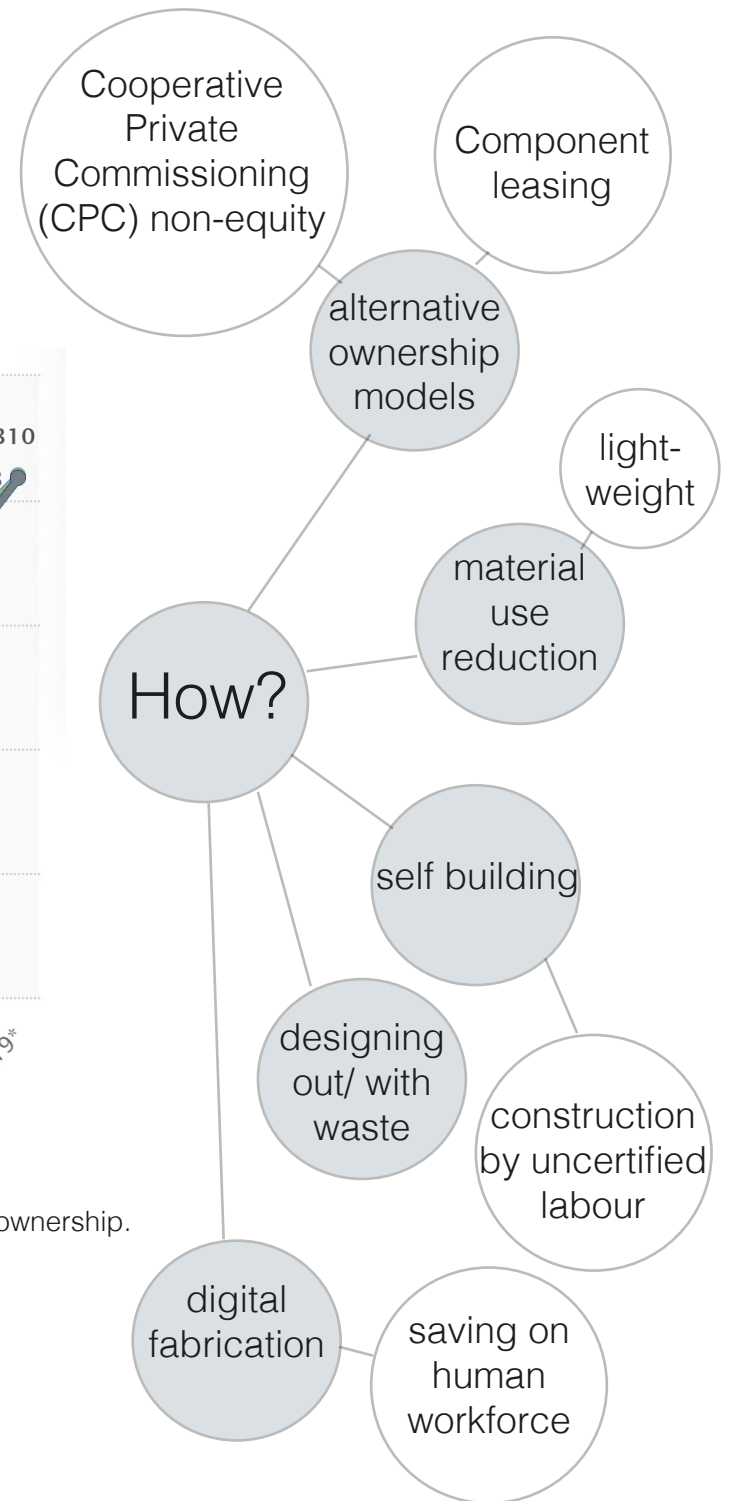
Productivity growth US - output per worker (1997=100), © ONS, 2018



We must make construction more affordable.



Average construction costs per cubic meter of houses in the Netherlands from 1990 to 2019, by type of ownership.
© Statista, 2021



What we do not want!



