Decentralised Sanitation & Reuse

Assessment of the viability of decentralised sanitation and waste water reuse in existing cities

Case study Poptahof, Delft (NL)

Delft University of Technology
Faculty of Architecture
Dept of Building Technology
Climate Design & Environment

Commissioned by: EET-DESAH / Wageningen University of Life Sciences

P.A. de Graaf, B.L.H. Hasselaar, A. van Timmeren

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Sustainable urban renewal the role of DESAR-systems

Design case study Poptahof

Extrapolation & further study

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Sustainable urban renewal

Why look at the existing city ?

The built environment is responsible for 20% of the CO2-emissions

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Projects built from now on will constitute 15 % of the housing stock in 2020

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The built environment is responsible for 20% of the CO2-emissions

Projects built from now on will constitute 15 % of the housing stock in 2020

The majority of housing does not comply with sustainability standards

Sustainable urban renewal

Definition

"a district based approach geared to

solving existing problems,

preventing new problems,

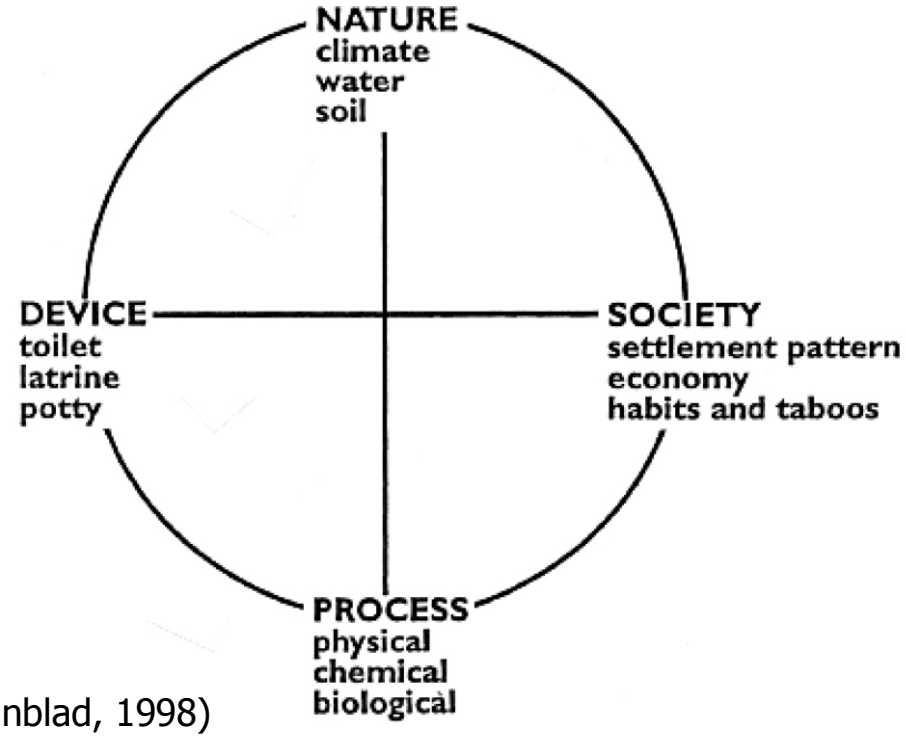
improving the quality of the local environment and

reducing supra-local environmental pollution"

(Bus, 2001)

DESAR systems

An integral perspective



Components of sanitation (Winblad, 1998)

DESAR systems

Integrated approach

Closing of loops (nutrients, energy, water)

Distribution of valuable resources

Flexible / adaptable to local conditions

Decentralised systems

Barriers

Presence of an existing system, which is:

Invisible to users / citizens

Embedded in existing institutional, socio-economic and legal structures

Poptahof

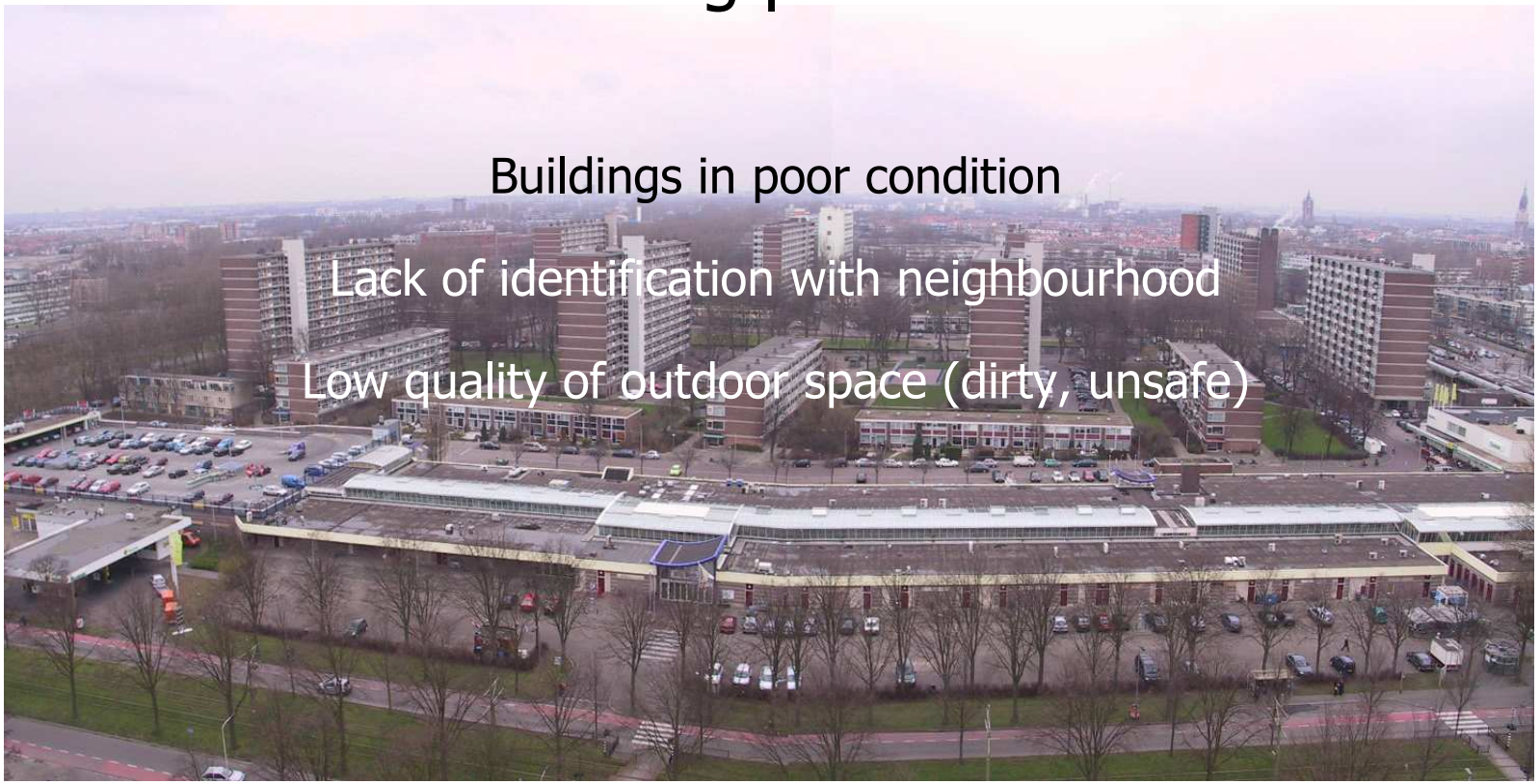
Implementation of DESAR in the existing city

