

31 October 2023

Retrofitting Rotterdam

Sparking incentive for retrofitting intensive-use rooftops in Rotterdam.

Metropolitan Ecologies of Place

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5644190

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2nd Mentor: Machiel van Dorst





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Intensive-use Rooftops

A type of rooftop that forms an integral part of the urban space

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A type of rooftop that forms an integral part of the urban space



why rooftops matter

why they are still empty

a way to change this

how it developed

how it changes the city

Intensive-use Rooftops

A type of rooftop that forms an integral part of the urban space



why rooftops matter

Rooftops offer **space**...

...which is **scarce** in urbanized areas...

...and is needed for a **sustainable** future

sustainable future

sustainable future

Liveability



Climate



Economy



Liveability

How pleasant a City is Experienced to Live in

- Control over Physical Environment
- Control Over Social Interactions
- Physical and Mental Health



Climate

Climate Change **Adaptation**

- Biodiversity
- Heat Stress
- Flooding

Climate Change **Mitigation**

- Reducing Carbon Footprint
- Reducing Consumption



Economy

Economic Balance

- Profitable
- Space for Businesses
- Real Estate Development
- Healthy Balance between these



sustainable future

Liveability



Climate



Economy



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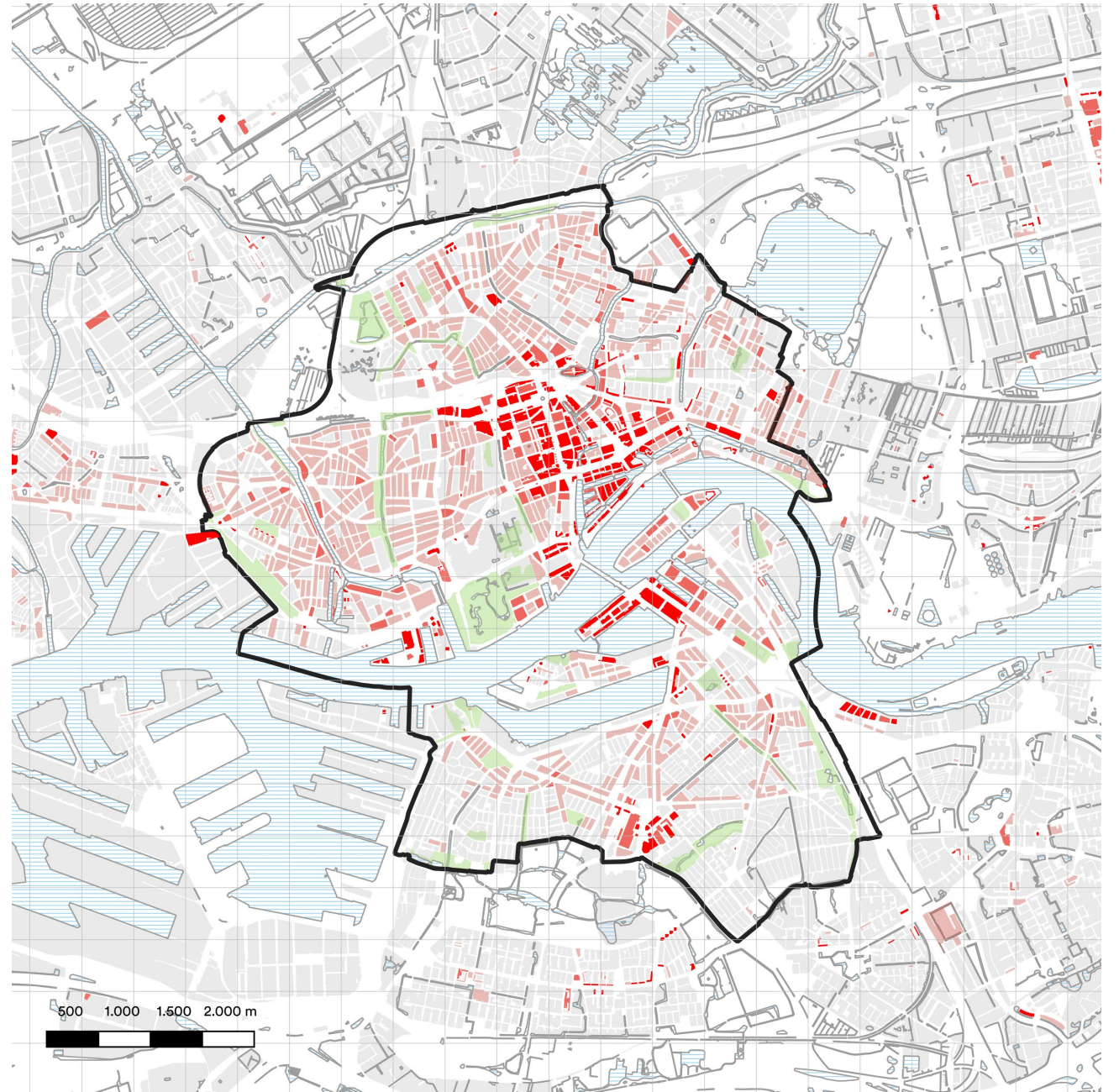
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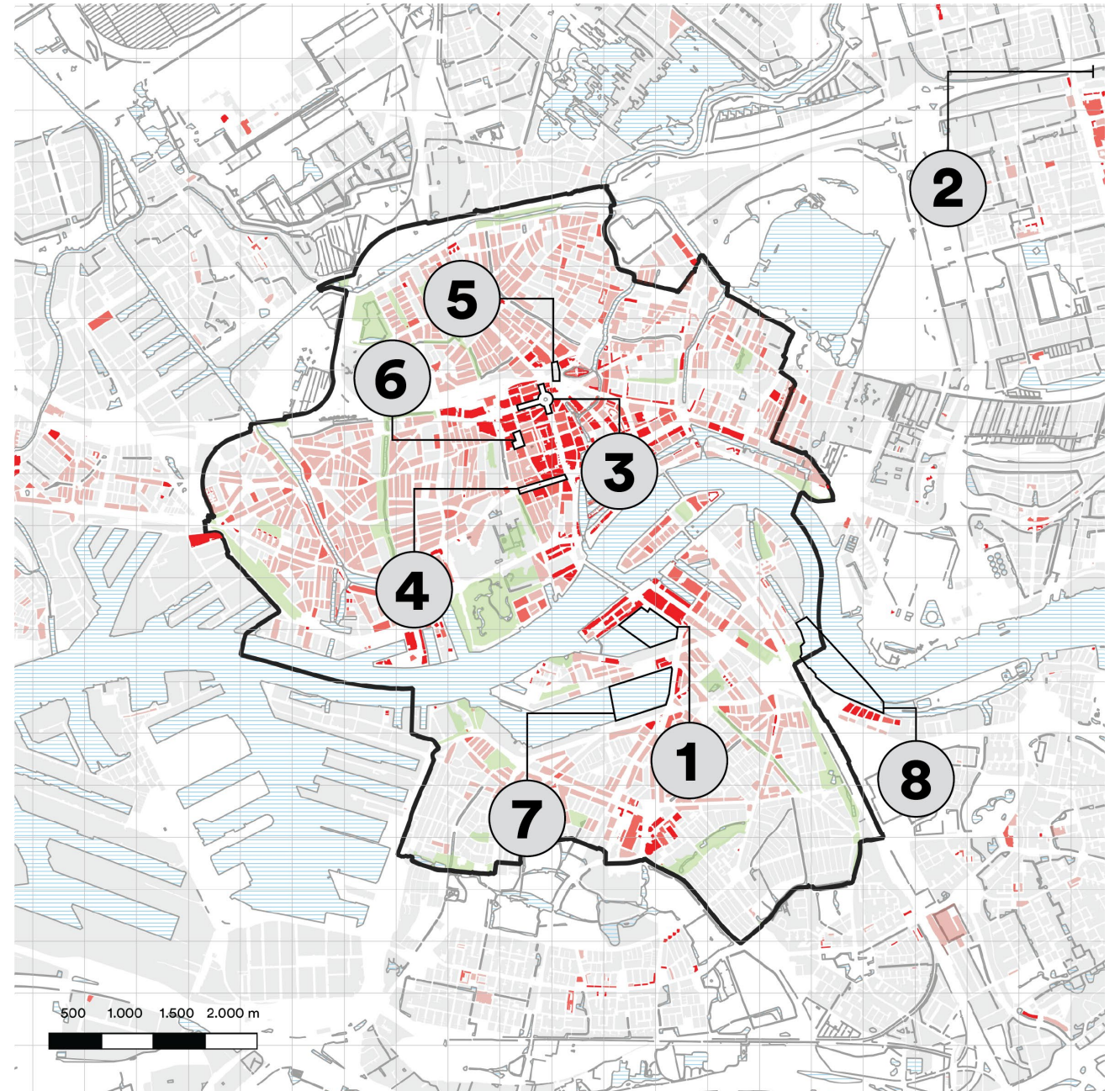
...and is needed for a **sustainable** future





Good and Smart Growth

1.





Good and Smart Growth

€55.000.000,-

Intensifying space
by adding functionality

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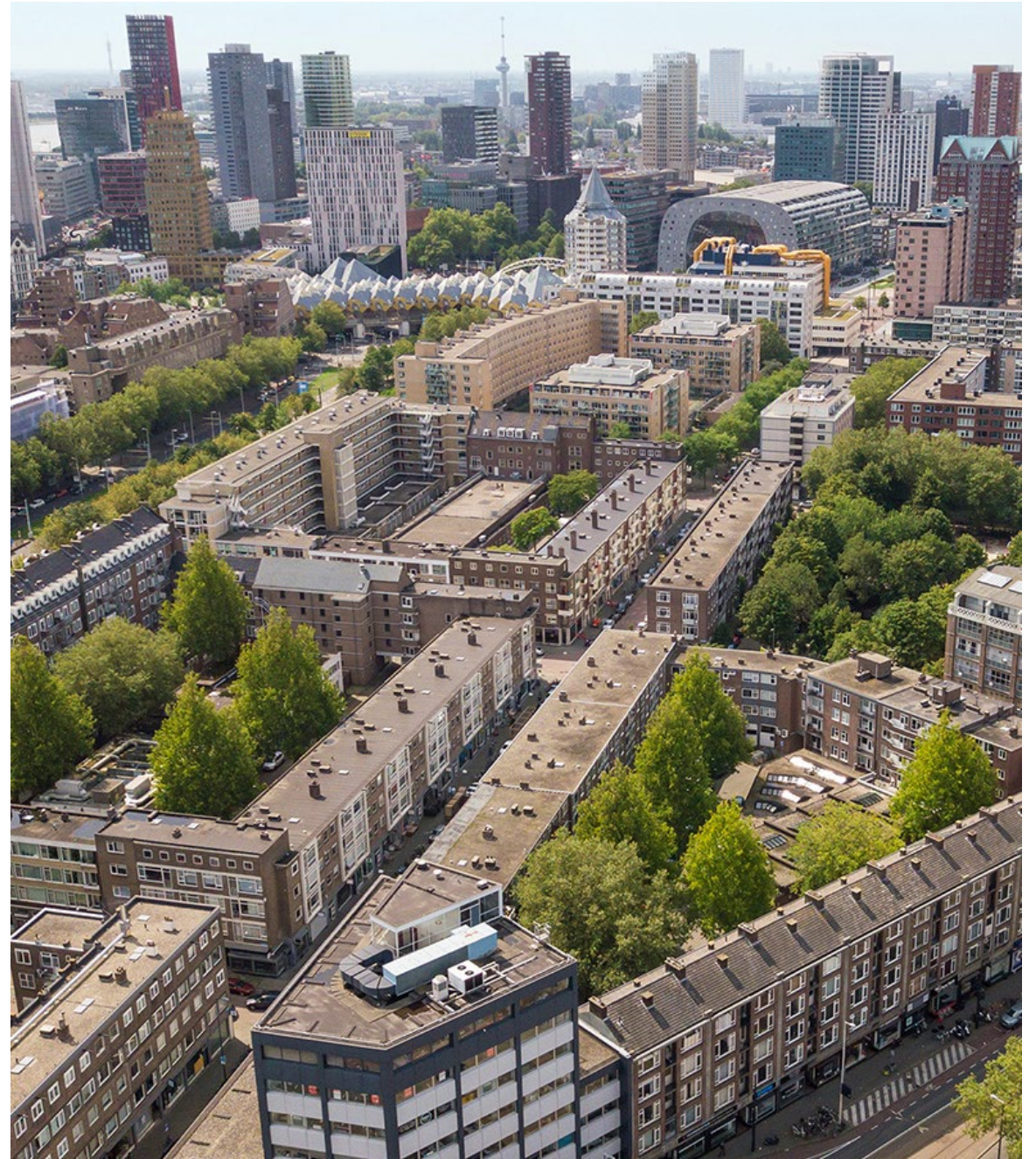
Intensifying space
by adding functionality