Architecture differs from other industries:
it has to be **contextualized!**



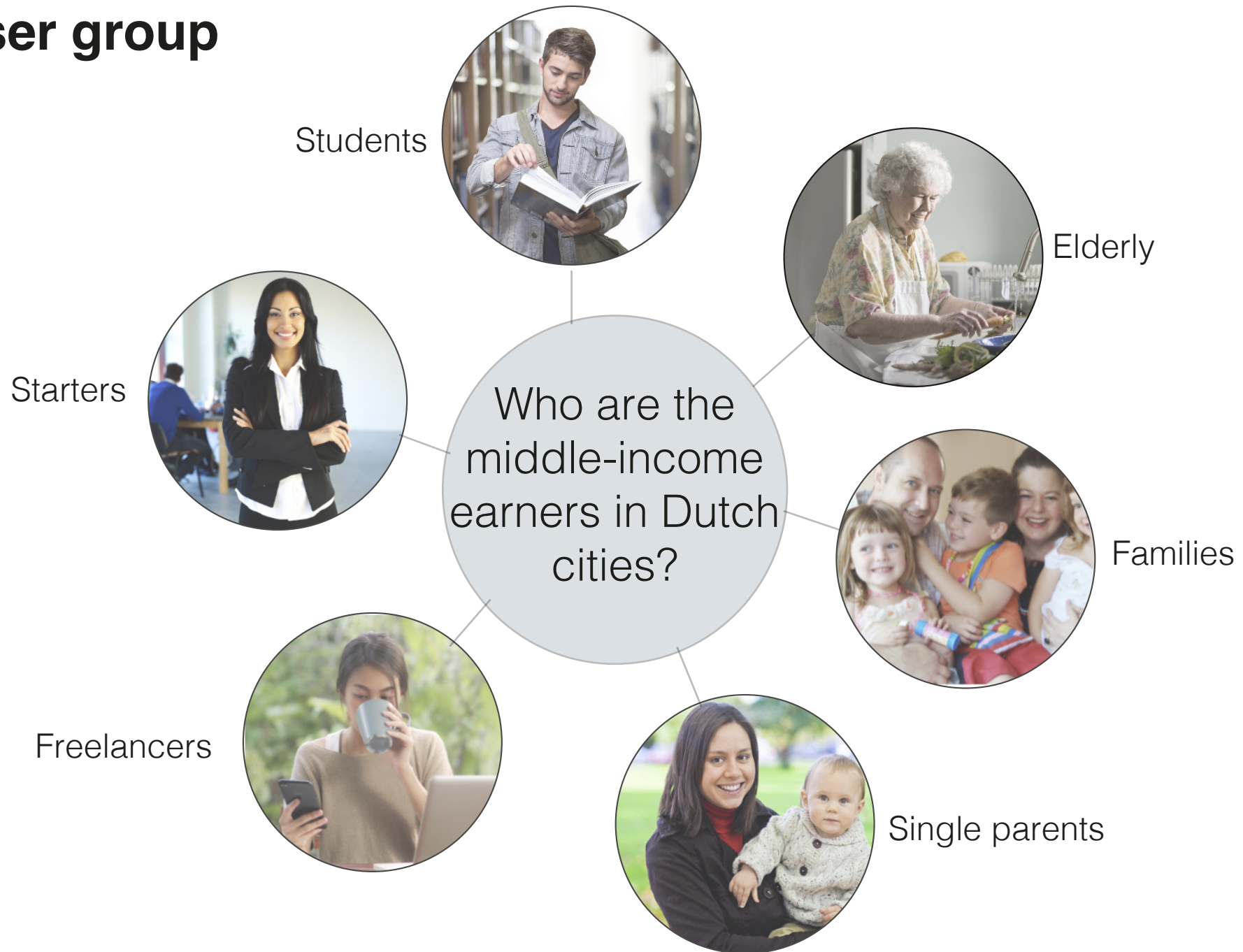
Humans have individual
needs differ and change
over time!

There is never a “tabula rasa” situation!



What are the contextual constraints?

User group



What are the individual needs of middle-income earners in Dutch cities?

Individual needs	Physical activity within reach	Shopping possibilities closeby	Home office proofness	Creative communal spaces	Quietude	Noise-production	+ Privacy	Getting to know other residents	Taking part in project organization
Starters	Shaded	White	Shaded	Shaded	White	White	Shaded	Shaded	White
Students	Shaded	White	Shaded	Shaded	White	Shaded	Shaded	White	Shaded
Elderly	White	Shaded	White	Shaded	Shaded	White	Shaded	Shaded	White
Families	White	Shaded	Shaded	White	White	Shaded	White	Shaded	Shaded
Single Parents	White	Shaded	Shaded	White	White	Shaded	White	Shaded	Shaded
Free-lancers	Shaded	Shaded	Shaded	Shaded	Shaded	White	Shaded	Shaded	Shaded

The building programme can be based on the overlap of individual needs in different user groups.

