

Assembling a circular life

Flexible and circular conversion of a vacant office building in Amstel III

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Introduction

Context/ Problem

Goals/opportunity

Research /principles

Map of Amsterdam

1km

City center

Amstel III

4/72

Problem

Netherlands.



Vacant office floor space by municipality, 2017

Context

Amstel III is also under this threat.



Vacancy intensive map of Amstel III

Problem

Main causes: Old buildings are out of date.

Building fit-outs are not suitable for new groups of people.



Visited vacant office building in Amstel III

Opportunity

Opportunity: Transformation of office building

- reduce the demolition waste
- save the embodied energy for new structures

Attract new groups of people to this area

- change the monofunctional situation
- be pioneers of a change and promote circular concept in larger scale



Visited vacant office building in Amstel III

A solution for young students

POLITIEK

Nieuw studiejaar gaat beginnen: hoe staat het met studentenhuisvesting in de stad?

26 augustus 2018, 16.45 uur · Aangepast 27 augustus 2018, 07.00 uur

VU 21 maart 2018

Studenten zijn woningtekort zat

Studenten verhogen de druk op politici om nu eindelijk iets te doen aan het schijnbaar onuitroeibare tekort aan studentenwoningen. Hoezo krijgen we het probleem maar niet onder controle?

at5.nl



STAD

Amsterdam moet in vier jaar tienduizend studenten- en jongerenwoningen bouwen

4 oktober 2018, 08.53 uur · Aangepast 4 oktober 2018, 11.27 uur



at5.nl

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Student house lacking in Amsterdam

Greater independence

52% of total students have left Their parental home. Students seek greater independence as they get older. The number for last period was 48%.



More students

Over the past eight years, the number of students of colleges and universities has Increased by 21%.



Higher rent

Amsterdam student rooms are the most expensive in the Netherlands: an average of 35 euros per m².



LANDELIJKE MONITOR STUDENTENHUISVESTING



Source: ABF Research, 2018

Education and research facilities around Amstel III



- 1. Amsterdam Health & Technology Institute (AHTI)
- Amsterdam Medical Center (AMC) University of Amsterdam (UvA), Faculty of Medicine
- 3. European Bartender School
- 4. Amsterdam University of Applied Sciences (HvA), Economics and Management domain
- 5. ROC vocational training institution, Business, IT, Security

Accessibility

	Car	Bicycle	Walking	Public transport
Station Bijlmer ArenA ớ		04 minutes	14 minutes	
Station Utrecht Central				20 minutes
Schiphol Airport 🔶	16 minutes			17 minutes
Amsterdam-Centre	15 minutes	30 minutes		20 minutes
Highway A1, A2, A9, A10	05 minutes			

Preliminary goal

Transforming an office building in Amstel III into a student apartment



Source: thestudenthotel.com

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Is this enough?

Second waste: some newly tranformed projects on site have short lives.

- Changeable ownership
- Land leasing contracts
- Area development plans

How to turn this short-term renovation mode into a long-term strategy?



Blue-grey student apartment Start: 2014 Life: 15 years Goal

Transforming an office building in Amstel III into a student apartment





A flexible system to fit the changing needs and achieve circularity Involving users to circular construction and lifestyle

How can a flexible infill system help the conversion of vacant office building in a circular and user involvement way?

Sub questions:

1. How to increase the technical flexibility of building system?

2. How to involve users to flexibility and circularity?

How to increase the technical flexibility of building system?



Source: Brand (1994)

For one credit the following minimum scores need to be achieved for each layer:

- "space plan": average minimum of 0,7
- "services": average minimum of 0,7
- "skin": average minimum of 0,6
- "structure": average minimum of 0,4

flexible

	accessory external connection or connection system	1.0
	direct connection with additional fixing devices	0.8
	direct intergral connection with inserts (pin)	0.6
Type of connections	direct integral connection	0.5
Type of connections	accessory internal connection	0.4
	filled soft chemical connection	0.2
	filled hard chemical connection	0.1
	direct chemical connection	0.1

fixed

Source: A Framework For Circular Buildings, CIRCLE ECONOMY, 2018

strategies

- detachment of structure and infill
- installations separated from structure
- reversible connections

A system that suits surrounding structures



Structure grid sizes

1 Hessenbergweg 109











2 Hettenheuvelweg 12







Grids size: 7200*7200 Void height: 3100



3 Hogehilweg 6











4 Hettenheuvelweg 45







Grids size: 6000*6000 Void height: 2900



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Preliminary strategy



How to involve users to flexibility and circularity?

To build a circular future needs more user involvement



Linear construction

Tested practices

Needs for larger scale implement

Typology of user needs driven flexibility





Source: PKMN Architectures

Source: Patch 22

Source: Circle House, GXN

Source: Ten Fold

Typology of user needs driven flexibility



Linear business models in traditional building world



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What materials and technical solution

can provide renovating flexibility and involve users in self-building ?