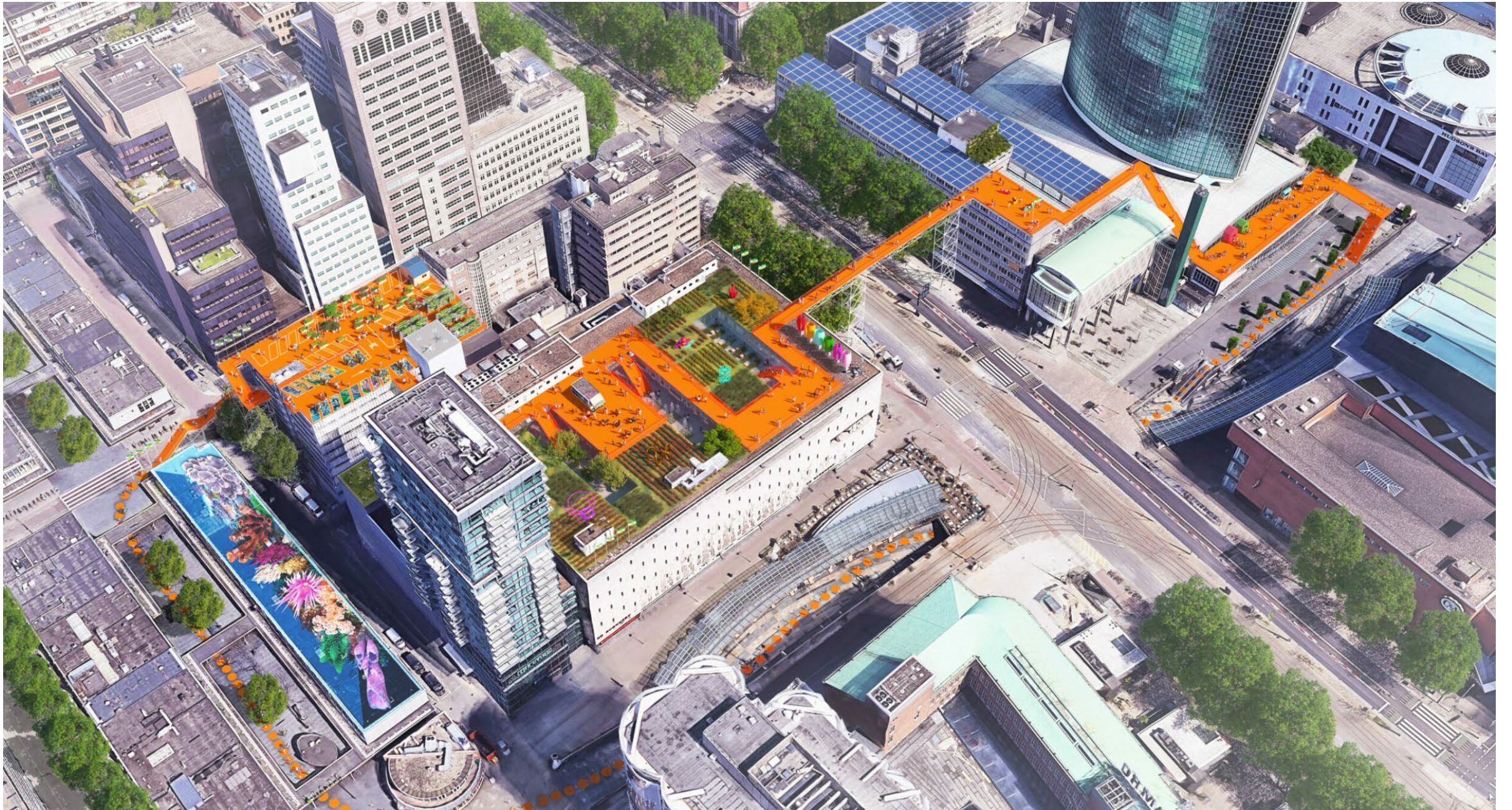


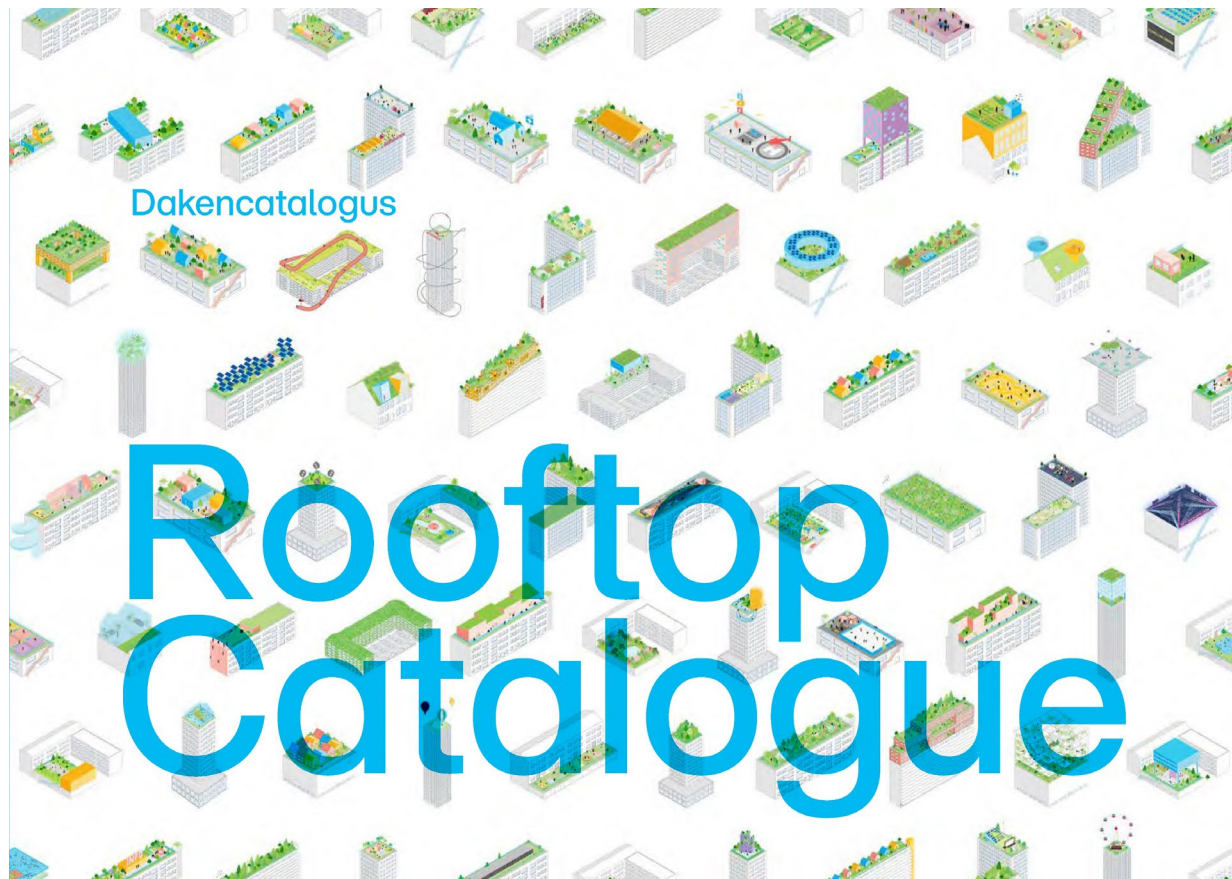
Intensifying space

by adding functionality

~29km²



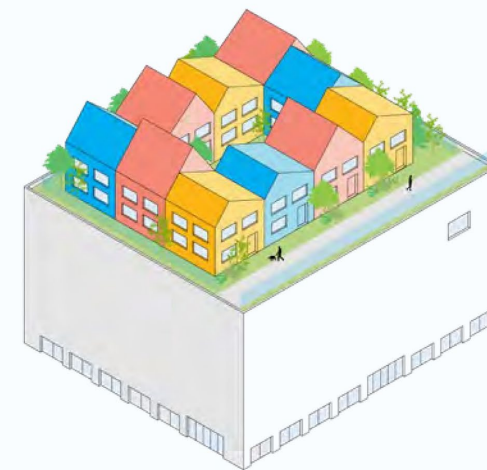




Neighbourhood

A whole new neighbourhood can be added to a large rooftop area: an ensemble of homes with a community courtyard garden and private gardens along the edge.

Buurt Op een dak met een groot oppervlak kan een hele nieuwe buurt toegevoegd worden. Een ensemble van woningen met een gemeenschappelijke binnentuin en private tuinen aan de rand.



Types of rooftops
Type dak



Building typologies
Gebouwtypologieën



UN Sustainable
Development Goals



Urban challenges
Stedelijke opgave







Social Function

Parks, Gardens



Clean Energy

Solar Panels, Wind



Green

Nature, Biodiversity



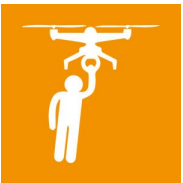
Water

Storage, Flood Prevention



Housing

Extra housing layers



Mobility

Drone Hubs



Utility

Air Conditioning, Batteries





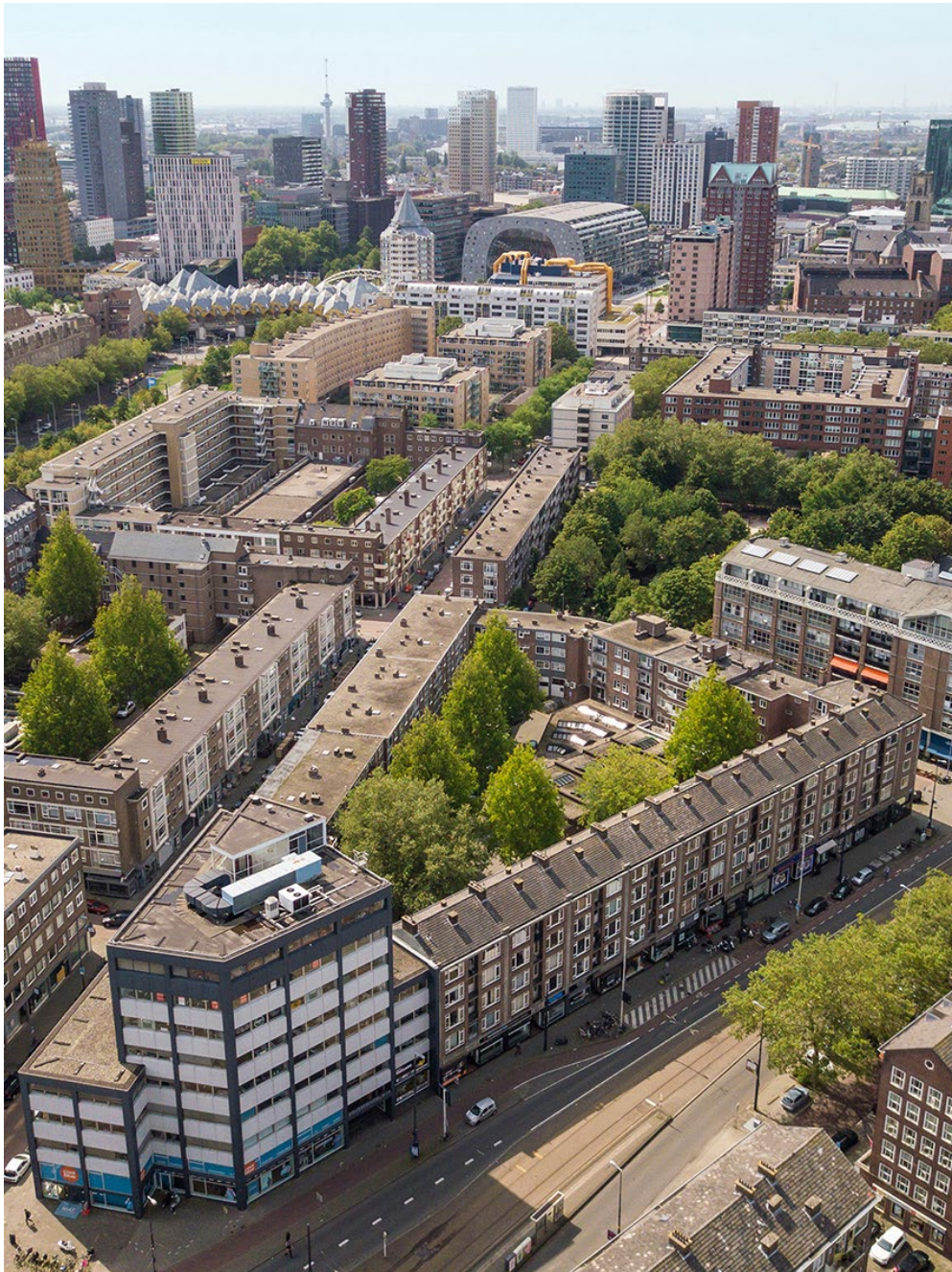
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why they are still empty

a way to change this

how it developed

how it changes the city



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Rooftops are **costly**...

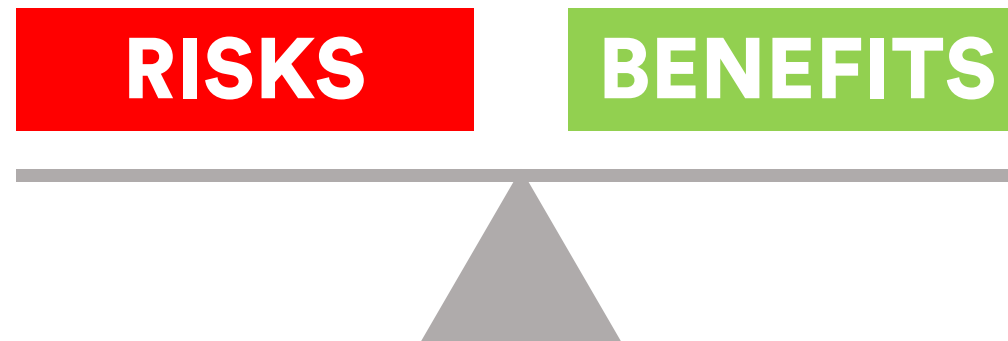
...stakeholders have different **ideals**...