Location

Merwedeterrein Arnhem



Green area that belongs to the railway (temporary living possible)



Caravan living



Small conglomeration of houses



Car workshops



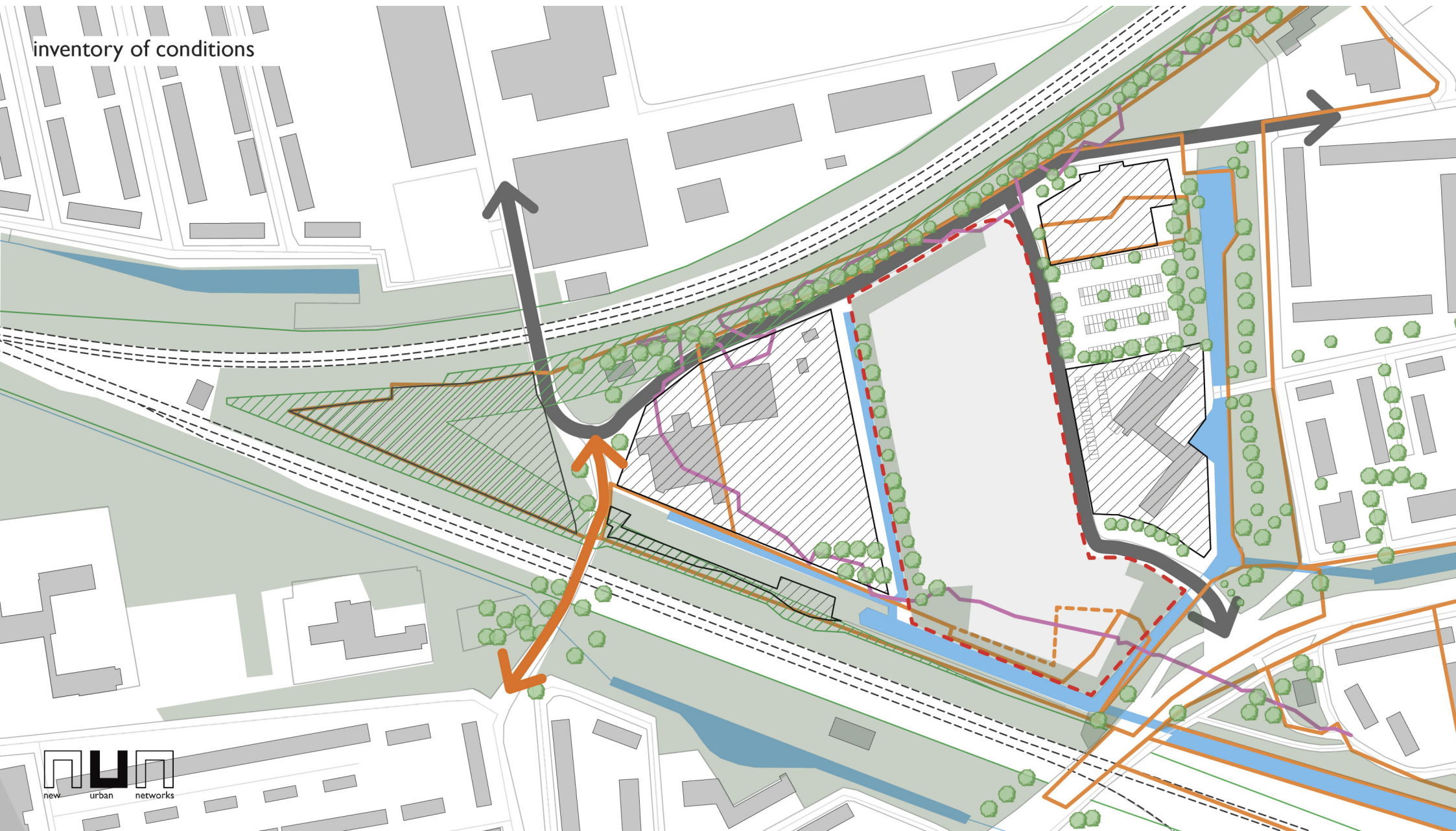
KW 37
Kunstwerkplaats Arnhem