Case study



Cine Lidia Technical solution: traditional craft Architect: Núria Salvadó y David Tapias Year: 2011



Liina Transitional Shelter Technical solution: prefab SIPs Architect: Aalto University Wood Program Year: 2011



Comfort Cabin Technical solution: digital fabrication Architect: TheNewMakers Year: 2016

What materials and technical solution

can provide renovating flexibility and involve users in self-building?

Introduce small scale industry



Plastic recycling



CNC prefabrication

What materials and technical solution

can provide renovating flexibility and involve users in self-building ?

Introduce small scale industry



Materials

- Recycled material from community and demolished building waste
- Wood-based materials





CNC prefabrication

Concept



Definition source: Geldermans, B., designingbuildings.co.uk

Principles

Circularity

- reuse existing structure
- recycle existing materials
- improve building sustainability
- design new components for disassembly

Technical flexibility

- digital fabrication
- standardized and modular dimensions
- detachment of structure and infill
- installations under raised floors or in walls
- reversible connections
- components to fit in elevator

User involvement

- visible process and result
- self-built construction
- customizable space
- promote circular user habits





Design

Construction strategy

Programs

Infill modules

Façade system

Building climate

Circulation and space



Apply principles into context



Hessenbergweg 109-117 Built year: 1999 Total area: 2520 m² Building height: 14 m

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Current Situation









Floor height: 3.3 m

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Structure: support layer



Urban strategy: introduce public green space



Relationship with future park and high-rises

Open old lobby to exterior



Showing a scenery of the transformation

Structure: reuse existing and recycle demolished part





recyclable glass and aluminum panels

Reusable glass(m²)	Embodied Energy (MJ)	Embodied Carbon (kg CO2)
39	2 62,230	4,410
Construction strategy



1 Old wall and facade treated by skilled labours

- 2 Flexible components produced in ground floor with user involvement
- 3 Flexible infill built by unskilled users



4 Users can further participate in recycling, maintenance and disassembly

Program



Building system: interior and exterior



Interior system



Interior system: floor module



450 × 450 mm Material: recycled polypropylene Source: collected from Amstel III community

Property: stable/recyclable/waterproof/ Can be accurately shaped by molding or CNC milling offers a good balance of thermal, chemical and electrical properties with moderate strength.

Fabrication method: injection Advantage: fast, one time mold cost, customizable patterns and colors

Interior system: wall module



Material: OSB board (mainly 18mm)

Property:

- stable
- low footprint
- low cost
- quick

Fabrication method: CNC milling Advantage: fast, accurate, customizable

Interior system: wall module



Interior system: wall configuration



Interior system: corners







Interior system: cross corners



Interior system: furniture and utilities





flexible furniture

kitchen



Interior system: furniture module



Interior system: furniture module



Interior system: utilities





Interior system: room types





balcony

Double rooms





Single rooms



balcony

Interior system: room transition









2 single rooms 4 1 double room

Façade system



Façade system: new façade and balcony space



Façade system: treating existing façade



Disadvantages:

- Static
- No related with interior function
- Need better climate performance

Façade system: treating old façade



Façade system: new façade and balcony space









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New façade: how to fit heights



suitable height: $3300 \rightarrow 3100 \text{ mm}$



Climate principle: providing various climate conditions



SUMMER

- protection by the overhang from direct sunlight exposure
- plants become another sun shading layer
- open greenhouses allow natural ventilation through the buffer zone
- natural thermal regulation from the green roof

Climate principle: providing various climate conditions

10 °C 10°C 20 °C open for cross ventilation open

SPRING/FALL

- insulated windows open for fresh natural air and comfortable temperature
- greenhouse can provide basic weather and noise protection
- natural thermal regulation from the green roof

Climate principle: providing various climate conditions



WINTER

- buffer zone naturally heated by the solar radiation
- natural ventilation through the pre-heated buffer zone combined with heat recovering units and floor heating
- leaves fall off, plants as sun shade become open
- natural thermal regulation from the green roof

Building climate: plant shading



Building installations: water



Building installations: ventilation and heating



Room installations



VENTILATION -individual installations -adjustable mechanical ventilation by heat recovery units



FLOOR HEATING -piping of heating in 0.3 m grids under floor modules

Circulation and spaces



vertical circulation



Ground floor


Flowing corridor space



Shared living space



Personal balcony

Customized floor plan and space



Conclusion





Dynamic redevelopment of vacant structures



Design for disassembly and recycle waste materials



Customized floor plan and space



Users continue contributing to circular transition

Thanks! Questions/Discussion

Qi Gao 06.28.2019