Poptahof

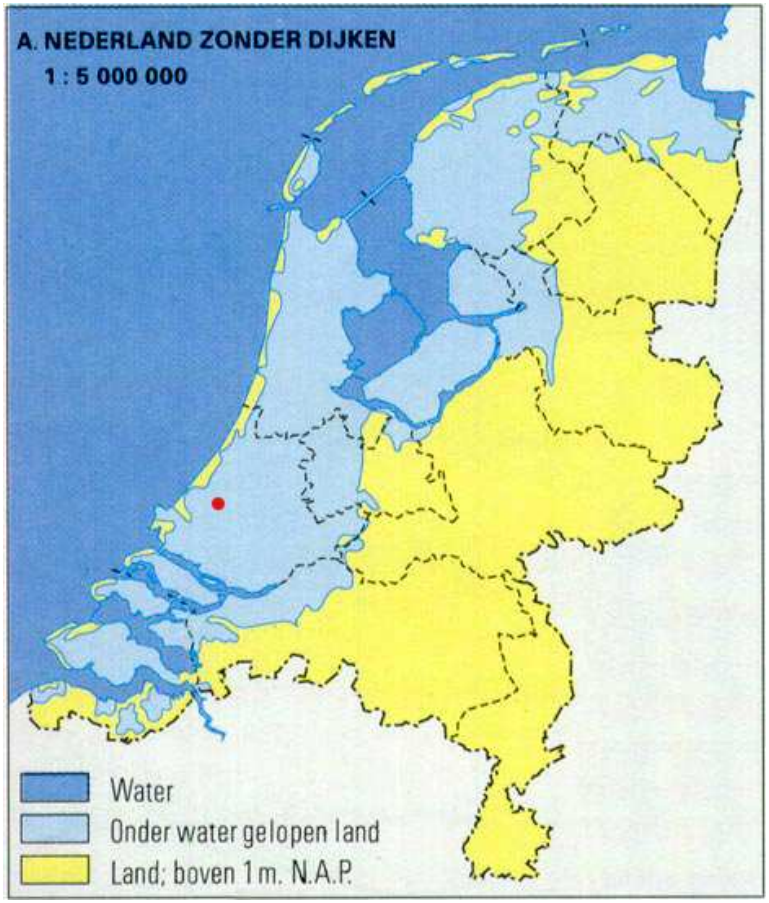
Relevance

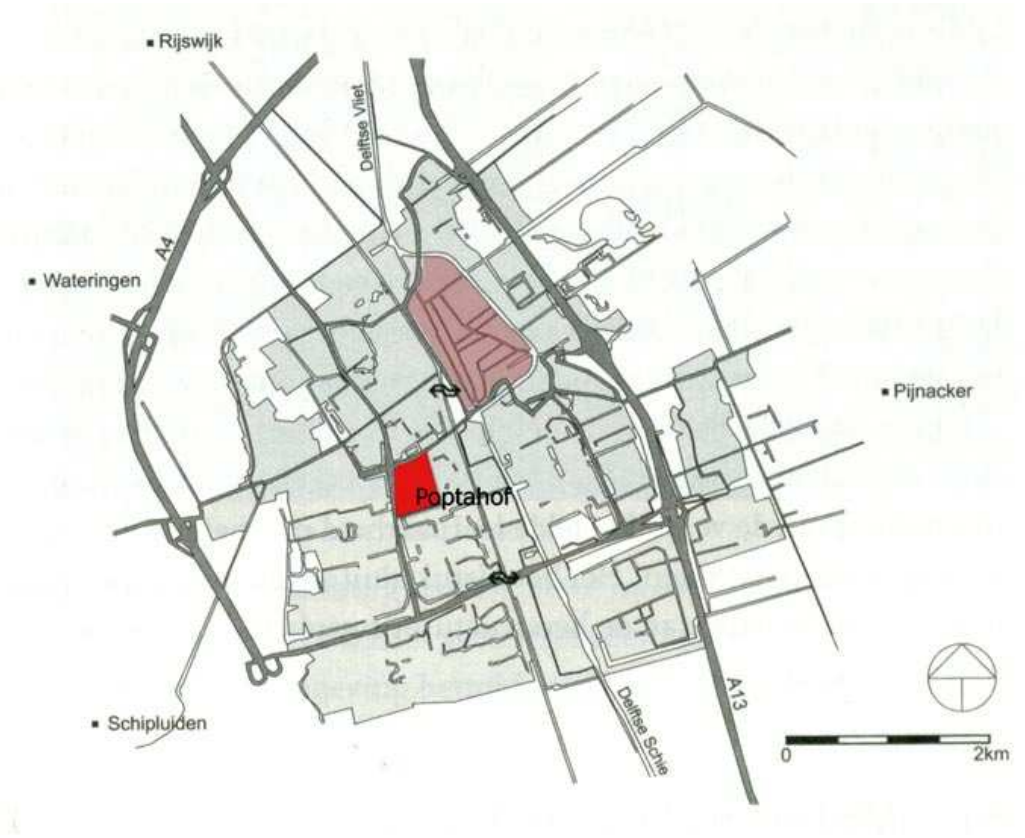
Poptahof

Existing problems



Context





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Design case study Poptahof

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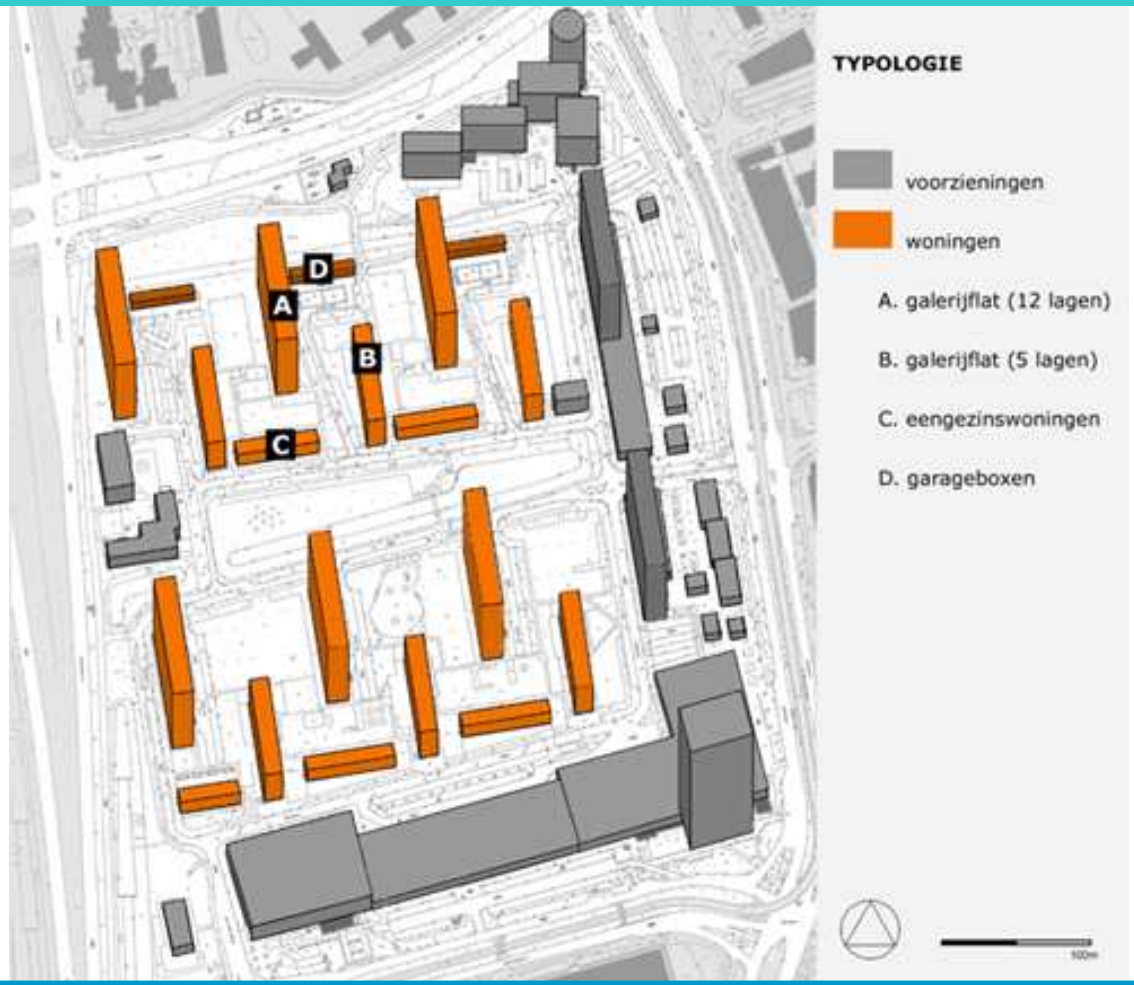
Spatial composition



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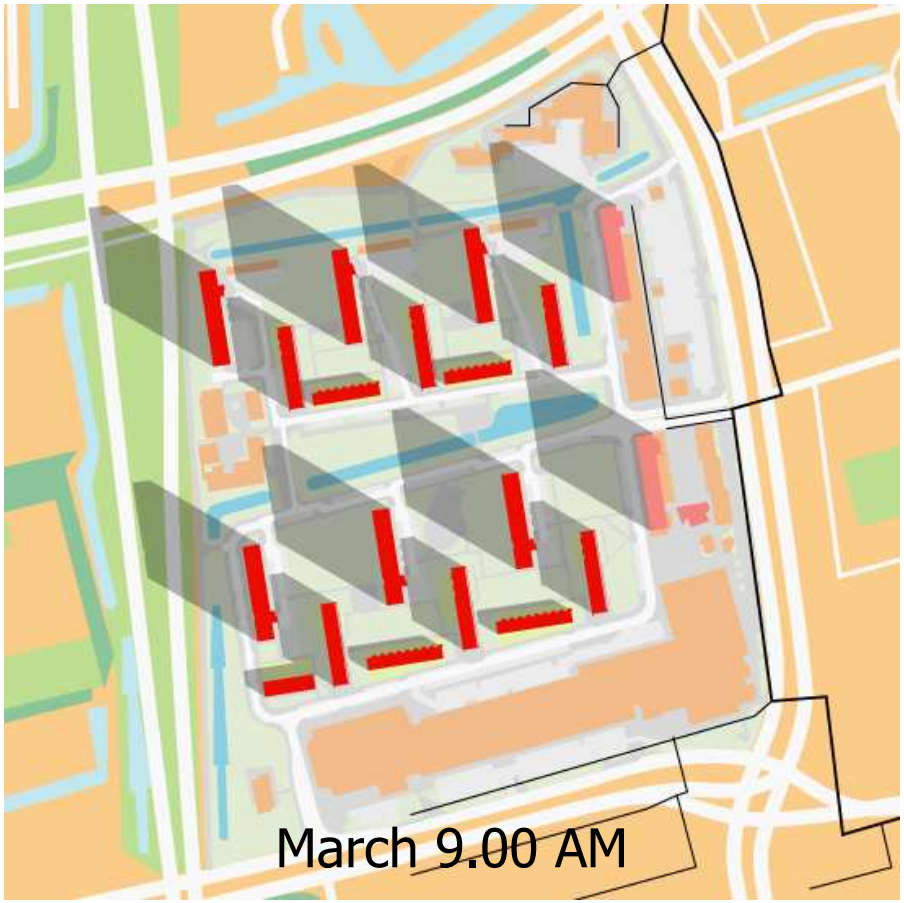