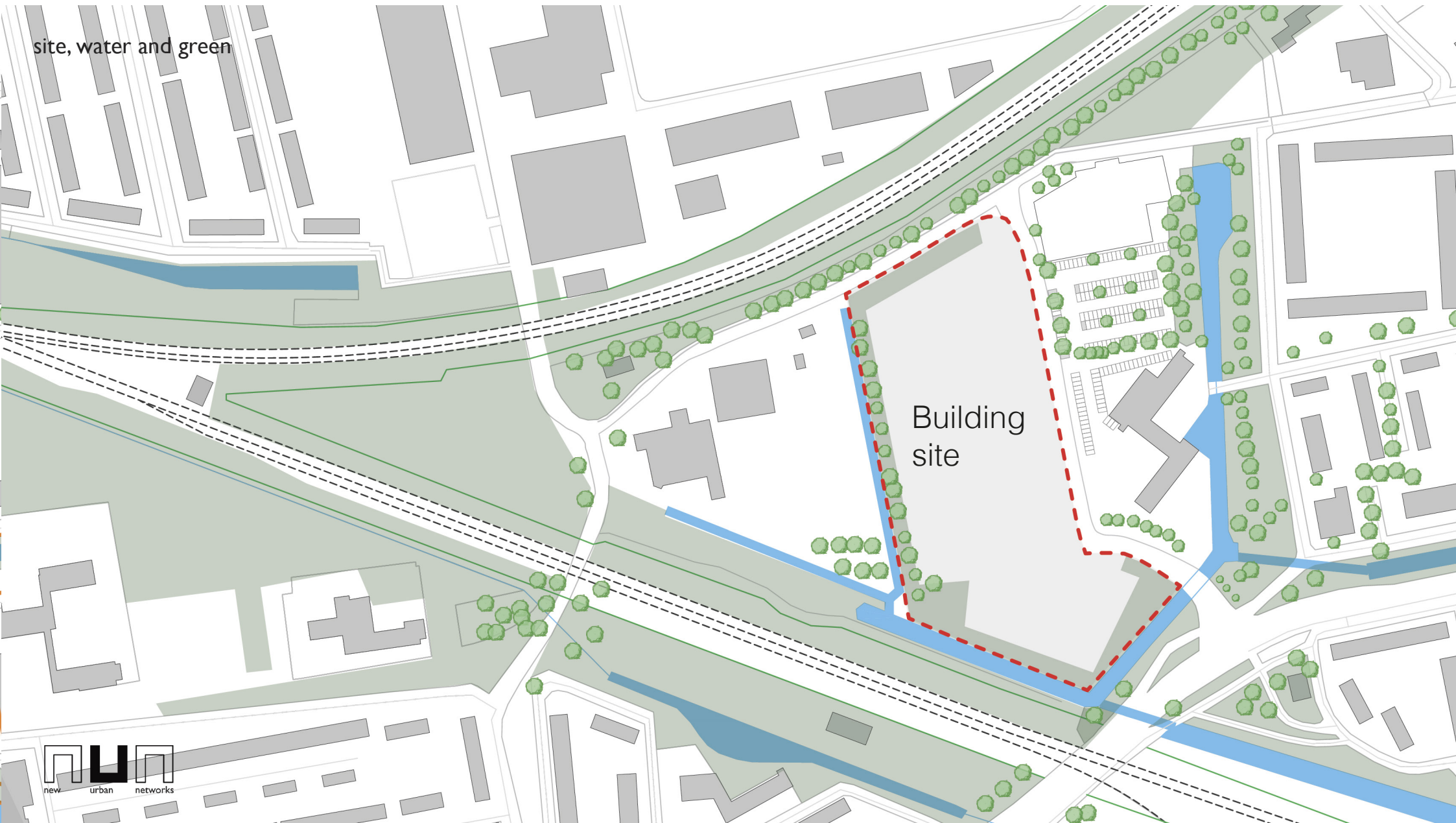
Mosque (former school)

Merwedeterrein Arnhem

inventory of conditions



Merwedeterrein Arnhem



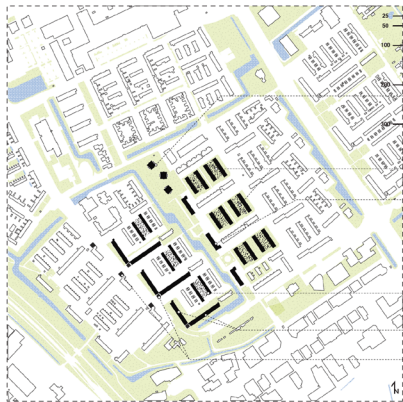
Merwedeterrein Arnhem



Broader Context: Redensification of Dutch cities.

