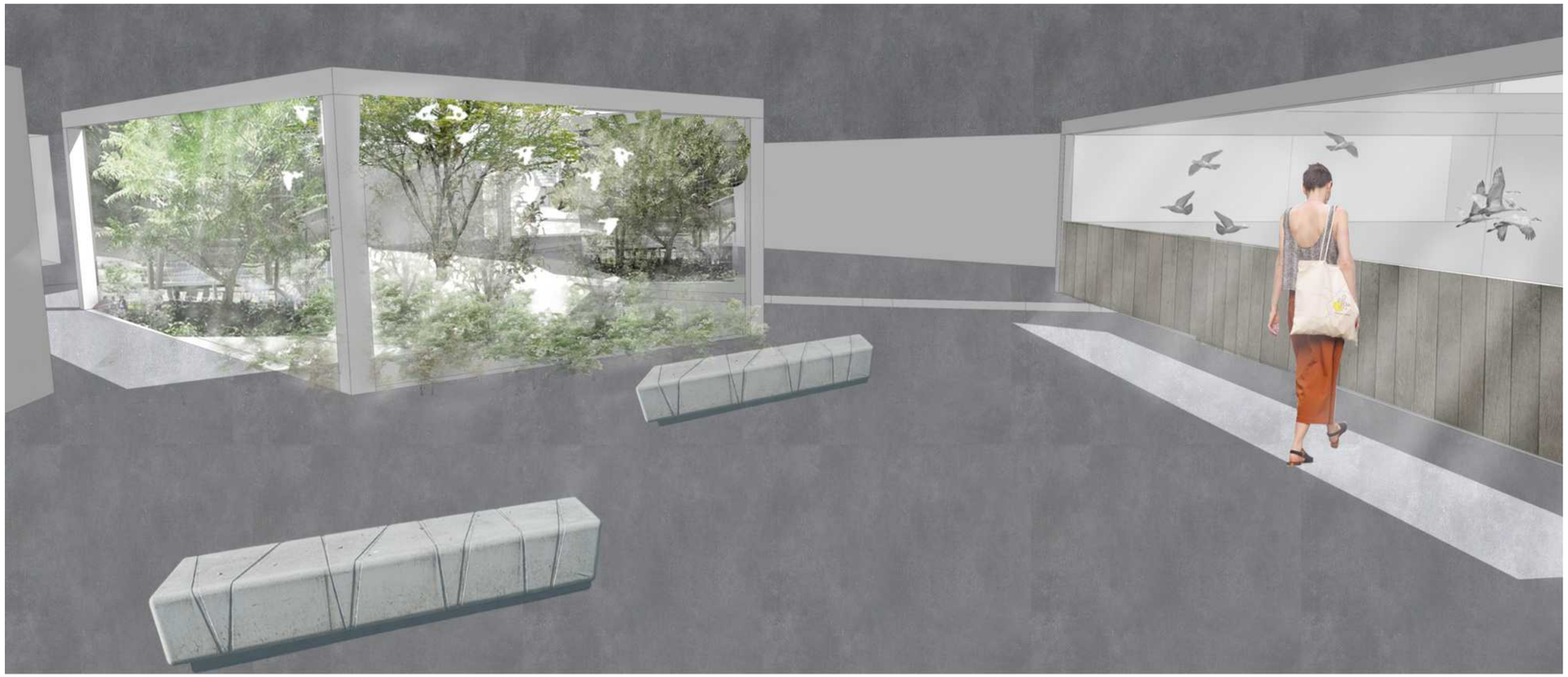


New Natural Landscape:

Restoring biodiversity in post-industrial region Parkstad-Limburg

Chang Guo
4740505

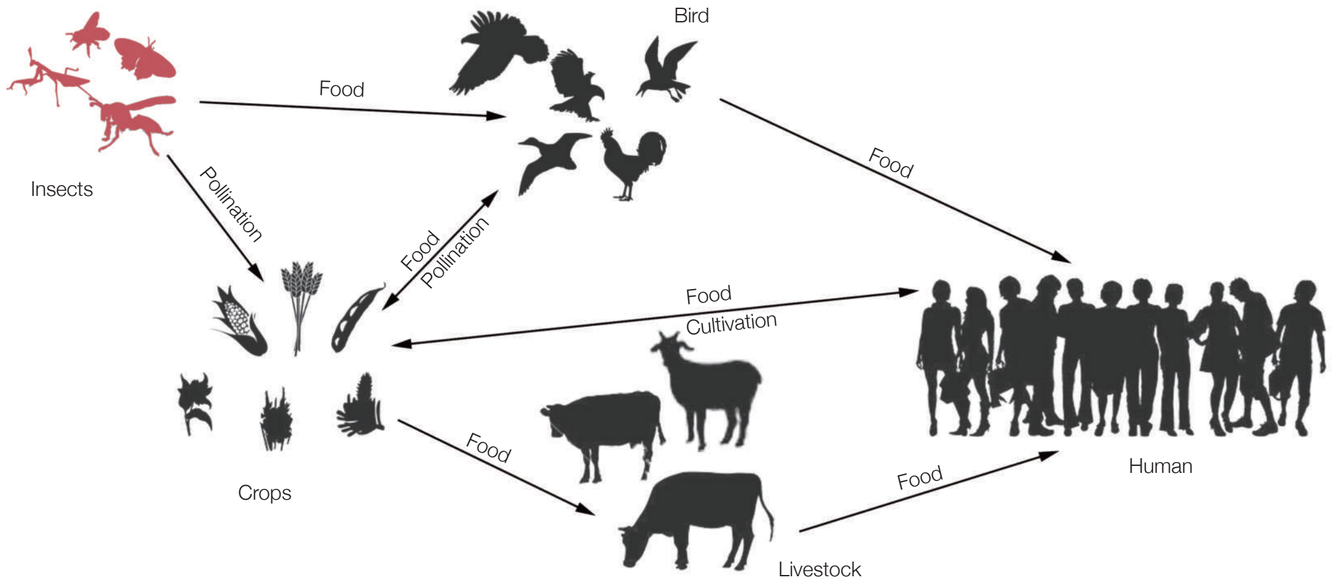
If the bee disappears, the human will be extinct after four years.



Photograph: Tony Phelps/Alamy Stock Photo

FASCINATION Biodiversity

Insects



76% insects have disappeared in the past 27 years-Netherlands

>75% insects have declined over almost 30 years-Germany

three quarters of butterfly species;250 species of bees,dropped significantly in numbers-UK



PLOS ONE

RESEARCH ARTICLE

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

Caspar A. Hallmann[1]*, Martin Sorg[2], Eelke Jongejans[3], Henk Siepel[1], Nick Hofland[1], Heinz Schwan[2], Werner Stenmans[2], Andreas Müller[2], Hubert Sumser[2], Thomas Hörren[2], Dave Goulson[3], Hans de Kroon[1]

1 Radboud University, Institute for Water and Wetland Research, Animal Ecology and Physiology & Experimental Plant Ecology, PO Box 9100, 6500 GL Nijmegen, The Netherlands, **2** Entomological Society Krefeld e.V., Entomological Collections Krefeld, Markstrasse 159, 47798 Krefeld, Germany, **3** University of Sussex, School of Life Sciences, Falmer, Brighton BN1 9QG, United Kingdom

* c.hallmann@science.ru.nl

Abstract

Global declines in insects have sparked wide interest among scientists, politicians, and the general public. Loss of insect diversity and abundance is expected to provoke cascading effects on food webs and to jeopardize ecosystem services. Our understanding of the extent and underlying causes of this decline is based on the abundance of single species or taxonomic groups only, rather than changes in insect biomass which is more relevant for ecological functioning. Here, we used a standardized protocol to measure total insect biomass using Malaise traps, deployed over 27 years in 63 nature protection areas in Germany (96 unique location-year combinations) to infer on the status and trend of local entomofauna. Our analysis estimates a seasonal decline of 76%, and mid-summer decline of 82% in flying insect biomass over the 27 years of study. We show that this decline is apparent regardless of habitat type, while changes in weather, land use, and habitat characteristics cannot explain this overall decline. This yet unrecognized loss of insect biomass must be taken into account in evaluating declines in abundance of species depending on insects as a food source, and ecosystem functioning in the European landscape.

OPEN ACCESS

Citation: Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, Schwan H, et al. (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PLoS ONE 12 (10): e0185809. https://doi.org/10.1371/journal.pone.0185809

Editor: Eric Gordon Lamb, University of Saskatchewan, CANADA

Received: July 28, 2017

Accepted: September 19, 2017

Published: October 18, 2017

Copyright: © 2017 Hallmann et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Funding: CH and EJ were supported by the Netherlands Organization for Scientific Research (NWO grants 840.11.001 and 841.11.007), and NH by the Triodos Foundation. The investigations of the Entomological Society Krefeld and its members are spread over numerous individual projects at different locations and in different years. Grants and permits that have made this work possible are

Introduction

Loss of insects is certain to have adverse effects on ecosystem functioning, as insects play a central role in a variety of processes, including pollination [1, 2], herbivory and detrivory [3, 4], nutrient cycling [4] and providing a food source for higher trophic levels such as birds, mammals and amphibians. For example, 80% of wild plants are estimated to depend on insects for pollination [2], while 60% of birds rely on insects as a food source [5]. The ecosystem services provided by wild insects have been estimated at $57 billion annually in the USA [6]. Clearly, preserving insect abundance and diversity should constitute a prime conservation priority.

Current data suggest an overall pattern of decline in insect diversity and abundance. For example, populations of European grassland butterflies are estimated to have declined by 50% in abundance between 1990 and 2011 [7]. Data for other well-studied taxa such as bees [8–14]



FEATURE

The Insect Apocalypse Is Here

What does it mean for the rest of life on Earth?



Where have all our insects gone?

There is a crisis in the countryside - and a massive decline in insect numbers could have significant consequences for the environment

Shutterstock

by Robin McKie, Observer science editor

When Simon Leather was a student in the 1970s, he took a summer job as a postman and delivered mail to the villages of Kirk Hammerton and Green Hammerton in North Yorkshire. He recalls his early morning walks through its lanes, past the porches of houses on his round. At virtually every home, he saw the same picture: windows plastered with tiger moths that had been attracted by lights the previous night and were still clinging to the glass. "It was quite a sight," says Leather, who is now a professor of entomology at Harper Adams University in Shropshire.

But it is not a vision that he has experienced in recent years. Those tiger moths have almost disappeared. "You hardly see any, although there used to be thousands in summer and that was just a couple of villages."

It is an intriguing story and it is likely to be repeated over the next few weeks. The start of summer is the time of year when the nation's insects should make their presence known by coating countryside windows with their fluttering presence, and splattering themselves on car windscreens. But they are spectacularly failing to do so. Instead they are making themselves newsworthy through their absence. Britain's insects, it seems, are disappearing.

This point was underlined last week when tweets from the naturalist and TV presenter Chris Packham went viral after he commented on the absence of insects during a weekend at his home in the New Forest. Packham said he had not seen a single butterfly in his garden, and added that he sleeps with his windows open but rarely finds craneflies or moths in his room in the morning. By contrast, they were commonplace when he was a boy. "Our generation is presiding over an ecological apocalypse and we've somehow or other normalised it," he later said.

Certainly, the statistics are grim. Native ladybird populations are crashing; three quarters of butterfly species - such as the painted lady and the Glanville fritillary - have dropped significantly in numbers; while bees, of which there are more than 250 species in the UK, are also suffering major plunges in populations, with great yellow bumblebees, solitary potter flower bees and other species declining steeply in recent years. Other threatened insects include the New Forest cicada, the tansy beetle and the oil beetle.

As for moths, some of the most beautiful visitors to our homes and gardens, the picture is particularly alarming. Apart from the tiger moth, which was once widespread in the UK, the V-moth (*Marcaria wauaria*) recorded a 99% fall in numbers between 1968 and 2007 and is now threatened with extinction, a fate that has already befallen the orange upperwing, the bordered gothic and the Brighton wainscot in recent years.

FASCINATION Biodiversity

IUCN: Is this the kind of world we want?

Over a million species will be lost in the coming 50 years













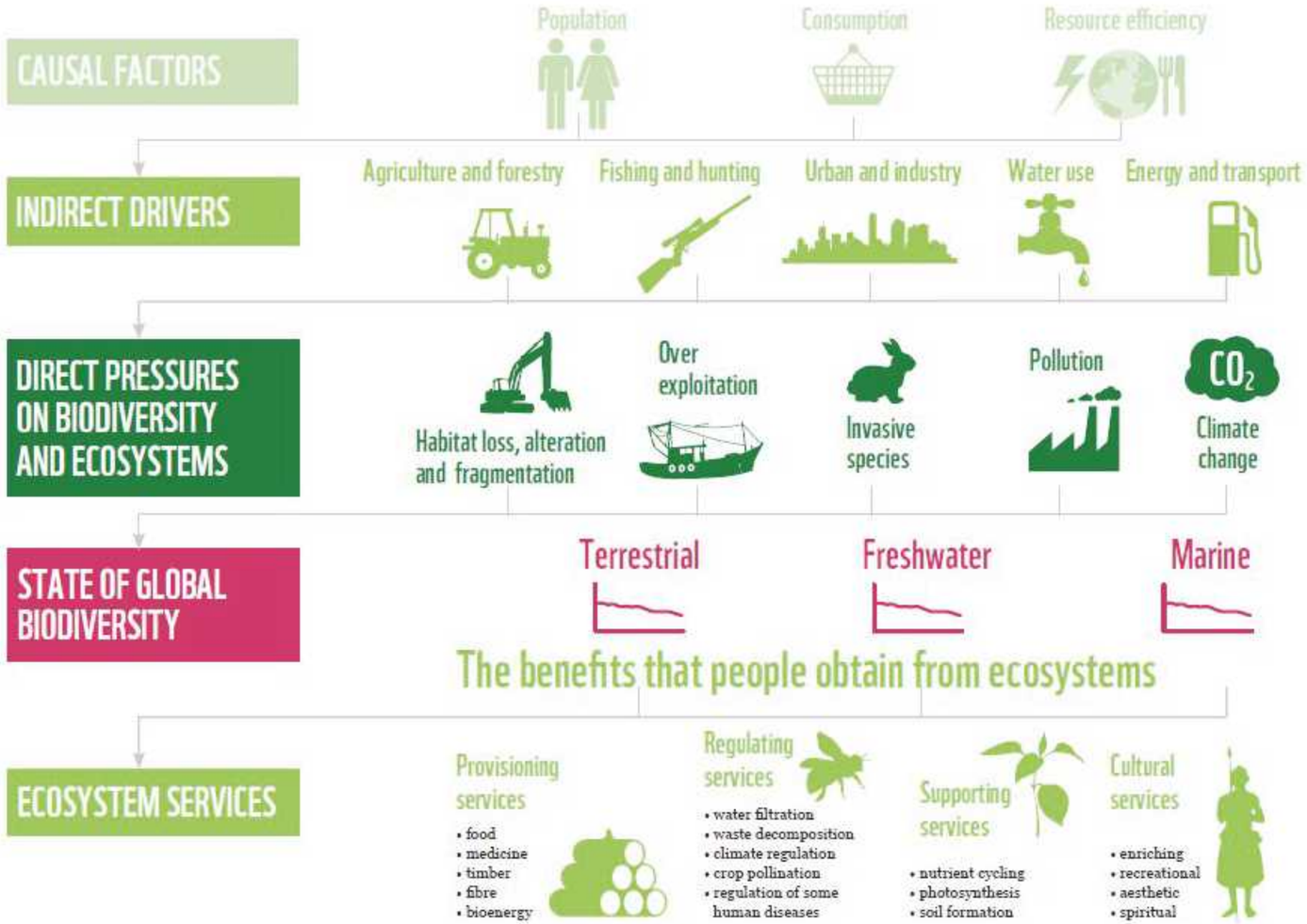




Destruction of Biodiversity has become a Global Problem

FASCINATION Biodiversity

Importance of biodiversity-ecosystem services





FASCINATION Biodiversity

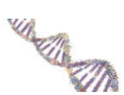
Restore Biodiversity

Our lives are inextricably linked with biodiversity and ultimately its protection is essential for our very survival

What is biodiversity?

Biodiversity is recognized at three levels- genetic, species, and ecosystem diversity.

Genetic Diversity



Diversity of genes within a species

Species Diversity



Diversity among species in an ecosystem

Ecosystem Diversity



Diversity of a habitat in a given unit area







FASCINATION Biodiversity

High density&expanding cities pay more value

New York





Hongkong





Rotterdam

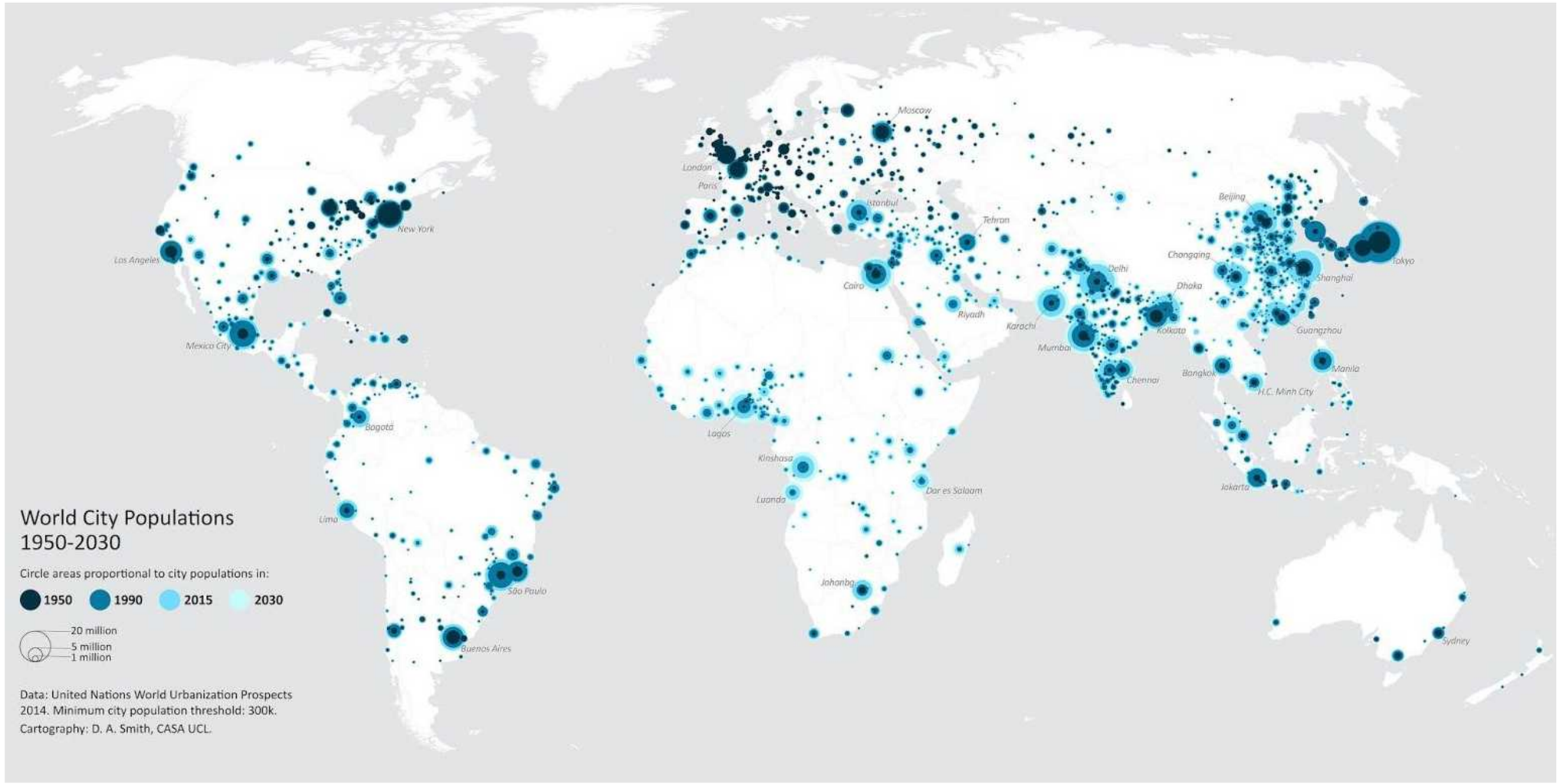




FASCINATION Shrinkage

Shrinking Cities

Massive population loss because a specific interplay of the economic, demographic or settlement systems, environmental hazards,and changes in political or administrative systems.



Source: United Nations Population Division, "World Urbanization Prospects: The 2014 Revision."

FASCINATION Shrinkage

The chance to enhance Biodiversity

Before



Fewer inhabitants but more space

↓

Vacancies and derelict land

↓

Reconfiguration of urban land-use patterns

↓

Nature conservation and green space development

Vacancy and demolition of buildings
Under-use and vacancy of built infrastructure
Residential and commercial brownfields and abandoned land

After



PARKSTAD LIMBURG

Hilly Landscape



Source: Snowworld Landgraaf

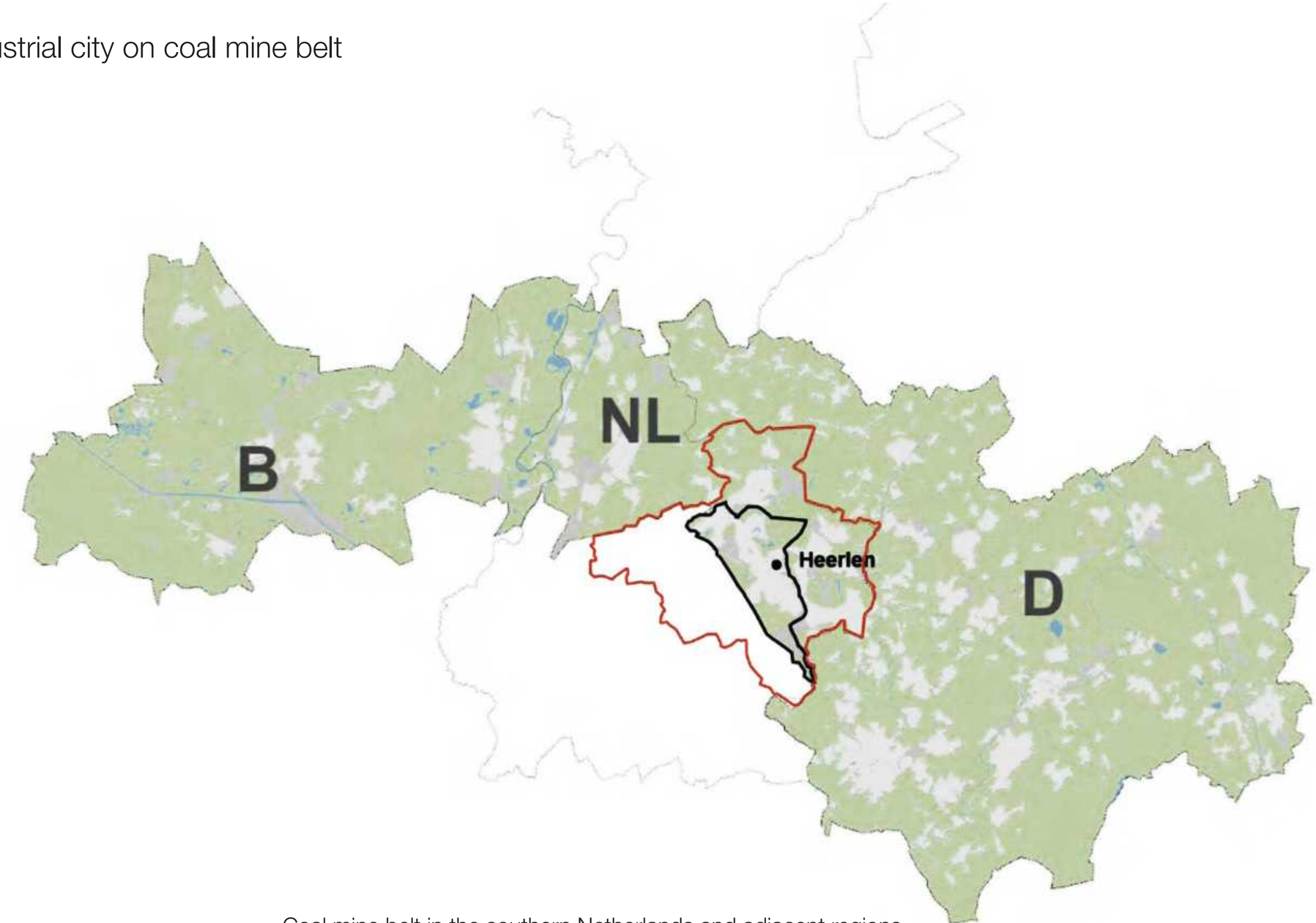
Coal Mine History



Source: Jesse, Nico,Memory of the Netherlands

PARKSTAD LIMBURG

Typical post-industrial city on coal mine belt

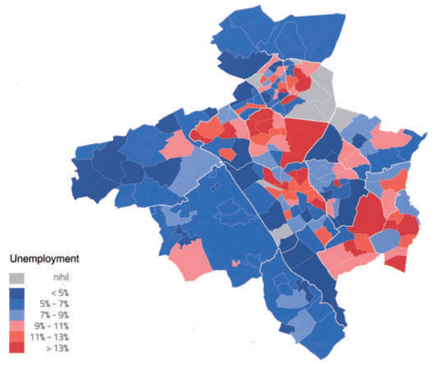


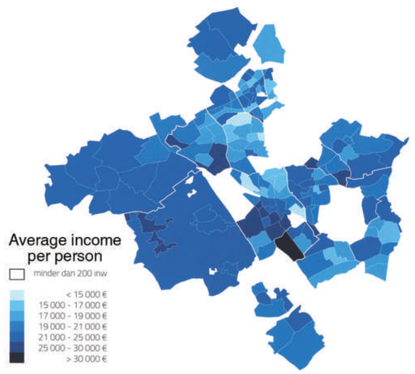
Coal mine belt in the southern Netherlands and adjacent regions

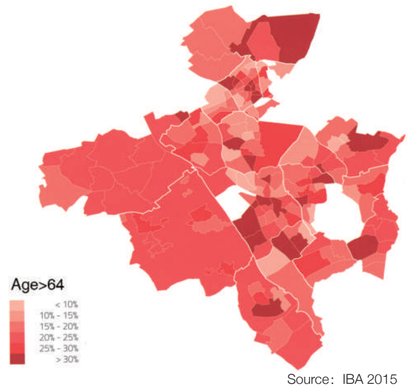
Source: Agence ter

PROBLEM STATEMENT Shrinkage

-High unemployed rate and low income

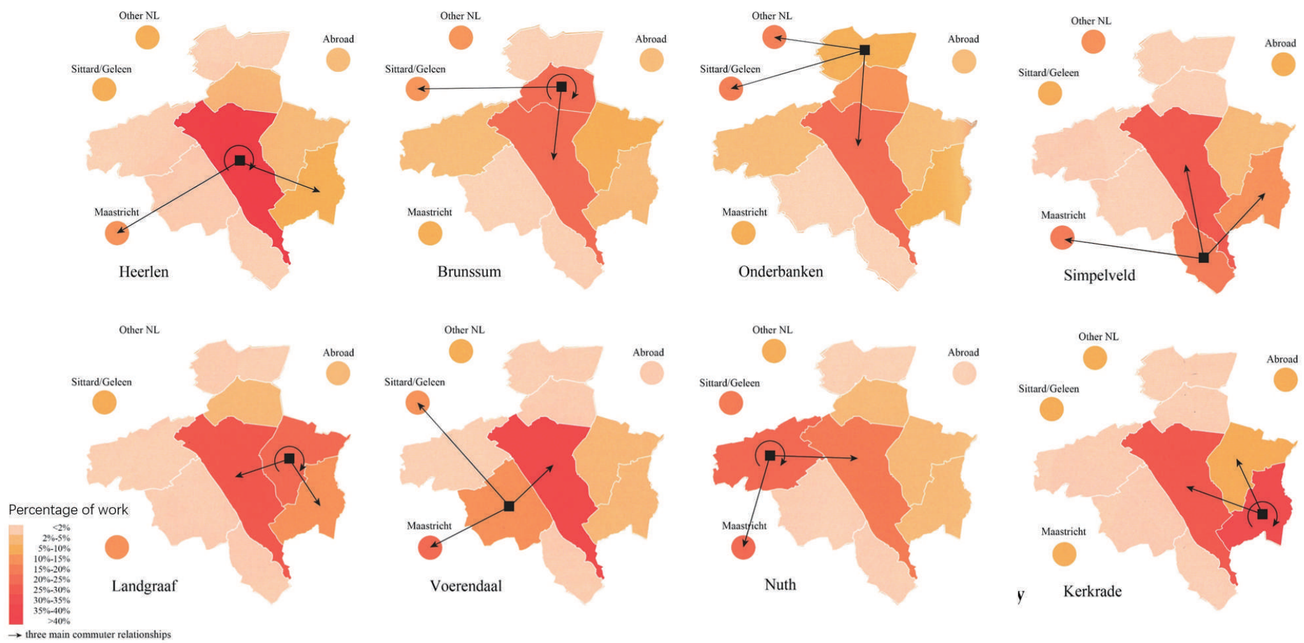






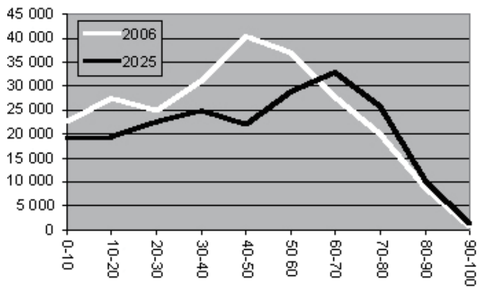
Source: IBA 2015

-Labor outflow and aging city



Source: IBA 2015





Shrinkage in economy and population

Ancient hunting period



Roman period



Medieval period



Agriculture period



Coal mining period



Transition Period



PROBLEM STATEMENT Shrinkage

Poor living quality for residents

Vacant and demolished buildings







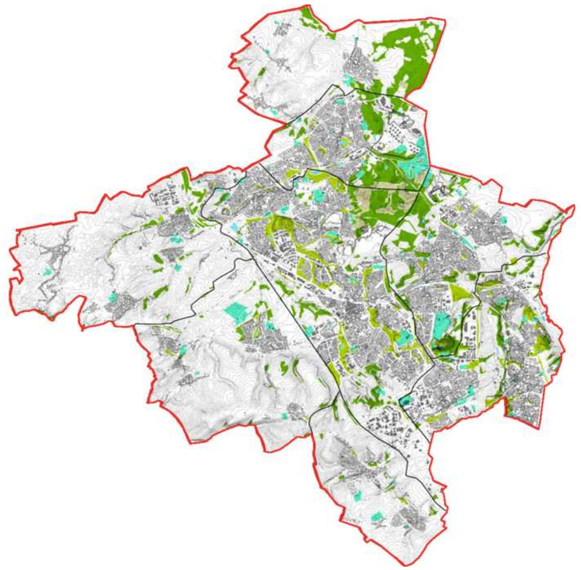

Bad maintenance of green space and stream system






PROBLEM STATEMENT Biodiversity

Fragment green space,isolated species provenances habitat.