...and finding **synergies** is difficult

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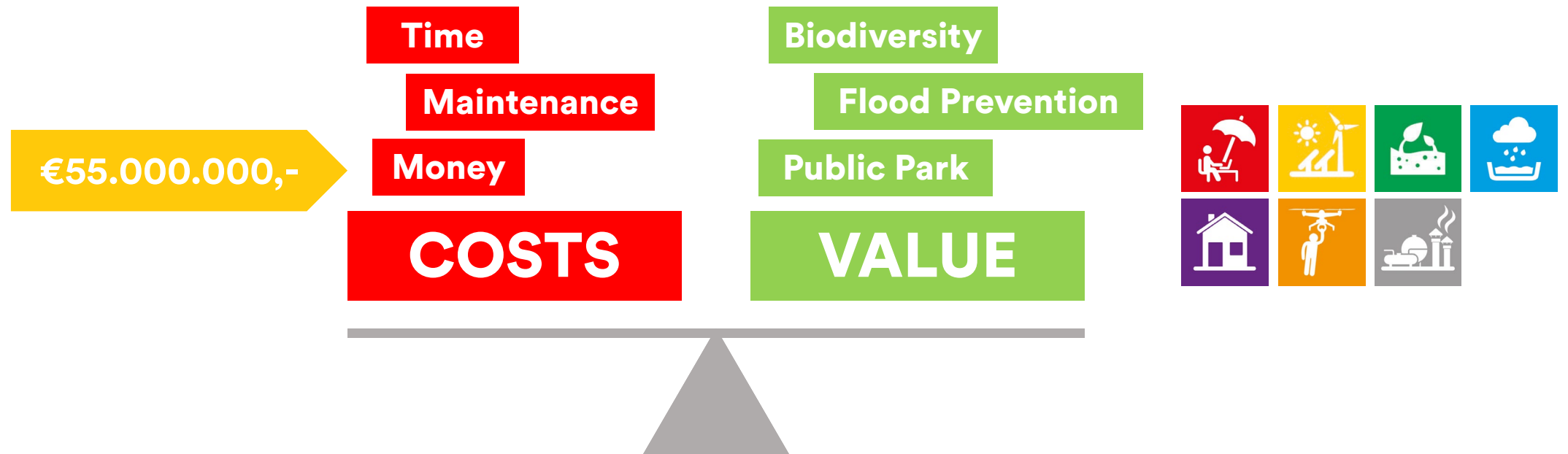
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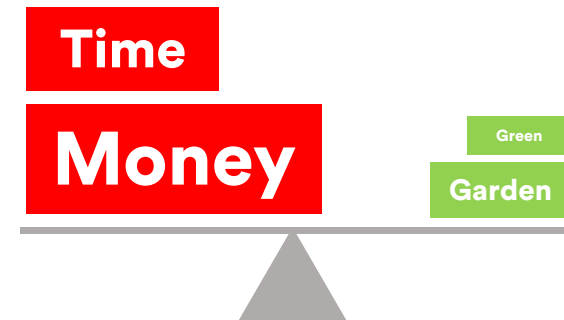
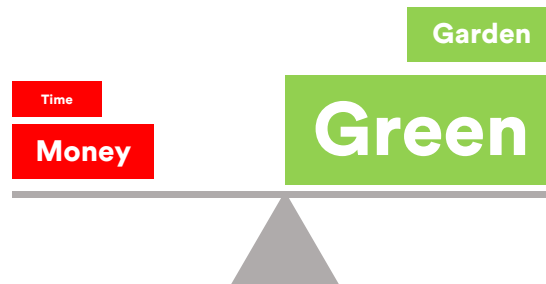
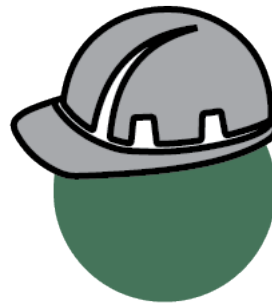
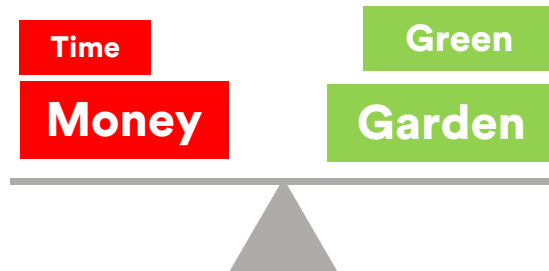
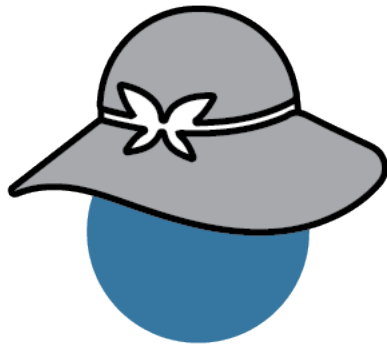
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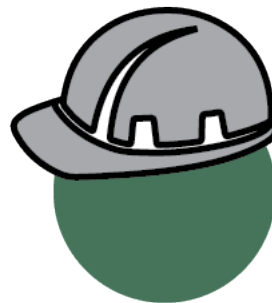
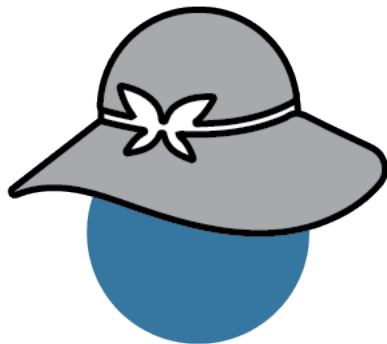
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Rooftops are **costly**...

...stakeholders have different **ideals**...

...and finding **synergies** is difficult



Money

Cost of a solar panel

vs

Money

Cost of Energy saved

Clean Energy





Money
Construction Costs

vs

Liveability
Of the added gardens

Biodiversity

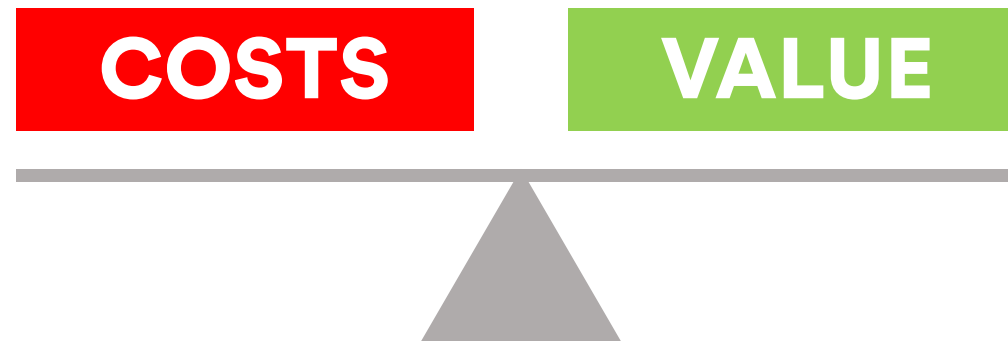
Flood Prevention

Social Cohesion

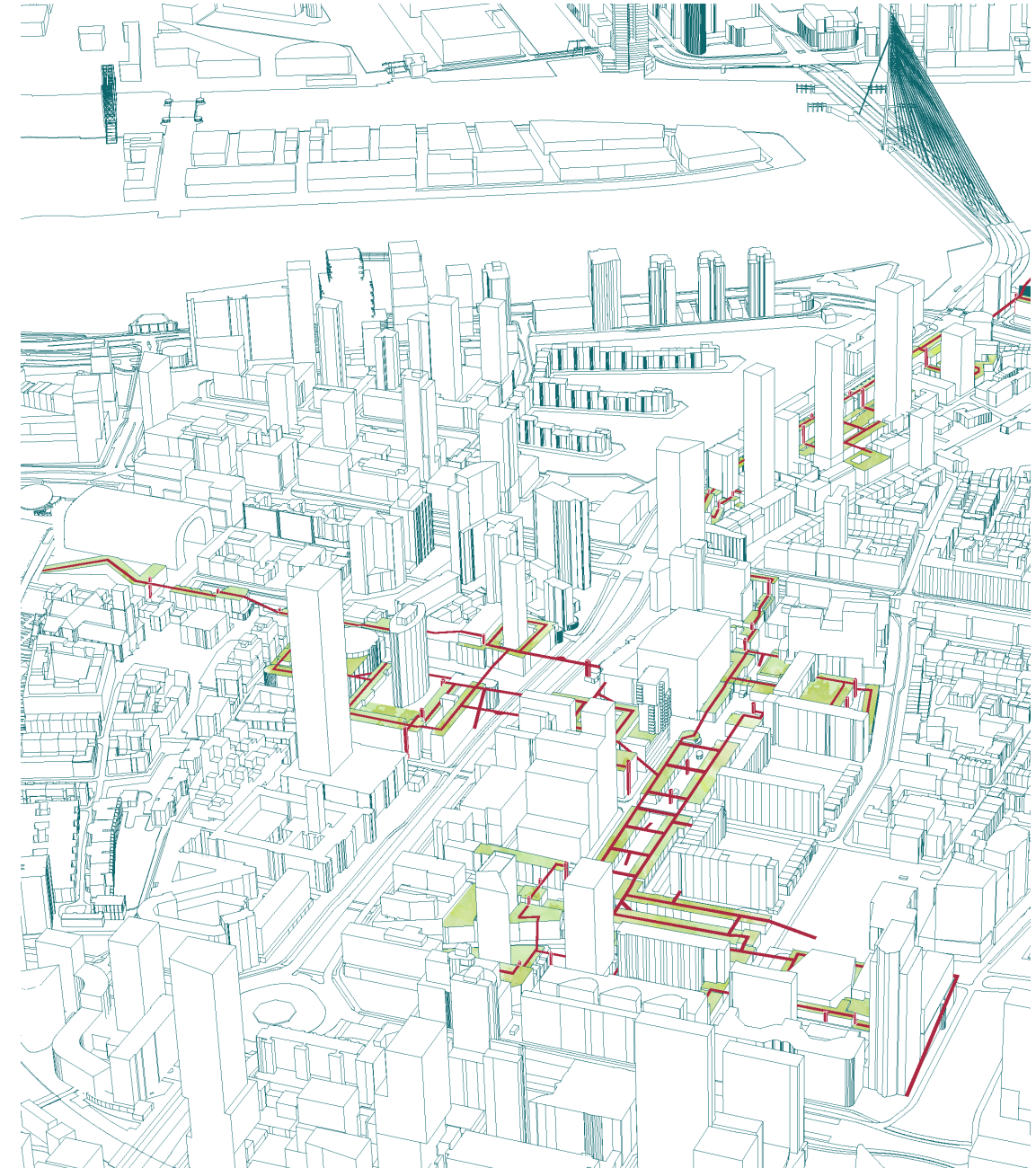
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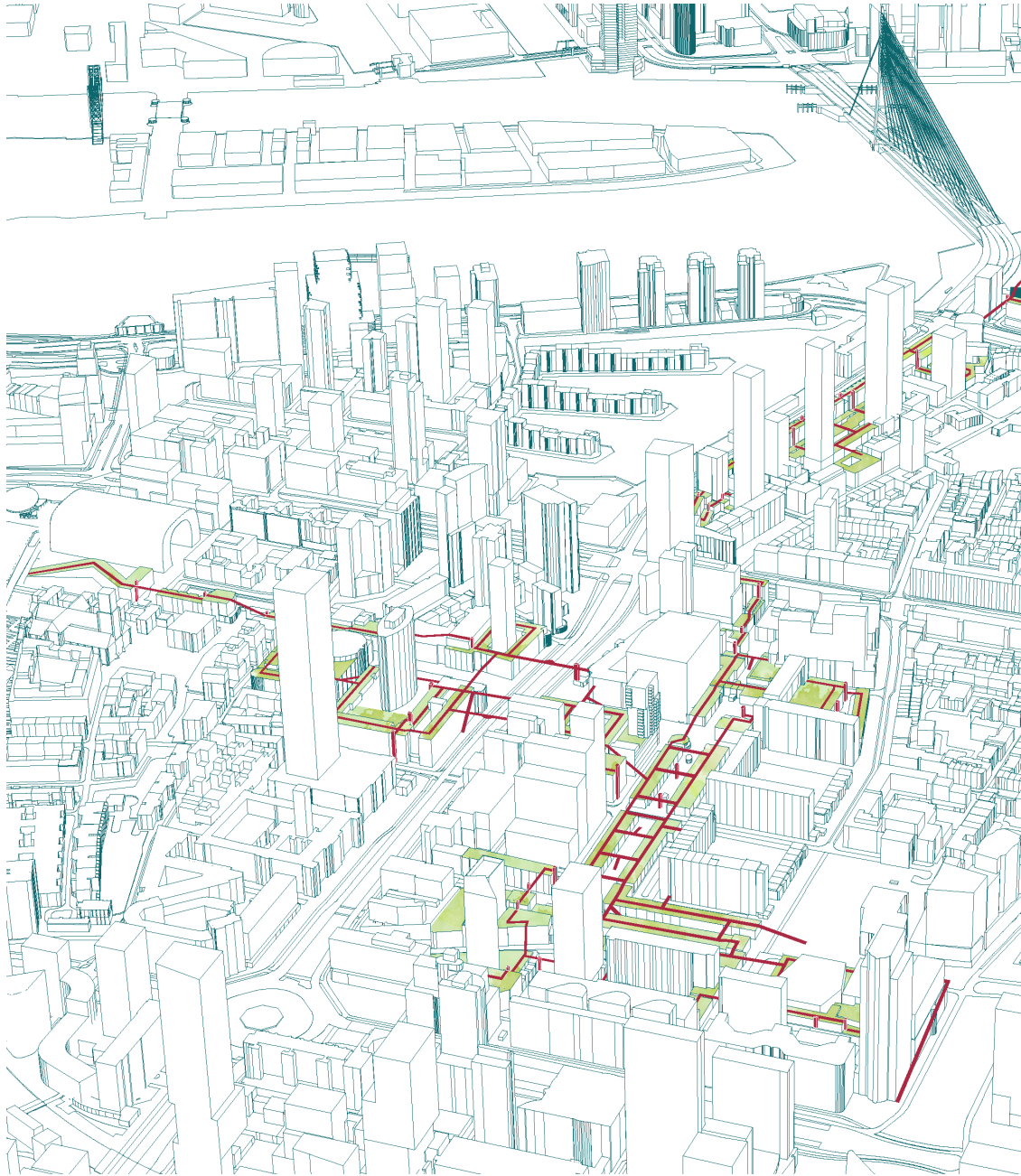
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Top-Down Approach