Redensification studies by New Urban Networks.

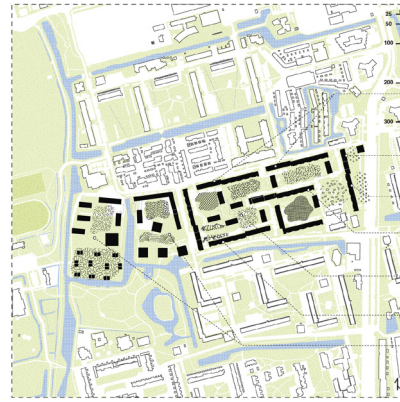
Arnhem Presikhaaf III



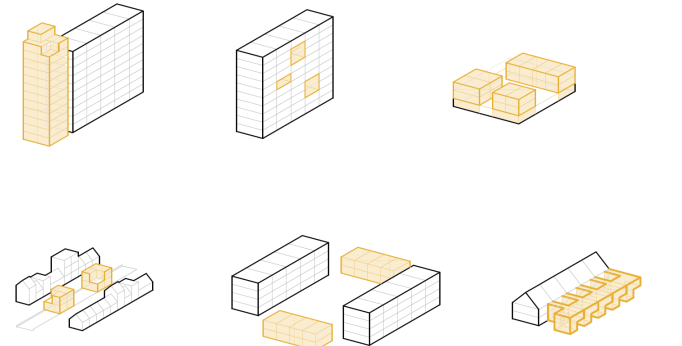
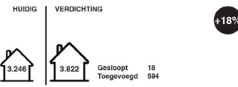
- 15 samenvilla's
- 2 optoppen rond nieuwe hof
- 10 activering plint
- 1 woning aanbouw
- 10 activering plint + optoppen woongebouw
- 14 parasitoren



Delft Gillisbuurt



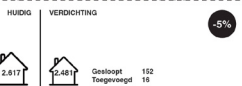
- 10 activering plint
- 10 activering plint + optoppen woongebouw + strategische sloep
- 10 activering plint + optoppen woongebouw + strategische sloep
- 16 nieuwe uitbreiding
- 10 activering plint + optoppen woongebouw + strategische sloep
- 16 nieuwe uitbreiding



Parkstad Rolduckerveld



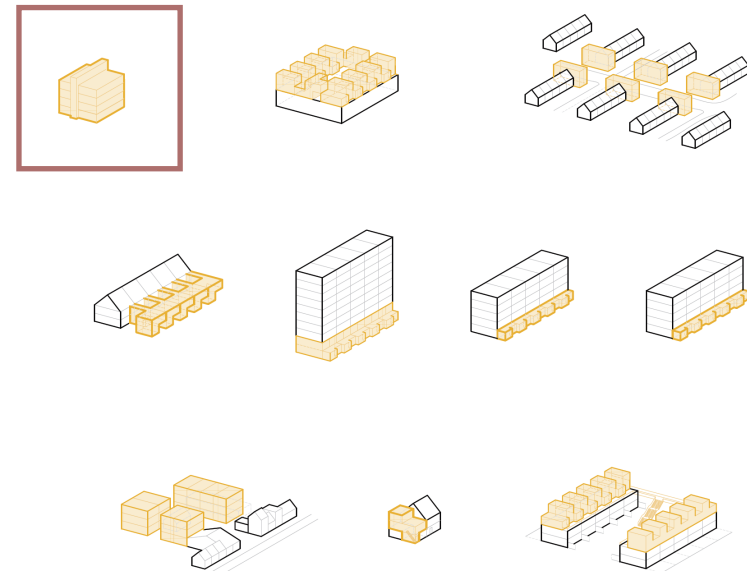
- 15 samenvilla's
- 12 strategische sloep + activering plint
- 2 optoppen rond nieuwe hof