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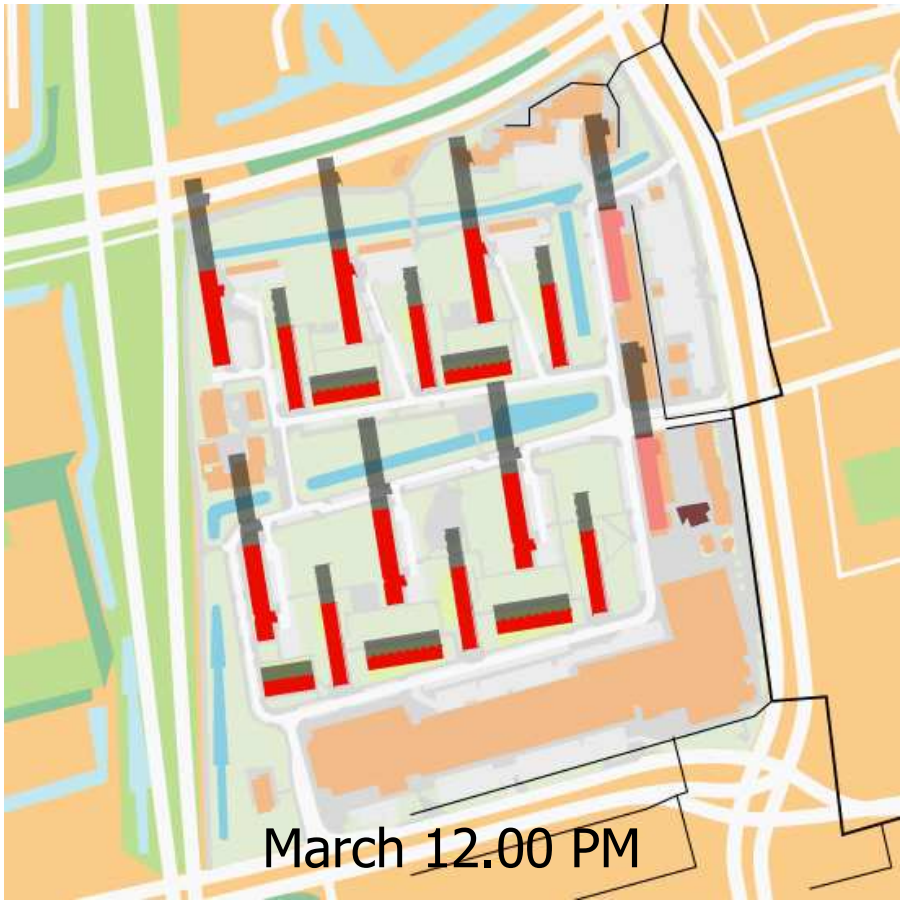
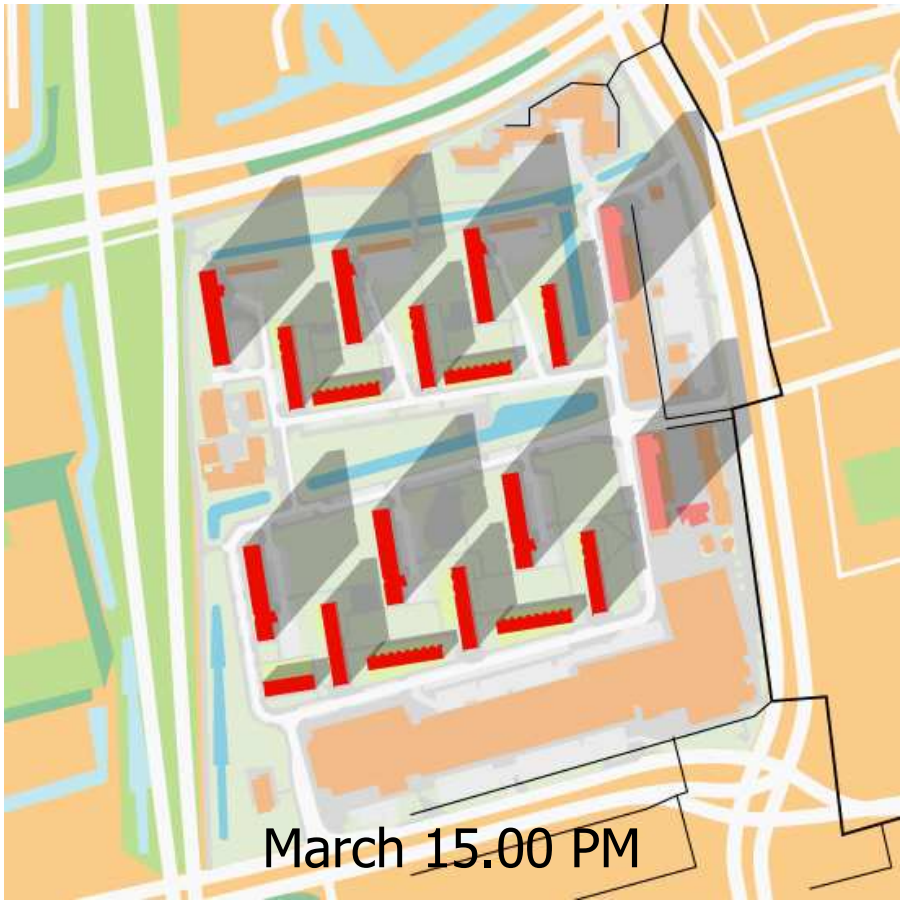


Spatial composition



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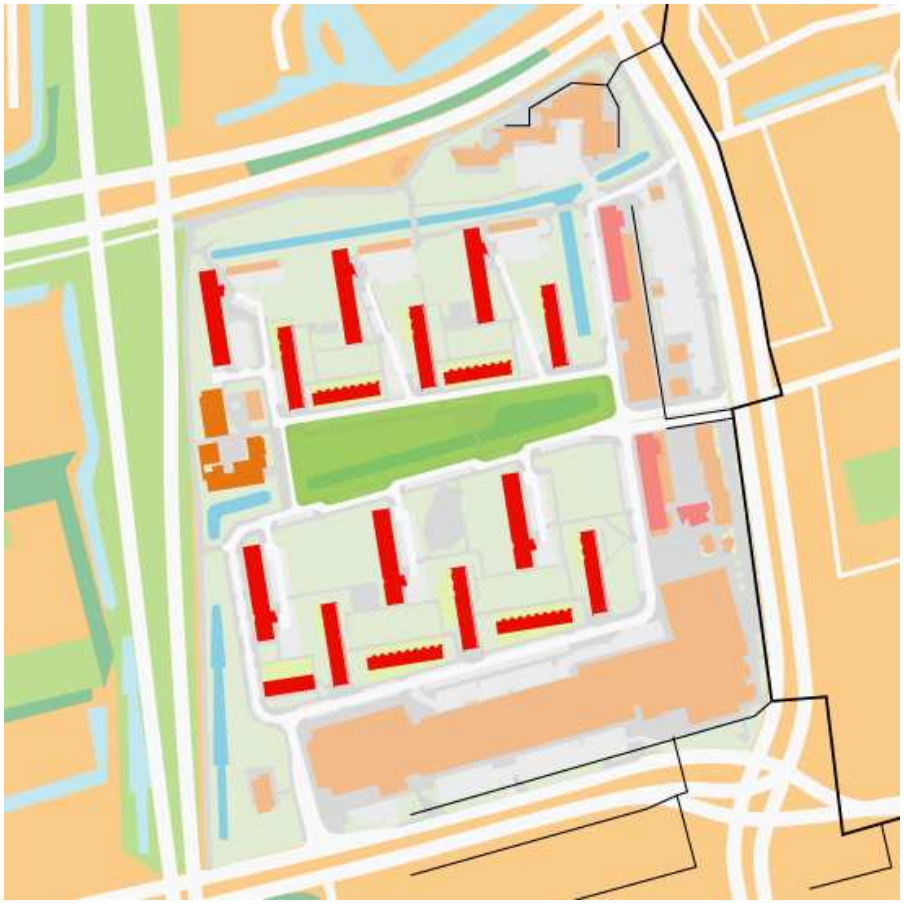
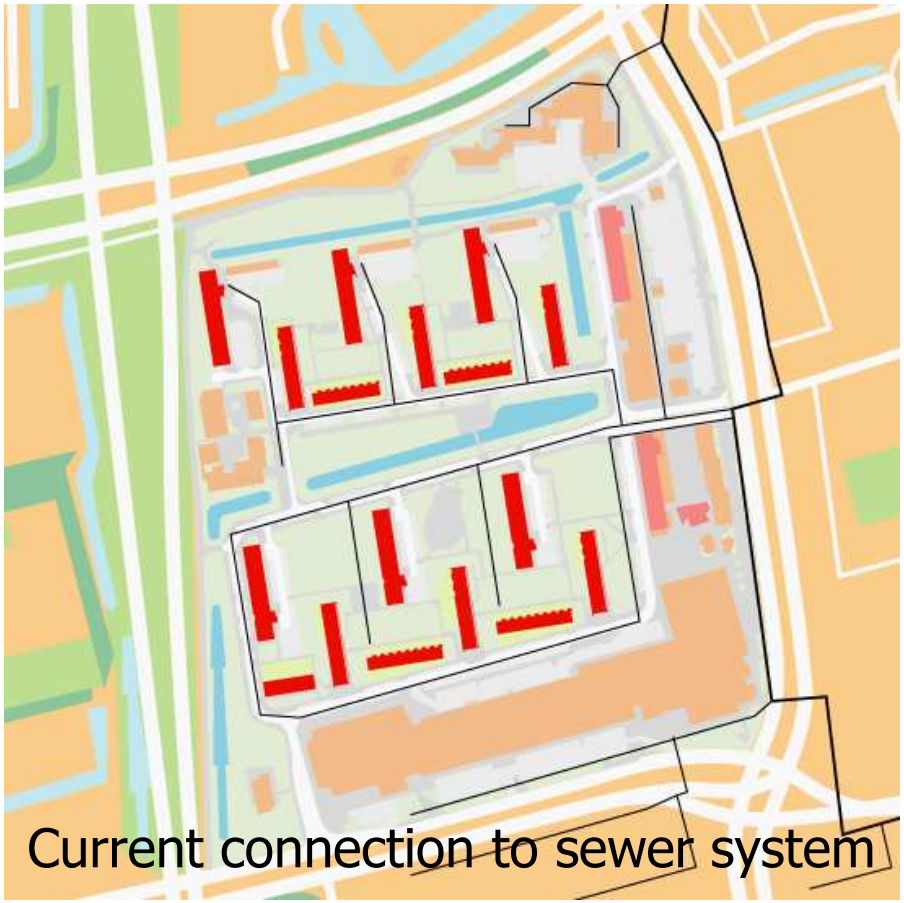
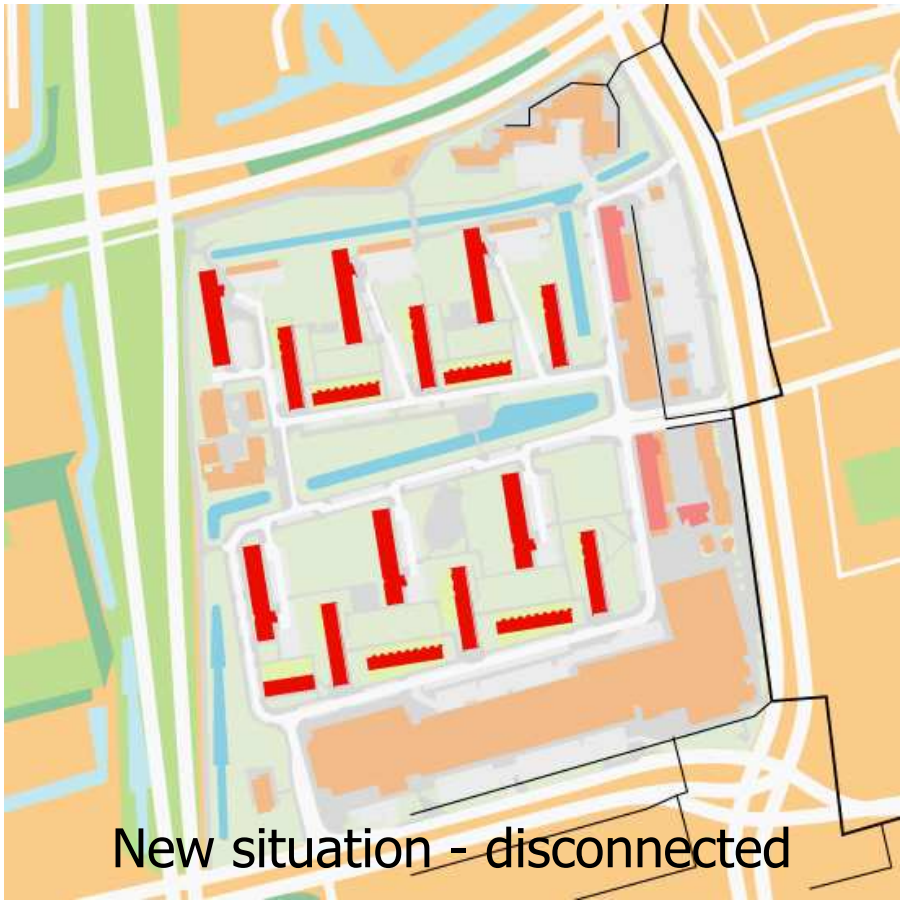