Planners, Municipalities and Housing Corporations

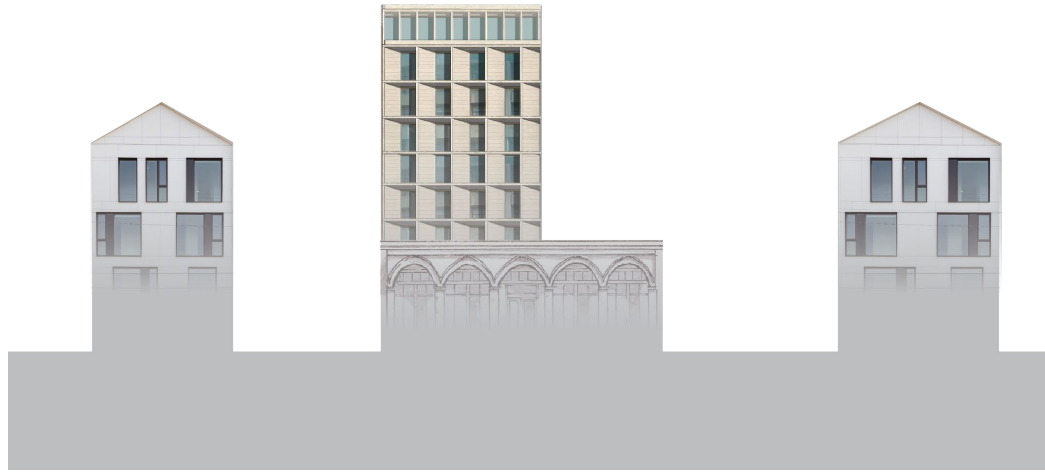


Bottom-Up Approach

Users, Independent Investors and Owners

Top-Down Approach

Planners, Municipalities and Housing Corporations



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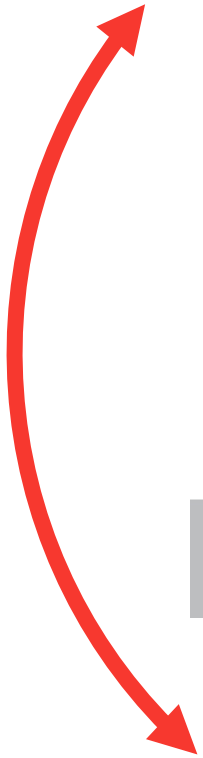
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Large Scale Needs



Individual Needs

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Communicate

Clarifying what the options and their consequences are

Contextualise

Being able to **adapt** to different stakeholders, building types and surroundings

Cooperate

Creating a tool for cooperation that helps to find **synergies**

Garden

Living Rooftop

p.07



Key Values:

stormwater retention

living space

outdooring

insulation

Garden

Living Rooftop

p.07



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stormwater retention

living space

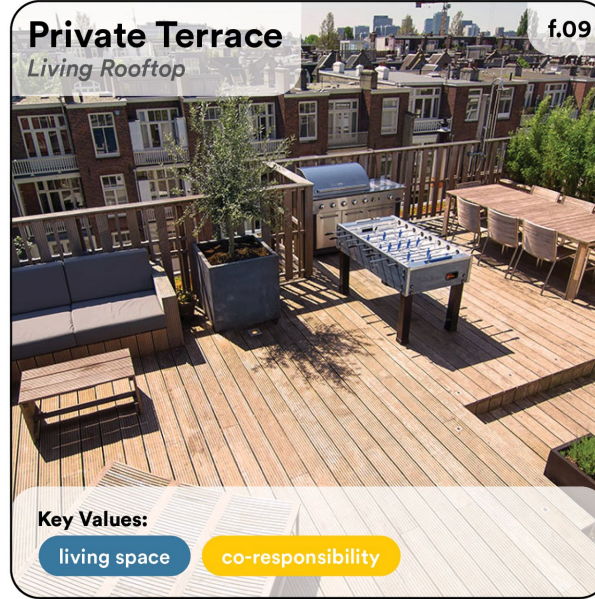
outdooring

insulation

Private Terrace

Living Rooftop

f.09



Key Values:

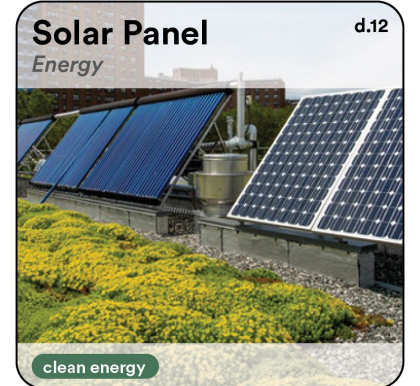
living space

co-responsibility

Solar Panel

Energy

d.12

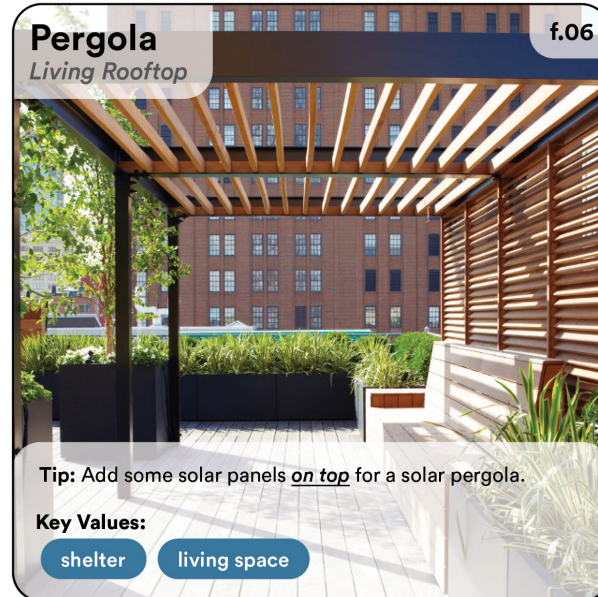


clean energy

Pergola

Living Rooftop

f.06



Tip: Add some solar panels on top for a solar pergola.

Key Values:

shelter

living space

Planter Boxes

Outdoor Leisure

d.21




Tip: Place around the edges for a green safety barrier!

outdooring

attractivity

Garden
Living Rooftop

p.07

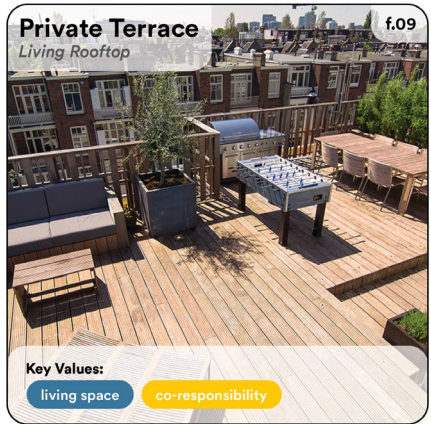


Key Values:

- stormwater retention
- living space
- outdooring
- insulation

Private Terrace
Living Rooftop

f.09

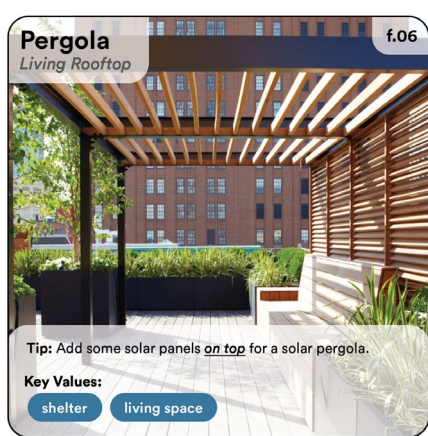


Key Values:

- living space
- co-responsibility

Pergola
Living Rooftop

f.06



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Key Values:

- shelter
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Solar Panel
Energy

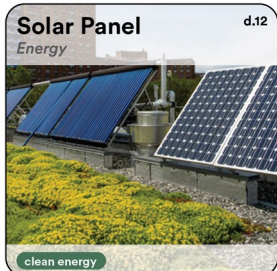
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clean energy

Solar Panel
Energy

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Planter Boxes
Outdoor Leisure

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Garden

Living Rooftop

p.07



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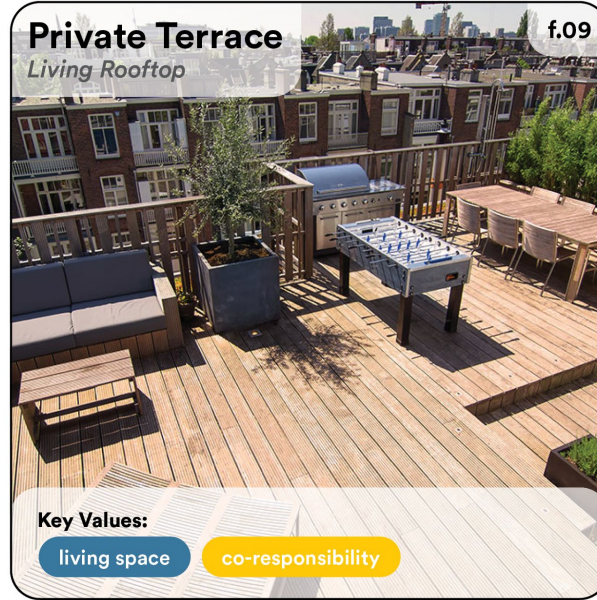
outdooring

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Living Rooftop

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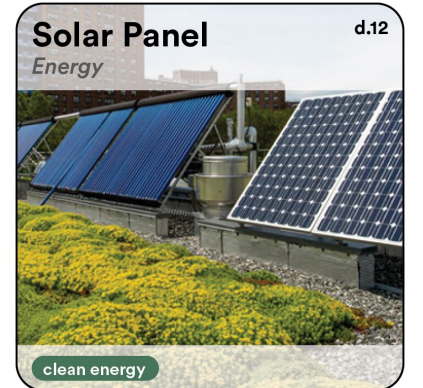
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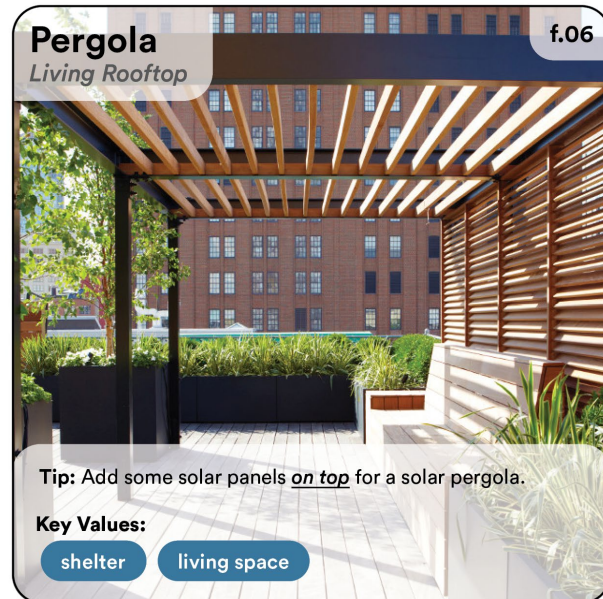


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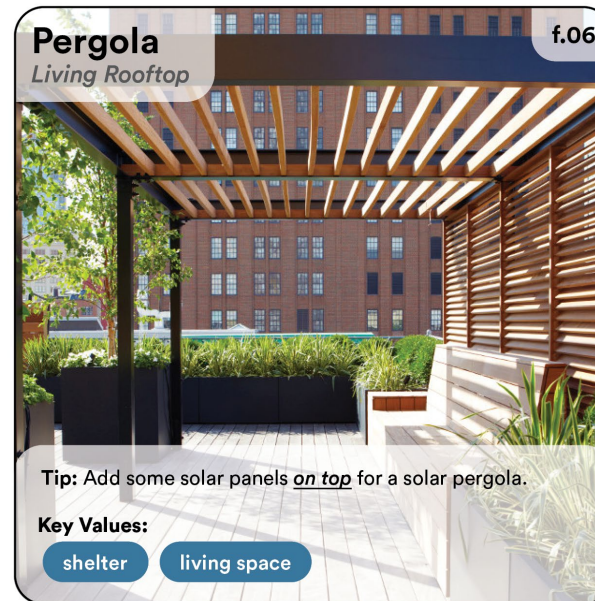
outdooring

attractivity



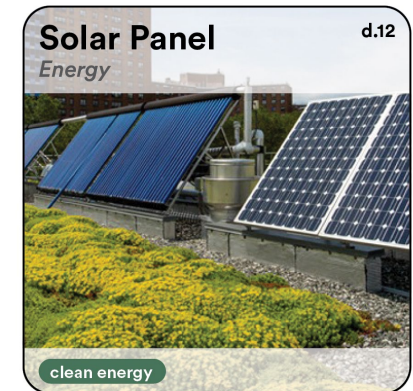
Programme

Main function of the Rooftop



Feature

Large elements with a function



Detail

Small Elements



Garden

Living Rooftop

p.07



Key Values:

stormwater retention

living space

outdooring

insulation



Liveability

cooling

exercise

living space

outdooring

shelter

social space

Climate

clean energy

food production

native ecology

rain harvesting

stormwater retention

urban nature

Economy

attractivity

co-responsibility

home extension

insulation

profitable space

Garden

Living Rooftop

p.07



Key Values:

stormwater retention

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outdooring

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Garden

p.07

A garden is an accessible green space for residents to enjoy. It can be used as a space for gardening or urban farming, outdoor recreation or socializing with friends and neighbours.

Technical Aspects

Structural Requirement



Costs



Depending on the type of substrate and vegetation, the structural requirements may be different.

Synergies

- Combine with a **Terrace** for a great living space.
- Add types of vegetation like a **Lawn, Trees, Herbs & Bushes** or **Planters**.