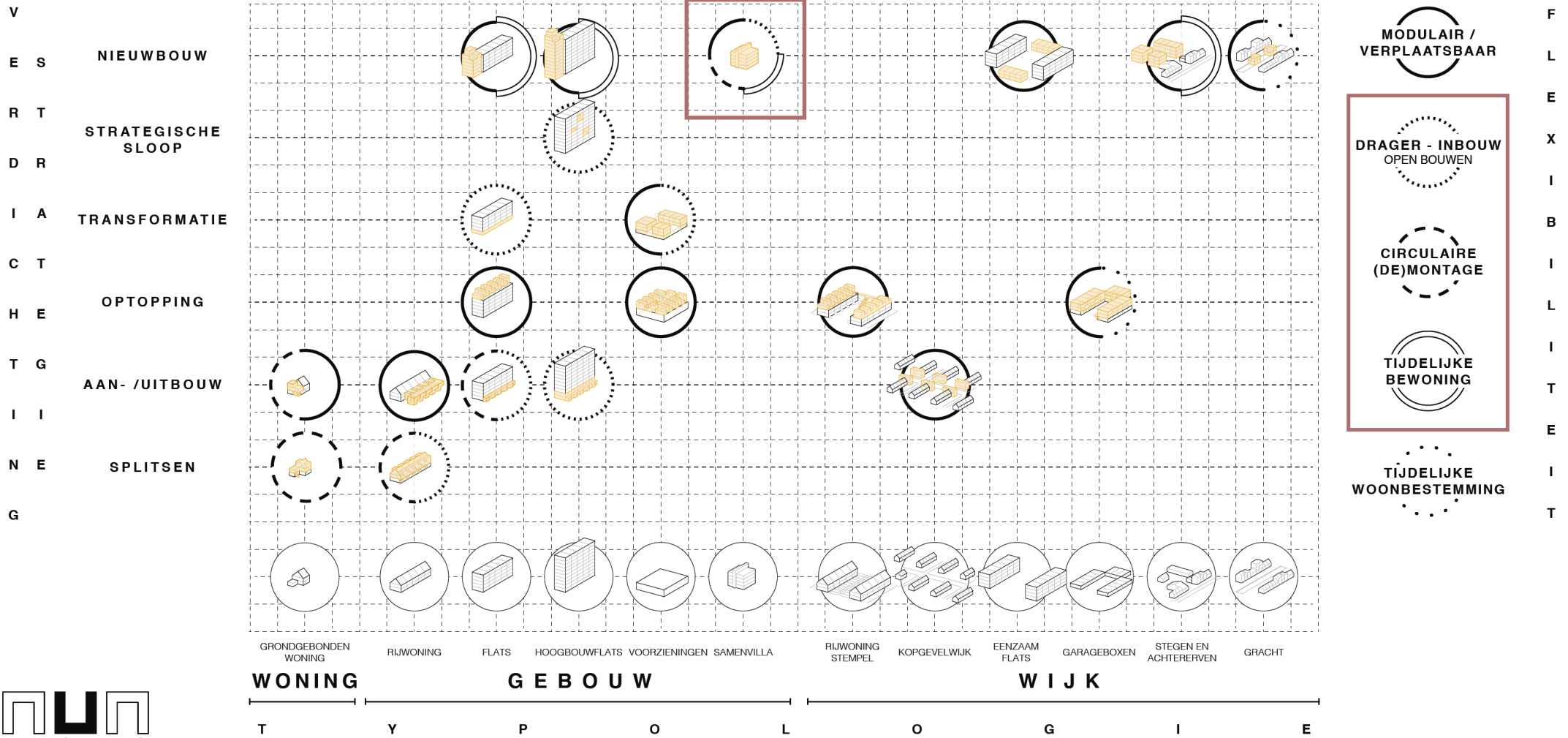
Hoeksche Waard



- 7 randen
- 6 bewoonde straten
- 14 parasitoren
- 8 optoppen voorzieningen
- 5 over het water
- 4 stegen en achtererven
- 9 gebouw-transformatie



Building Type



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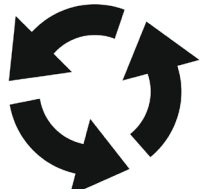
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Design Objective



circular



sustainable

I want to create a circular and sustainable housing scheme that is quick to (dis) assemble, and affordable for its residents.



quick to
(dis) assemble



affordable

Design Vision



Easy (dis) assembly of circular components



Flexible multi-storey structure

I envision a collective private commissioned (CPC) non-equity multi storey housing scheme that follows open building principles. It will house 200 middle-income residents at Merwedeterrein Arnhem. The building system consists of on-site produced circular plug & play components. Besides the flexible multi-storey structure, there are in-fill components which are so easy to (dis)assemble, that even inexperienced lessees are able to self-build their apartments, and perform repairs without further tools.