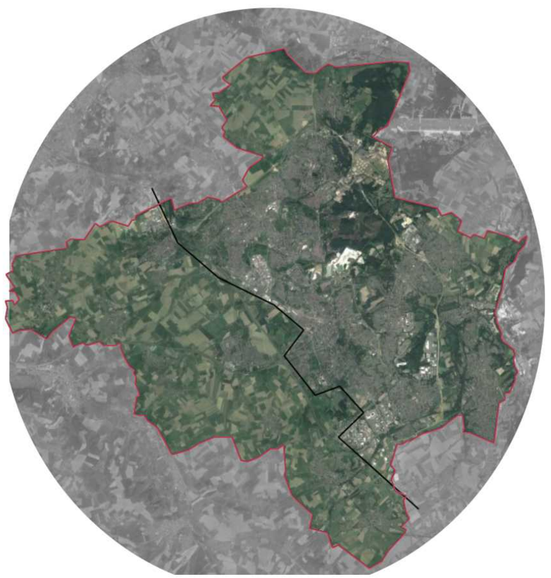






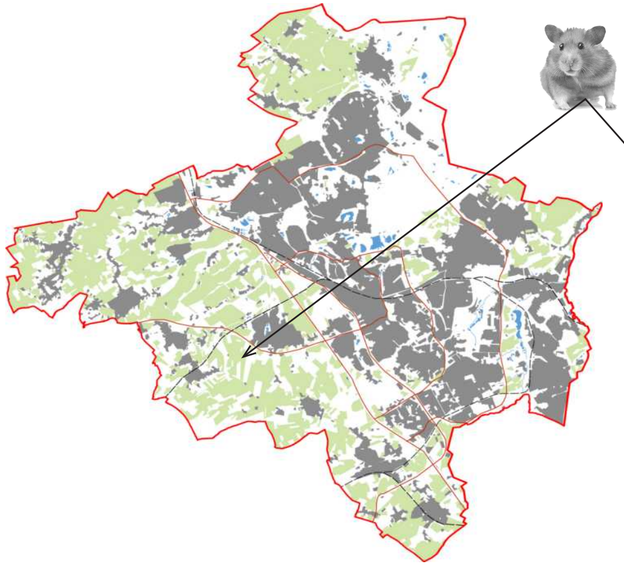


Clear bounday between Nature and Urban system, limited interaction(HighwayA76,N281)

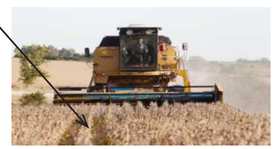




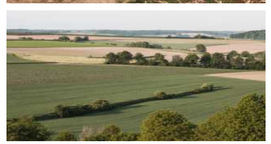
A large number of intensive homogenized agriculture



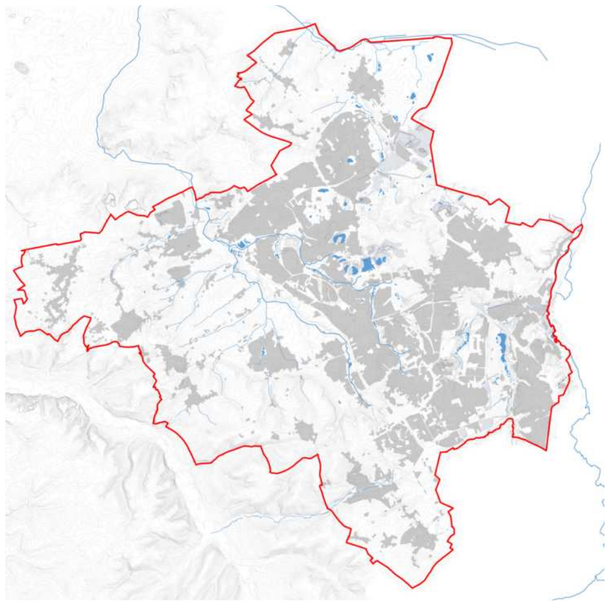


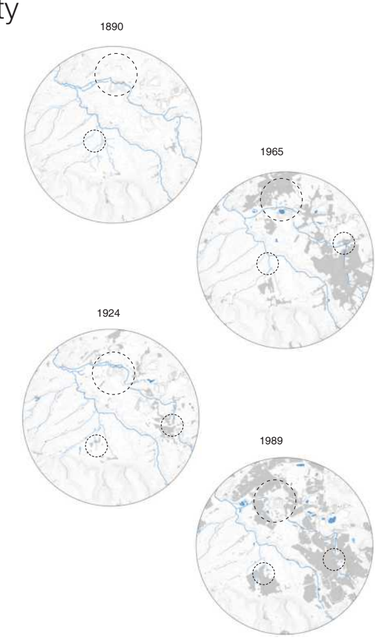






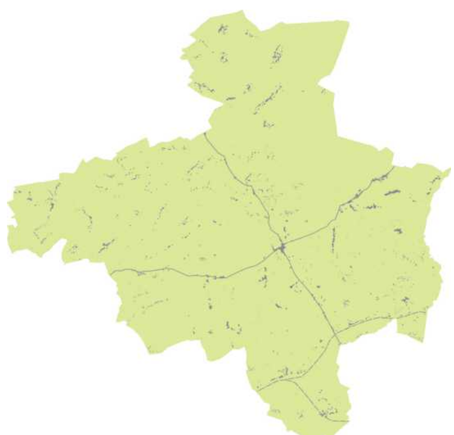
Disconnected water system and bad water quality



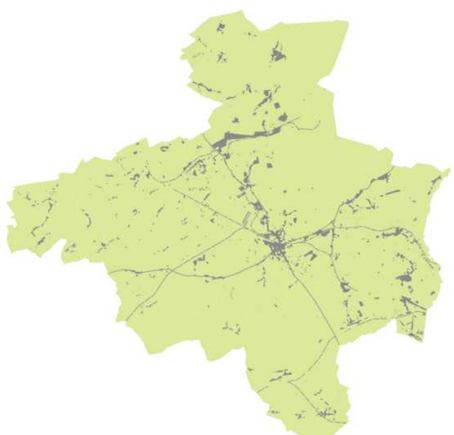


PROBLEM STATEMENT Nature and Urban systems

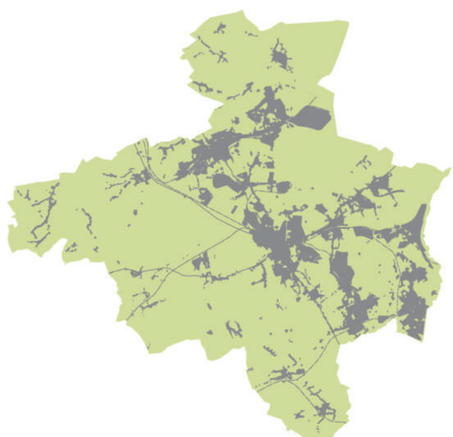
Development from 1850-2017



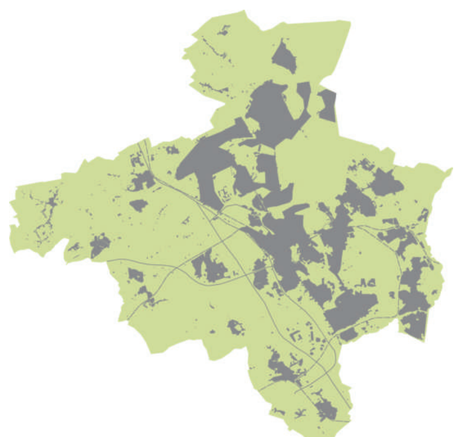
1890



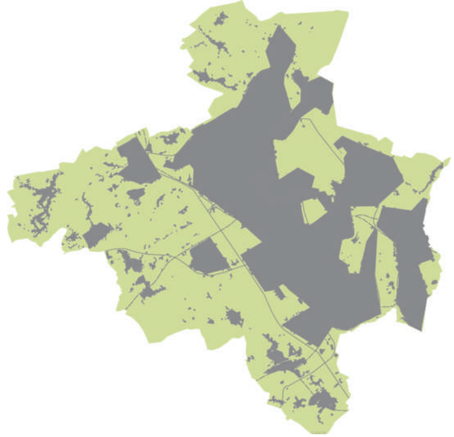
1924

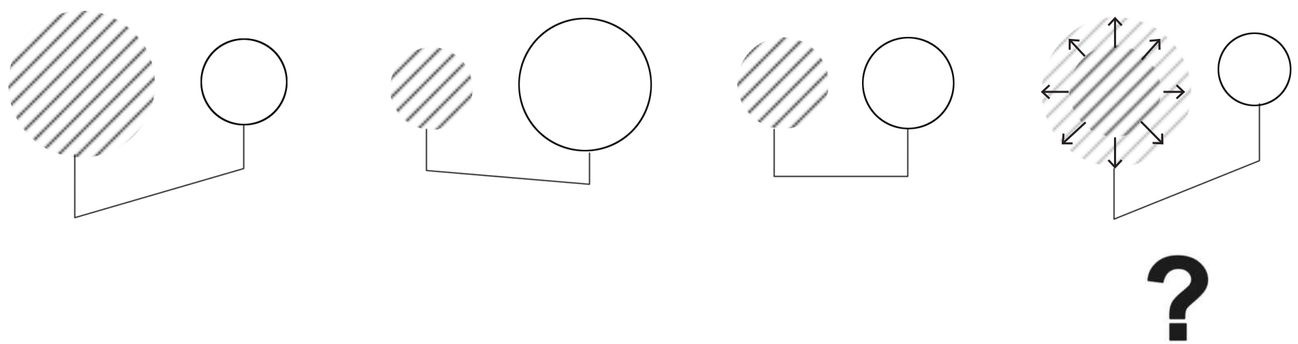


1965



1989





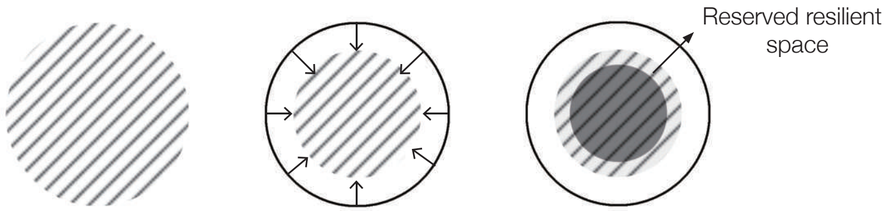
Future ?

A process of changing the relationship between nature and urban systems

Theoretical Background Smart Decline

A smaller but better system

Planning for less: fewer people, fewer buildings, fewer landuses
A development method designed to improve living quality of current residents.



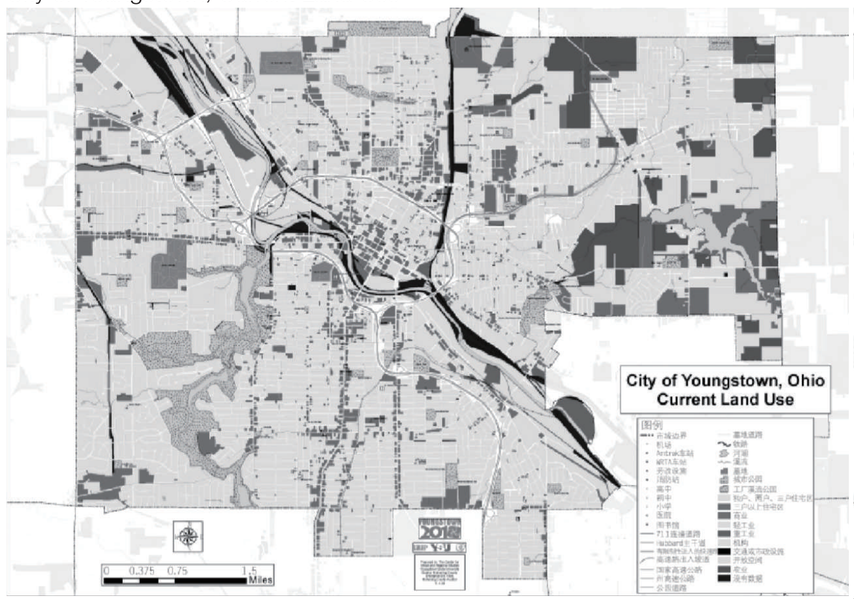
The Youngstown Citywide plan 2010

Establish a green space network for cities; build competitive industrial zones; build diverse neighborhoods to promote continued neighborhood vibrancy; foster vibrant urban centers

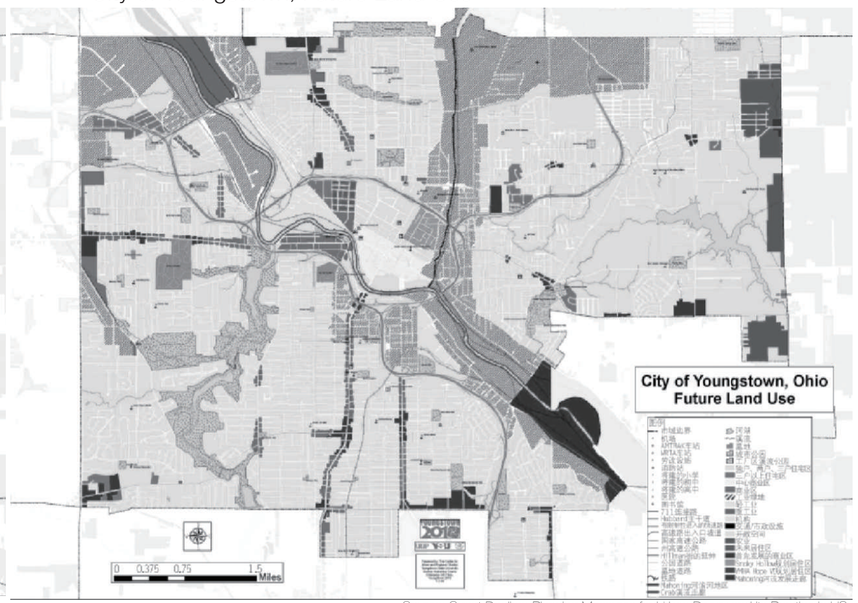
During the recession, many industrial cities tried to become more competitive in the post-industrial knowledge economy era through transformation, but unfortunately, the knowledge economy tends to go to cities with more developed economies and more beautiful environments. Therefore, these shrinking industrial cities have to turn back to face the long-standing predicament.

Hope to develop → Face the recession Passive recession → Active contraction

City of Youngstown, Current Land Use



City of Youngstown, Future Land Use



Source: Smart Decline: Planning Measures for Urban Decay and Its Practice in US

Core issues that need to be addressed:

1.How to maintain the vitality and subsequent development of the city with a reduced population?

2.How to solve a lot of vacant or abandoned plots and real estate?

3.How to develop effective planning and effective implementation?

1974 Philadelphia Green Program:

Transforming abandoned plots into urban open spaces and green spaces to improve urban suitability

2006 Buffalo Queen City Comprehensive Plan:

Reinjecting population, rebuilding industrial bases, revitalizing business districts, and strengthening green spaces and public spaces

2008 Detroit Vacant Property Campaign:

Negotiate with the owner of the house adjacent to the vacant lot to improve the condition of these plots

OBJECTIVE AND RESEARCH QUESTIONS

Prepare a resilient future for Parkstad Limburg by using natural system to replace some part of urban system to convert land value

How to adjust and reorganize natural and urban systems to enhance biodiversity and ecological value to improve living quality?

OBJECTIVE AND RESEARCH QUESTIONS

Sub-Questions

Analysis

-What the existing natural and urban patterns and characteristics of Parkstad Limburg

-How to utilize these characteristics as guiding elements for future resilient system?

-What are the criteria and basis for selecting the transform urban space?

Theoretical background

-How to maintain the vitality and development of the city in the case of urban system contraction?

-How to maximize the biodiversity by the composition and connection of the patch-corridor-matrix?

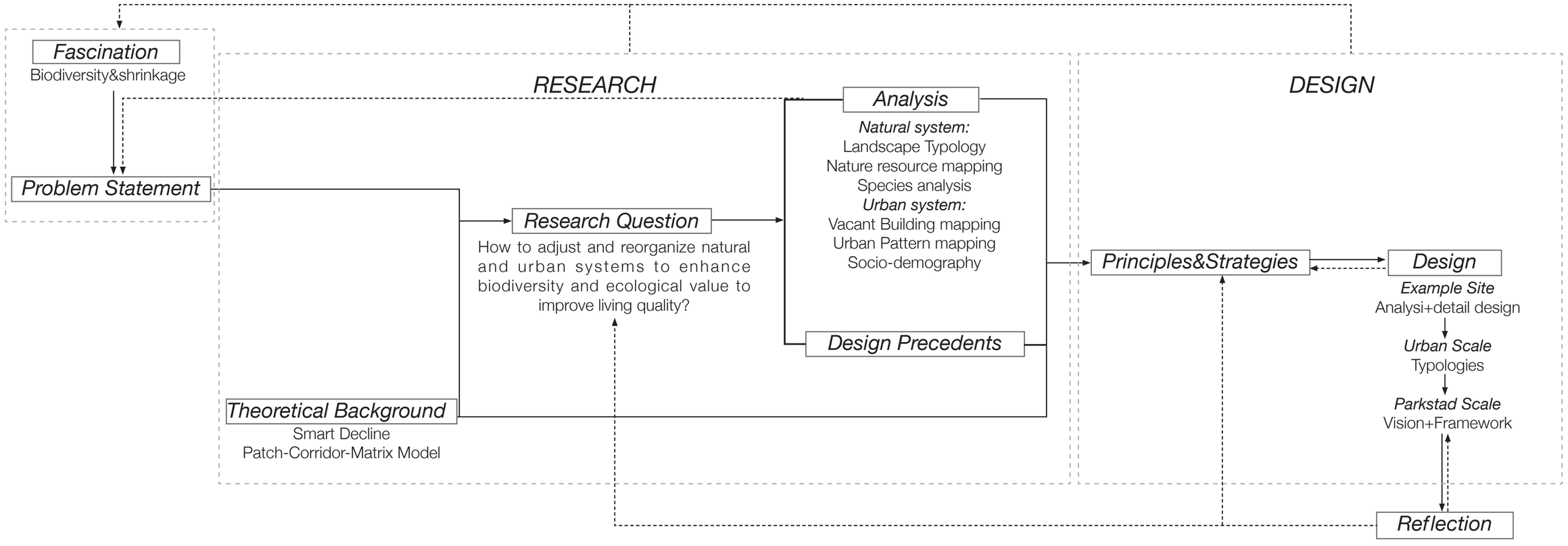
Application

-How to judge the future direction of these converted urban area whether is natural value or updated urban value?

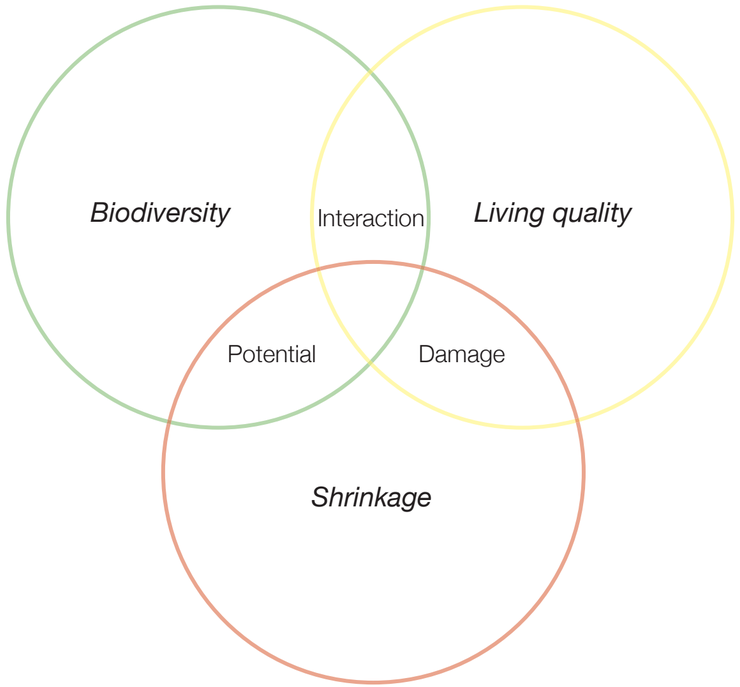
-How to control the degree of human intervention while introducing new species to achieve a harmonious coexistence of human, flora and fauna