Garden

Living Rooftop

p.07



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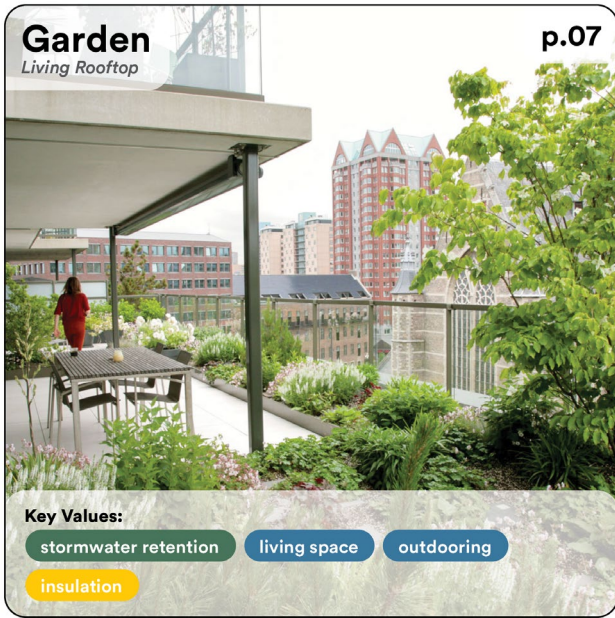
insulation

Showcase

What kind of designs can we make with the patterns?

Garden
Living Rooftop

p.07

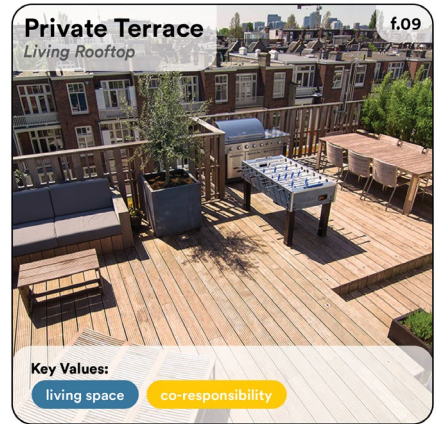


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Private Terrace
Living Rooftop

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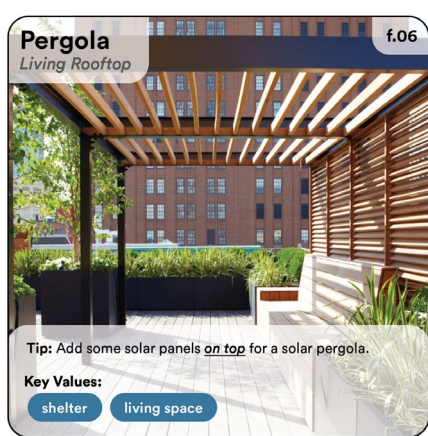


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Living Rooftop

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Energy


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clean energy

Solar Panel
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Planter Boxes
Outdoor Leisure

d.21



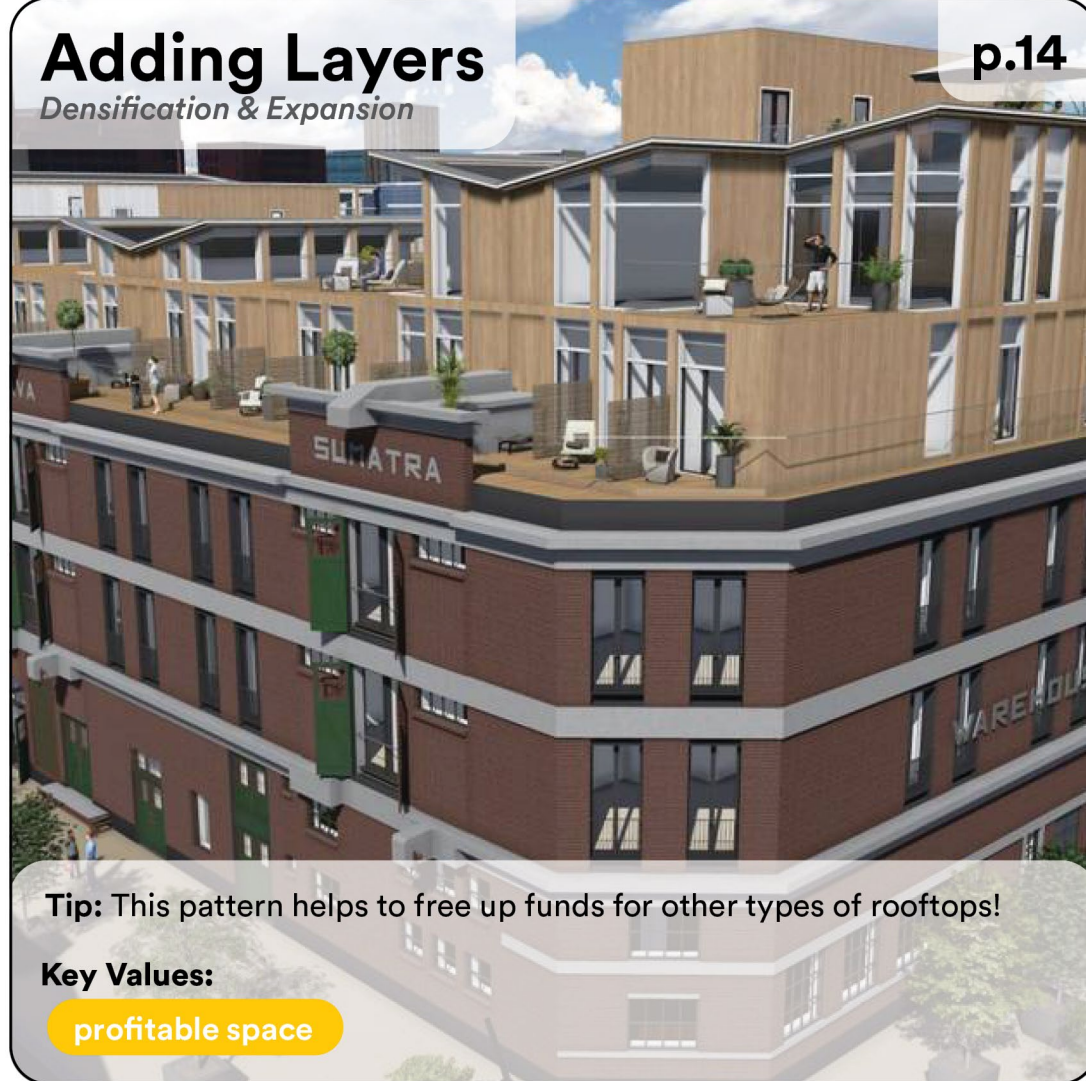
Tip: Place around the edges for a green



Adding Layers

Densification & Expansion

p.14



Tip: This pattern helps to free up funds for other types of rooftops!

Key Values:

profitable space

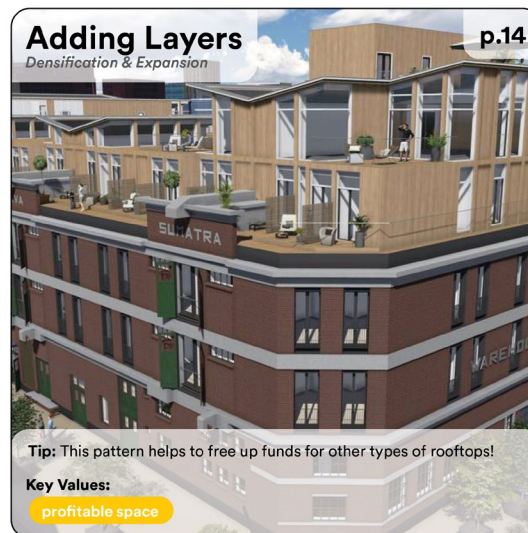
Adding Layers p.14
Densification & Expansion



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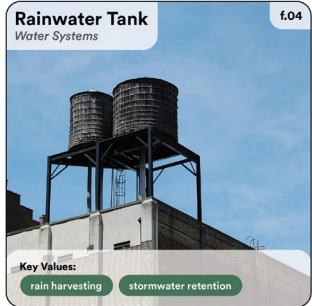
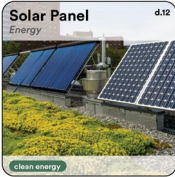
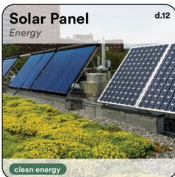
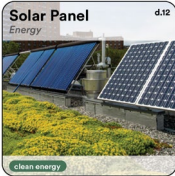
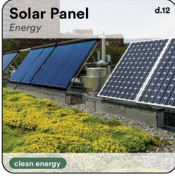
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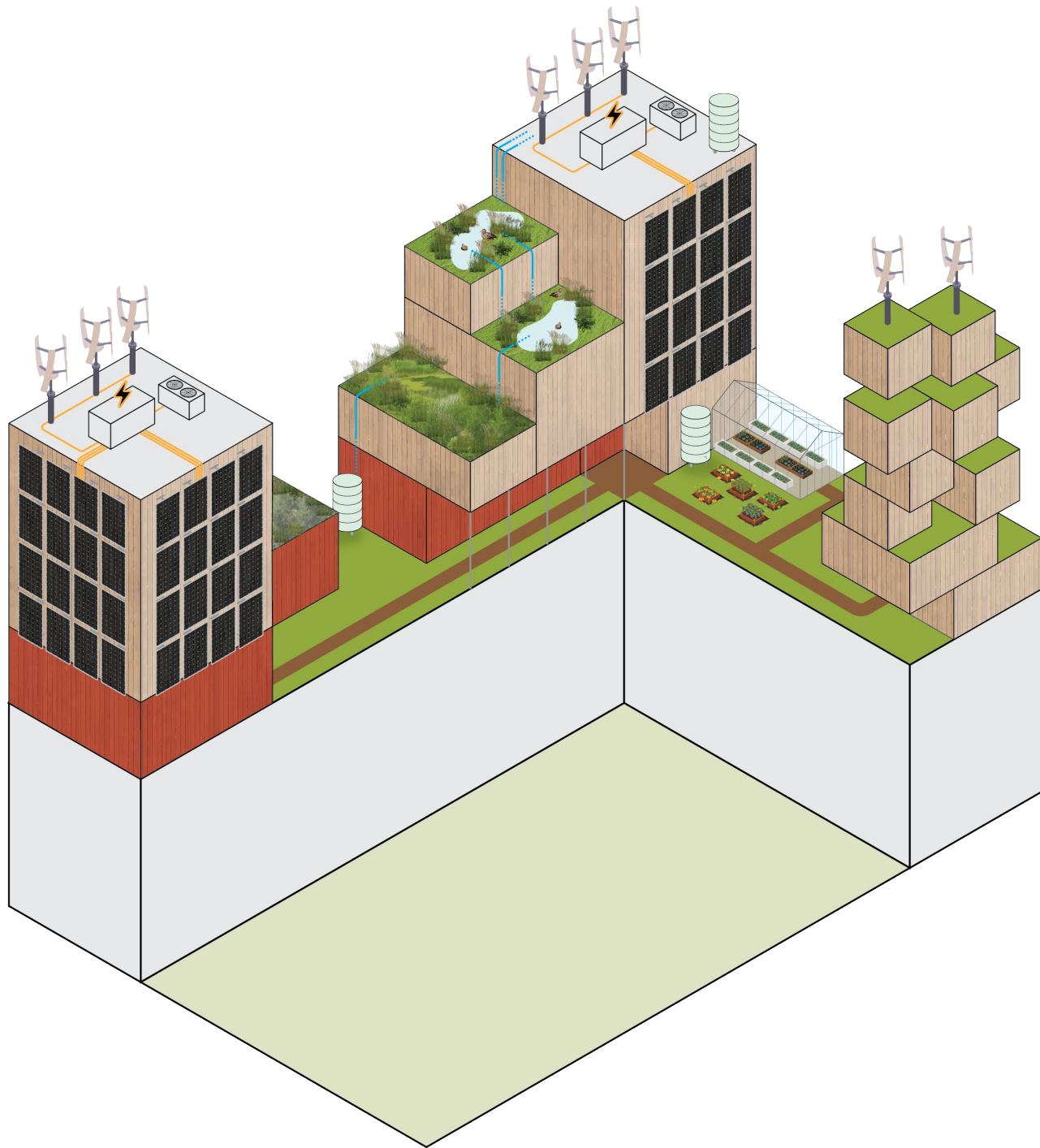
Adding Layers p.14
Densification & Expansion



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Key Values:
profitable space





Adding Layers
Densification & Expansion p.14

Tip: This pattern helps to free up funds for other types of rooftops!

Key Values:
profitable space

Powernest
Energy

Key Values:
clean energy profitable space

Solar Panel
Energy d.12

clean energy

Solar Panel
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Energy d.12

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Energy d.12

clean energy

Adding Layers
Densification & Expansion p.14

Tip: This pattern helps to free up funds for other types of rooftops!

Key Values:
profitable space

Polder Roof
Water Systems

Key Values:
stormwater retention

Adding Layers
Densification & Expansion p.14

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profitable space



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S.01 Nesting and Resting



RELATED TOPICS
 U: Mental Health
 S: Green
 E:

PRACTICAL IMPLICATIONS
 Placing nests and foliage on rooftops, or hanging bird houses on facades. etc.etc.

ROLE OF USER
 Waking up with the sound of singing birds can provide a bit of relief and relaxation for the users, which can be beneficial for the mental health of the residents.

ROLE OF SOCIETY
 Creating small habitats for [specific_bird] can help to restore their population and strengthen the ecosystem.

ROLE OF ENTERPRISE
 The intervention can be performed without investment or interference, and can be left to the residents.

Creating [specific_bird] habitats on rooftops and facades for bird species.