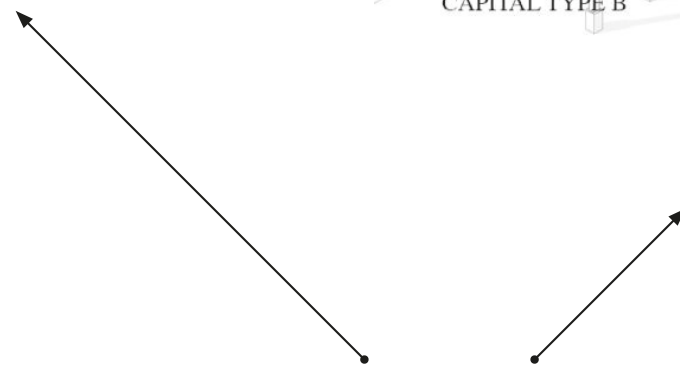
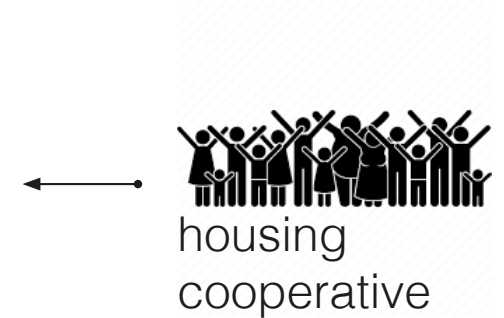
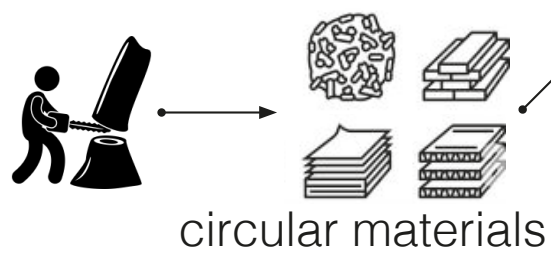
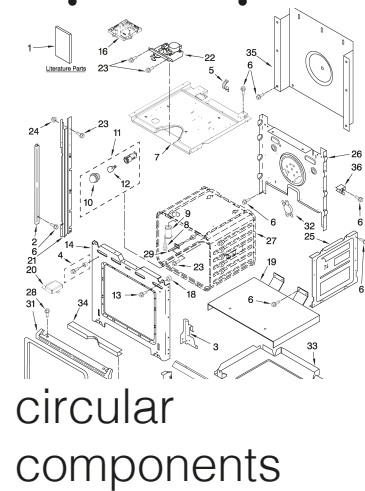
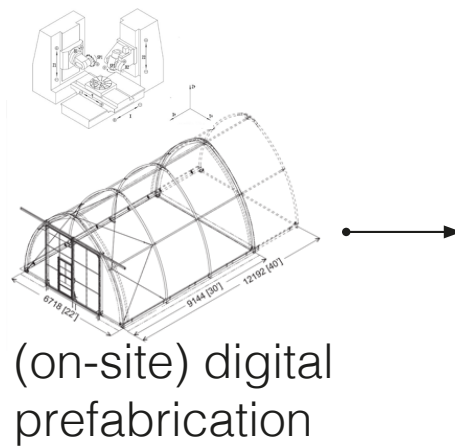
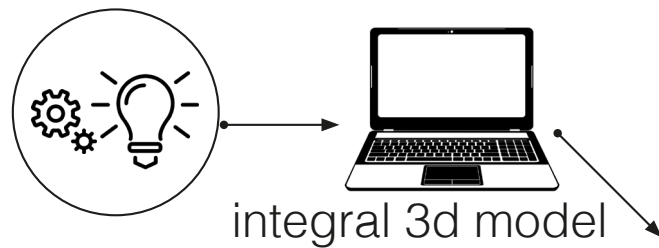
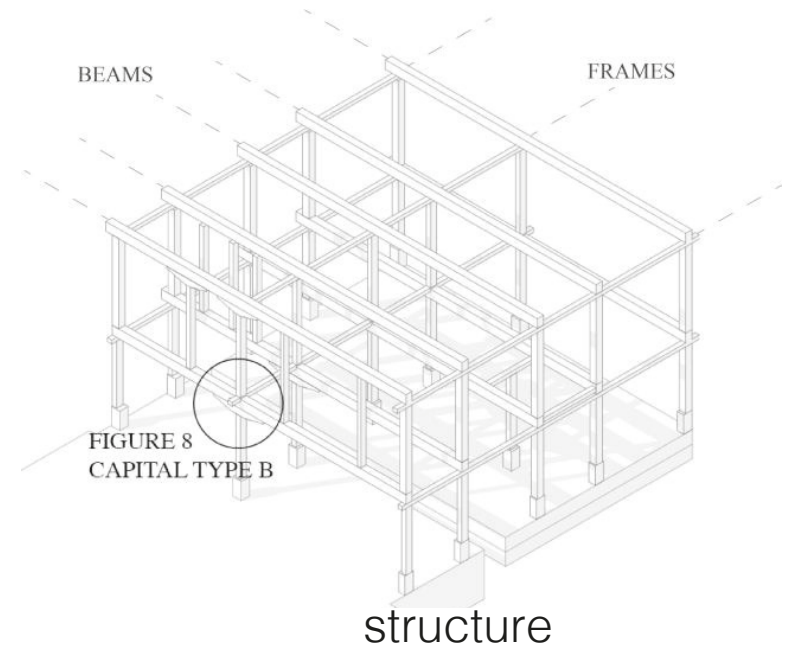