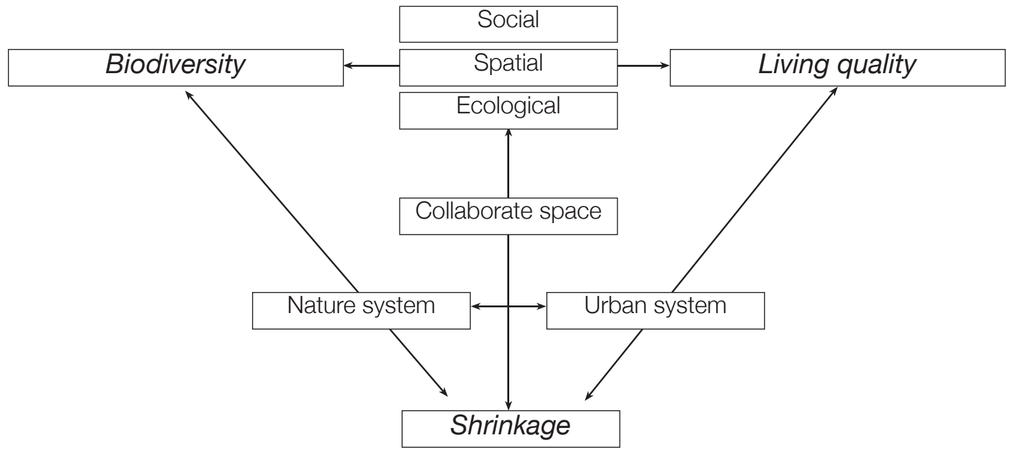
Reflection

METHODOLOGY



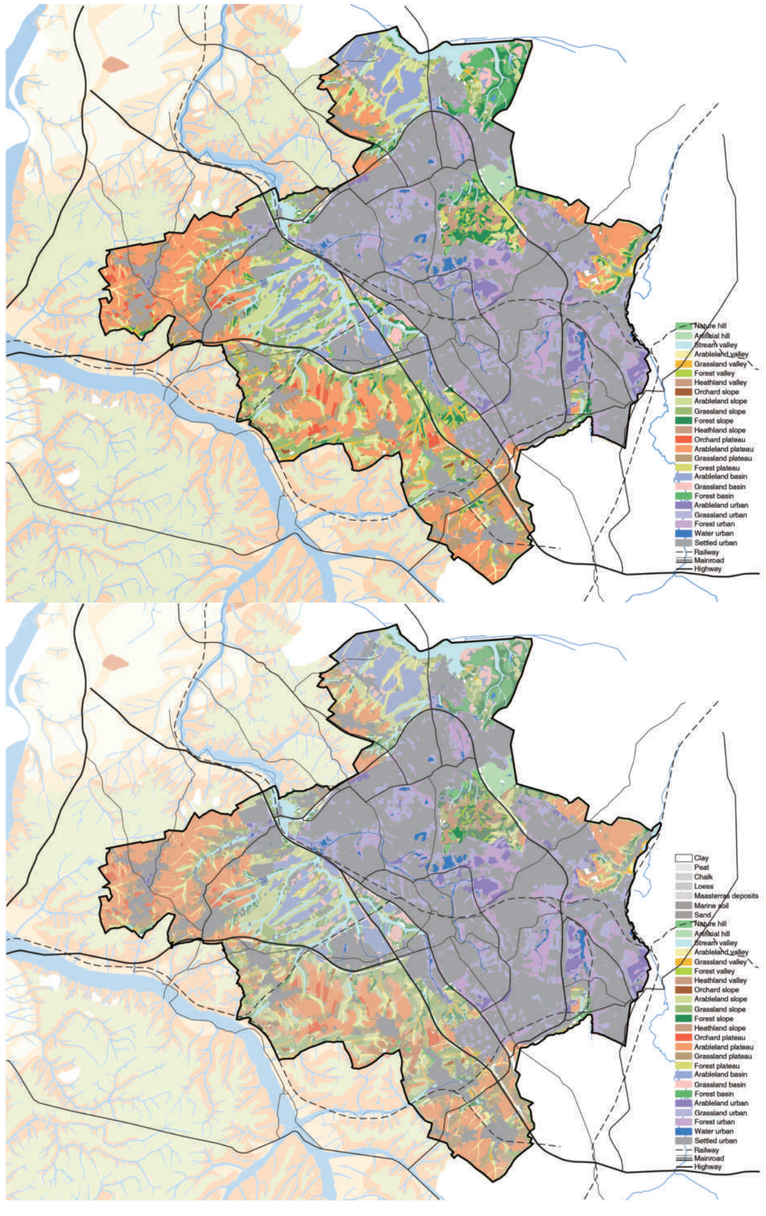
METHODOLOGY

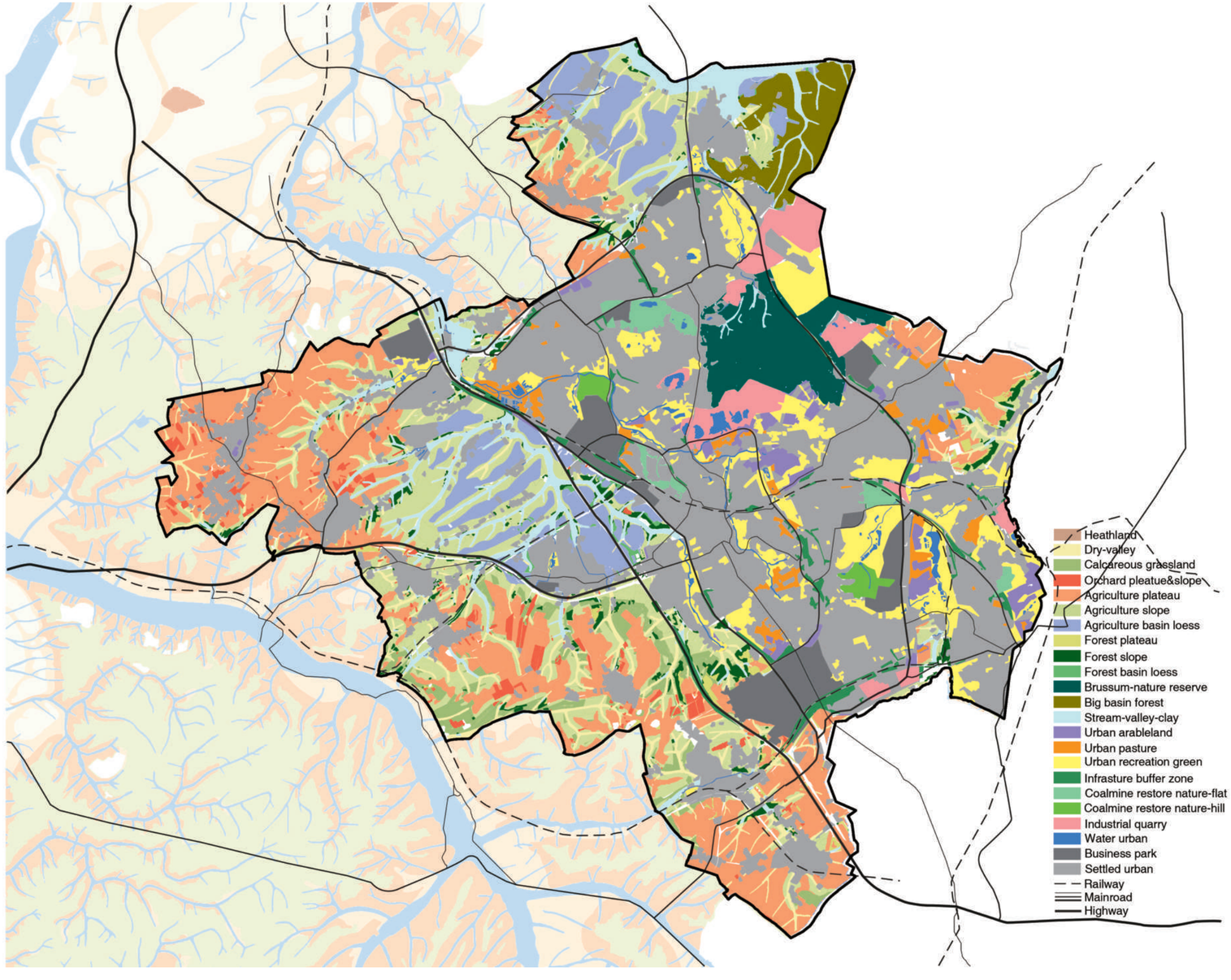




ANALYSIS Parkstad Scale| Nature System

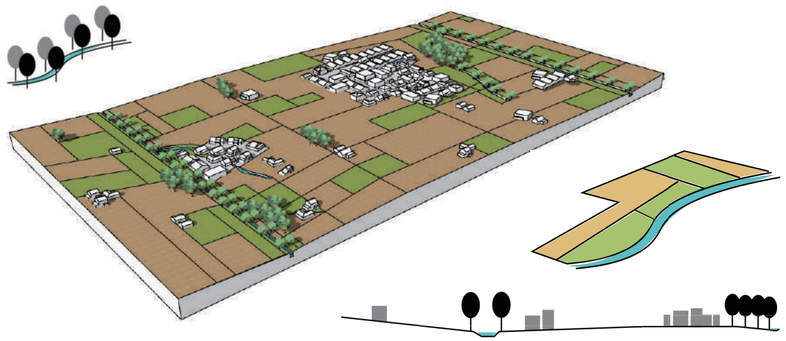
Landscape Typology





ANALYSIS Parkstad Scale| Nature System

Landscape Typology







Basin Forest loess landscape





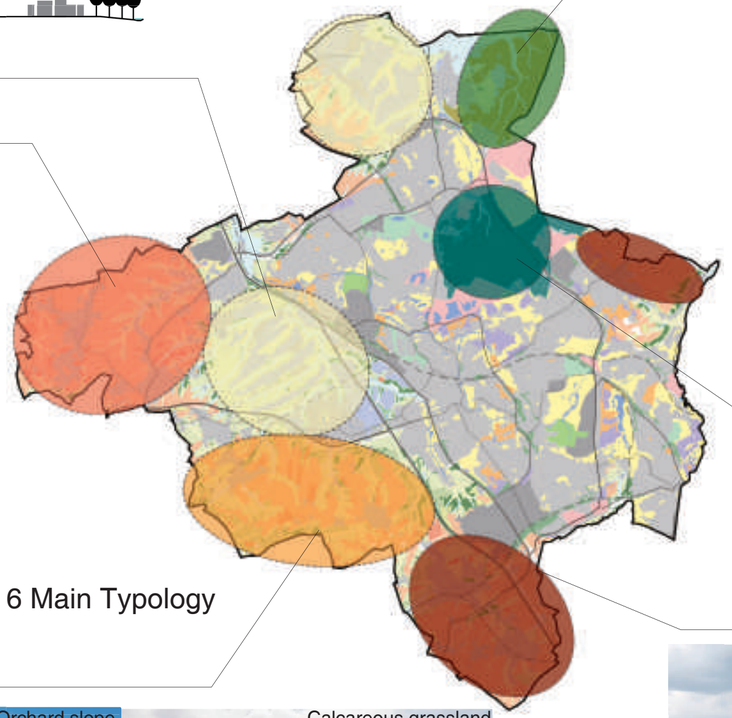
Brunssum Nature reserve

Basin-stream loess landscape

Plateau-Orchard landscape







6 Main Typology

Chalk plateau-slope landscape

Plateau-hill landscape





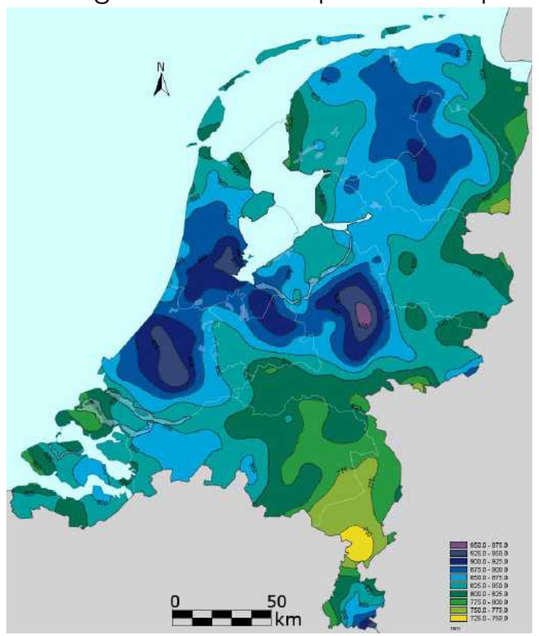




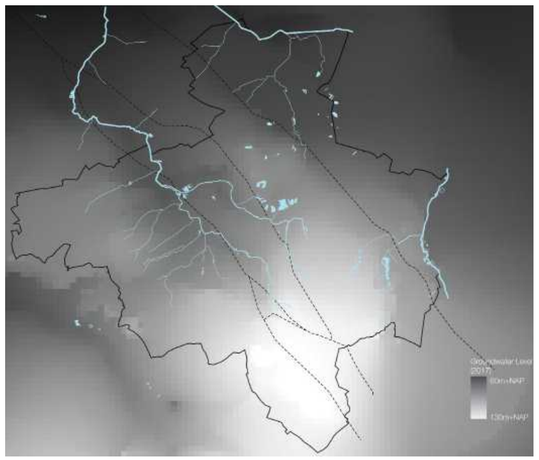
ANALYSIS Parkstad Scale| Nature System

Hydrology

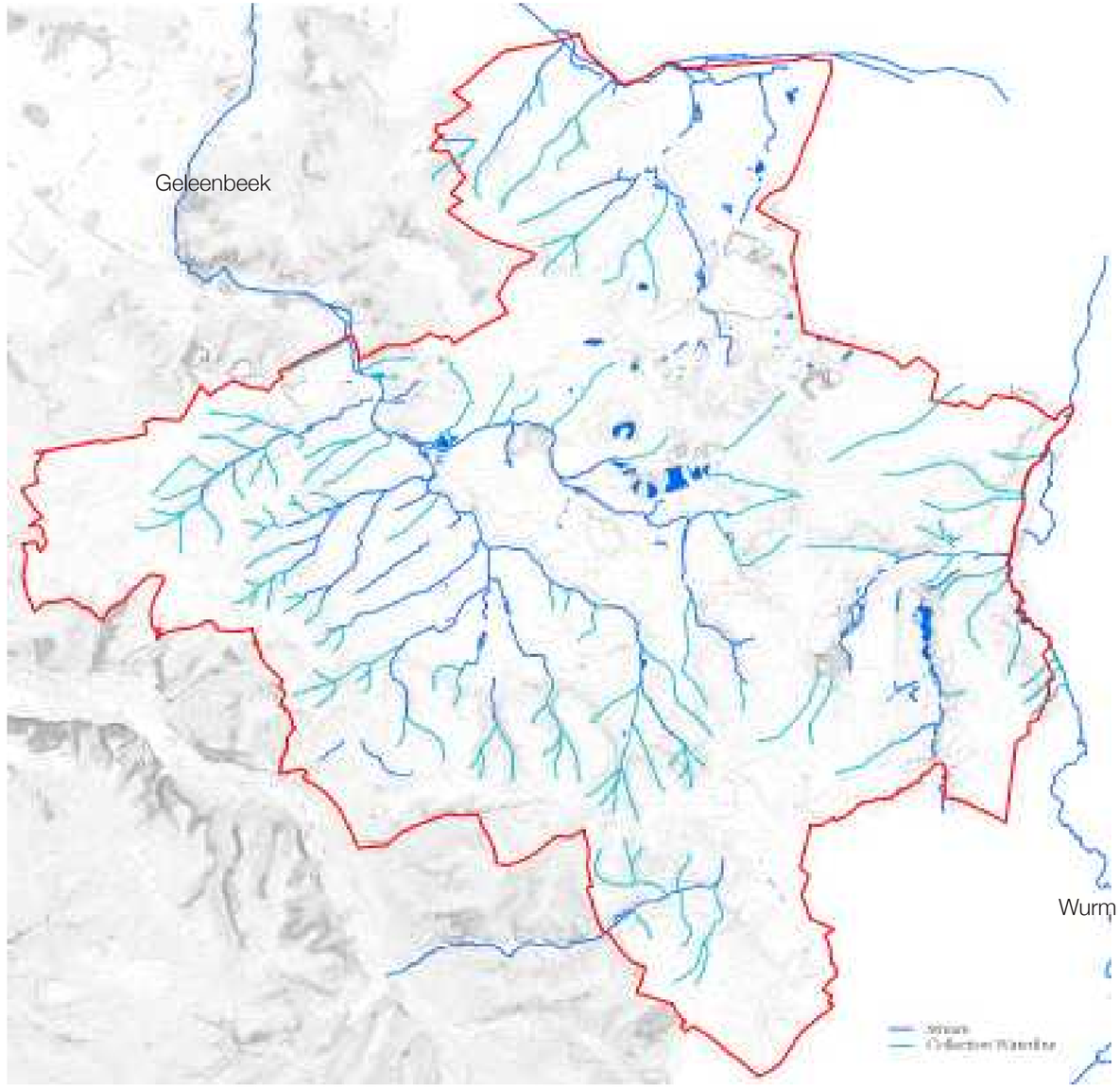
Long-term average 1981-2010
Average annual Precipitation Map



Groundwater level

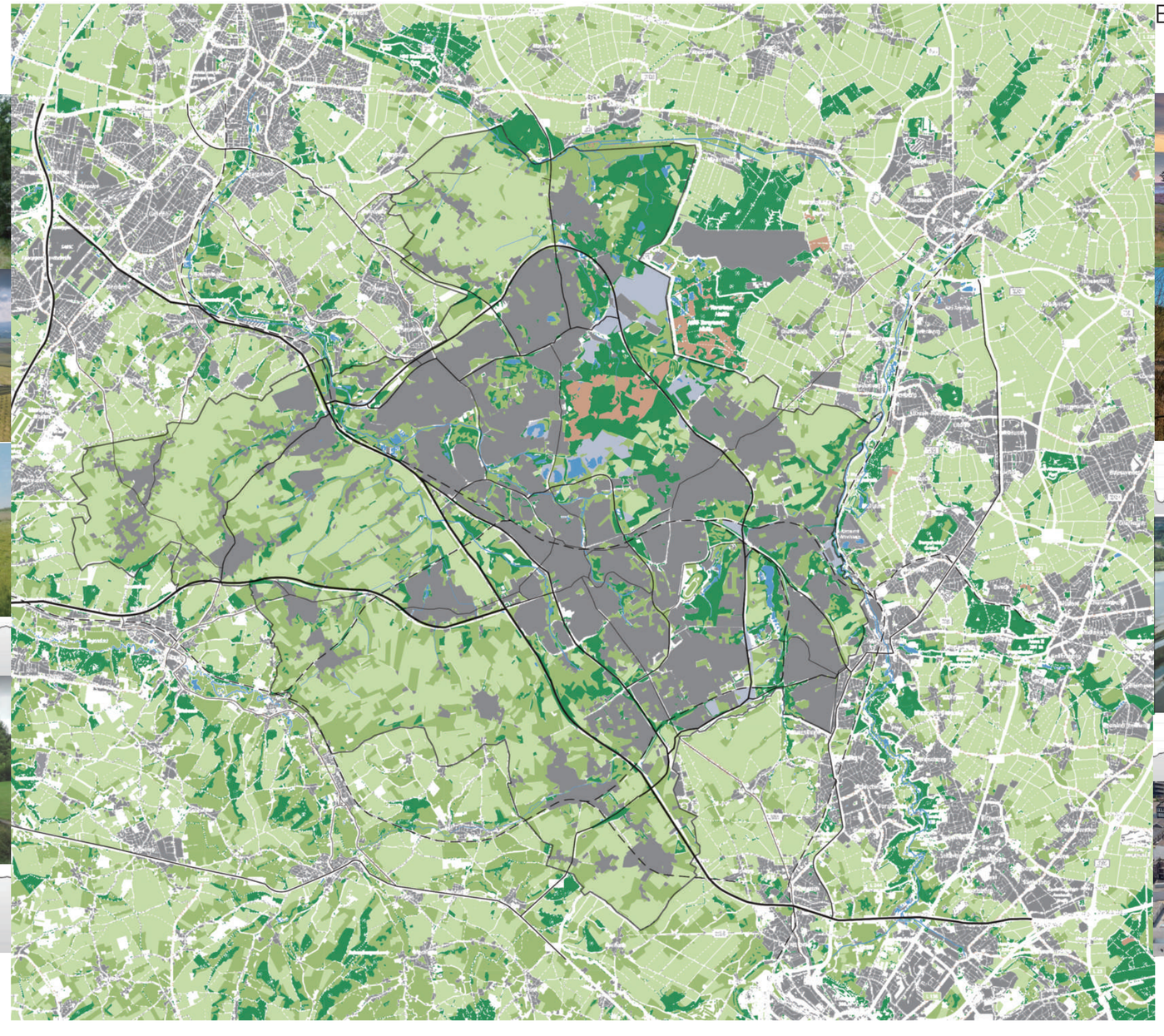


Collection waterline



ANALYSIS Parkstad Scale| Nature System

Existing Nature Resource



Stream Landscape

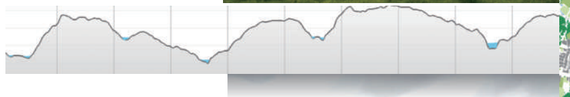


Basin agriculture



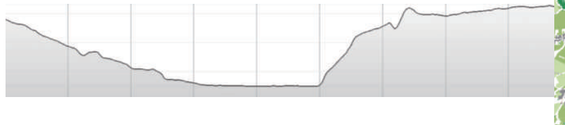
Slope agriculture





Big stream-valley landscape





Big potential,limited by existing structure



Brunssummerheide nature reserve

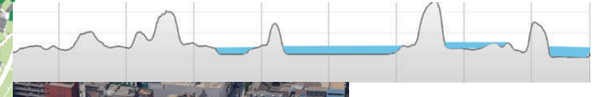


Forest nature resource





Industrial sand quarry





Dense city center

BIRD-How to use this area?



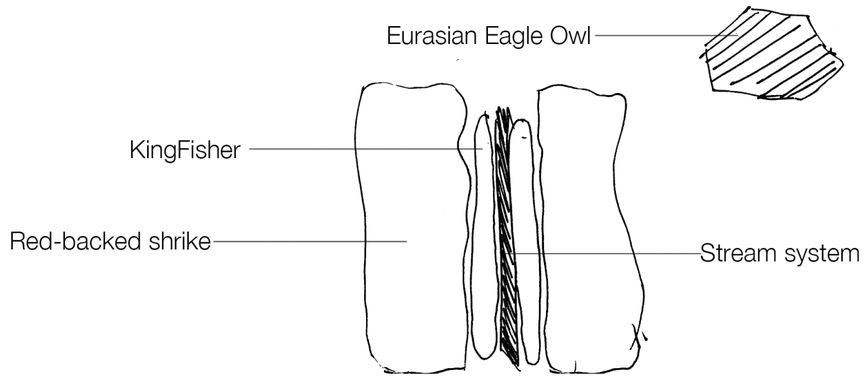
Eurasian Eagle Owl-*Bubo bubo*
Red List



Red-backed shrike-*Lanius collurio*
Red List



KingFisher-*Alcedo atthis*
Small amount of hibernators/migrants



Relation with water

ANALYSIS Parkstad Scale| Nature System

Users map-BIRD

Eurasian Eagle Owl-*Bubo bubo*

Red List

HABITAT PREFERENCES
Rocky landscapes:cliffs, ravines, quarries(sand and limestone)
Wooded areas:tree lined waterways,coniferous,pine trees,oaks
Water: vicinity of riparian or wetlands areas
FOOD
Mice, rats, rabbit, squirrels, and birds

Adequate food supply and nesting sites seem to be the most important prerequisites.
Major roads and town centres are avoided



60-75 cm, wingspan 160-188 cm

Source:Bird Protection

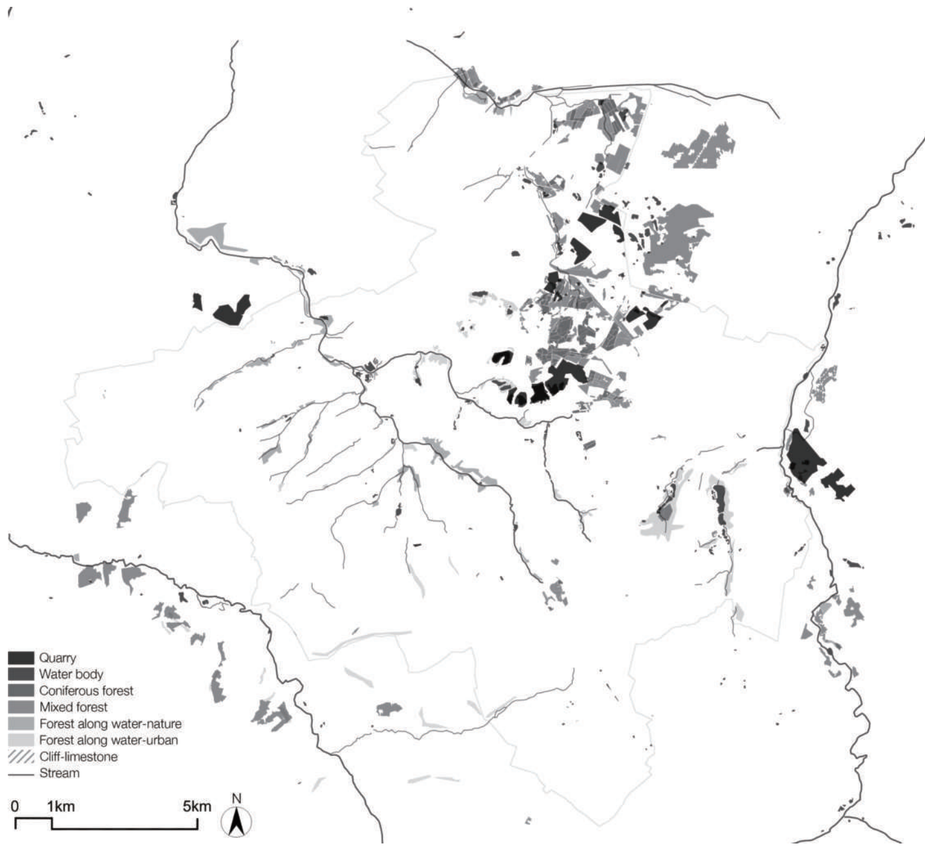




Photo by Shane McPherson



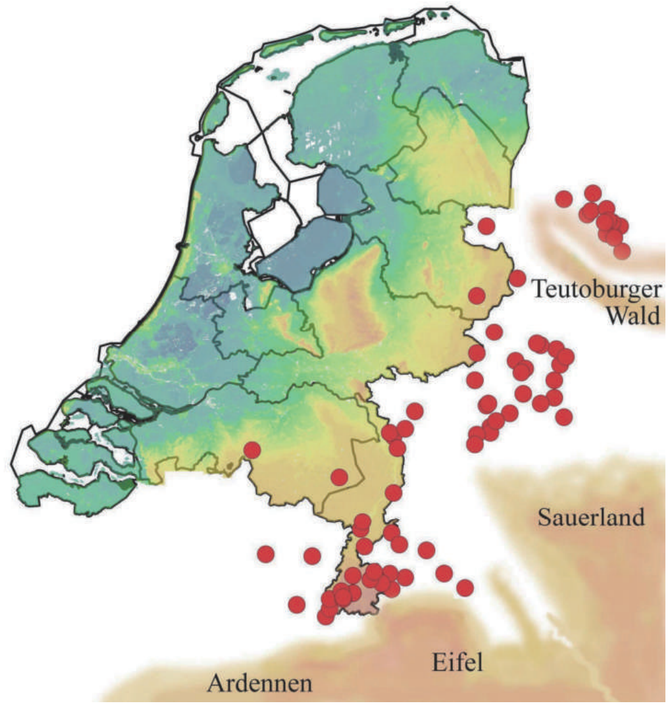
Photo by Rob Reijnen



Photo by Paul Smith

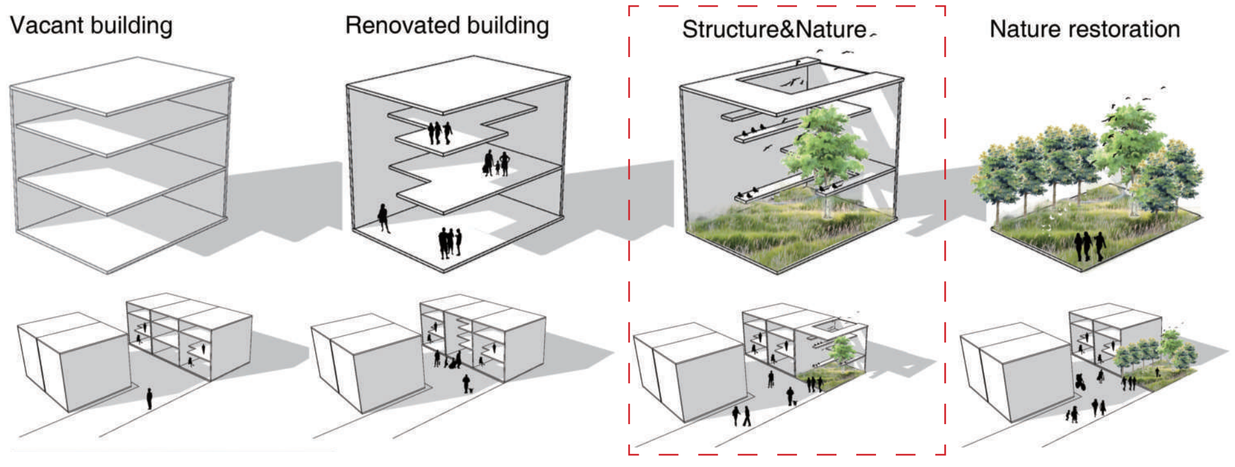


Photo by VISUALPHOTOS









ANALYSIS Parkstad Scale| Nature System

Users map-BIRD

Red-backed shrike-*Lanius collurio*

Red List

HABITAT PREFERENCES

A mix of open areas and patches of woody vegetation, with many thorny shrub&trees forests edges, shrubs near road, in shortly grazed or cut meadow

Thorny shrubs:Hawthorns *(Crataegus spp),*Blackthorn *(Prunus spinosa),*Scots pine *(Pinus sylvestris),*Juniper bushes *(Juniperus communis),*Blackberries *(Rubus spp)*

Water: along the edge of small streams(10-20m)

FOOD

Insects, small mammals, reptiless,mall invertebrates

High wetness,heterogeneous vegetation,food availability is important

Not be affected by human disturbance associated with roads or paths within their territories.