Sewer system



Current connection to sewer system

Sewer system



Sustainable urban renewal

Contribution of DESAR approach to the improvement of the local environment

Positive contribution to outdoor space

(visibly, audibly, symbolically)

Spatially accentuating urban lay-out (spatial & social identities)

Local distribution of valuable resources

Offering additional collective facilities / environments

Added comfort in the home

Choice of DESAR-system

Anaerobic digestion:

Reuse of nutrients possible

Combination with vacuum toilets: low water use (3 liter/flush)

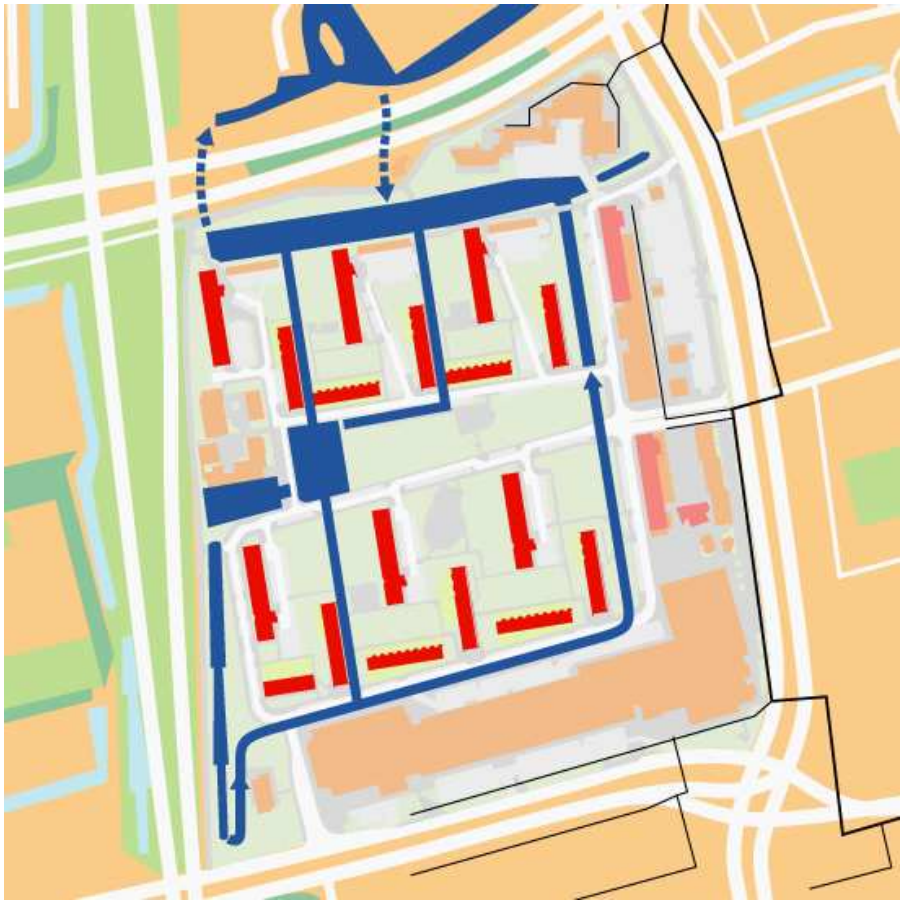
Production of methane for energy generation

Compact

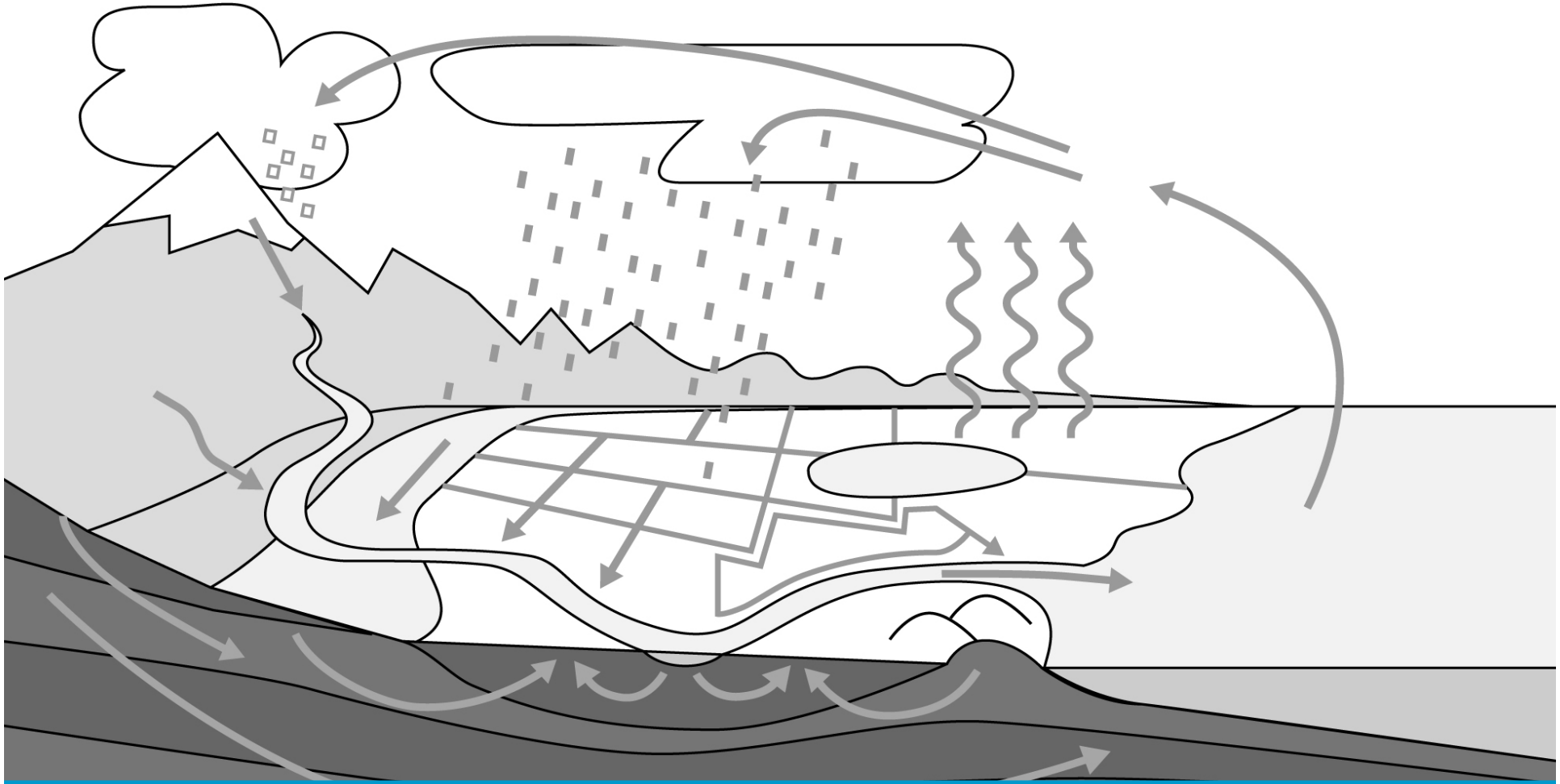
Optimum scale of operation (around 1000 pe) fits neighbourhood scale

Secondary treatment (in case of discharge to surface water)

Rain / surface water system



The hydrological cycle



Water in the built environment

Assessment of the viability of DESAR-systems in existing cities

Water in the built environment

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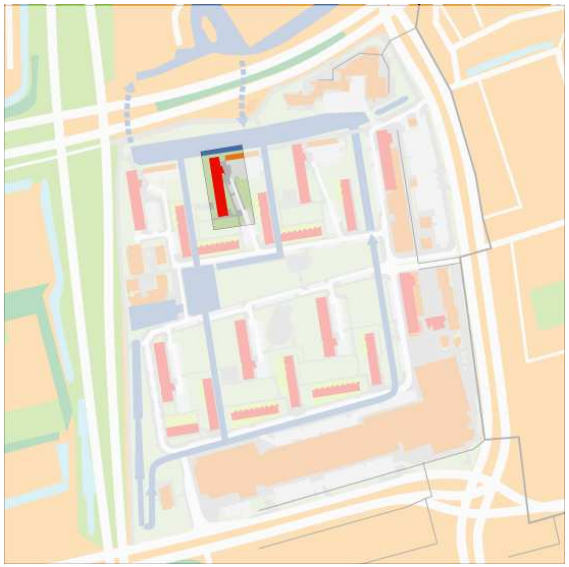
Scales of implementation