Plug & play components



Collective private commissioned (CPC) non-equity + Component leasing

Construction diagram











Overall Design Question

How can we create circular and sustainable high quality components for both the structural, and infill systems of an open building?

Sub-questions:

What systems are already there? How can we use the knowledge that already has been produced?

How does CPC and leasing influence the design of components?

What requirements are posed to building components in a Dutch context and how can they be fulfilled in the component design?

How can the components be used after they phase out?

How can we brake down a building infill into parts small enough to be carried and (dis) assembled by two people?

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Hypothesis

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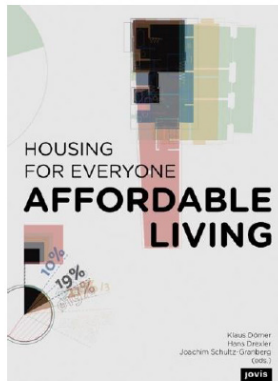
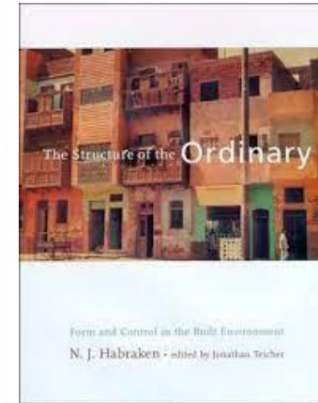
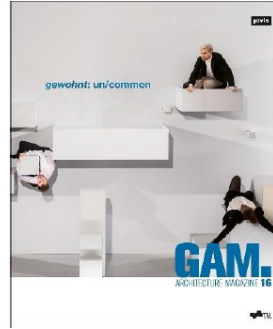
Research Structure

Thematic Research Question

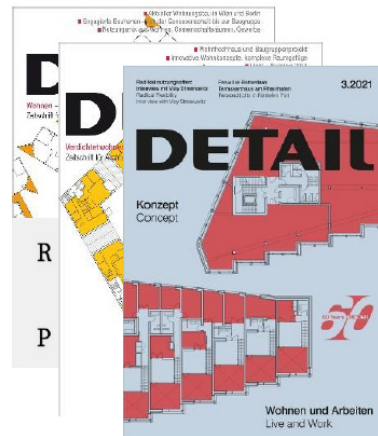
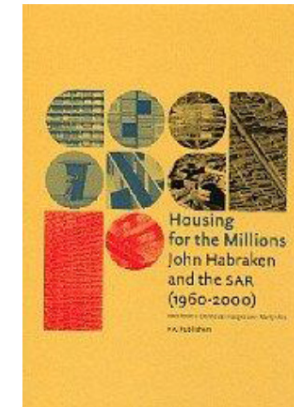
How can we create long term affordability and sustainability by design for disassembly within the economic model of non-equity collective private commissioned (CPC) housing?

Hypothesis

If we implement detachable components that are made up of detachable elements, building projects will get more affordable and sustainable in the long term due to lower maintenance costs and less waste.



Literature research





De Warren

- self-building housing cooperative
- participatory processes
- cooperative private commissioning



Superlofts Amsterdam

- participatory processes
- circular materials (renewable/urban mining)
- componential logic, open building infill system

Analysis of reference projects



Hof van Cartesius

- circular materials (renewable/urban mining)
- Design for disassembly
- Flexible, temporary