16-18 cm

Source:Bird Protection

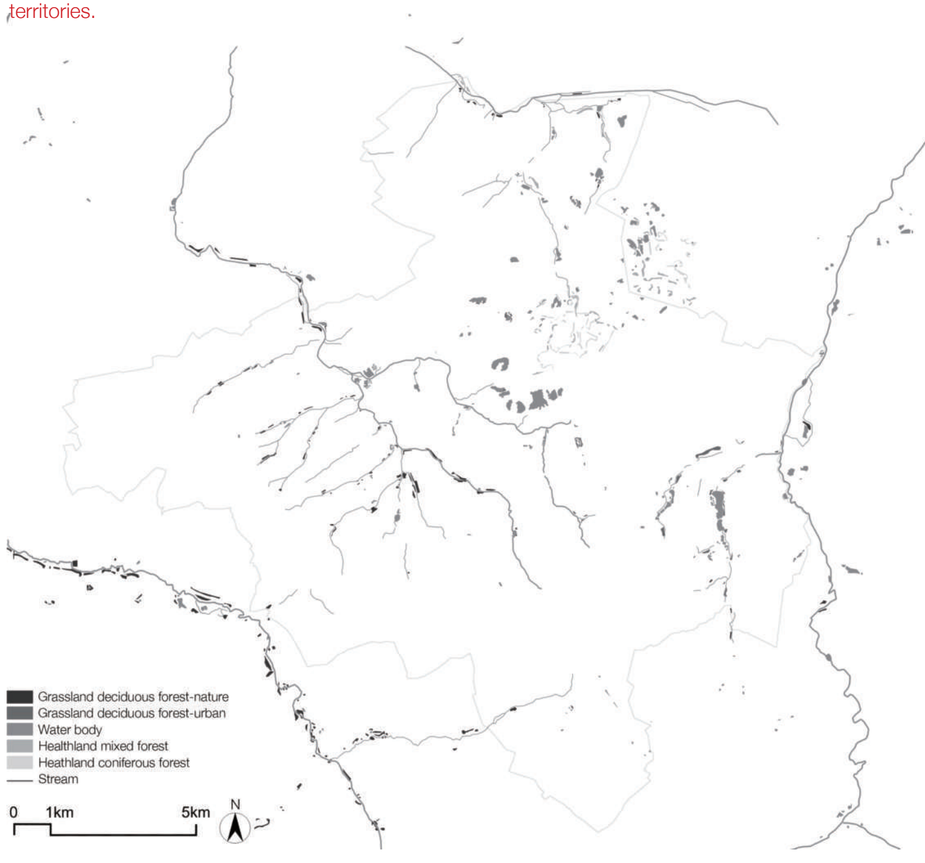




Photo by Bird Protection



Photo by Getty Images

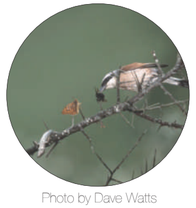
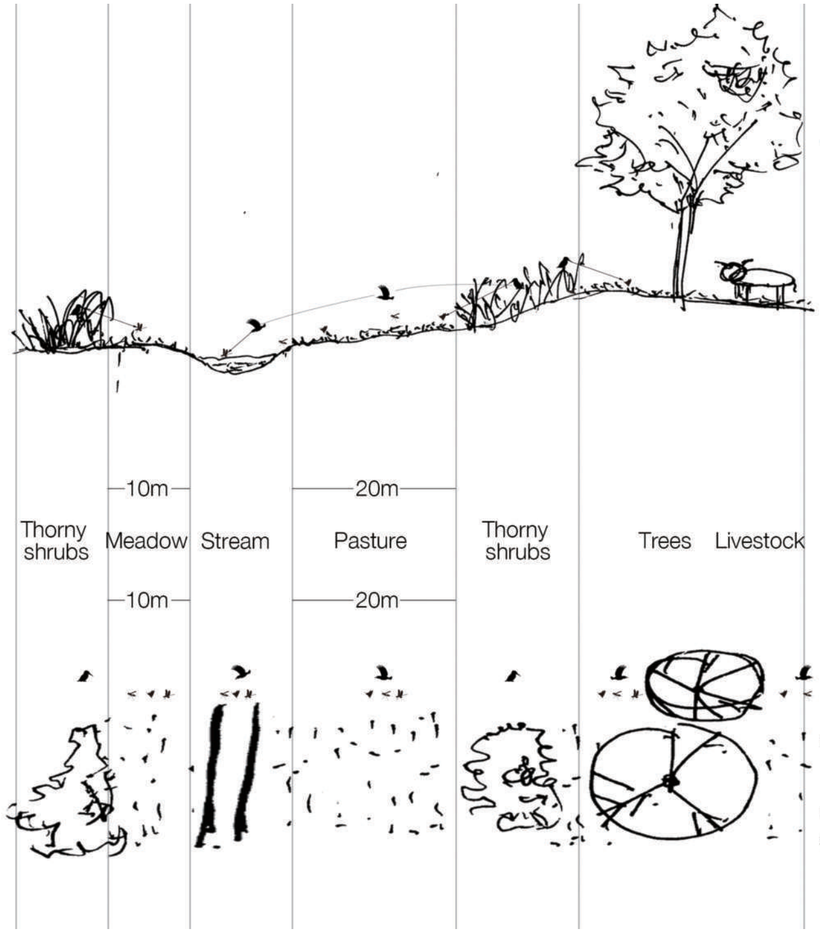
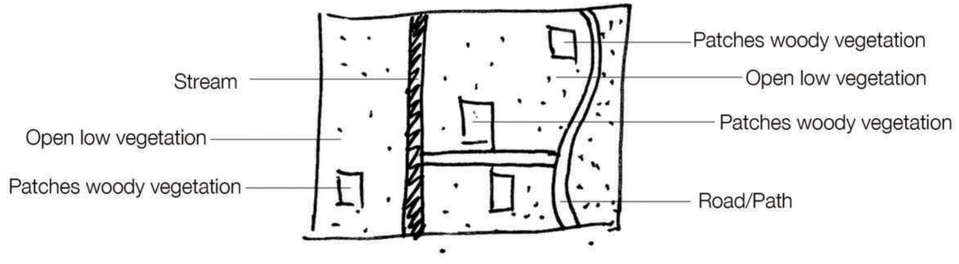


Photo by Dave Watts



Photo by VISUALPHOTOS





ANALYSIS Parkstad Scale| Nature System

Users map-BIRD

KingFisher-*Alcedo atthis*

Red List

HABITAT PREFERENCES

Water: shallow, clear, slow-running streams, rivers, lakes with enough fish, cover and seats.avoid heavy siltation or discolouration

Bank:Well-vegetated,soft but firm banks,steep or vertical banks of compact sand or earth.avoid reinforced or rock banks

Trees or bushes with branches overhanging the river provide important fishing perches.indicators of cleanwater, nesting on ledges and gaps in walls. hovering flight

FOOD

small fish and aquatic insects

Adequate food supply and nesting sites seem to be the most important prerequisites.

Shy nature,away from disturbance of human and dog.Cold weather or flooding in the summer



17-19.5 cm, wingspan 24-26 cm

Source:Bird Protection

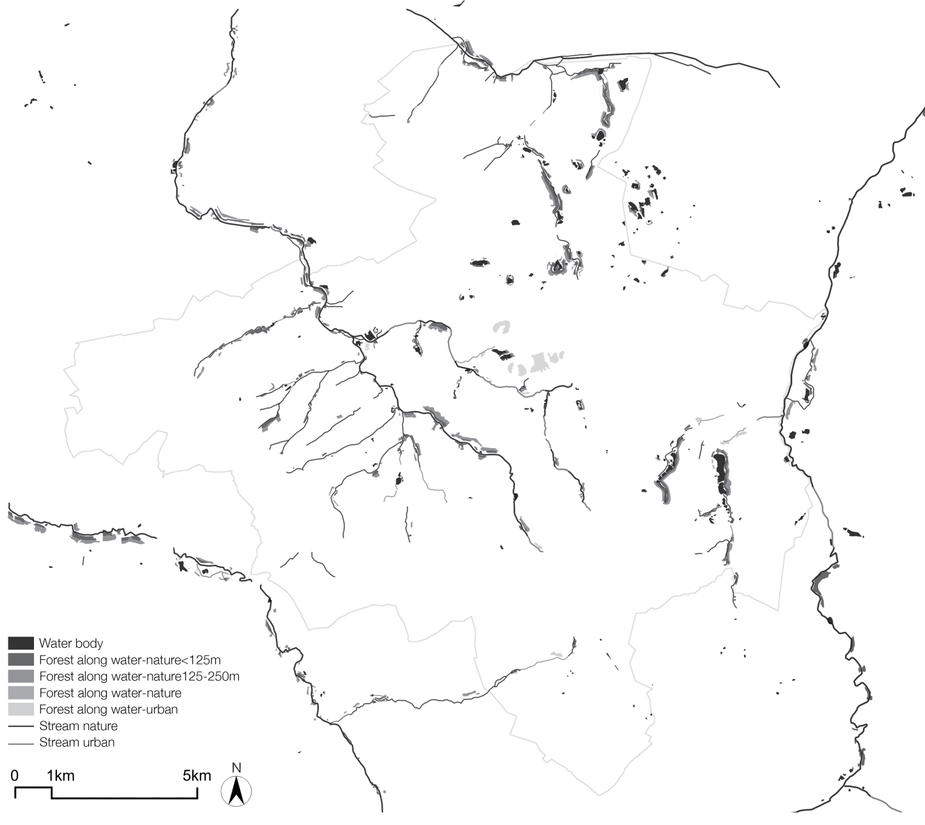




Photo by LandScape magazine Alamy



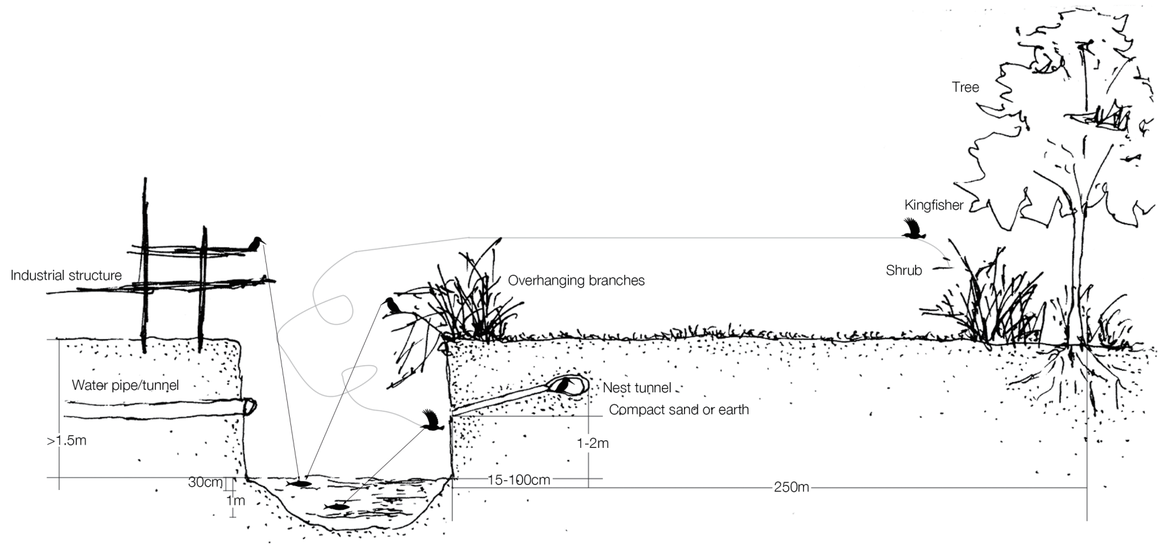
Photo by LandScape magazine Alamy



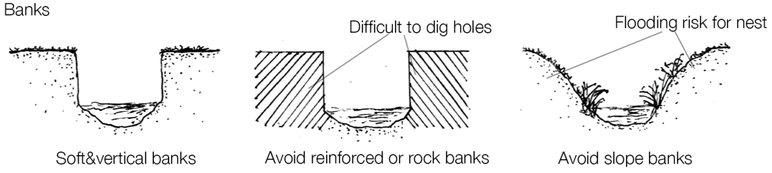
Photo by LandScape magazine Alamy



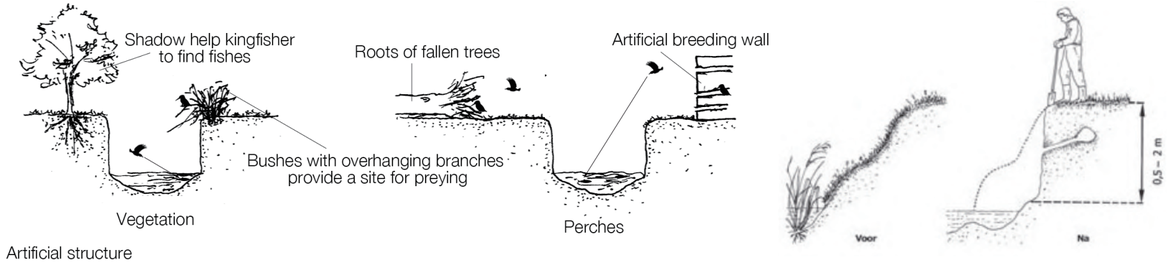
Photo by Landschap Noord-Holland



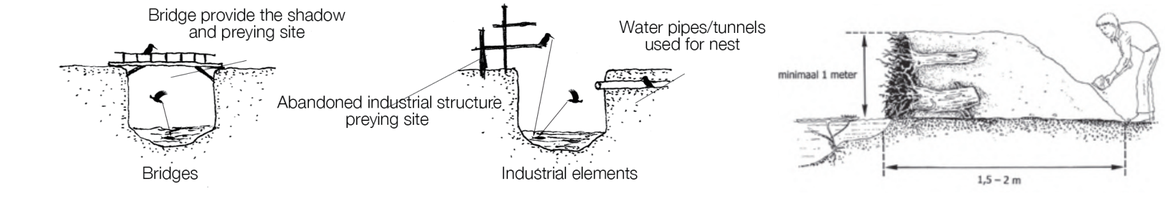
Banks



Nature habitats



Artificial structure



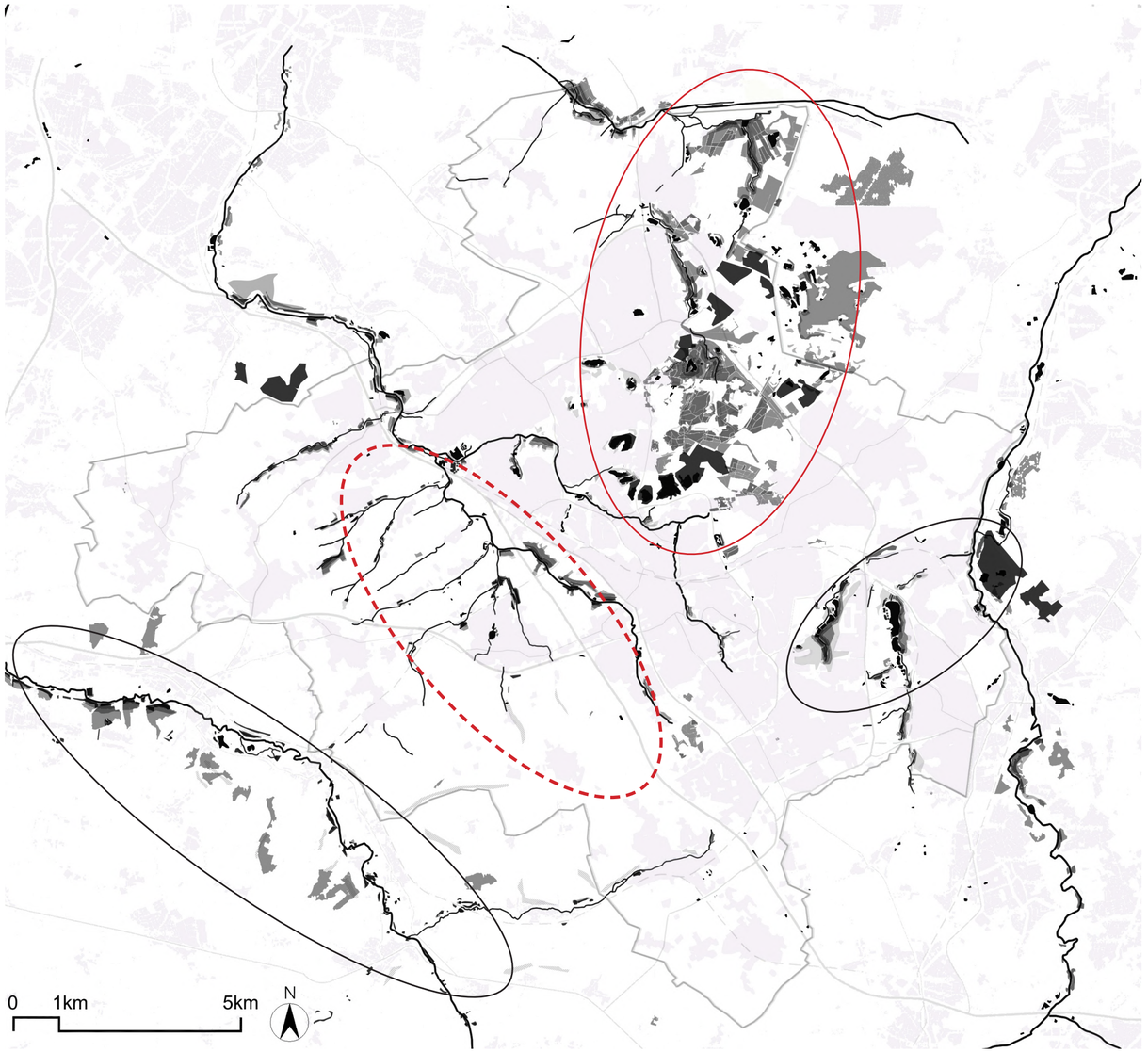
ANALYSIS Parkstad Scale| Nature System

Overlap 3users distribution maps

Four important habitat area

-Along stream systems have more nesting possibilities
-Southeastern nature reserve and sand quarry with many forest provide good and various habitats
-Stream system around two sides givepossibilities to organism

Stream system is quiet important to all the organism



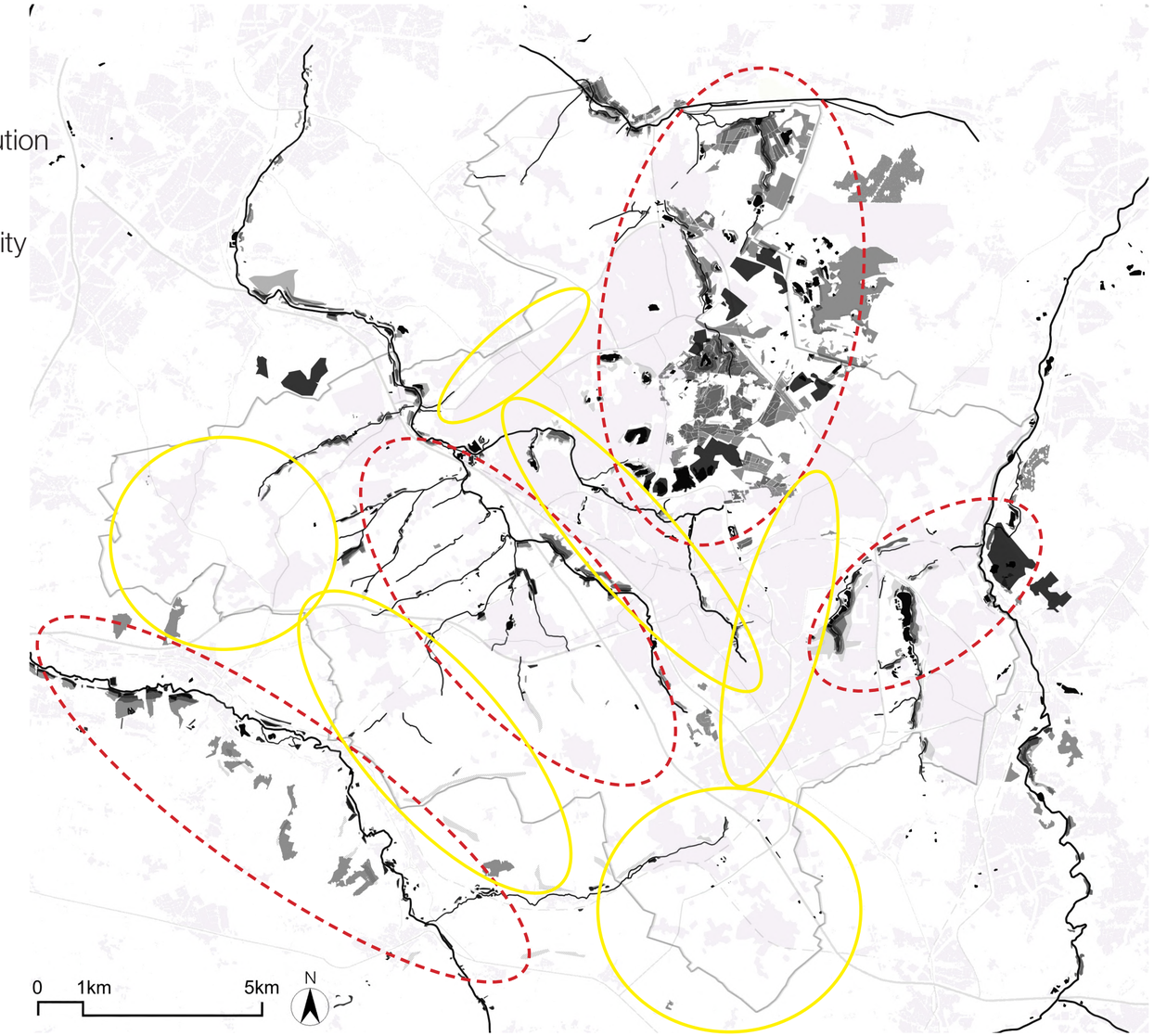
ANALYSIS Parkstad Scale| Nature System

Area need to be improve

Isolated green island leads to uneven distribution of organisms

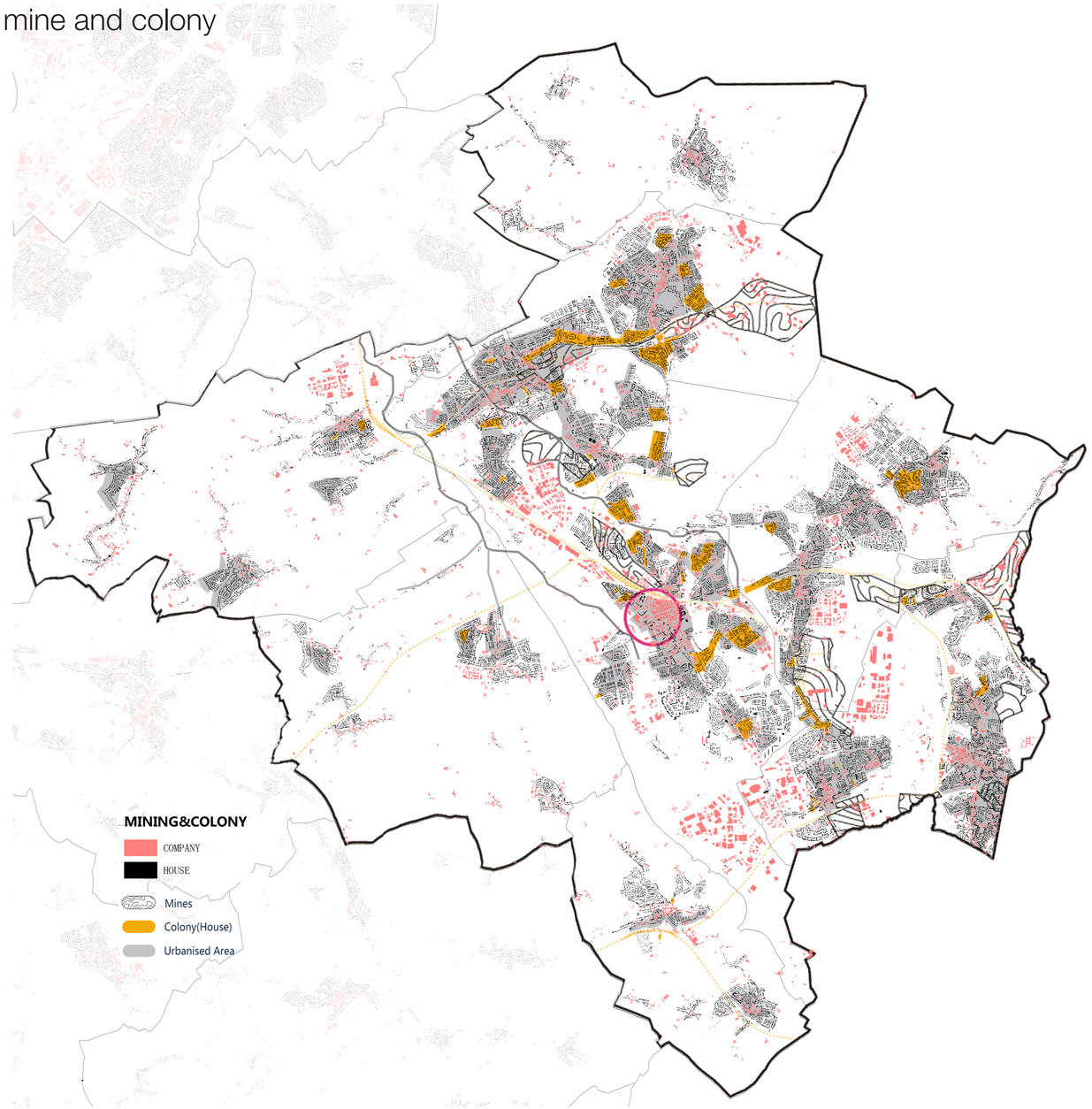
Agricultural and built area have less biodiversity