Spatial and social identities

Neighbourhood

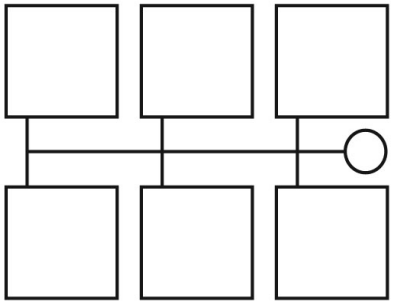
Imprint



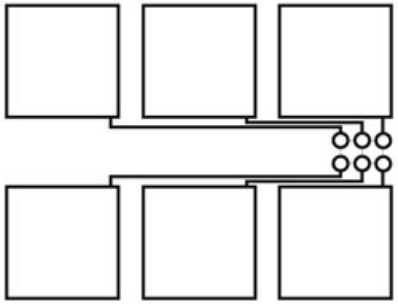
Building

Scales of implementation

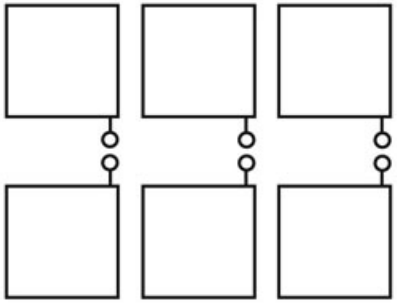
Technical implementation



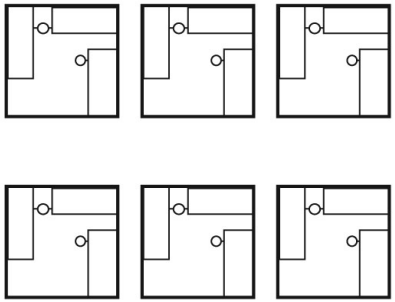
1A. Neighbourhood



1B. Imprint/neighbourhood

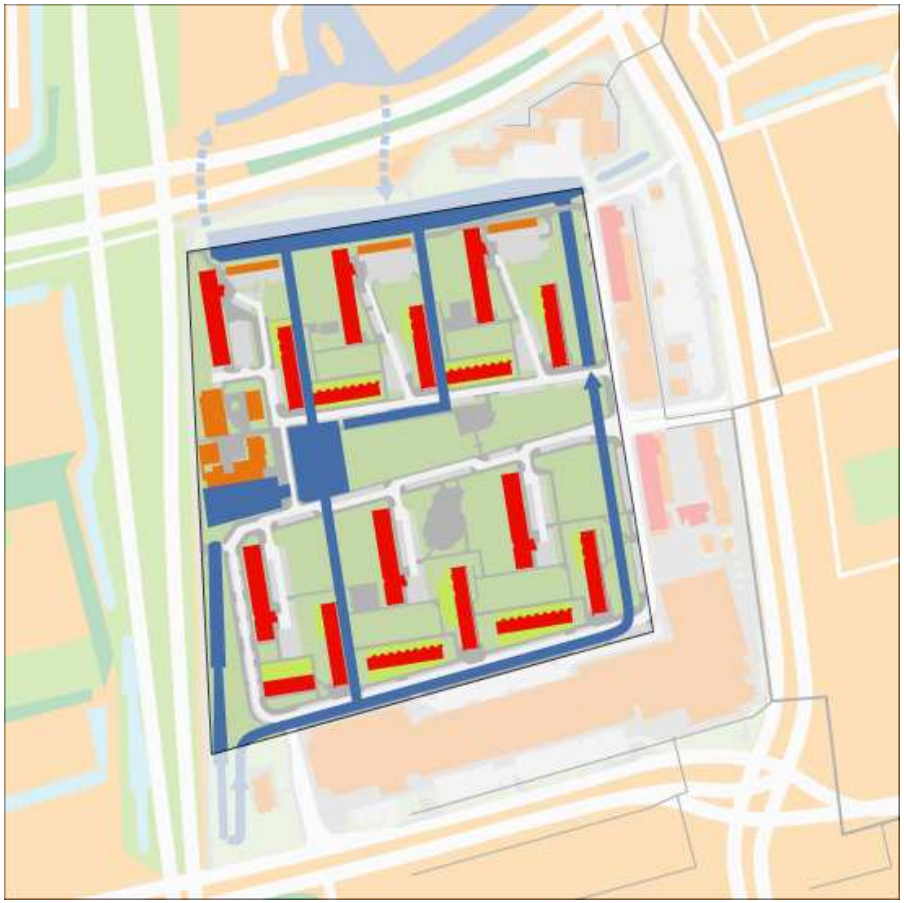


2. Imprint

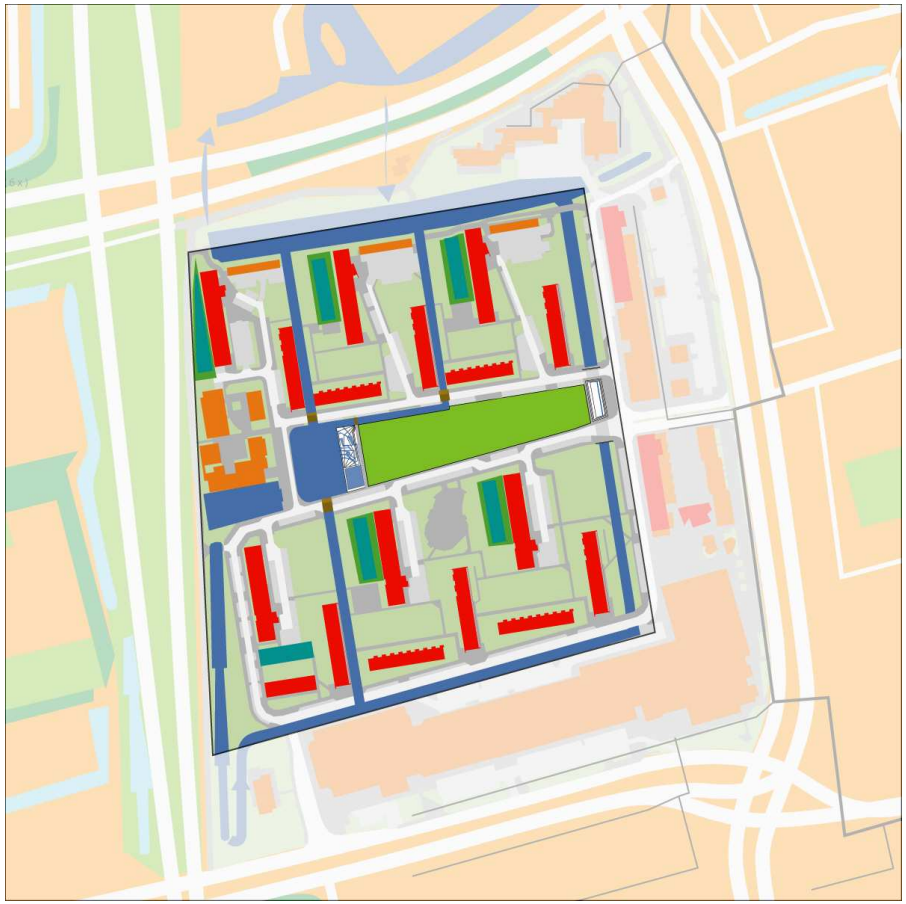


3. Building

1. Neighbourhood scale

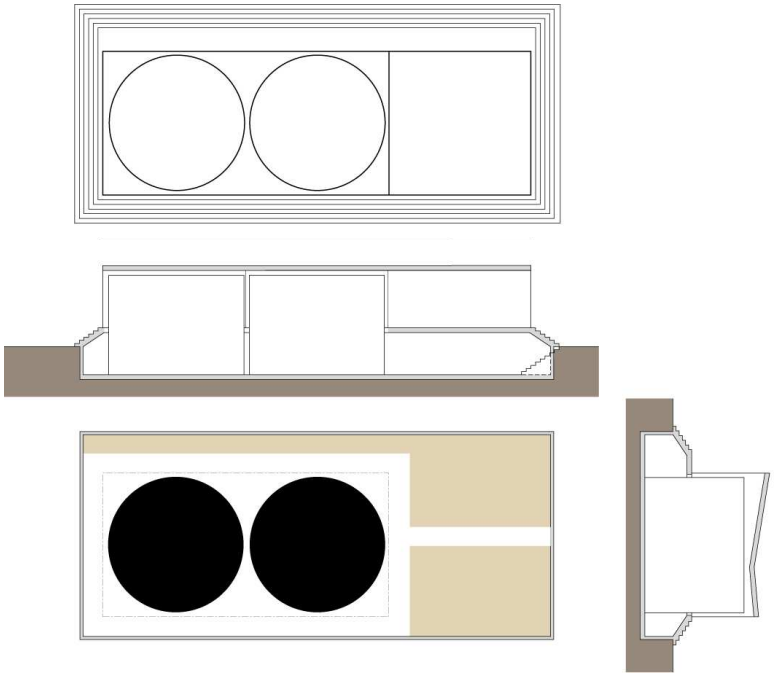


Urban design

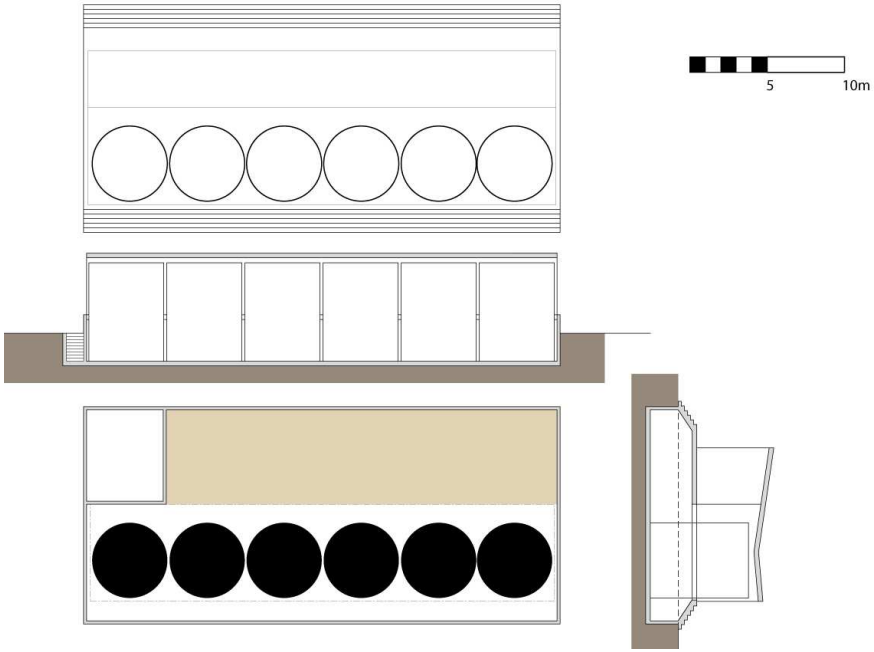


Poptahof – implementation on neighbourhood scale

Treatment facility