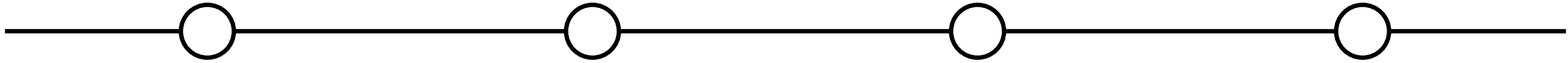
SYNERGIES: U.03 / E.04 / S.17 / S.19

U S E

Garden p.07
 Living Rooftop



Key Values:
 stormwater retention living space outdoor
 insulation




Urban Farm / Garden

Blue Durability Green Heat

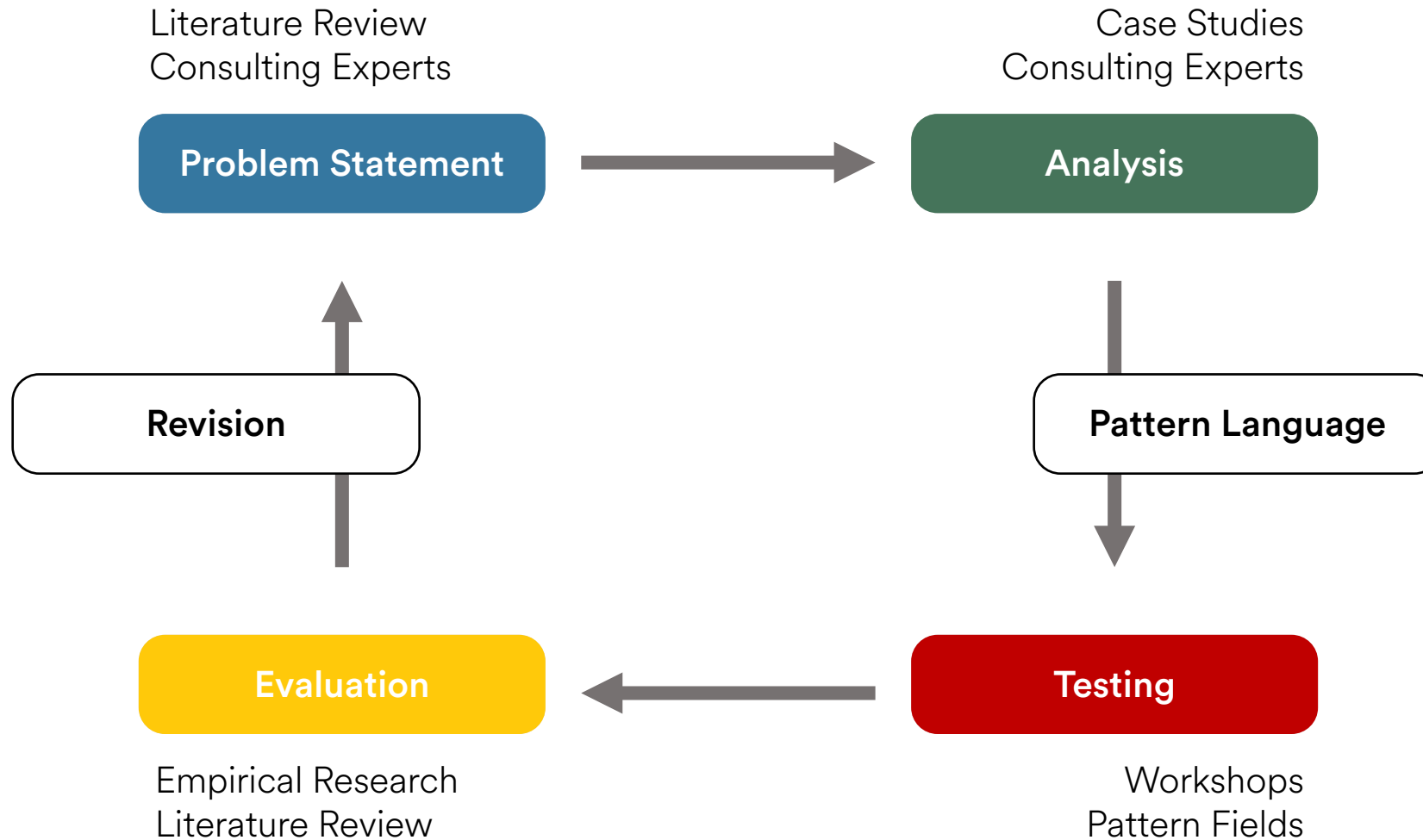
Social Space Spacious Vista

Data Center .4



Description
 Data centers typically take up a lot of space in natural areas. But by placing them on empty surfaces in the city, this space can be kept for nature! These data centers can be compact and lightweight so they can be easily placed on many vacant roofs. Combine them with some solar panels to generate their own energy!

Iterative Cycle



Testing





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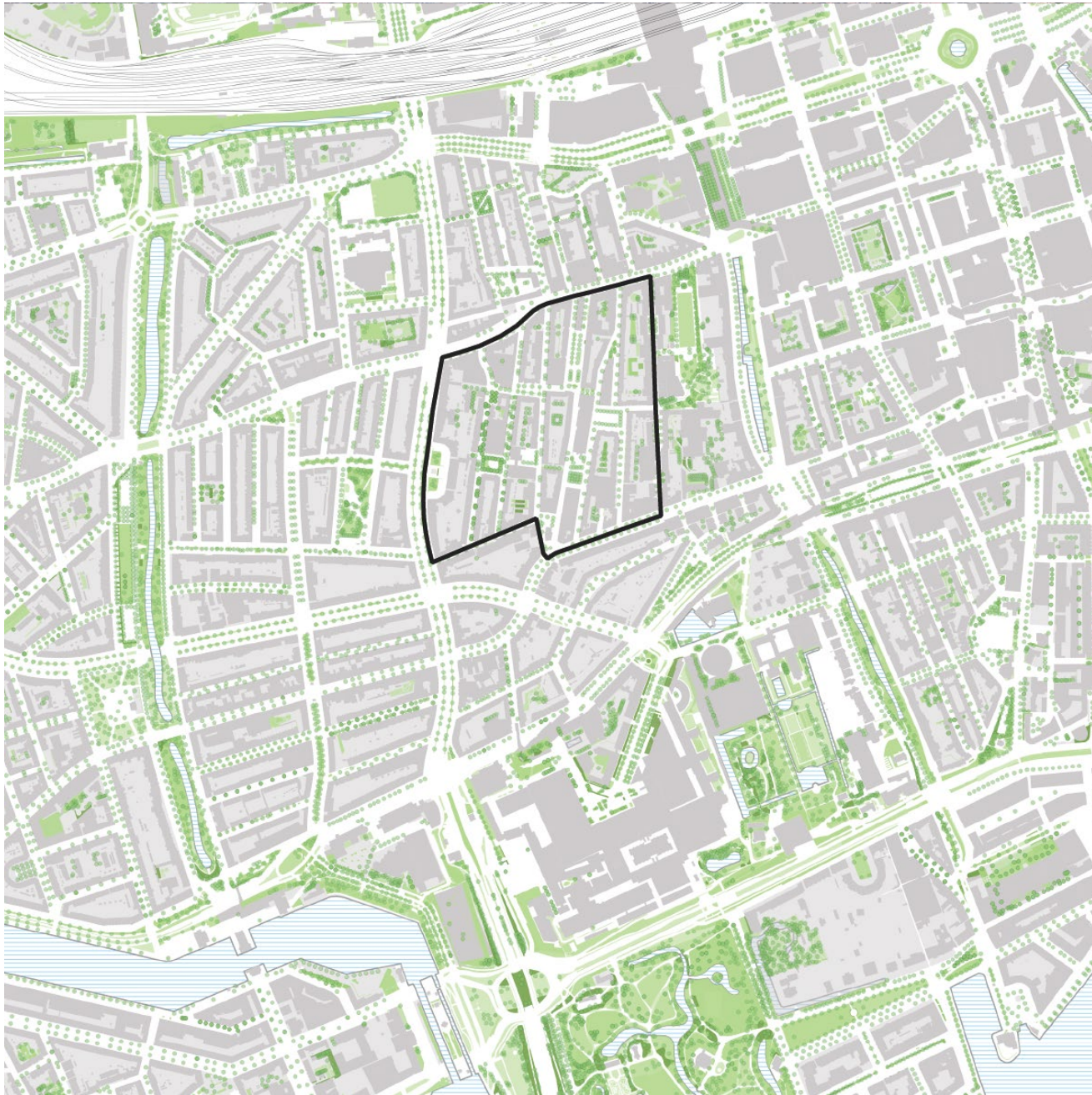
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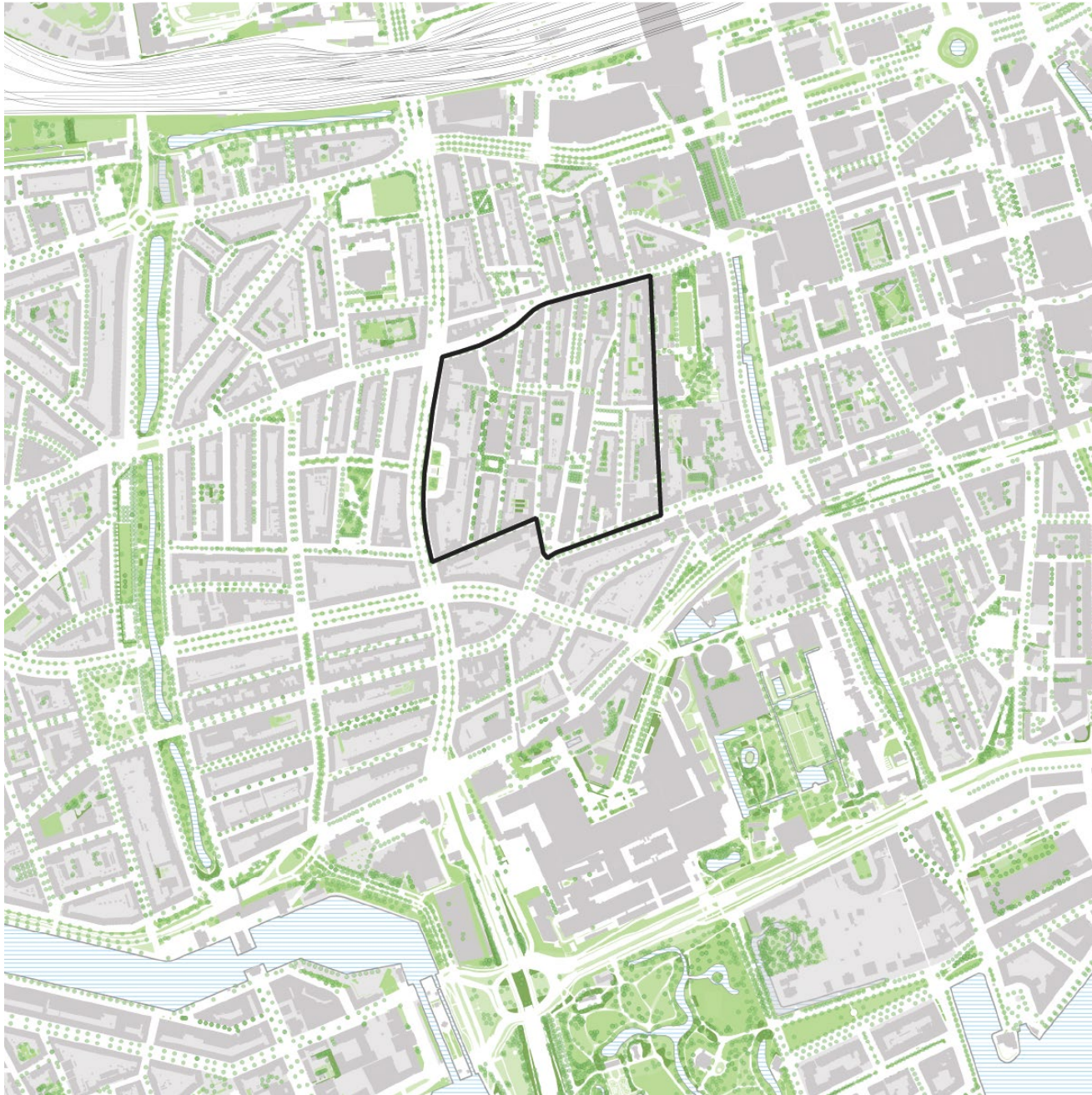
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“Does the **translation** of the **rooftop strategy** to a **roofscape design** address the **urgencies** of the city in an effective manner?”