Blank,gap,breakpoint in the urban area

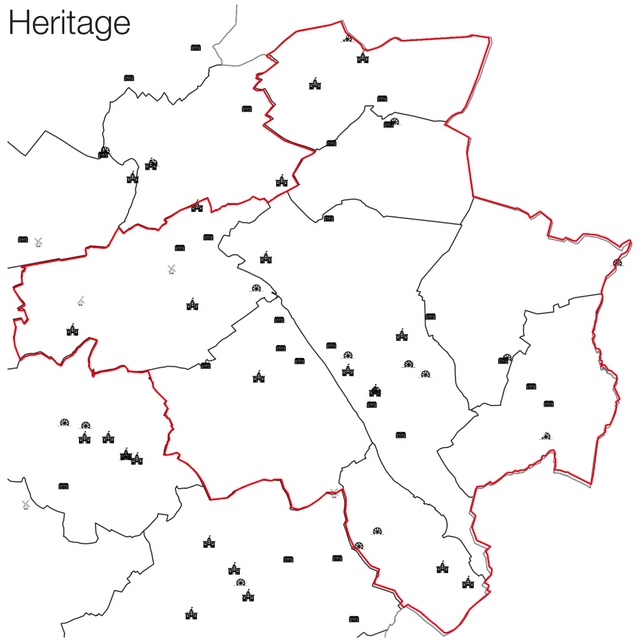


ANALYSIS Parkstad Scale| Urban System

Used Coal mine and colony



Heritage

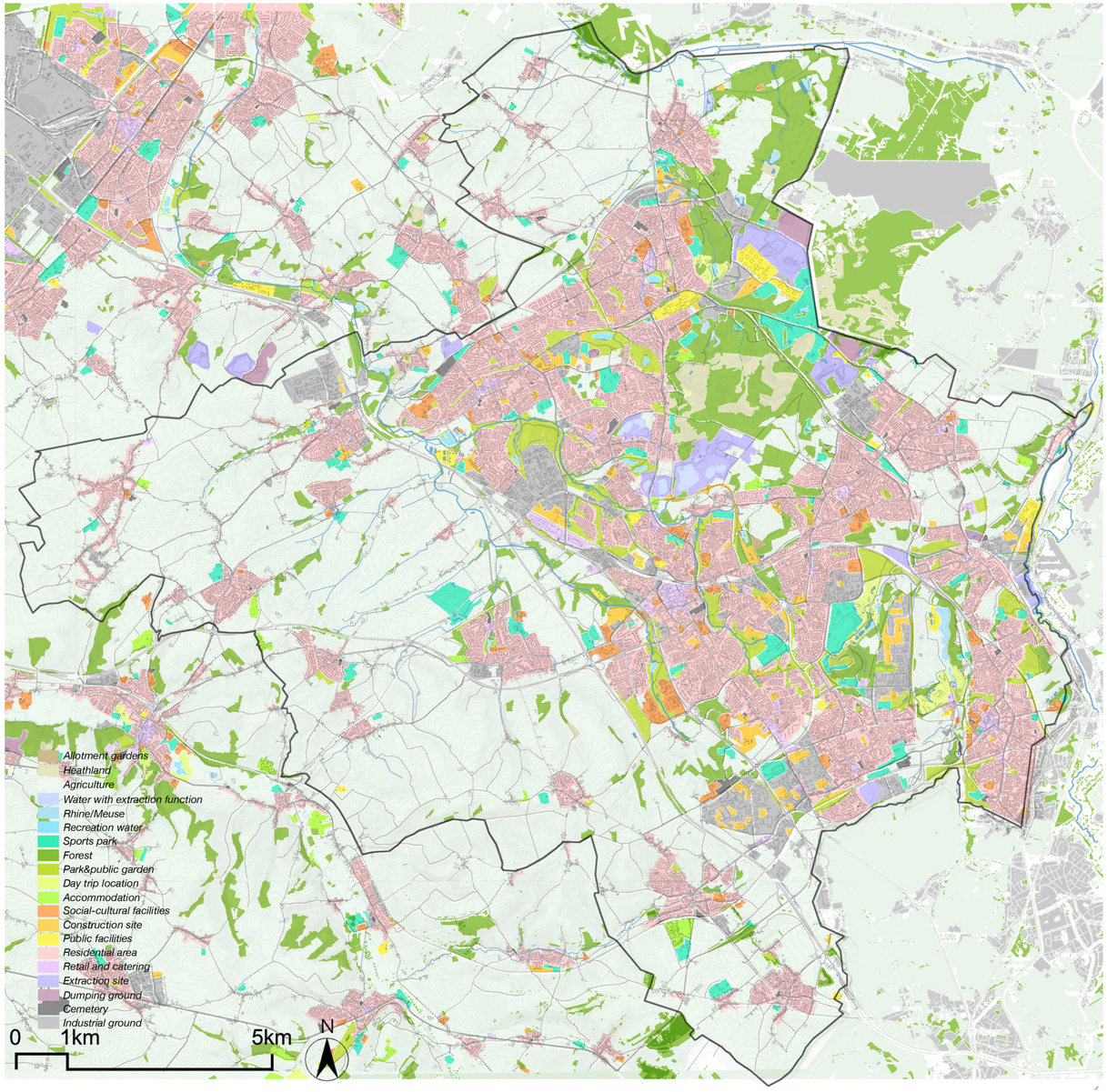


Attractions

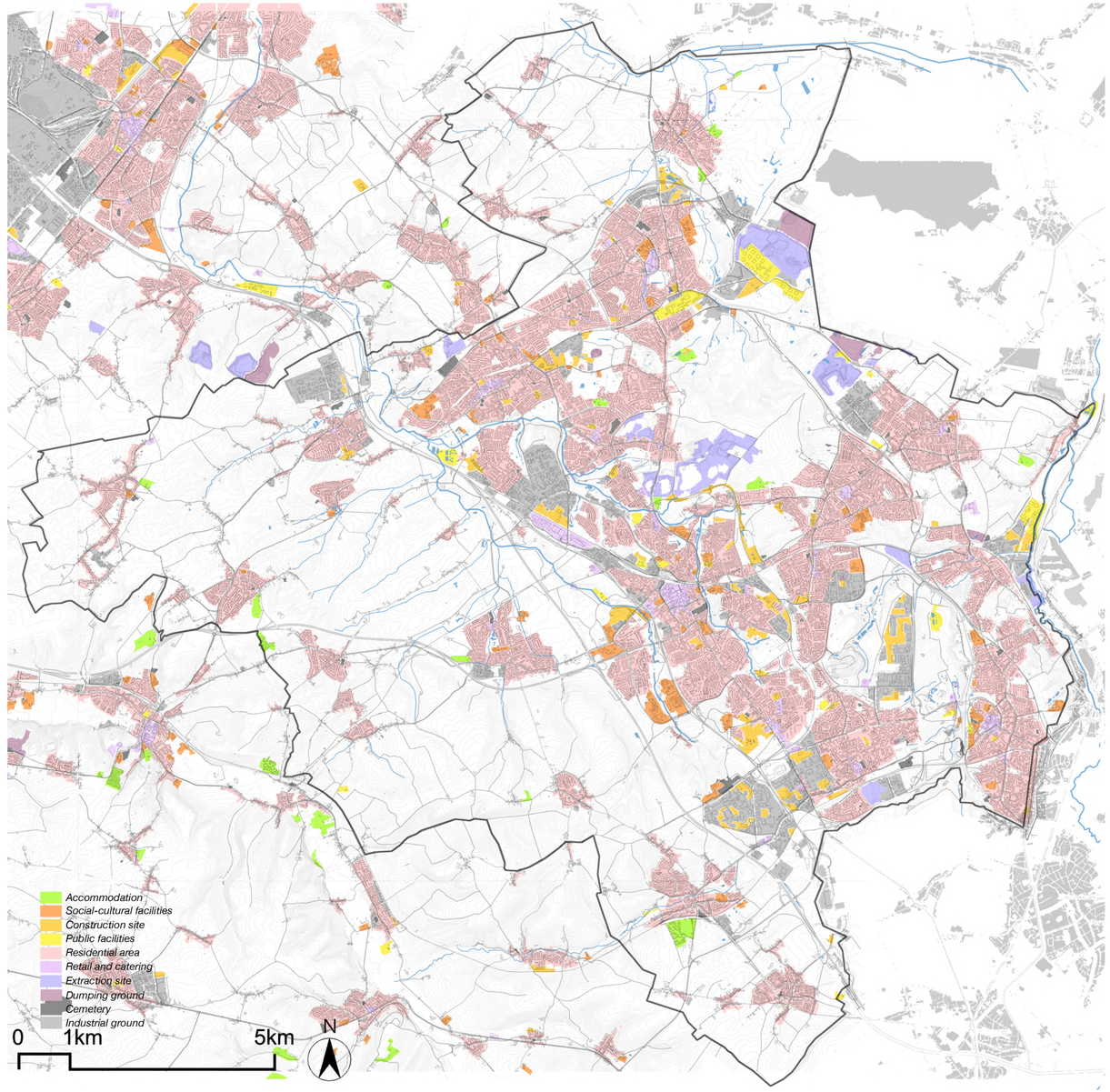


ANALYSIS Parkstad Scale| Urban System

Function map

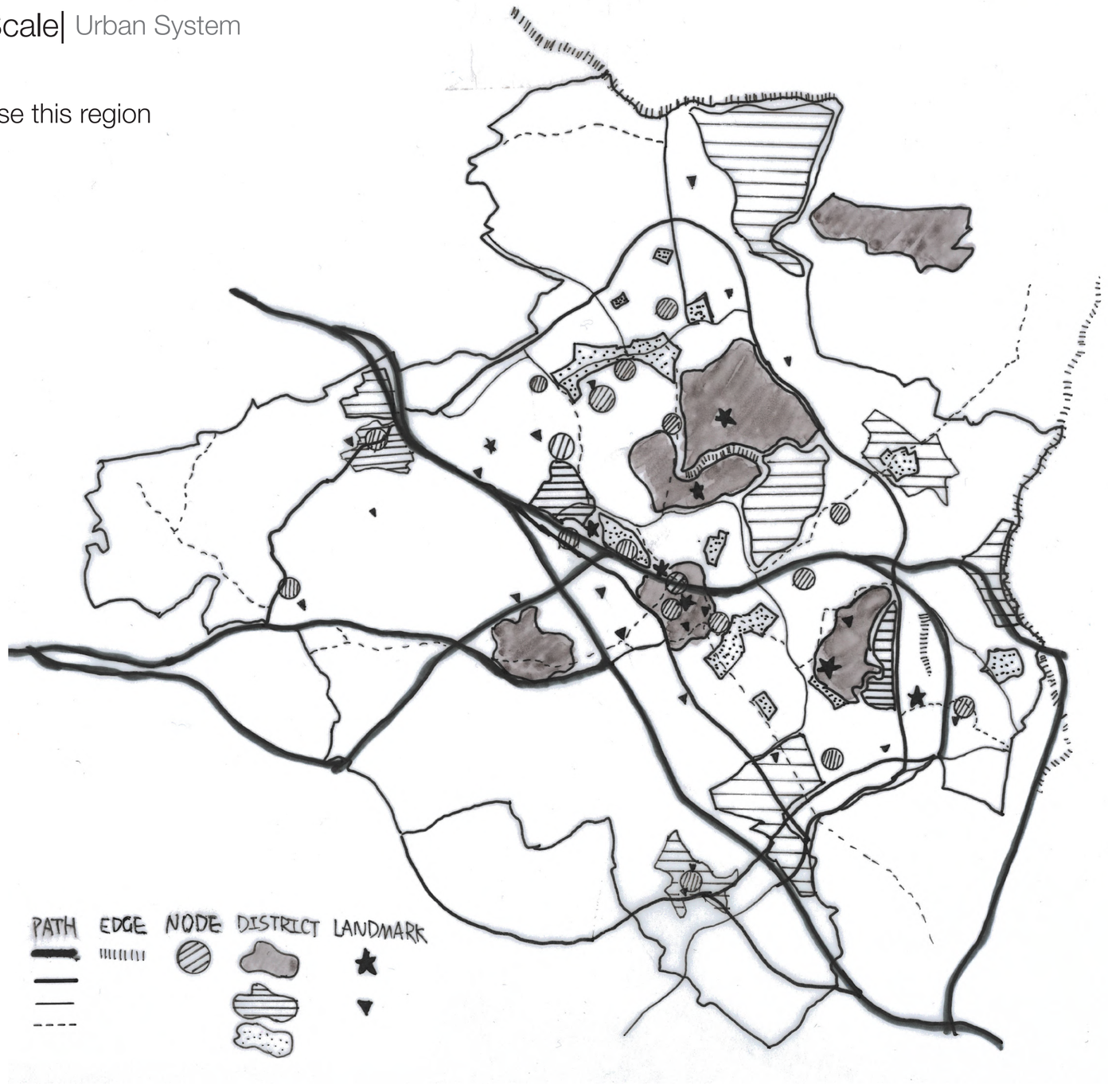


Function Urban



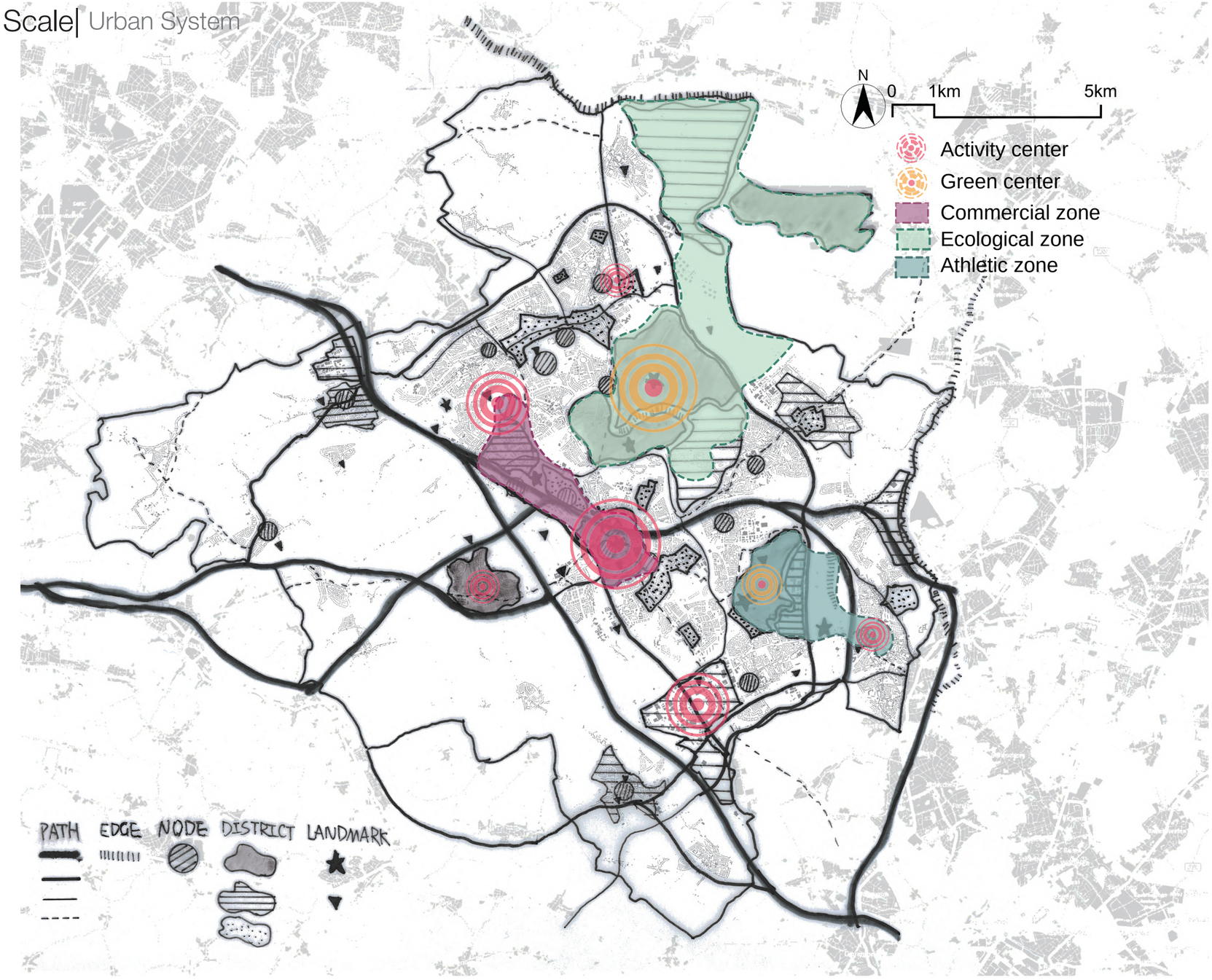
ANALYSIS Parkstad Scale| Urban System

Kevin lynch map-How people use this region



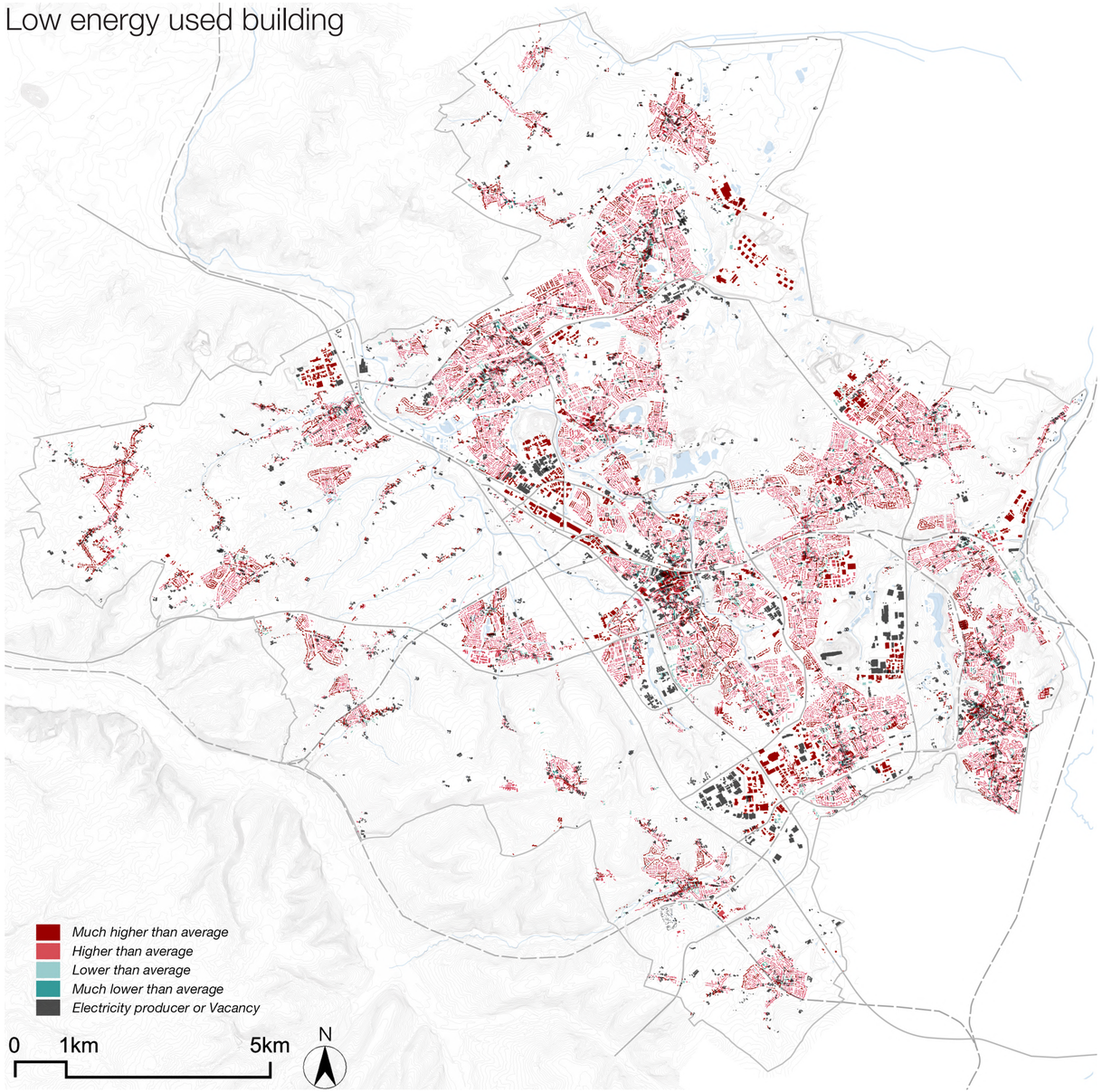
ANALYSIS Parkstad Scale| Urban System

Two centers & Three zones

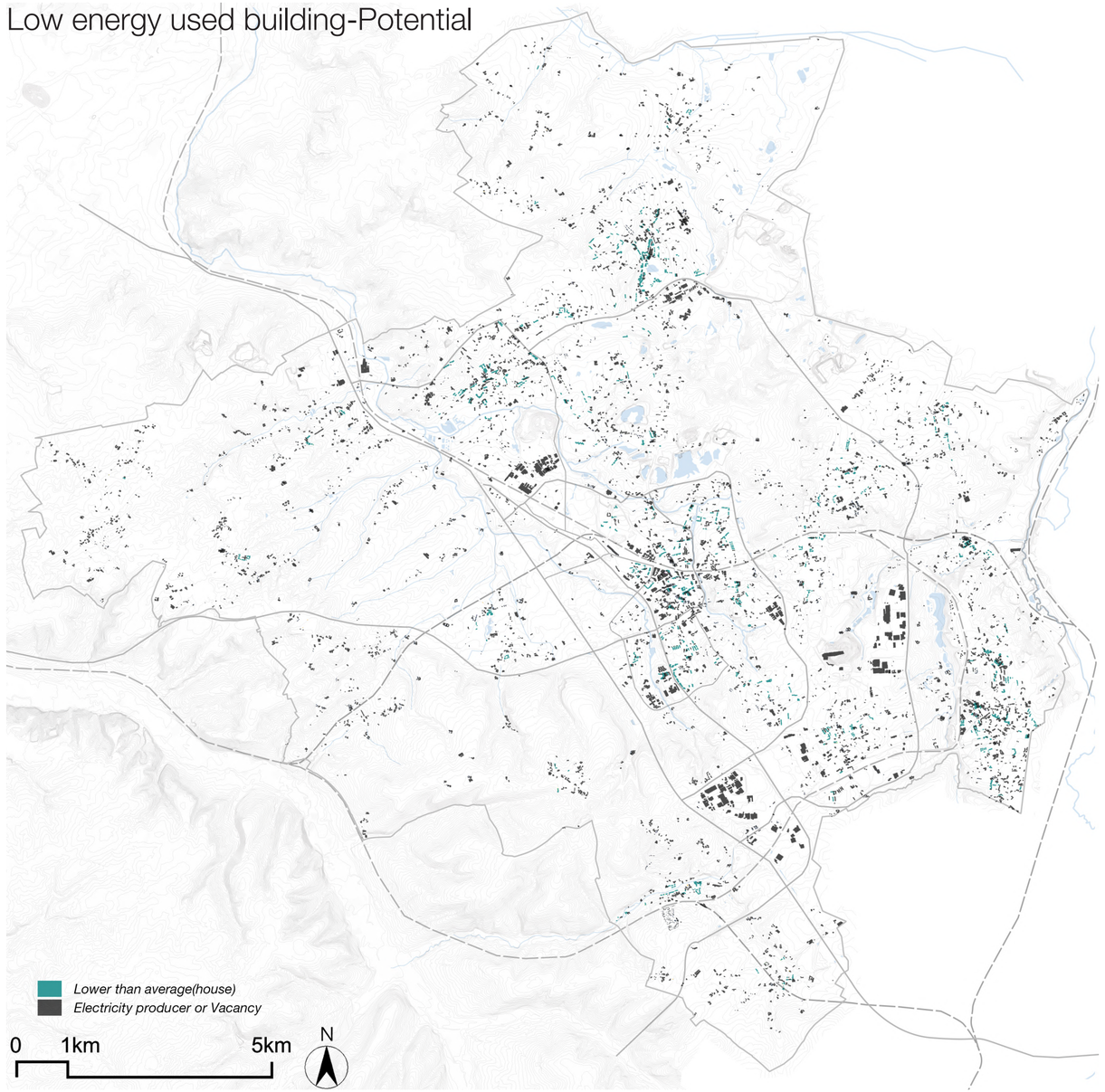


ANALYSIS Parkstad Scale| Urban System

Low energy used building



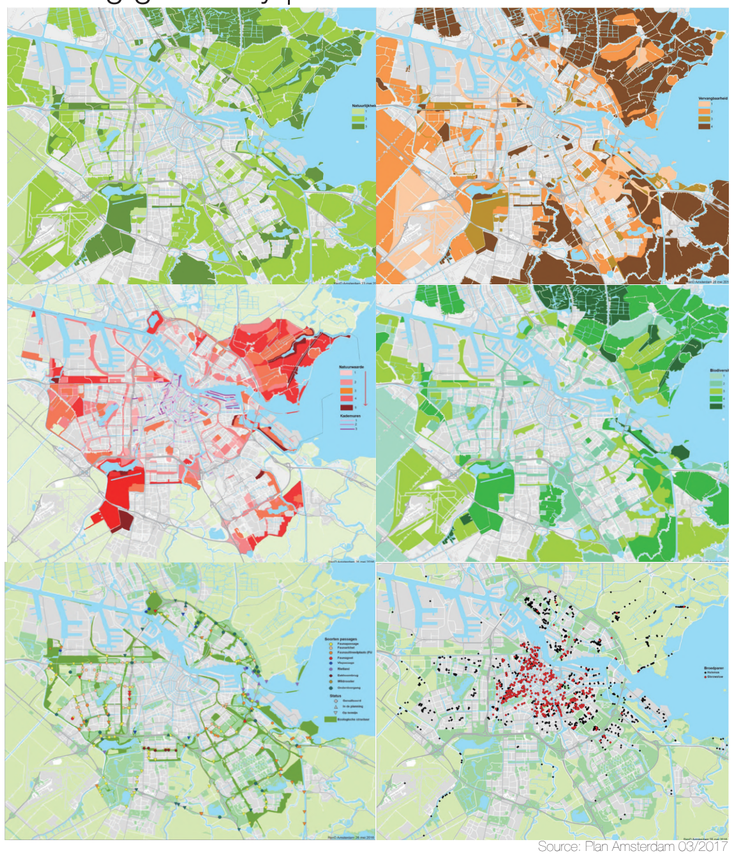
Low energy used building-Potential



PRINCIPLES & STRATEGIES

Case Study

Building green city | Amsterdam



Source: Plan Amsterdam 03/2017

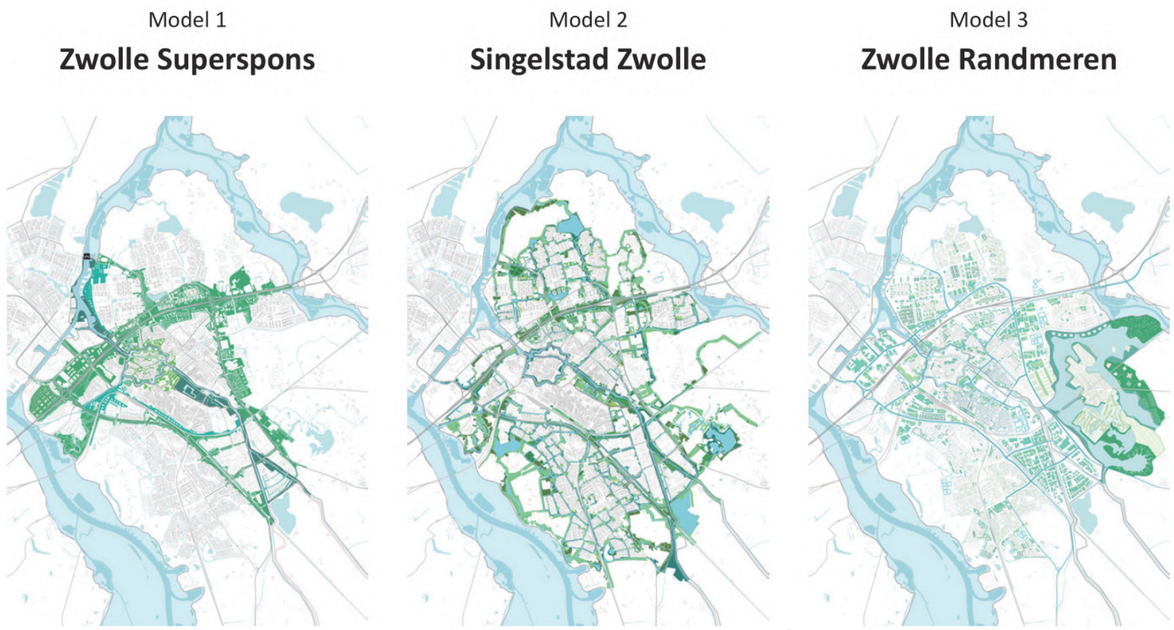
Connect green spaces to form *urban green networks*

For *different species*, connect the "*breakpoints*" on the *migration road*

A reinterpretation of urban *green-blue networks* as infrastructural systems where *traditional values of public space* are combined with *green values in ecosystem services*

Consider green-blue networks as *valuable quantifiable assets in urban economies*

Good green is golden | Zwolle



Source: http://www.urbanisten.nl/wp/?portfolio=good-green-is-golden-2

Landschaftspark Duisburg Nord

Remodel and update the abandoned industrial sites with ***diverse function***

Create different ***vegetation environments*** with ***old industrial structure***



Source: Ralke,04/24/2009



Source: Urbane Künste Ruhr



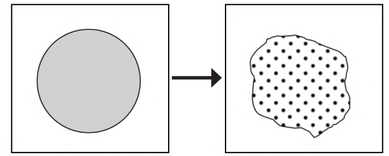
Source:https://www.landschaftspark.de

PRINCIPLES & STRATEGIES

Principles: ***New habitats*** | ***Heterogeneous Patches*** | ***Native Network***

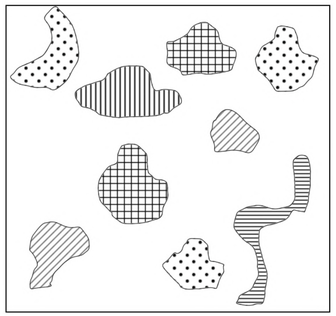
1. New habitats: Rebutild ***abandoned land cover*** into ***new habitats*** to support more ***species***

Broken | Ugly Landscape ⟶ Vital | Beautiful Landscape ---------- Species Diversity



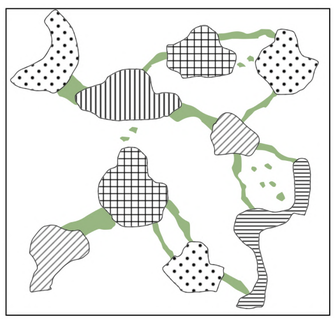
2. Heterogeneous Patches: Establish ***various types of circumstances*** to conserve and appeal more ***species***

Homogenous | Dull Landscape ⟶ Heterogeneous | Attractive Landscape ---------- Ecosystem Diversity
Species Diversity

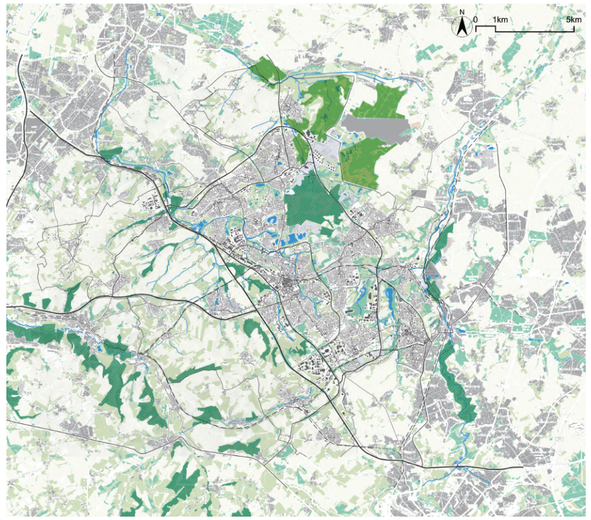


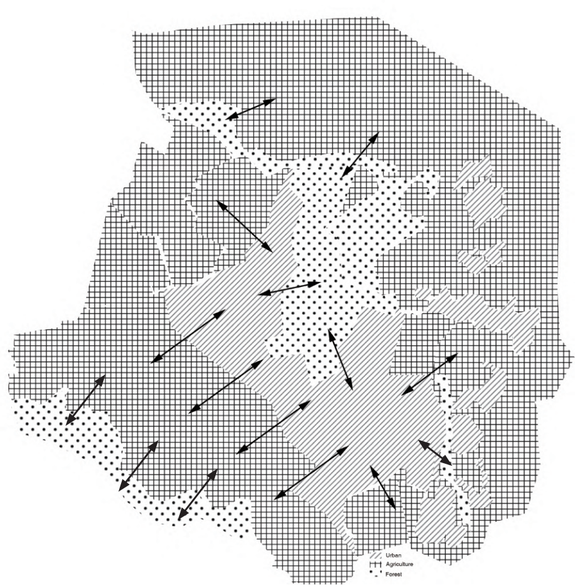
3. Native Network: ***Make connection*** between different habitats to promote ***species migration***