1A. Treatment on neighbourhood scale



1B. Treatment on imprint scale – implementation on neighbourhood scale

Pavilion housing the anaerobic digestion unit

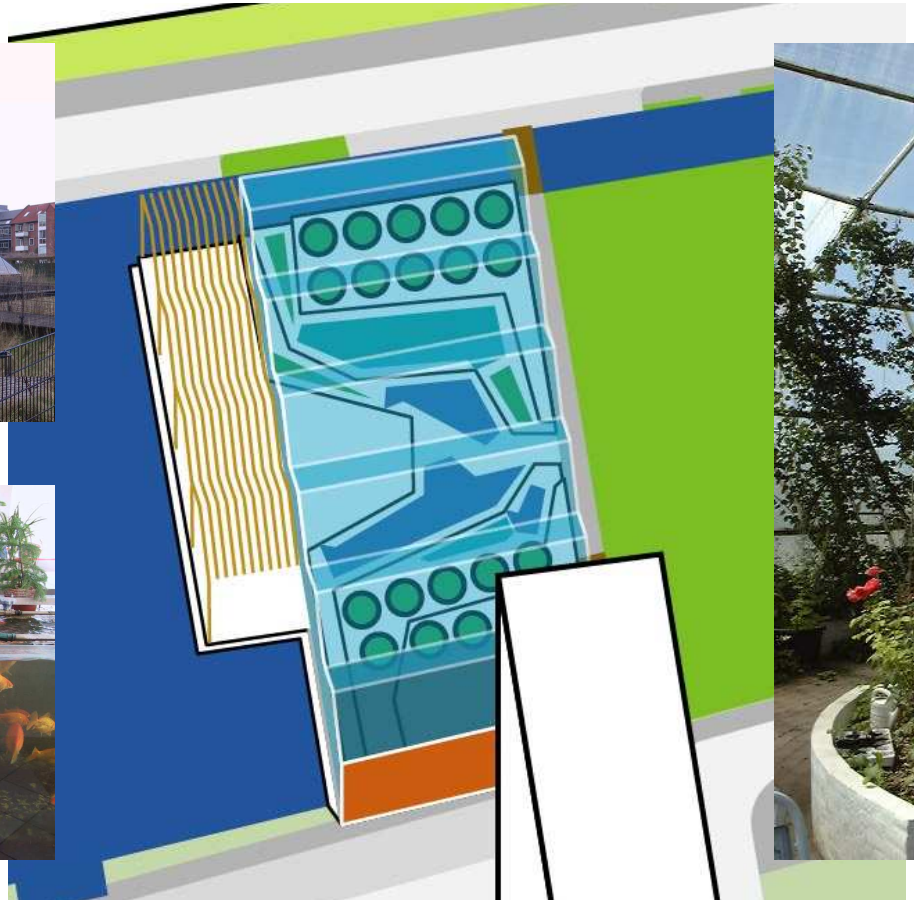
Treatment facility

Marking the entrance & offering facilities (e.g. shop)

Urban design

Alternative - greenhouse as a collective indoor environment

Treatment facility + added function



Alternative - greenhouse as a collective indoor natural environment

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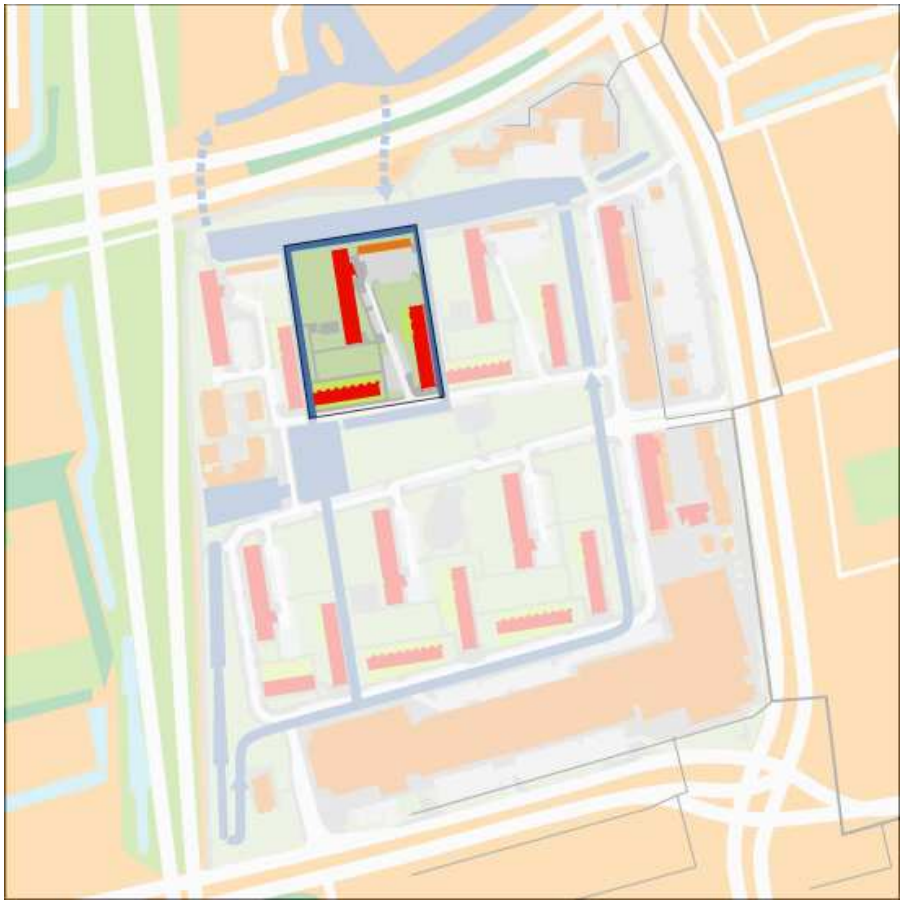
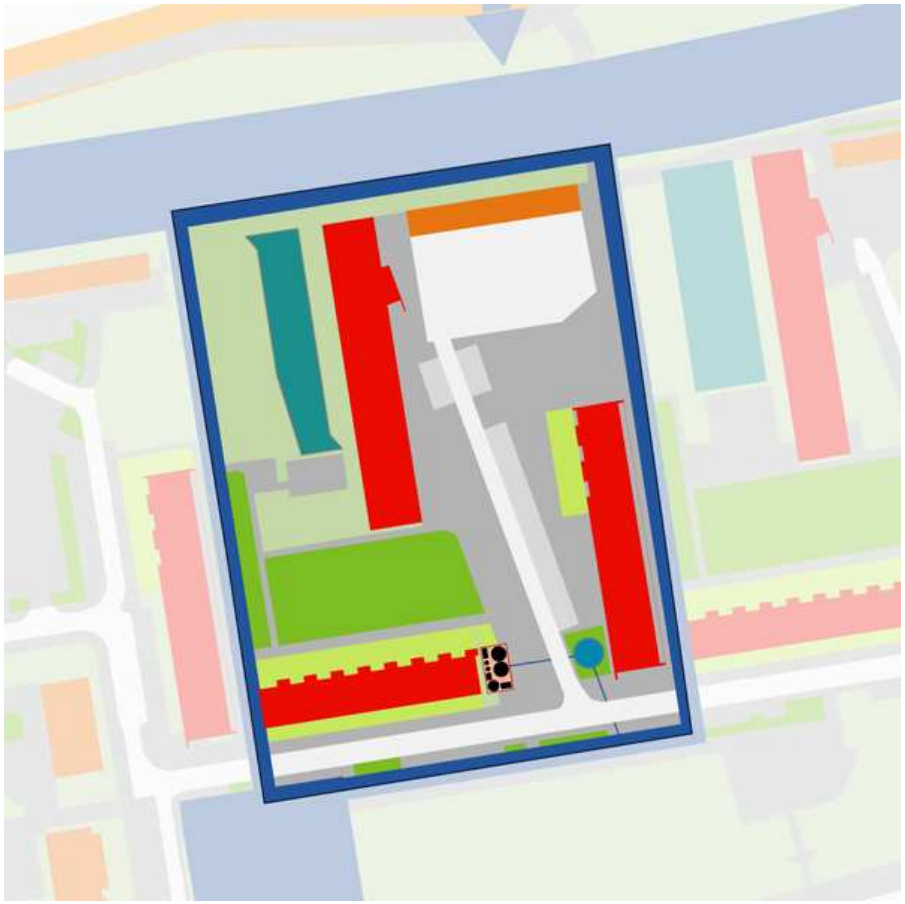
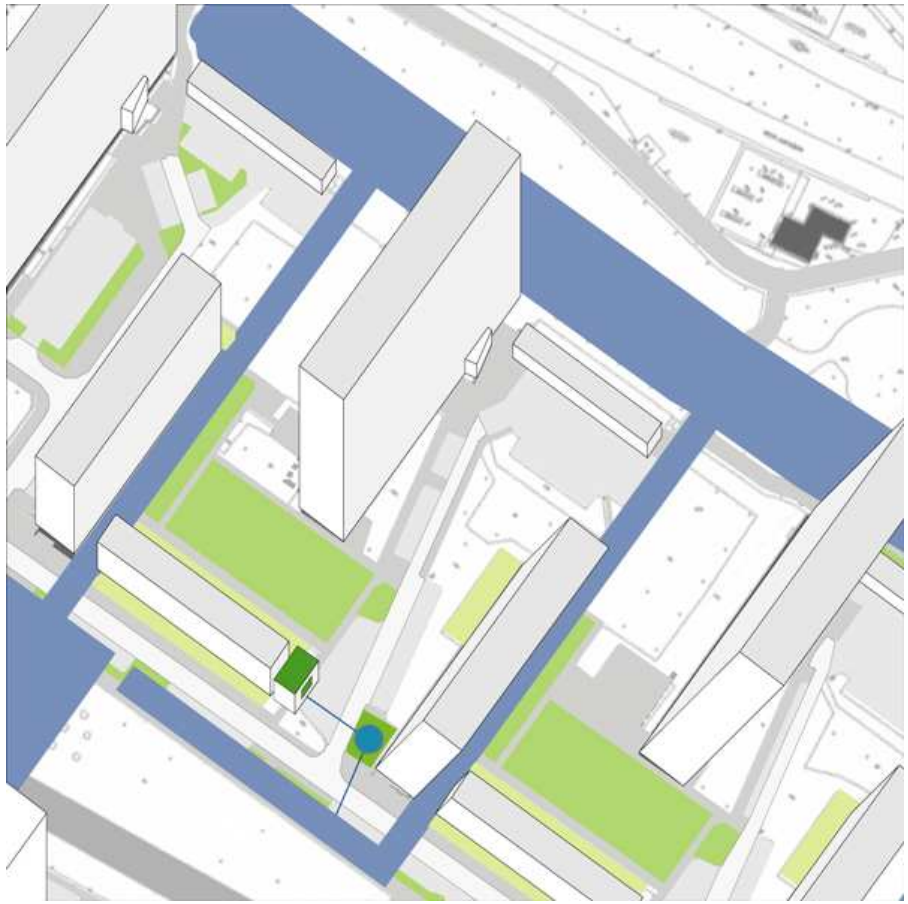
2. Imprint scale