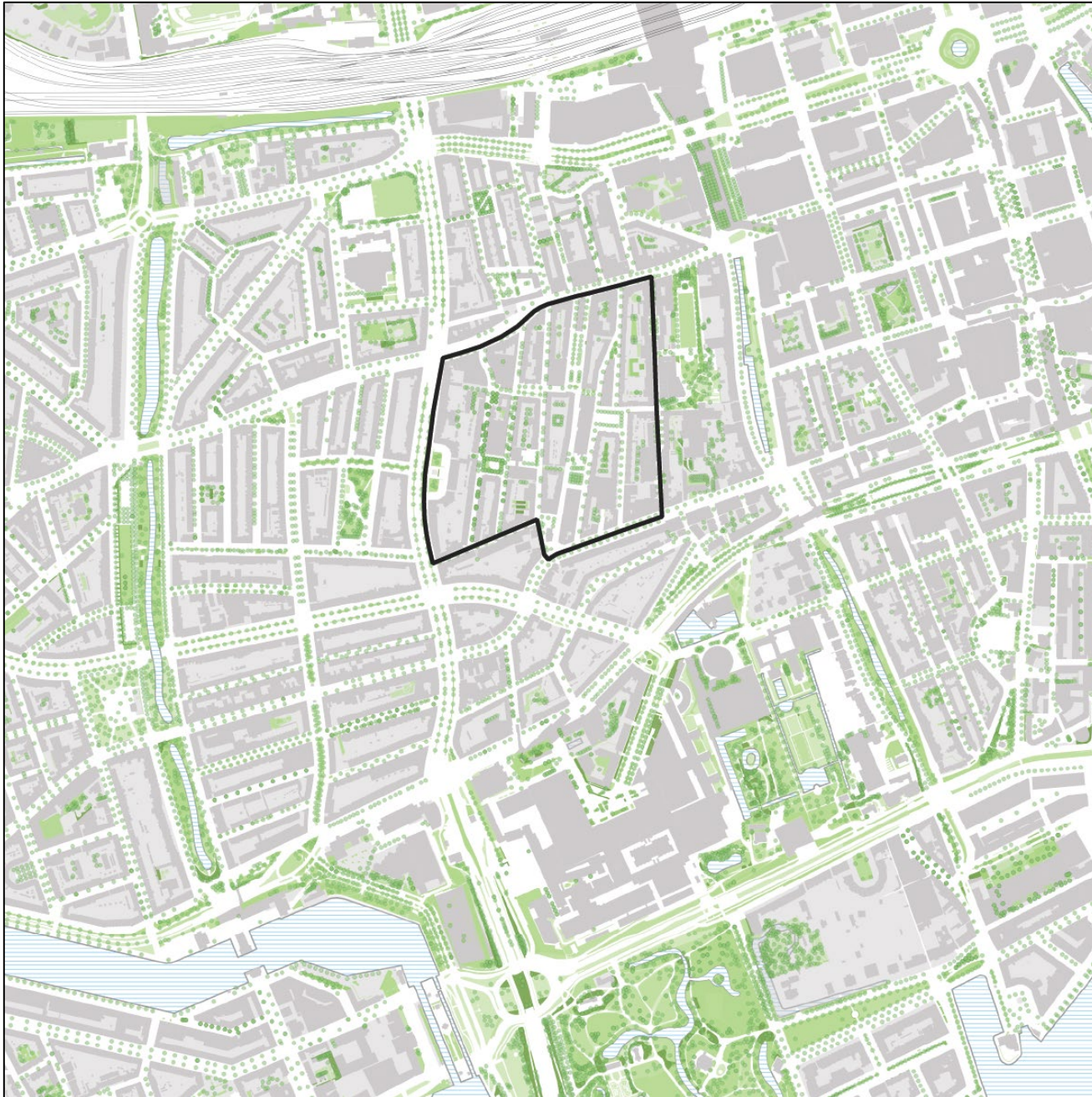


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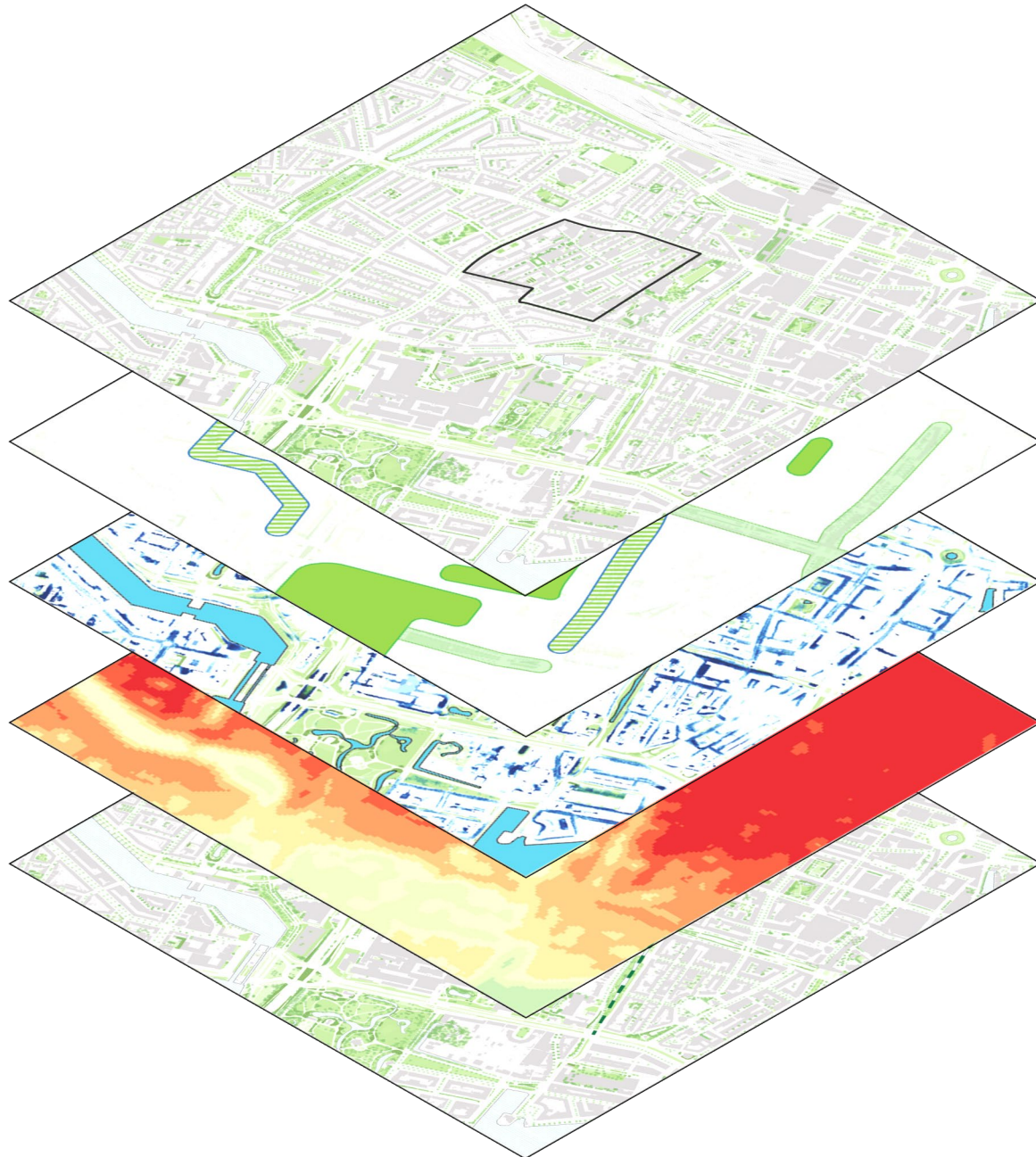
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- Neighbourhood Analysis
- Building Analysis
 - Typologies
- Design
 - Design Goals
 - Pattern Selection
 - Visualisation
- Evaluation



Neighbourhood Analysis

- General Analysis
- Climate Adaptation
 - Maps
- Demographic Profile
 - CBS Data
- Liveability
 - Field Trip



Neighbourhood Analysis

- General Analysis
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Strengths

profitable space

outdooring

attractivity

exercise

urban nature

social space

co-responsibility



Strengths

profitable space

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exercise

urban nature

social space

co-responsibility

Weaknesses

attractivity

outdooring

social space

shelter

cooling

urban nature

native ecology

stormwater retention

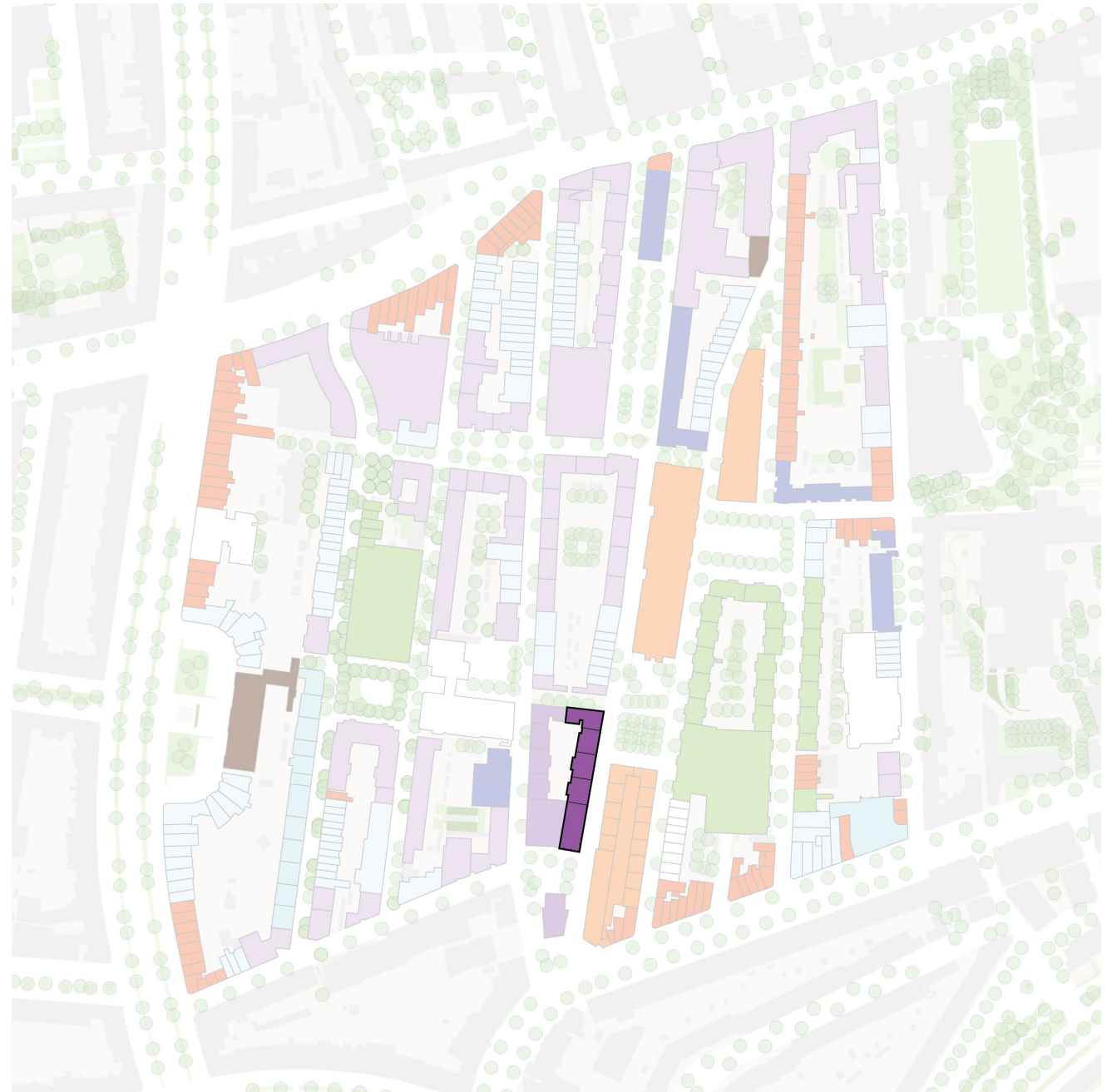


Building Analysis

- General Analysis
 - Building Typology
 - Historical Buildings
- Rooftops
 - Flatness
 - Current Use
- State of the Building
 - Energy Label
 - Foundation State
 - Possible Structural Capacity
- Ownership Configuration
- Function

Rooftop Types

- Concrete Social
- Wooden Social
- Closed Block
- Mixed Residential
- Traditional Sloped
- Traditional Flat
- Unique
- Heritage



Rooftop Types

Concrete Social

- Social Housing Corporation
 - Single Block Owner
- Concrete Structure
 - High Capacity
- Semi-Private Courtyard
- Residential Plinth
 - Lacking Hybrid Zone



Rooftop Types

Concrete Social

- Intensive Green Roof
 - Structural Capacity
 - Micro-climate
 - Insulation

cooling

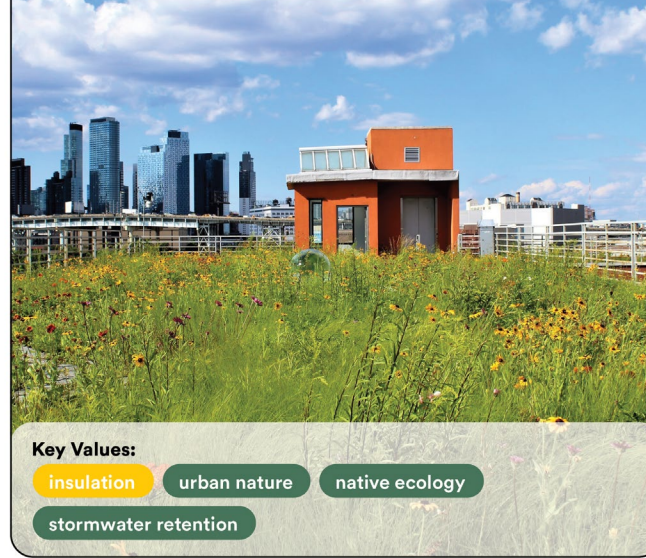
urban nature

native ecology

Nature Preserve

Natural Habitats

p.16



Key Values:

insulation

urban nature

native ecology

stormwater retention

Shrubs

Natural Habitats

f.19



Key Values:

urban nature

native ecology

attractivity

Flower Field

Natural Habitats

f.17



Key Values:

urban nature

native ecology

attractivity

Climbing Ivy

Natural Habitats

d.18



attractivity

urban nature

Rooftop Types

Concrete Social

- Intensive Green Roof
 - Structural Capacity
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cooling