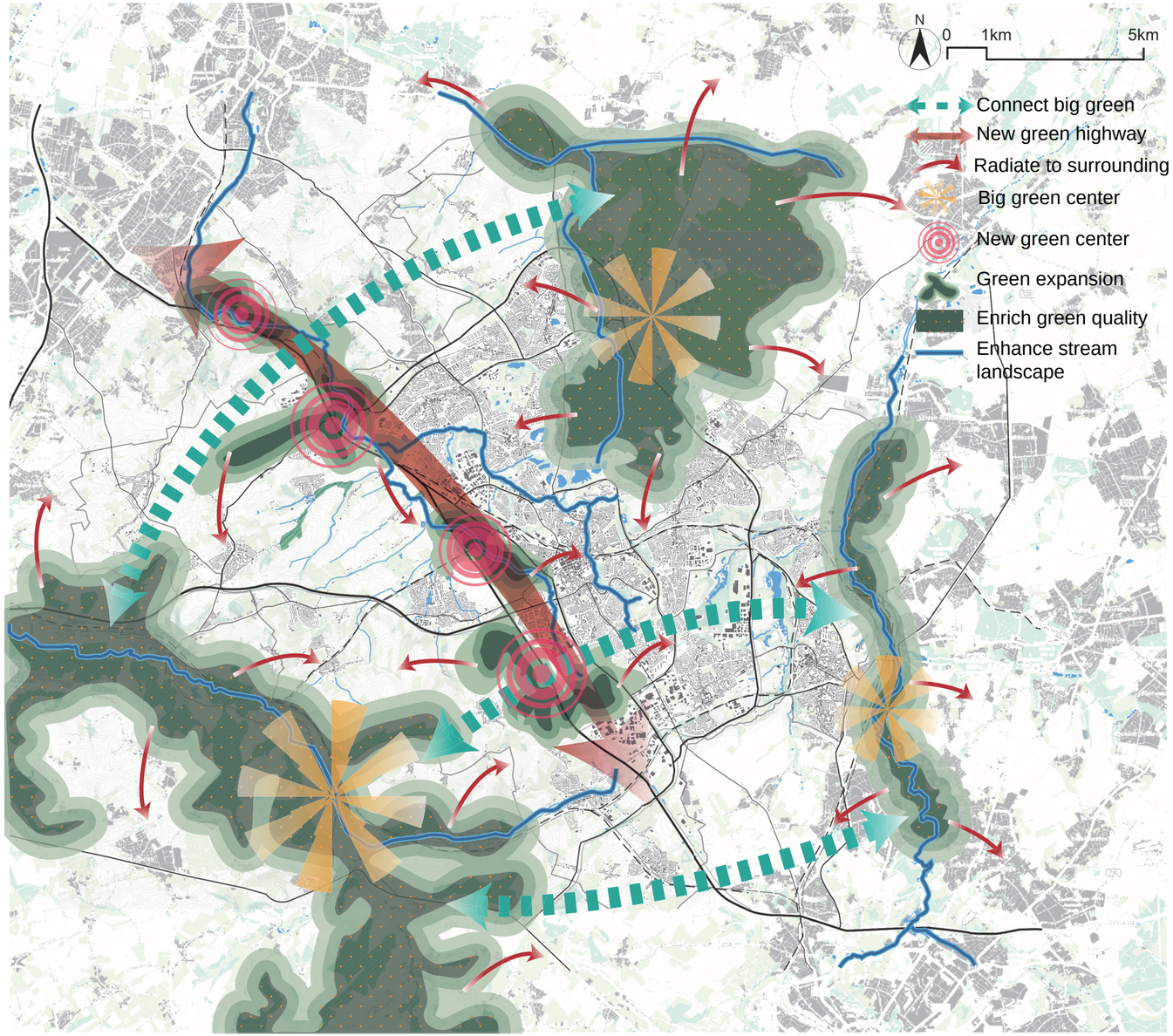
Isolated | Fragile Landscape ⟶ Complex | Strong Landscape ---------- Genetic Diversity
Species Diversity



DESIGN Parkstad Scale

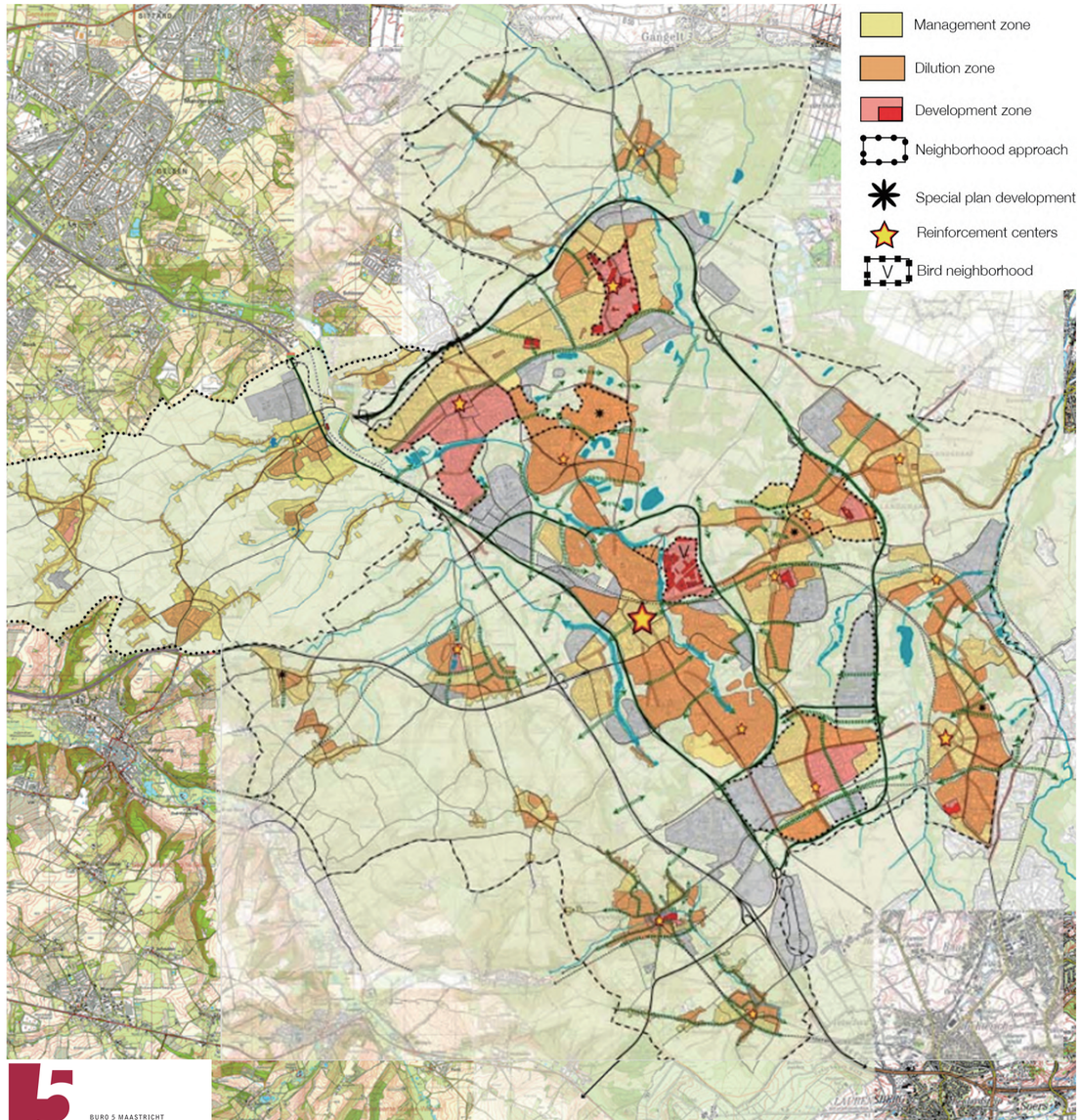






DESIGN Urban Scale

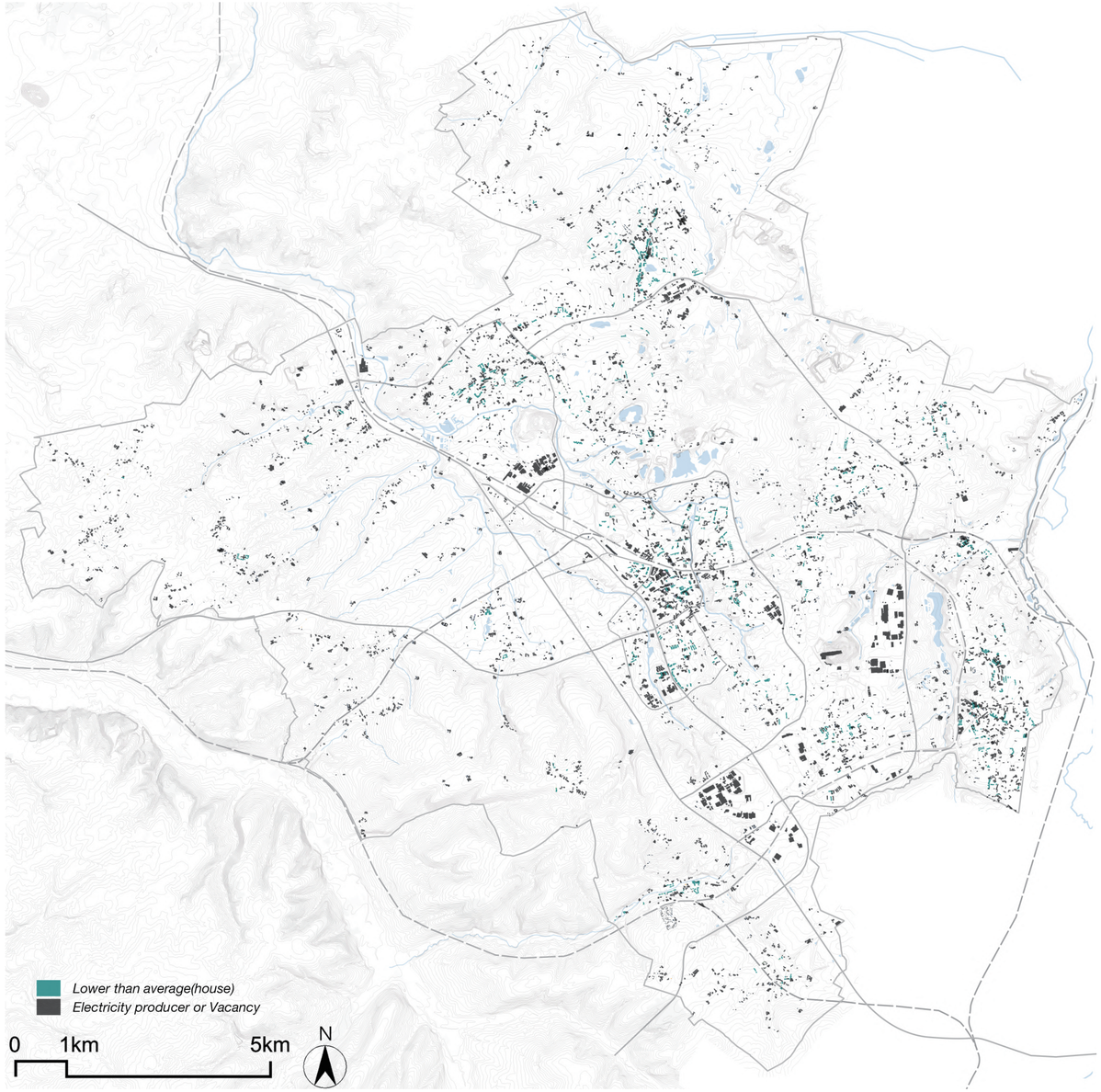
Restructuring vision by Parkstad Limburg



BURO 5 MAASTRICHT
architectuur, stedenbouw, landschap en planologie

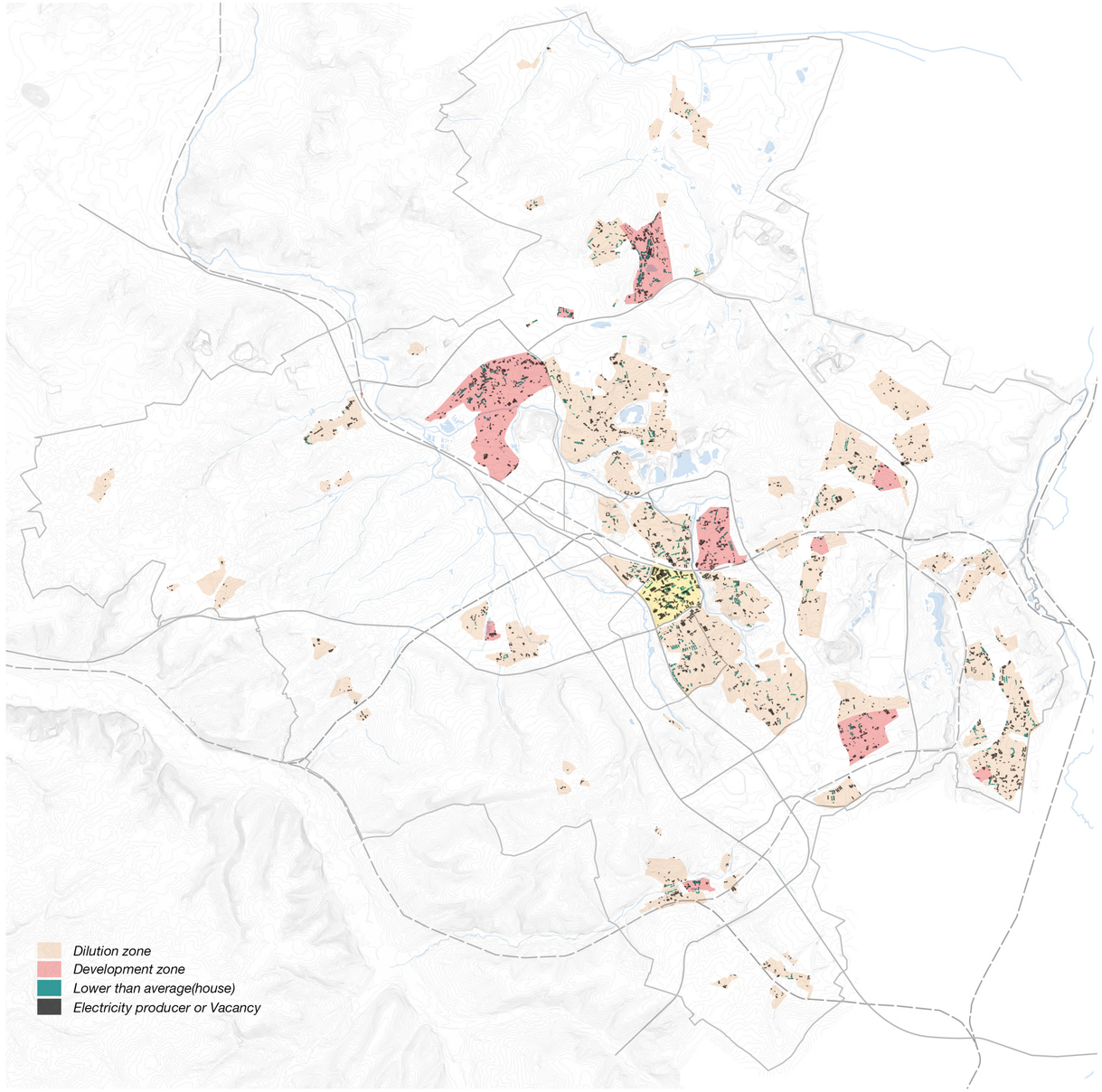
Source: Herstructureringsvisie Voor De Woningvoorraad Parkstad Limburg,2011

Potential vacant buildings

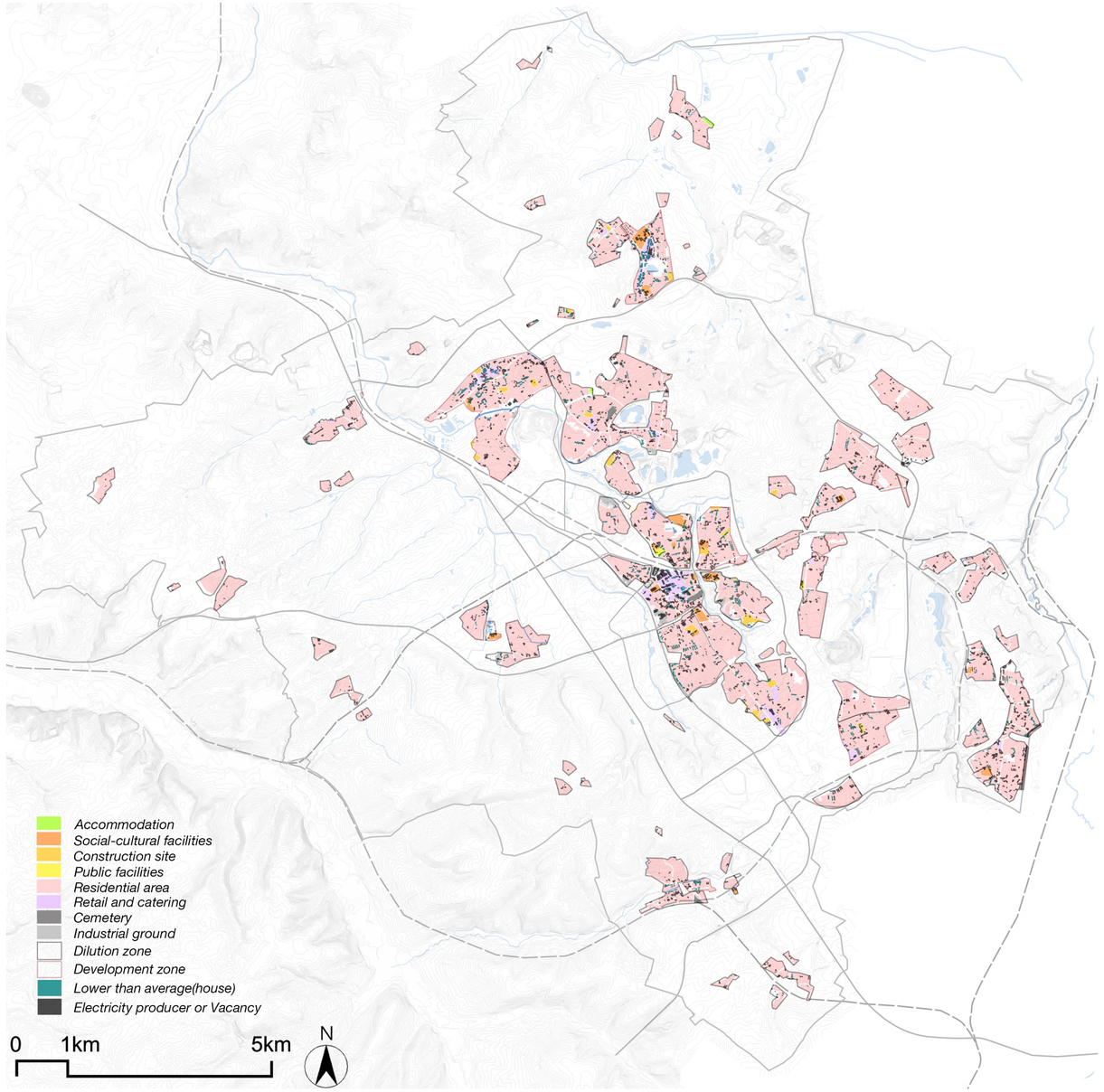


Design Urban Scale

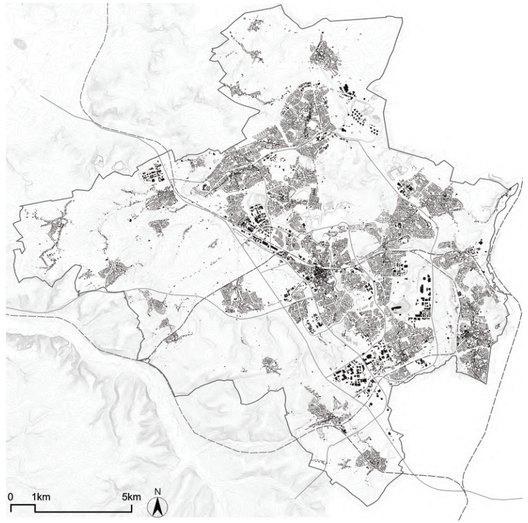
Possibilities sites

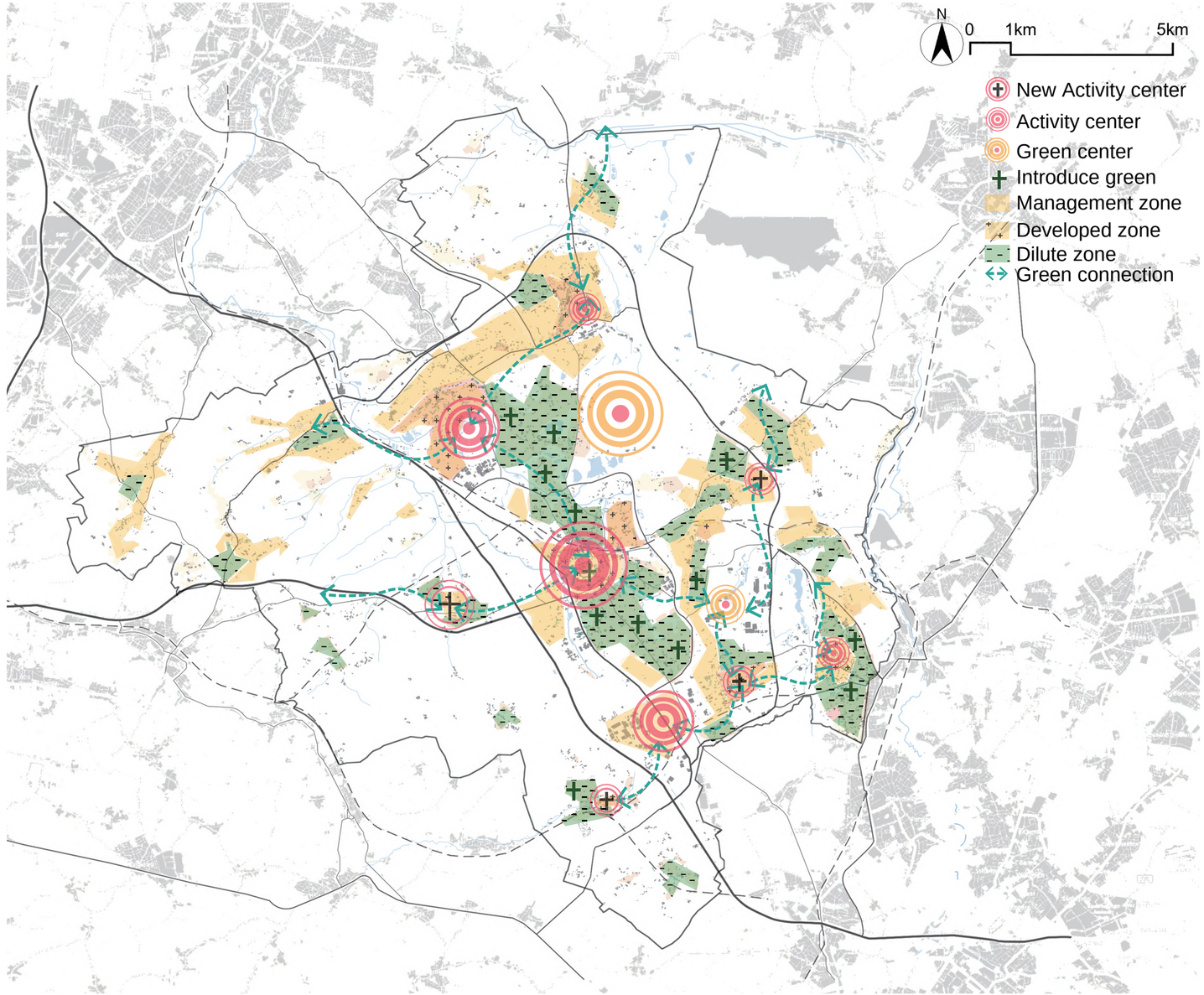


Function of the possibilities

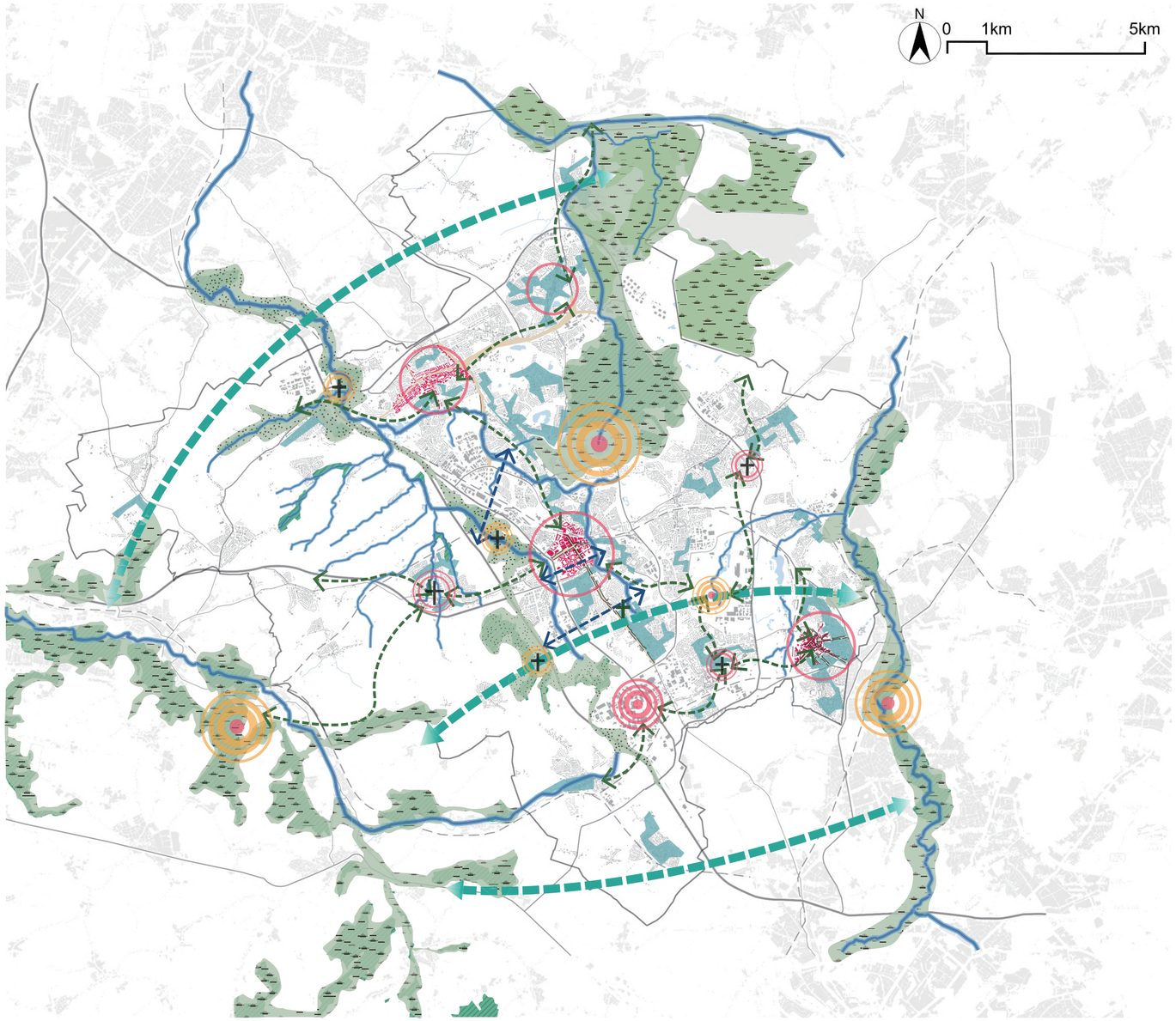


DESIGN Parkstad Scale





DESIGN Parkstad Scale



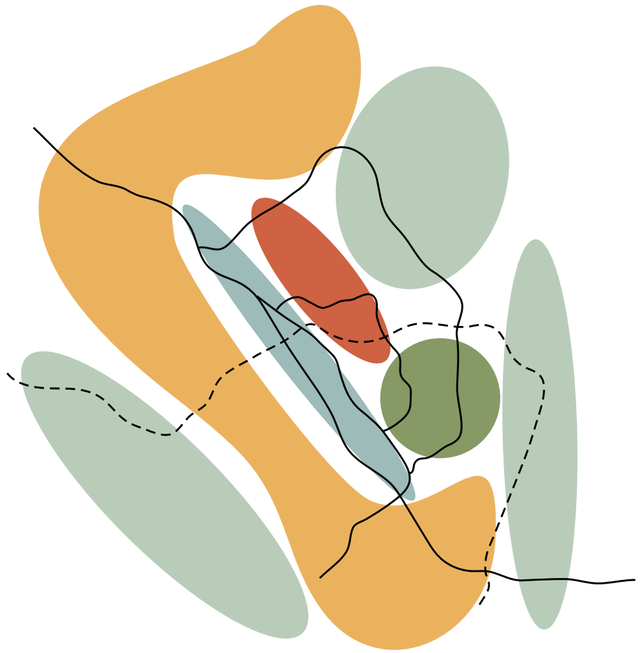
- Development core
- New Activity center
- Activity center
- Green center
- New green center
- Dilute zone
- Green buffer zone
- Expanded nature
- Green connection
- Blue connection
- Enhance stream landscape

Strategy

- Keep, manage and reinforce the important center & nodes.
- Dilute plots where lots of vacant buildings and lack of resource.
- Develope along or around the main Nature or Urban Infrastructure.
- Introduce green in both dilute and developer areas.
- Green and blue corridors to connect centers.
- Enhance stream landscape and add interaction with surroundings
- Improve connection and interaction between two stream tributaries.
- Green spcae radiate to the surrounding patches.
- Build connection between big green nature resource.
- New green buffer zone between two high way.