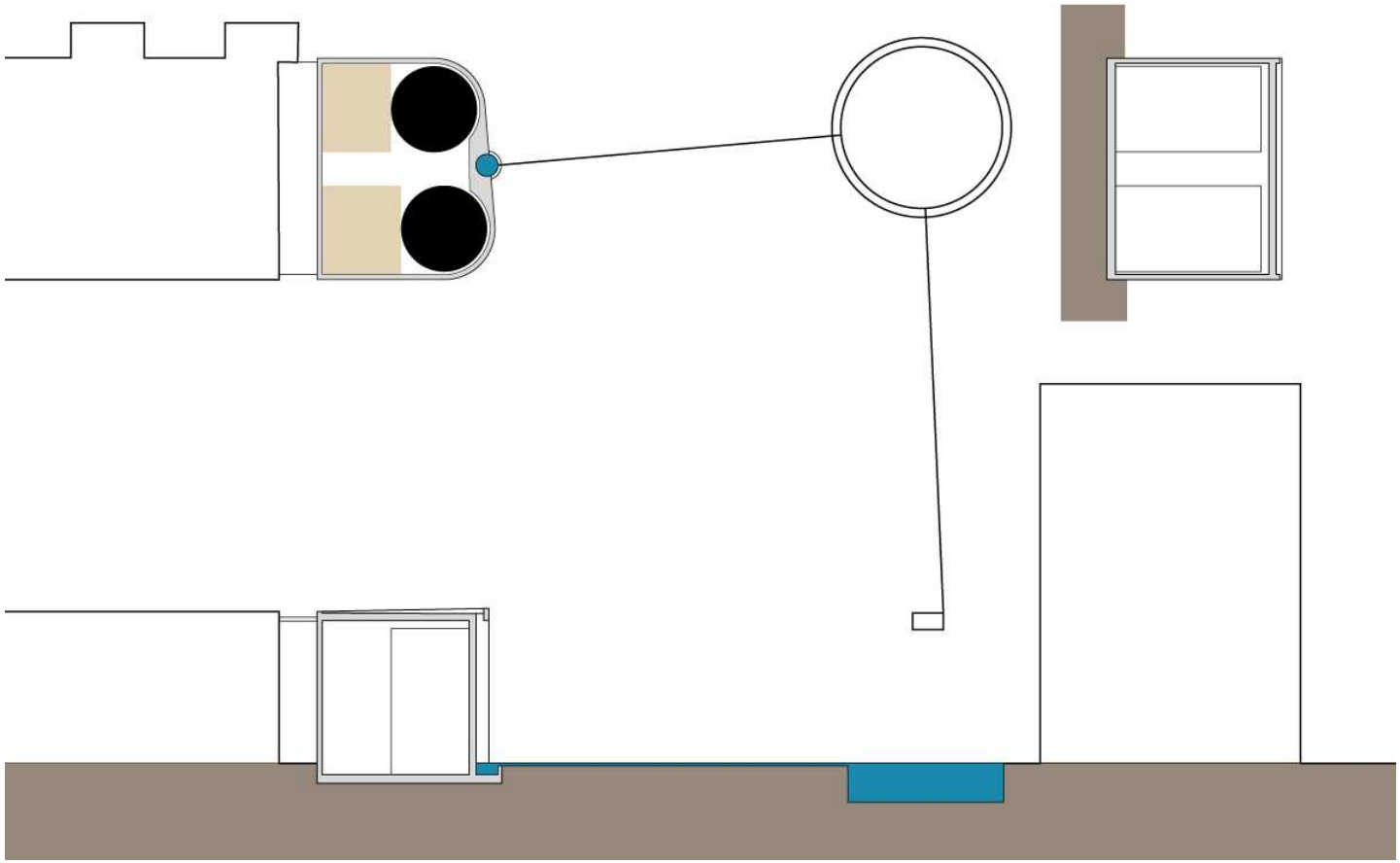
Urban design





Poptahof – implementation on imprint scale

Treatment facility



Anaerobic digestion unit in extension to the terraced housing

Treatment facility

16 februari 2006 - Wageningen

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Marking the entrance - visibly & audibly

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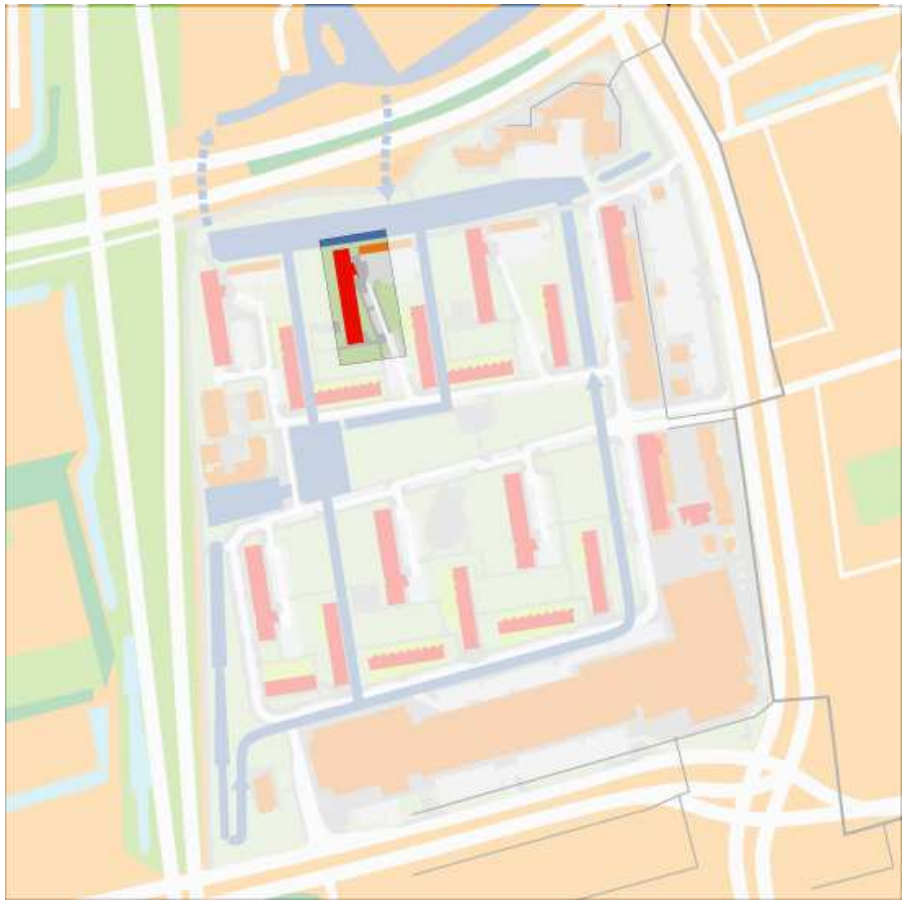
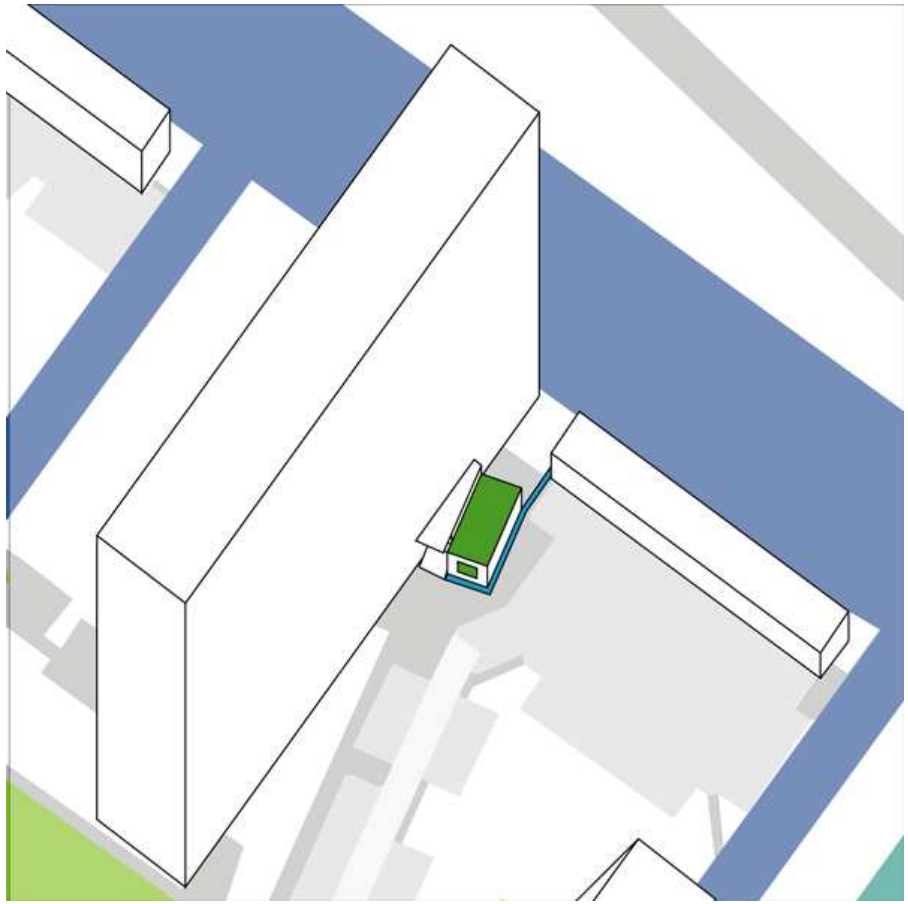
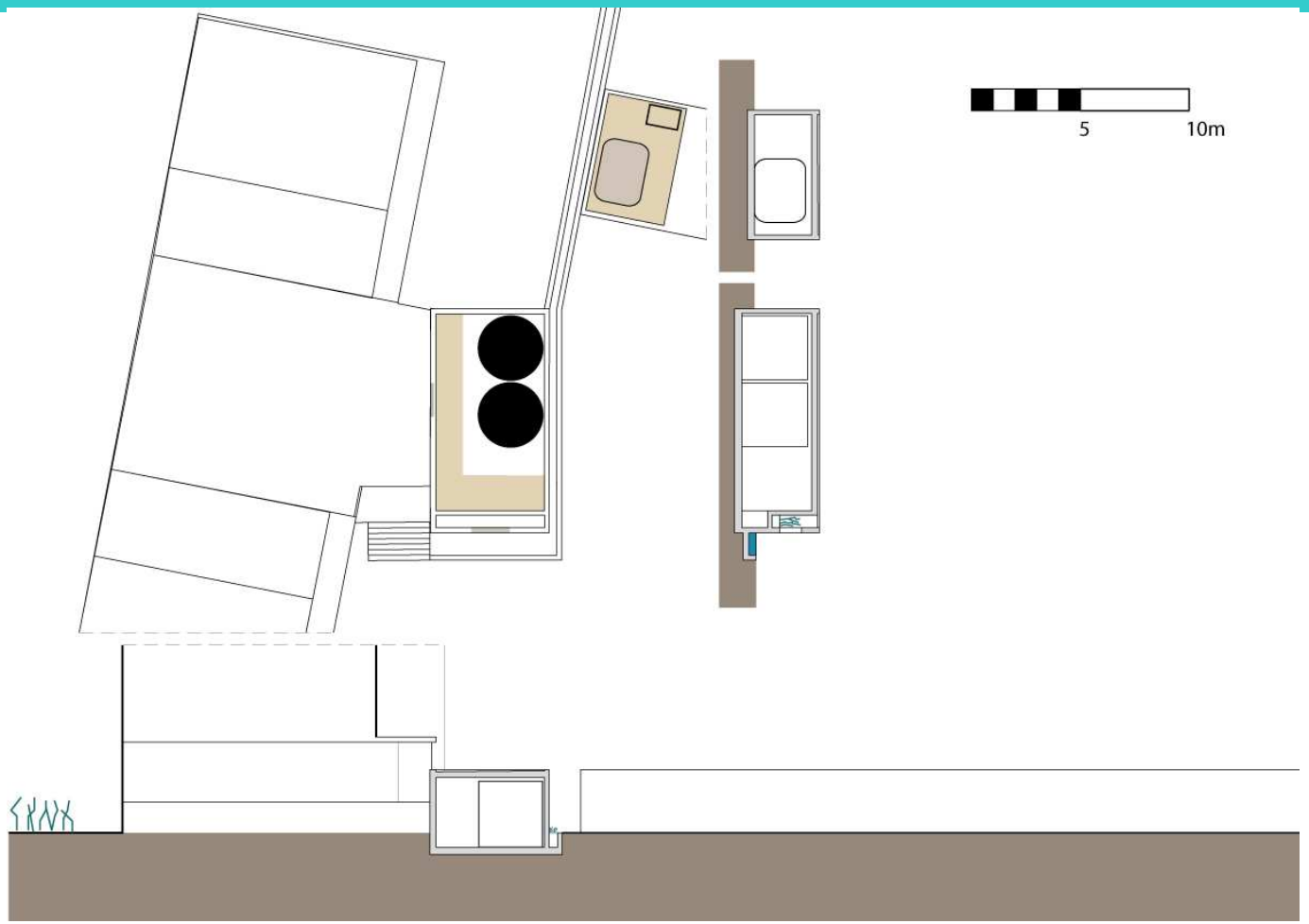
3. Building scale