urban nature

native ecology

- Green Solar Fields

- Clean Energy
- Lower Energy Bill
- Insulation and Efficiency

clean energy

insulation



Rooftop Types

Concrete Social

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clean energy

insulation

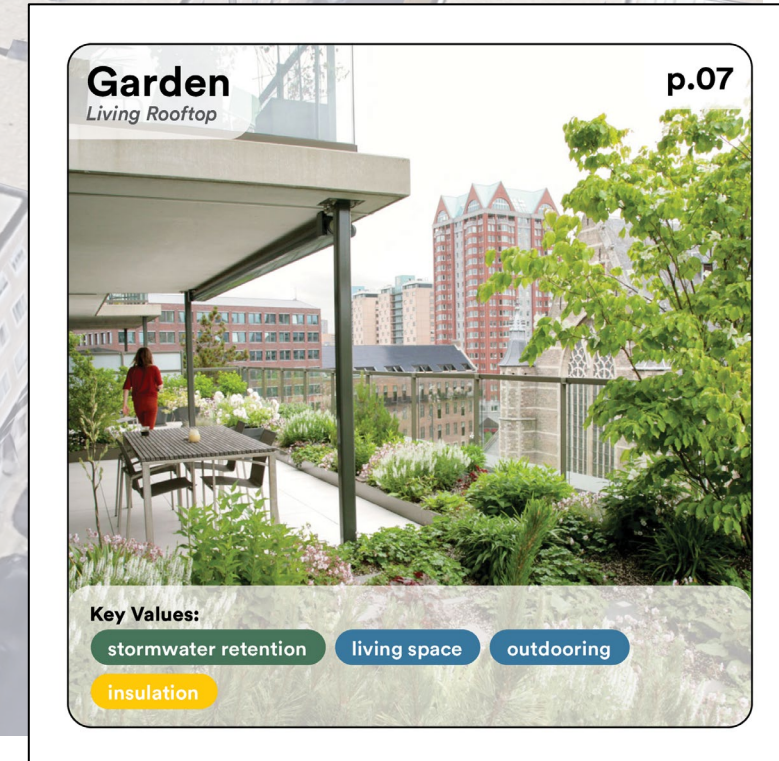
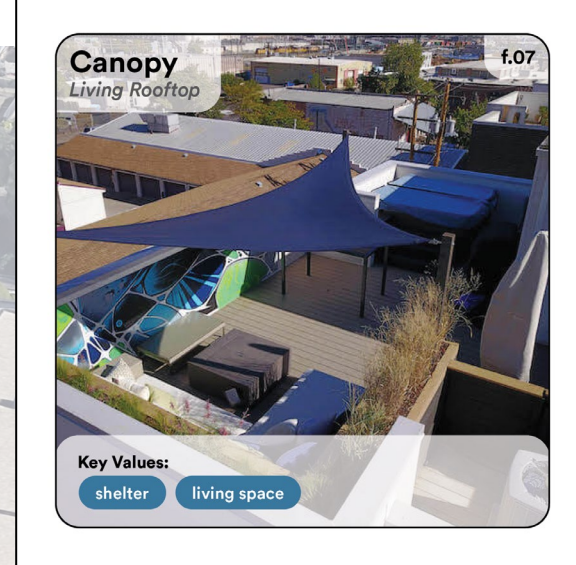
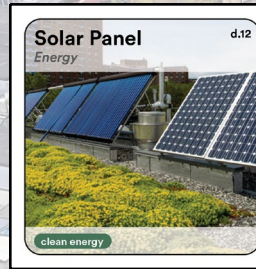
- Community Space

- Gardening
- Outdoor Experience

social space

outdooring

co-responsibility



Seating d.06
Living Rooftop

living space

Canopy f.07
Living Rooftop

Key Values:
shelter living space

Flower Field f.17
Natural Habitats

Key Values:
urban nature native ecology attractivity

Nature Preserve p.16
Natural Habitats

Key Values:
insulation urban nature native ecology
stormwater retention

Shrubs f.19
Natural Habitats

Key Values:
urban nature native ecology attractivity

Tool Shed f.10
Living Rooftop

Key Values:
living space

Garden p.07
Living Rooftop

Key Values:
stormwater retention living space outdooring
insulation

Flower Field f.17
Natural Habitats

Key Values:
urban nature native ecology attractivity

Solar Panel d.12
Energy

clean energy

Climbing Ivy d.18
Natural Habitats

attractivity urban nature

Vegetable Planter d.03
Urban Farming

food production outdooring

Solar Panel d.12
Energy

clean energy

Solar Panel d.12
Energy

clean energy

- Intensive Green Roof

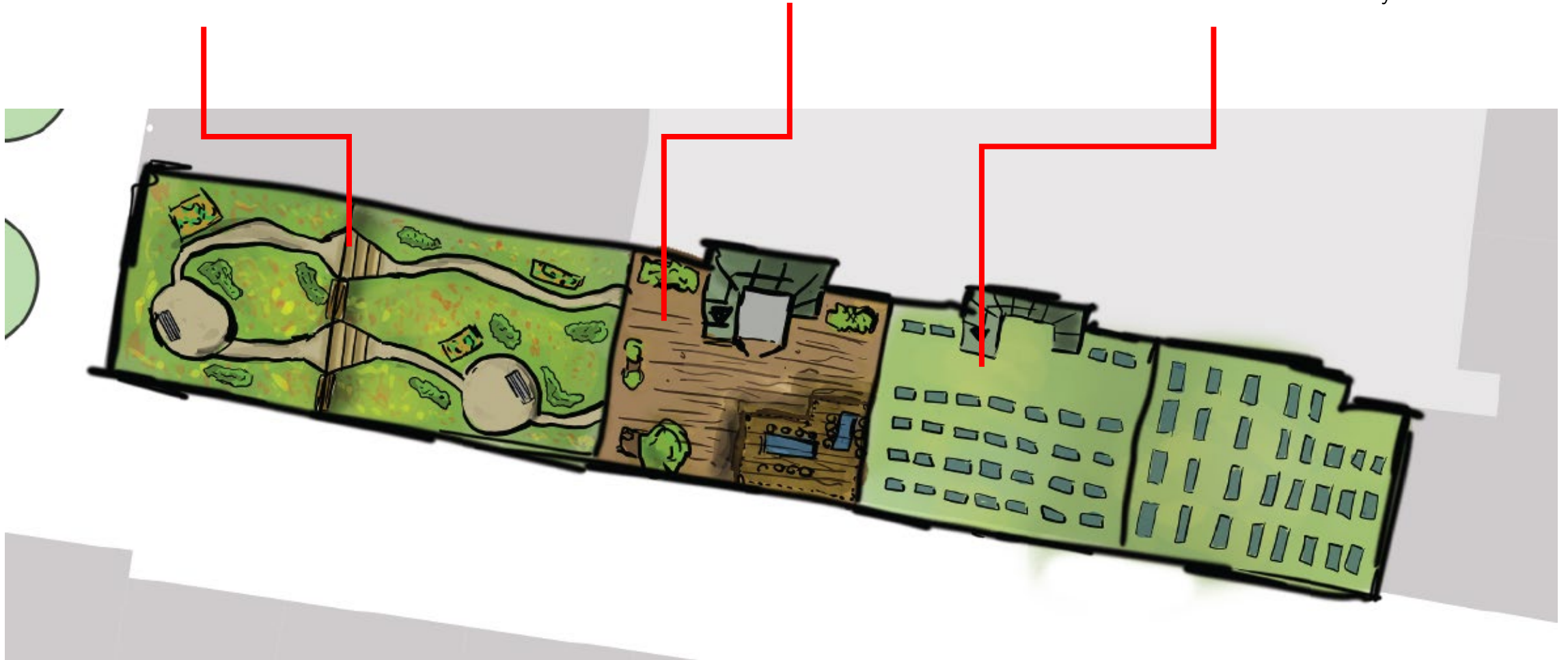
- Structural Capacity
- Micro-climate
- Insulation

- Community Space

- Gardening
- Outdoor Experience

- Green Solar Fields

- Clean Energy
- Lower Energy Bill
- Insulation and Efficiency







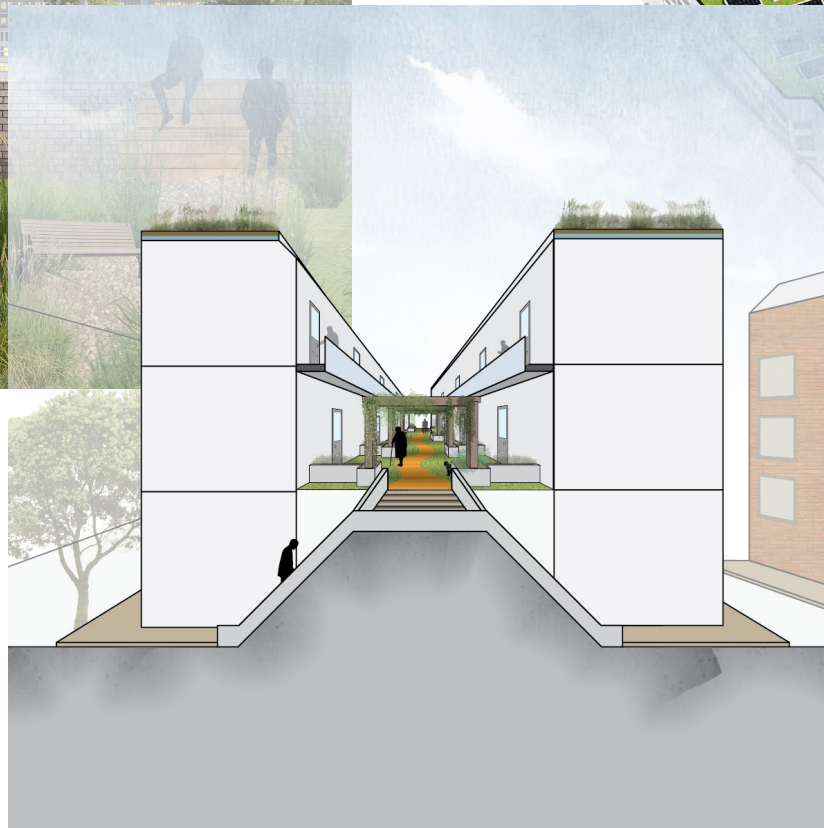
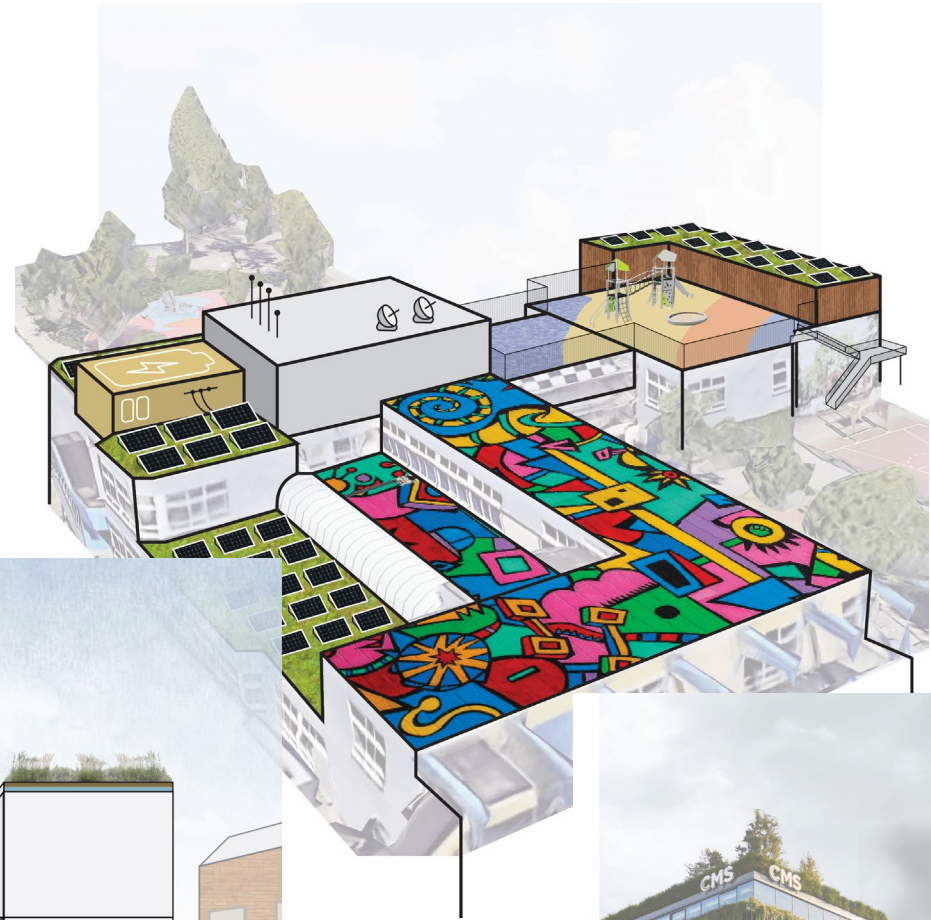
“Does the **translation** of the **rooftop strategy** to a **roofscape design** address the **urgencies** of the city in an effective manner?”

“Does the **translation** of the **rooftop strategy** to a **roofscape design** address the **urgencies** of the city in an effective manner?”

Considerations

- Only individual rooftops have been designed, which makes it hard to draw conclusions
- The Patterns as a tool for designers and planners.
- The Patterns are relatively ‘simple’
- The interaction between stakeholders has not been sufficiently tested





Garden

Living Rooftop

p.07



Key Values:

stormwater retention

living space

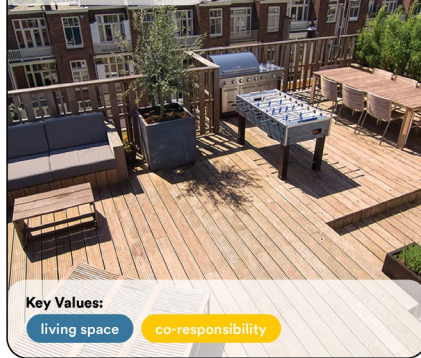
outdooring

insulation

Private Terrace

Living Rooftop

f.09



Key Values:

living space

co-responsibility

Pergola

Living Rooftop

f.06



Tip: Add some solar panels on top for a solar pergola.

Key Values:

shelter

living space

Solar Panel

Energy

d.12



clean energy

Solar Panel

Energy

d.12



clean energy

Planter Boxes

Outdoor Leisure

d.21



Tip: Place around the edges for a green safety barrier!

outdooring

attractivity