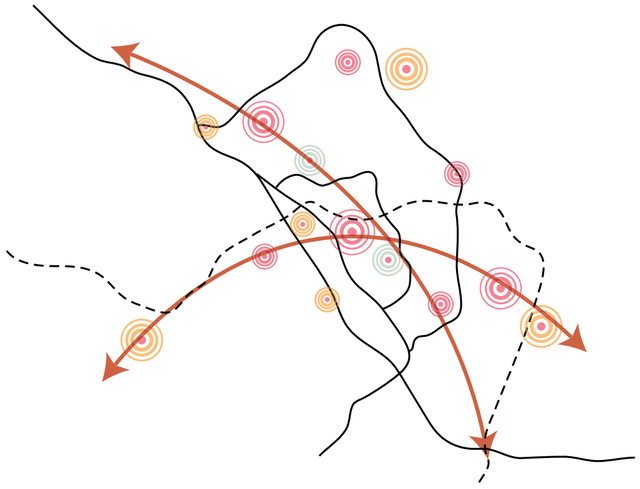
DESIGN Parkstad Scale

District



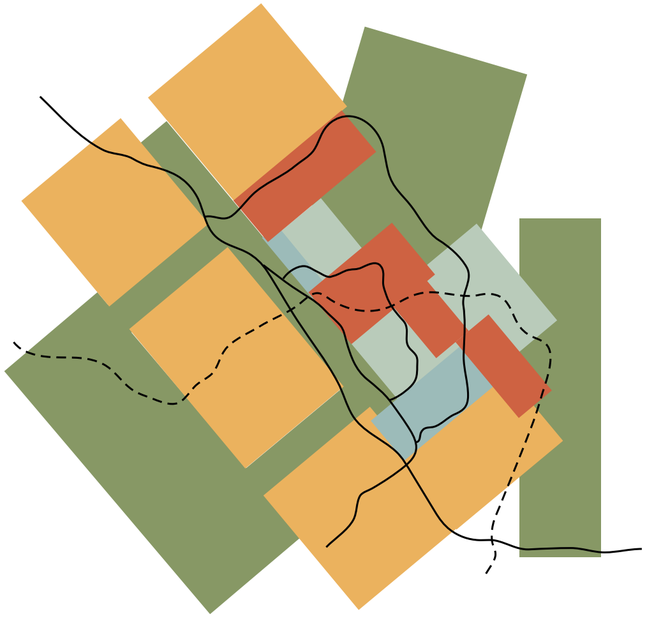
- Comerical zone
- Agricultural zone
- Athletic zone
- Green buffer zone
- Ecological zone

Center



- Urban center
- Natural center
- Mixed center
- Main connection

Economy



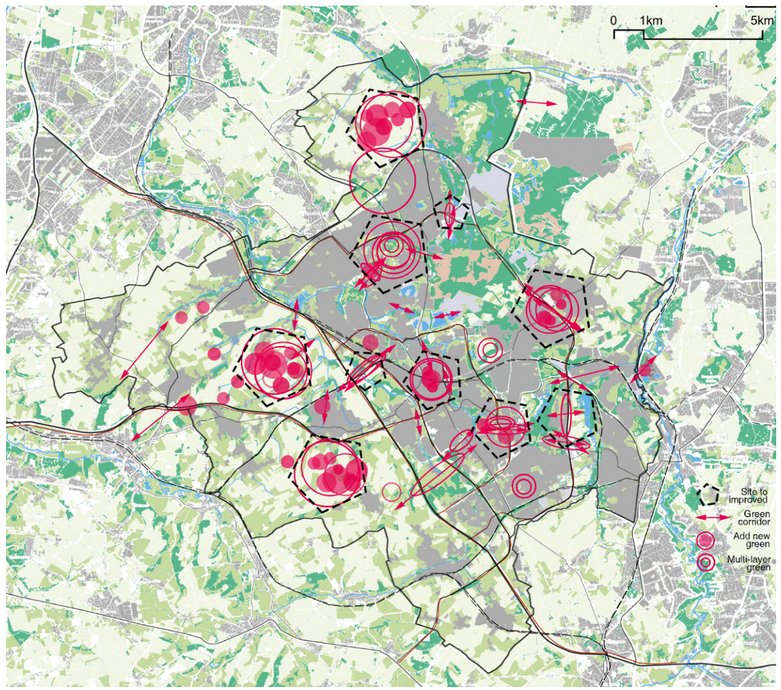
- Retaiil and comercial
- Agricultural
- Eco-tourism
- Industrial
- Mixed ecological&comercial

DESIGN Parkstad Scale

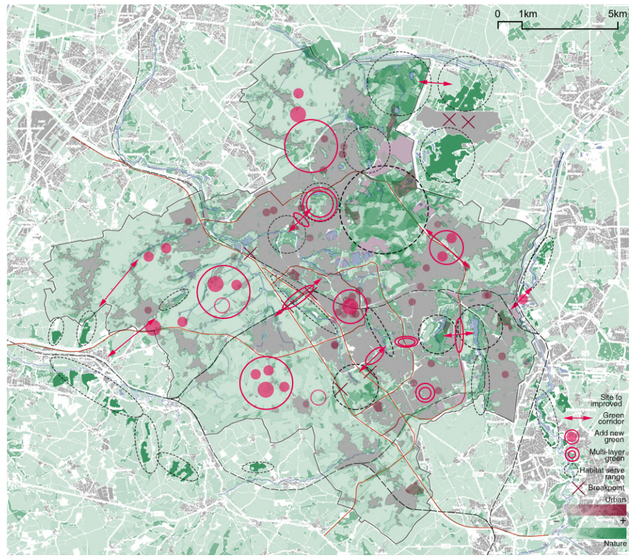
Where and how to make the connection?

Combine the break point and potential area of 4users,get the general map of the places need to be improved.

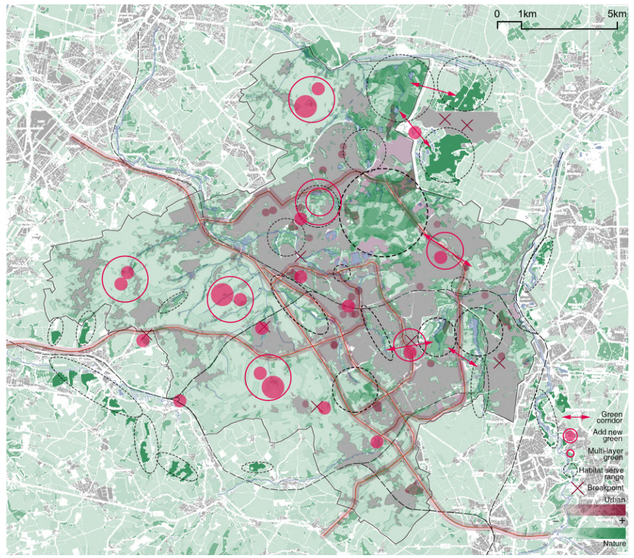
We can find common breakpoints through the map, that is, the point that is urgently needed to be solved first, as the first place we consider connecting corridors and ascension.



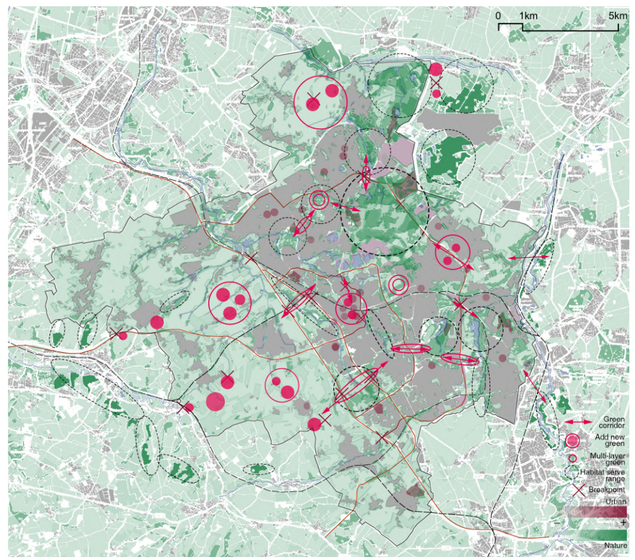
Bird



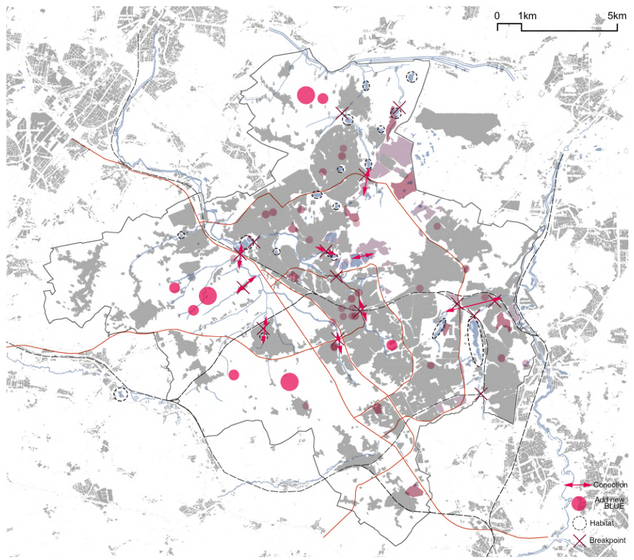
Insect



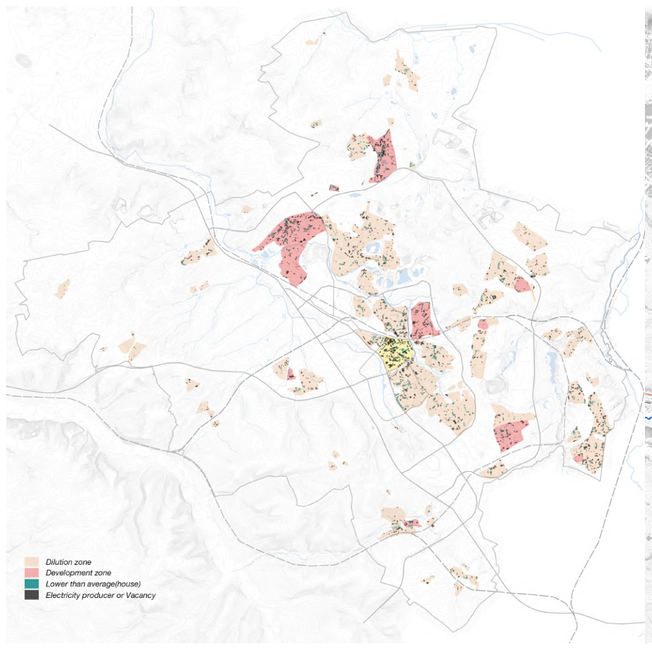
Mammal



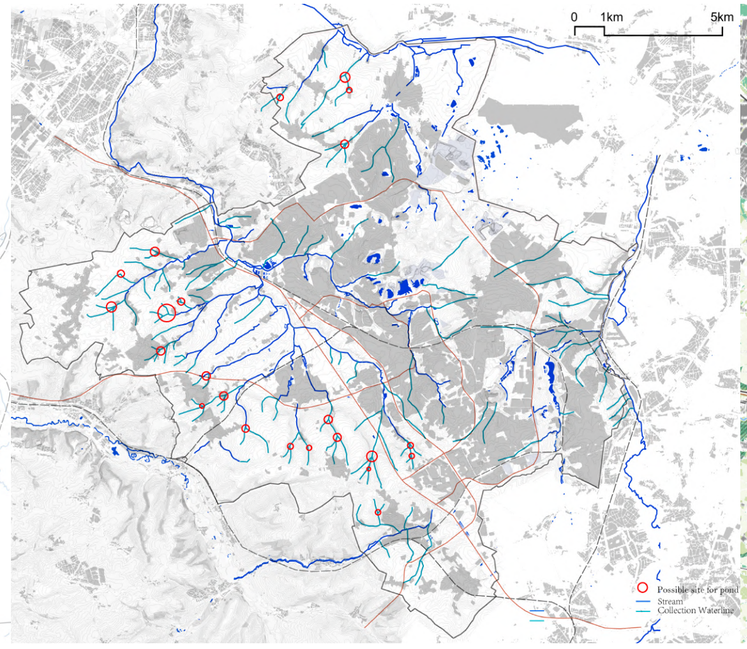
Fish



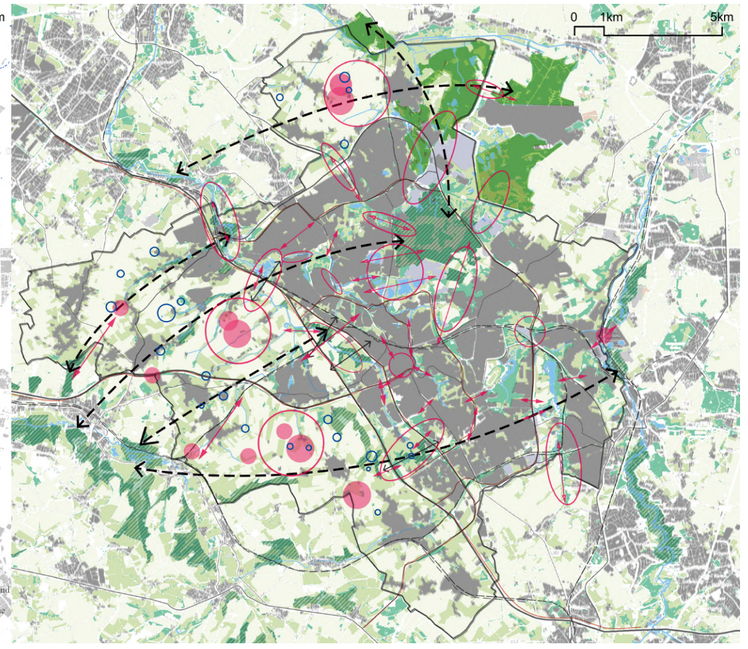
DESIGN Parkstad Scale



Possibilities sites in urban area



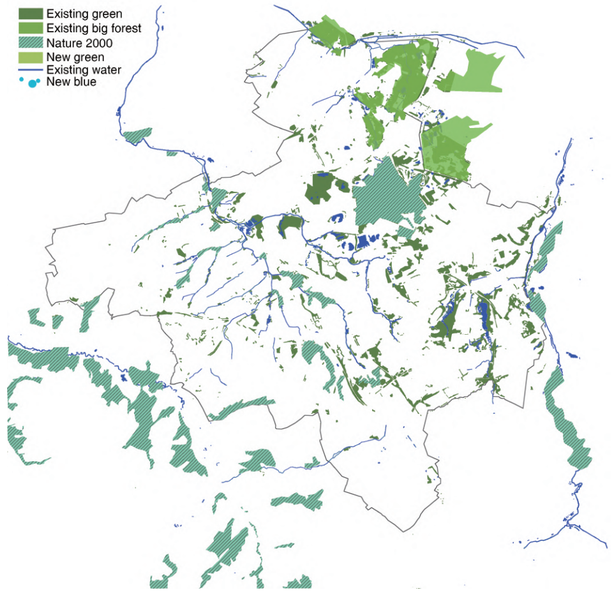
Collection waterline
Water catchment area