Urban design



Treatment facility



Anaerobic digestion unit connected to entrance of building

Treatment facility

Poptahof – implementation on building scale

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(visibly, audibly, symbolically)

Spatially accentuating urban lay-out (spatial & social identities)

Local distribution of valuable resources

Offering additional collective facilities / environments

Extrapolation

Post-war housing

– International style

Repetitive elements

Large unbuilt area (79%)

Public space extensively used

Apartment blocks are relatively easy converted

Social problems – design solutions?

Extrapolation

Other areas

Different densities
(not necessarily lower)

Low-rise

In general less outdoor space

Systems integrated in existing buildings or courtyards

Different ownership (public-private)




Extrapolation

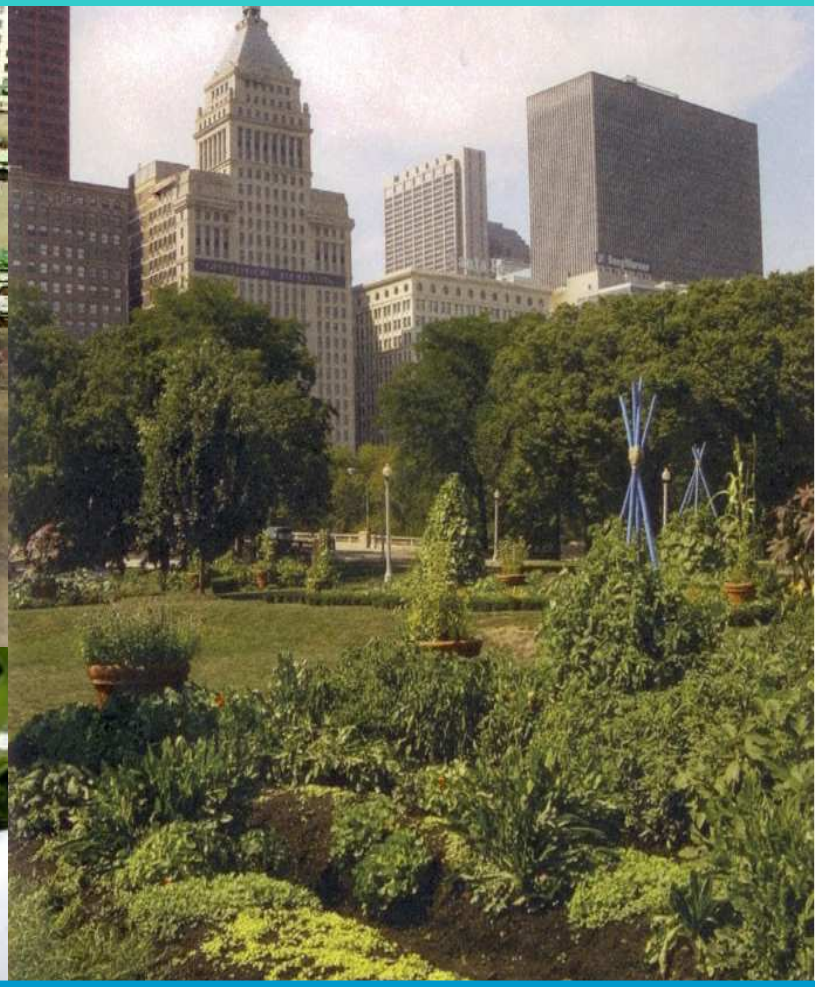
General guidelines

Fitting in the DESAR-system with the overall goals of urban renewal

Implementation in relation to overall urban design

Connect to a local need, demand and/or market for DESAR-products
(distribution of resources: water, biogas, fertilizer)

Public green / urban agriculture



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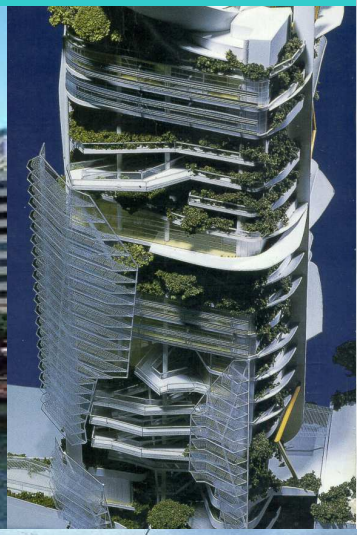
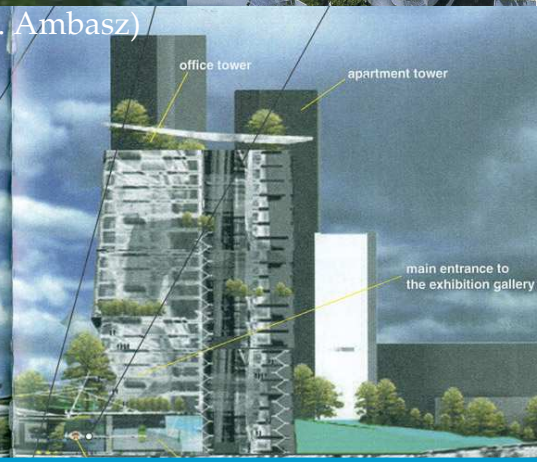
Public green / urban agriculture



ACROS, Fukuoka, Japan (E. Ambasz)



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Suggestions for further study

In the field of urban & architectural design

- Design case studies of implementation of DESAR-systems in pre-war nineteenth century and early twentieth century city districts

- Research into the possibilities for and spatial consequences of using the recovered nutrients locally in the maintenance of public green, production of bio mass and urban agriculture.

- Research into the integration of DESAR systems in double facades and intelligent skins of buildings and possible synergy as for climatisation and system efficiency, specifically in relation to the renovation and re-use of existing buildings.

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Thank you

Paul de Graaf Ontwerp & Onderzoek

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Questions?

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