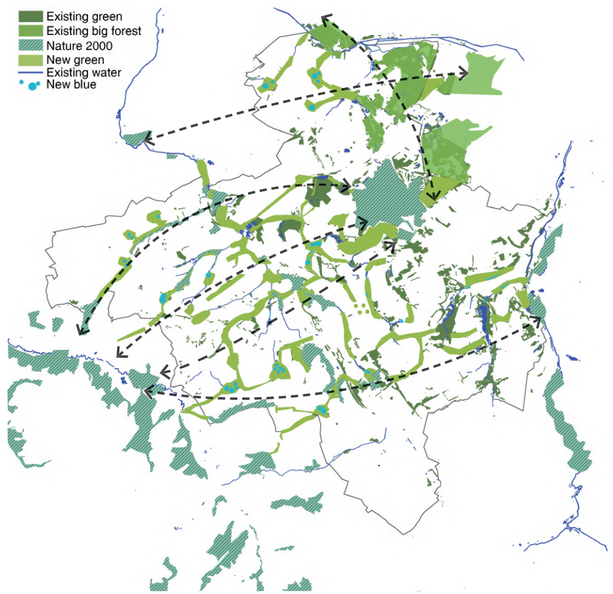


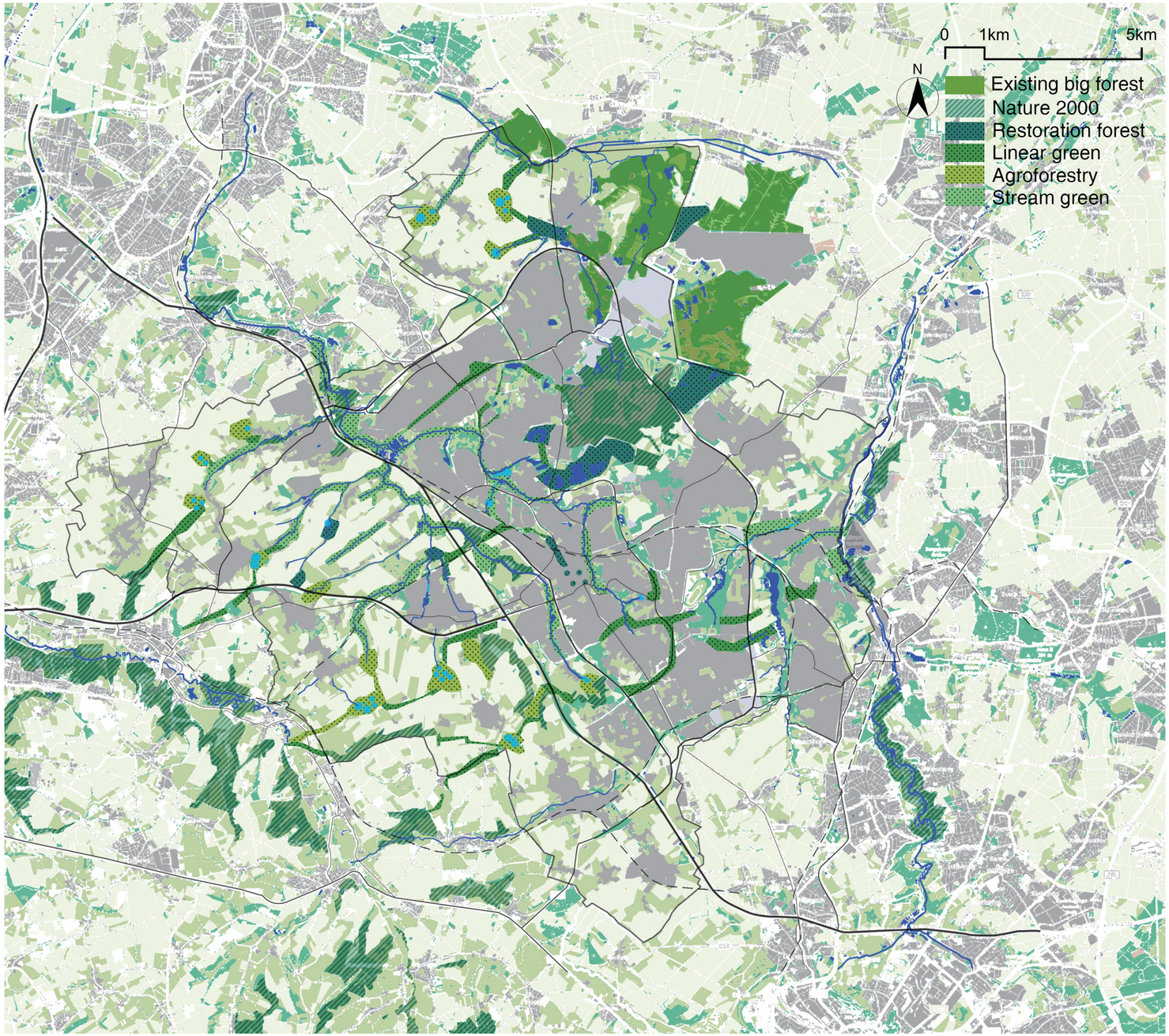
Final possibilities

DESIGN Parkstad Scale

Green and Blue Framework

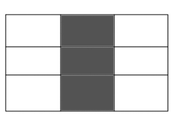






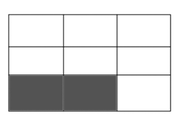
city-center





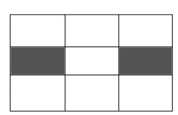
7.7%





62.3%





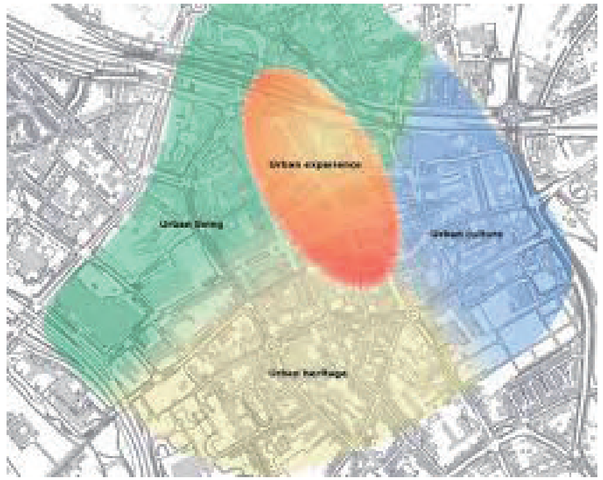
30.0%

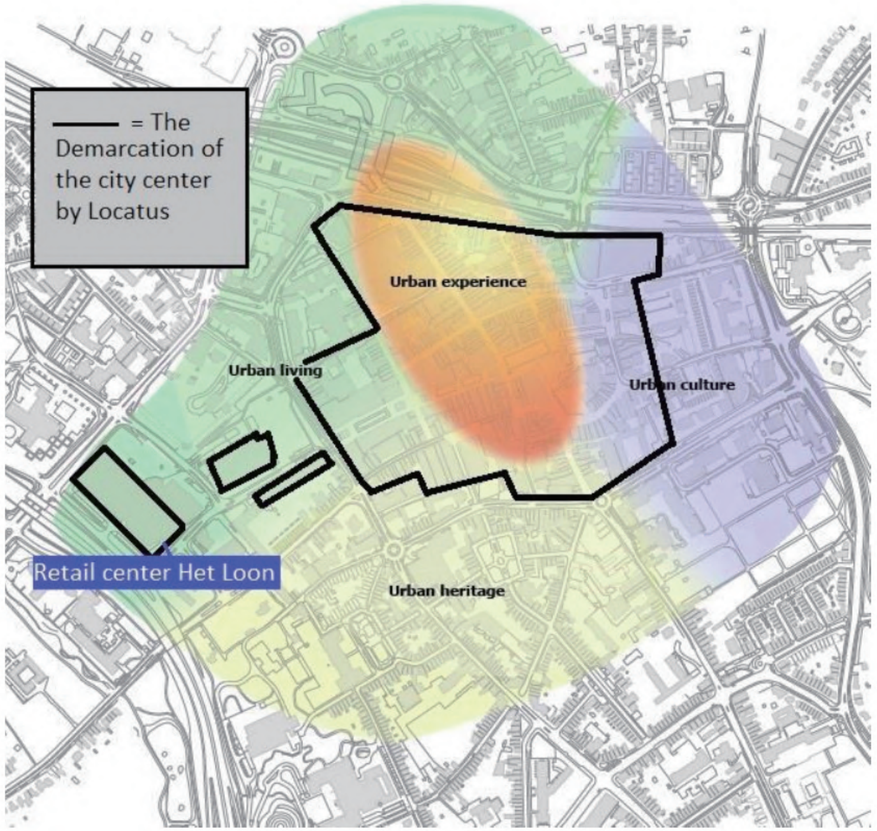


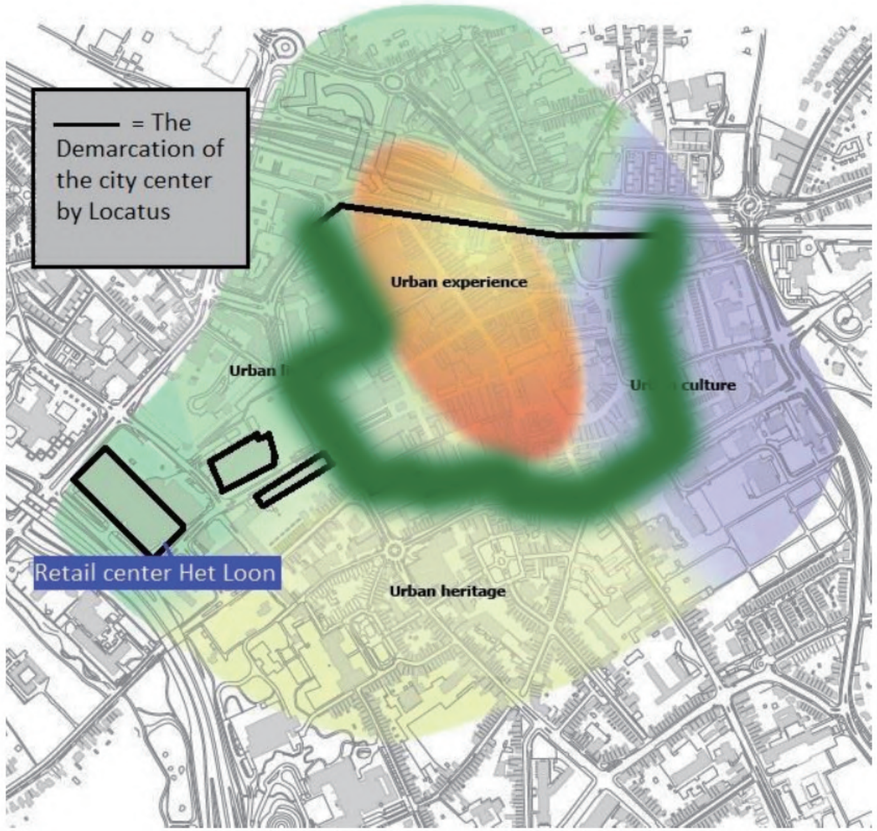


Design Urban Scale

Choose city center as the starting point



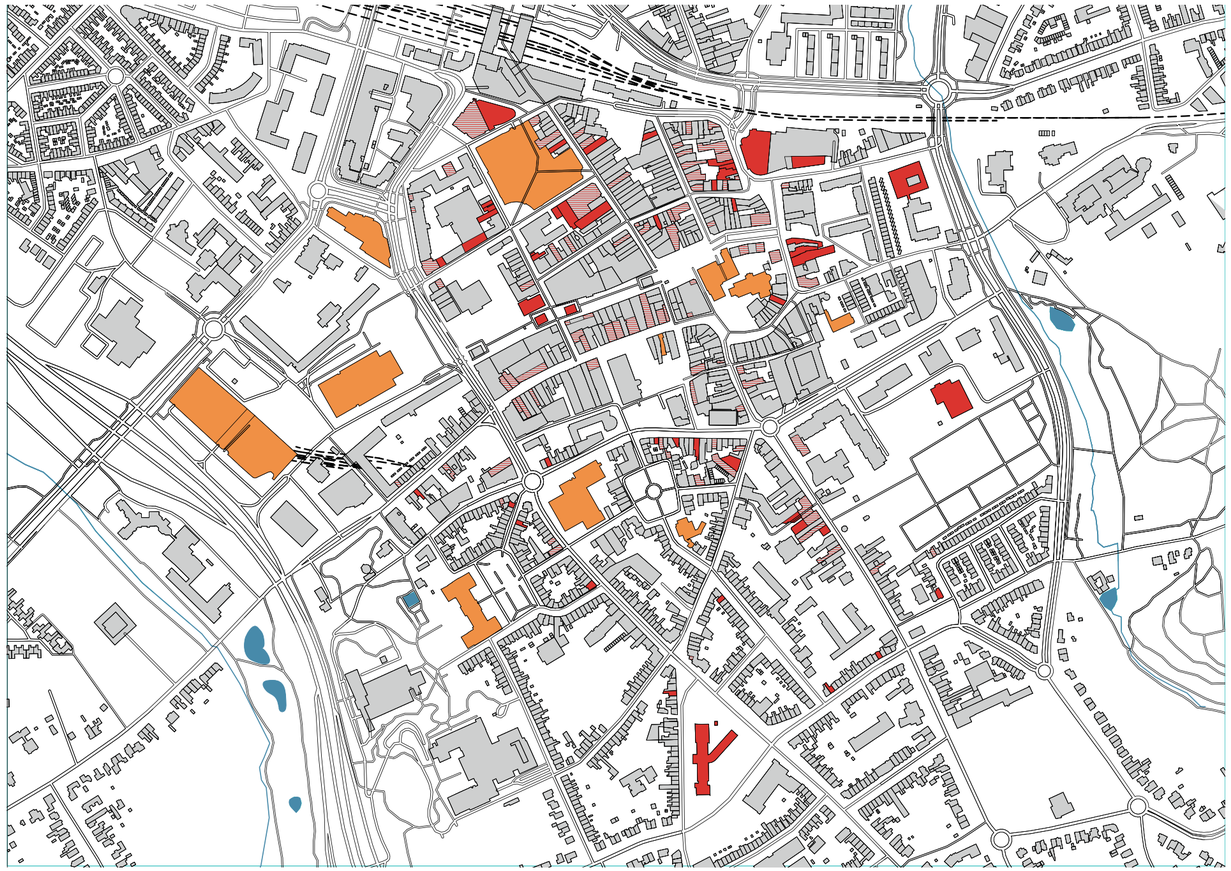




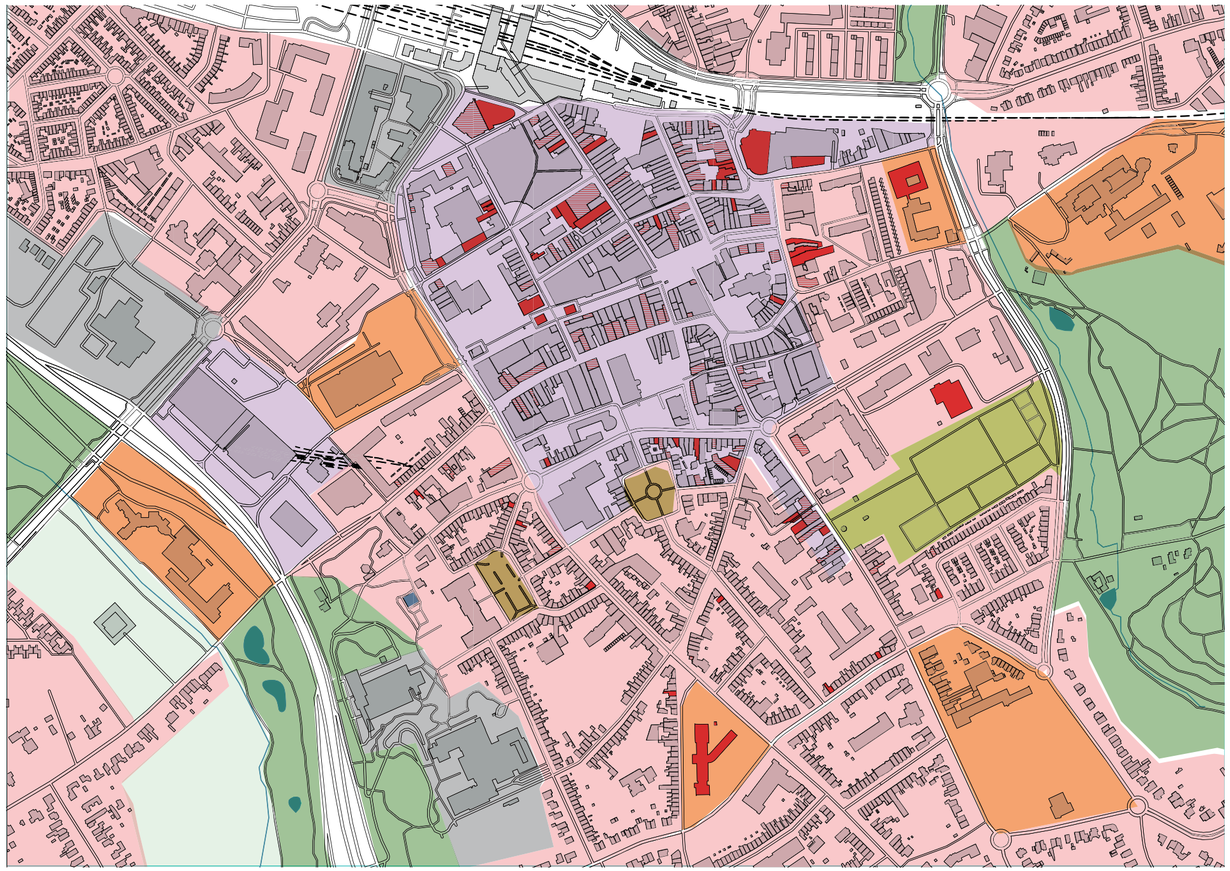
New green ring

Design Urban Scale

Vacant buildings



Function map

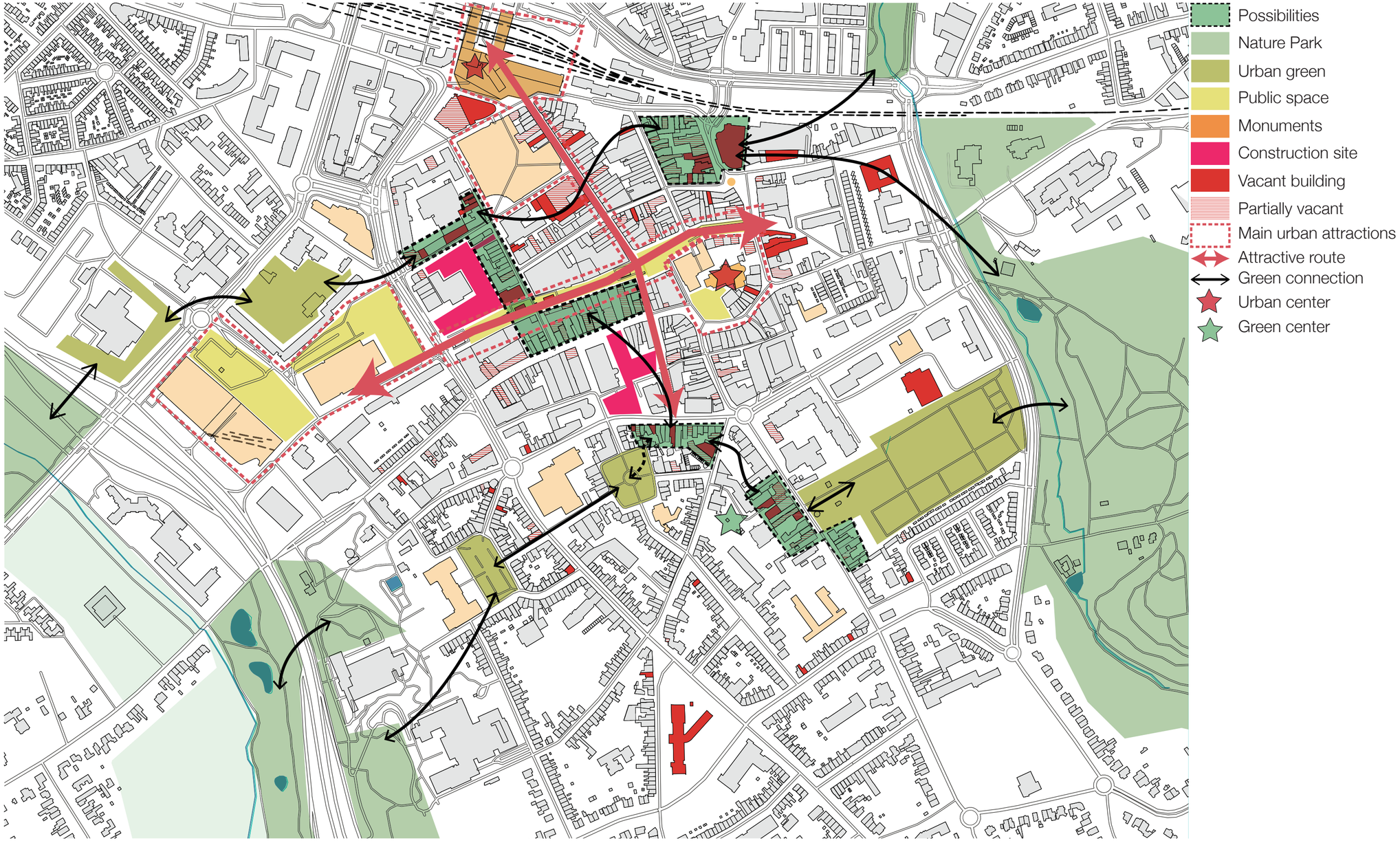


Design Urban Scale

Three possible sites

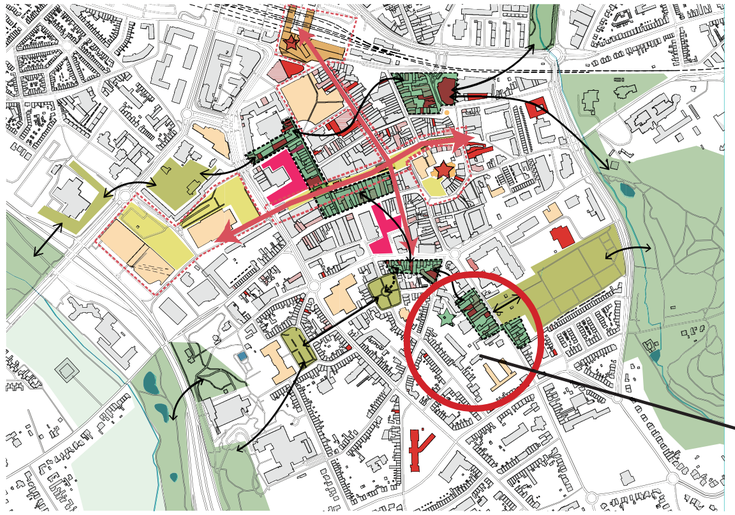
Build new green belts

Strength the two axis



Design Community Scale

Final Site





Design Community Scale

1



4



2



5

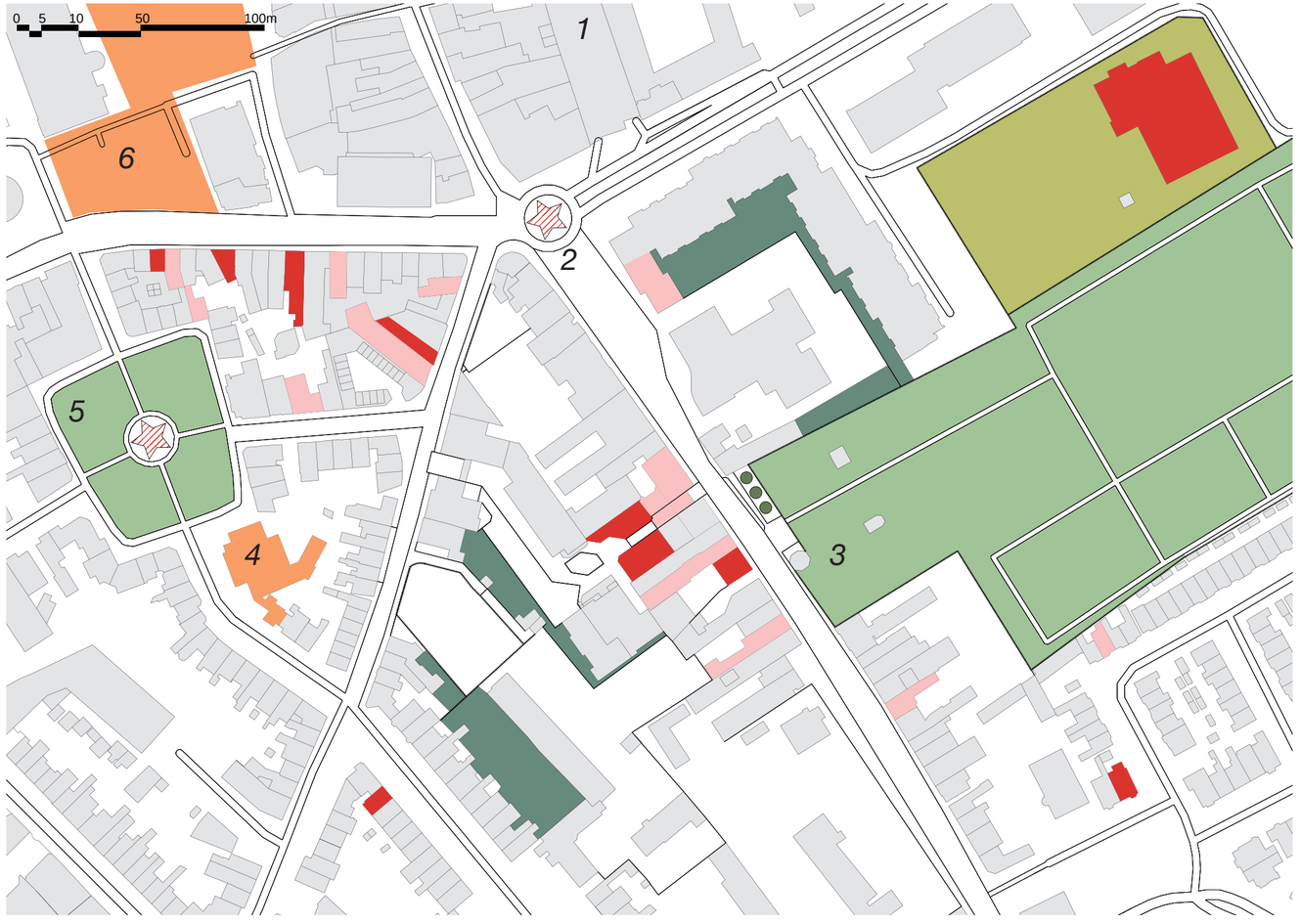


3



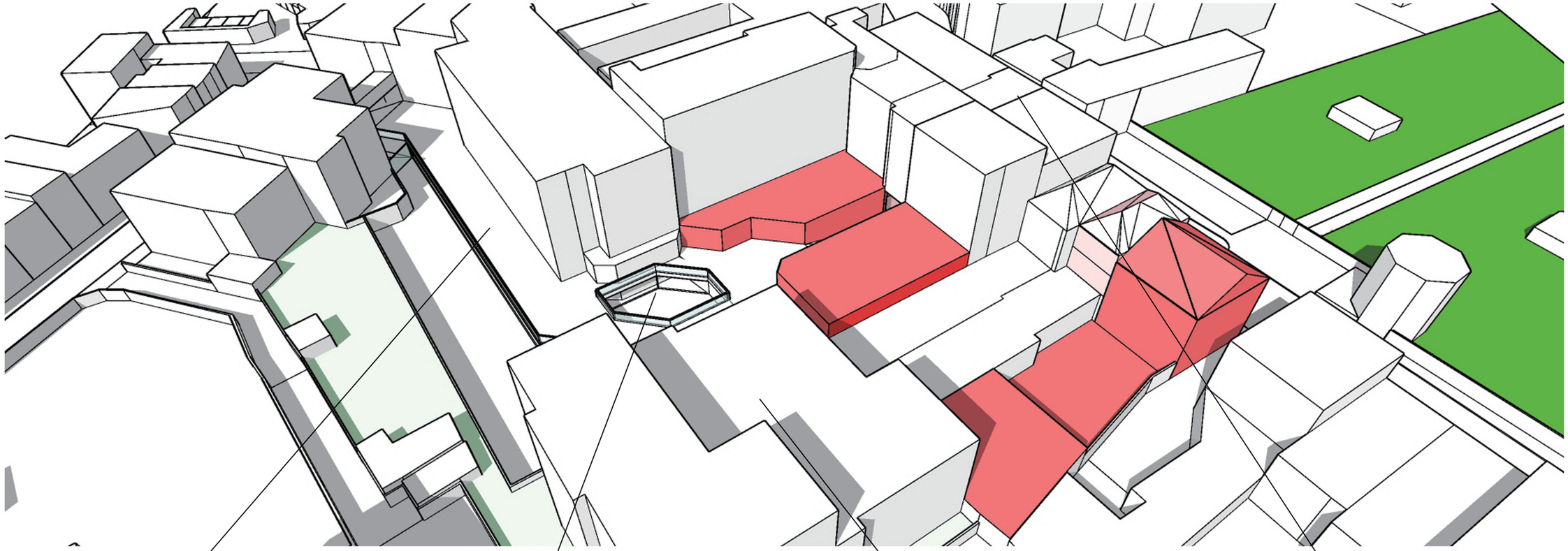
6







Design Community Scale











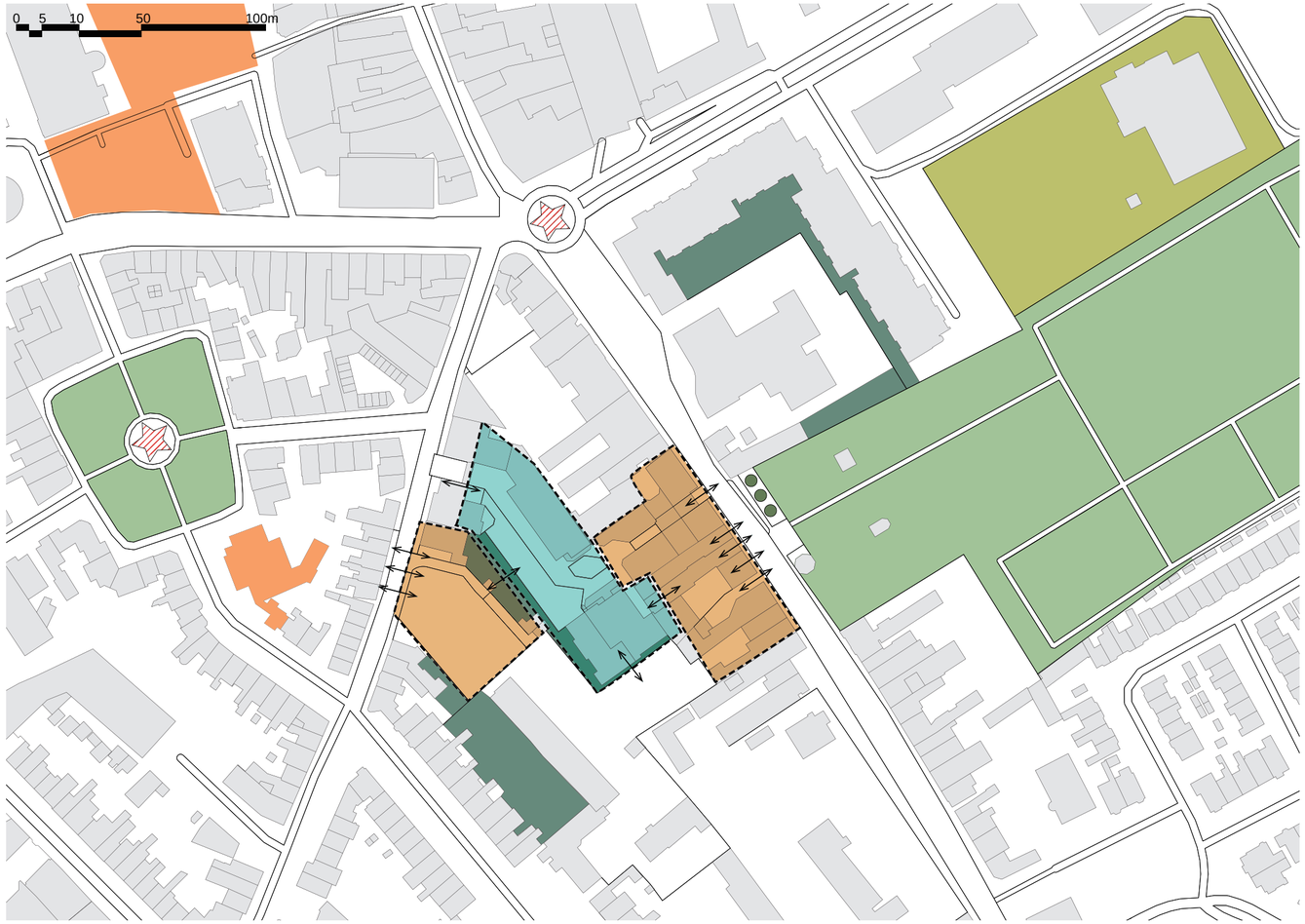
Traffic map



Site Range



Partition



Design Community Scale

4 Tset Design for 4 users



Eurasian Eagle Owl-*Bubo bubo*
Red List



Red-backed shrike-*Lanius collurio*
Red List



KingFisher-*Alcedo atthis*
Small amount of hibernators/migrants



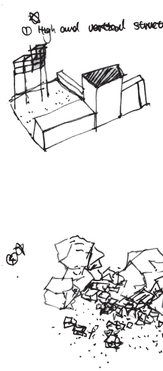
People
Shrinking in population| Eging society

Design Community Scale

Needs and Requirements

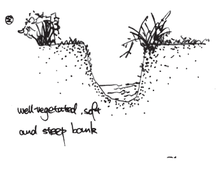
Spatial elements



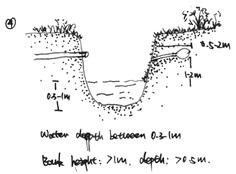












Network connection

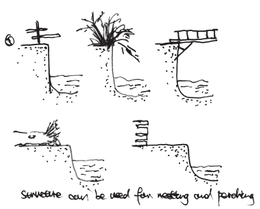






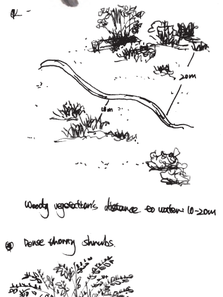


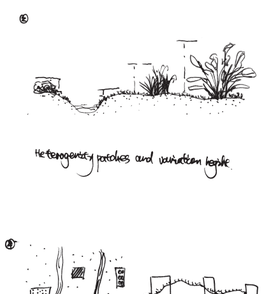




Spatial elements

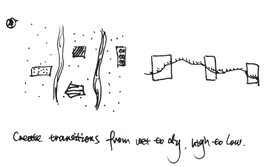


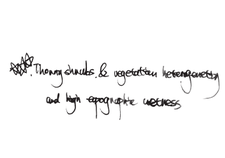






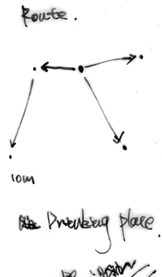






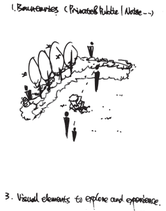


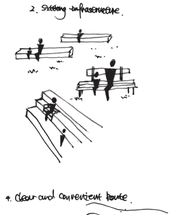
Network connection

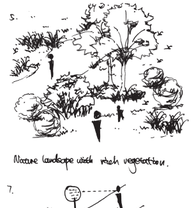


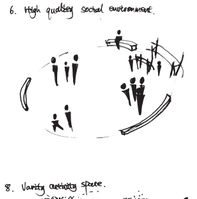


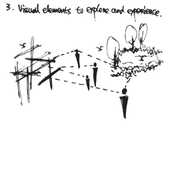






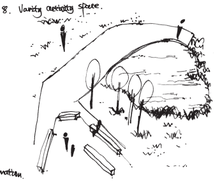


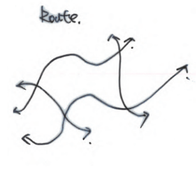










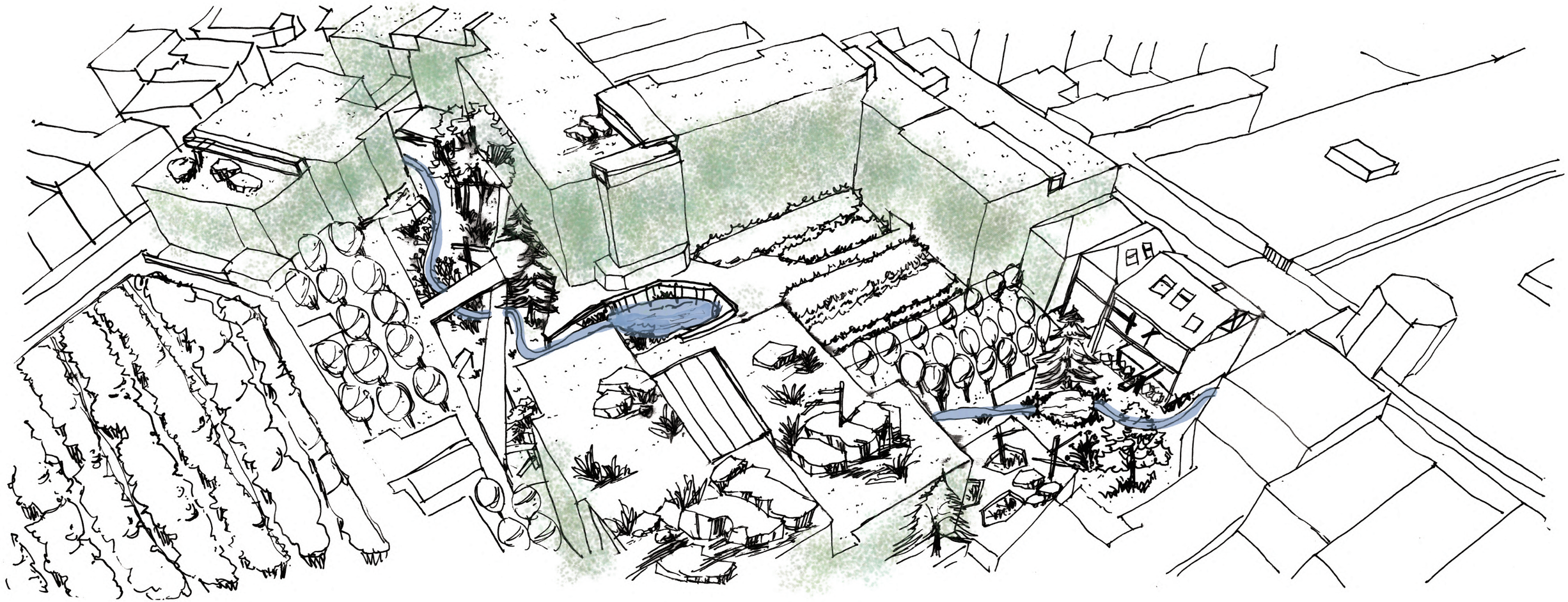




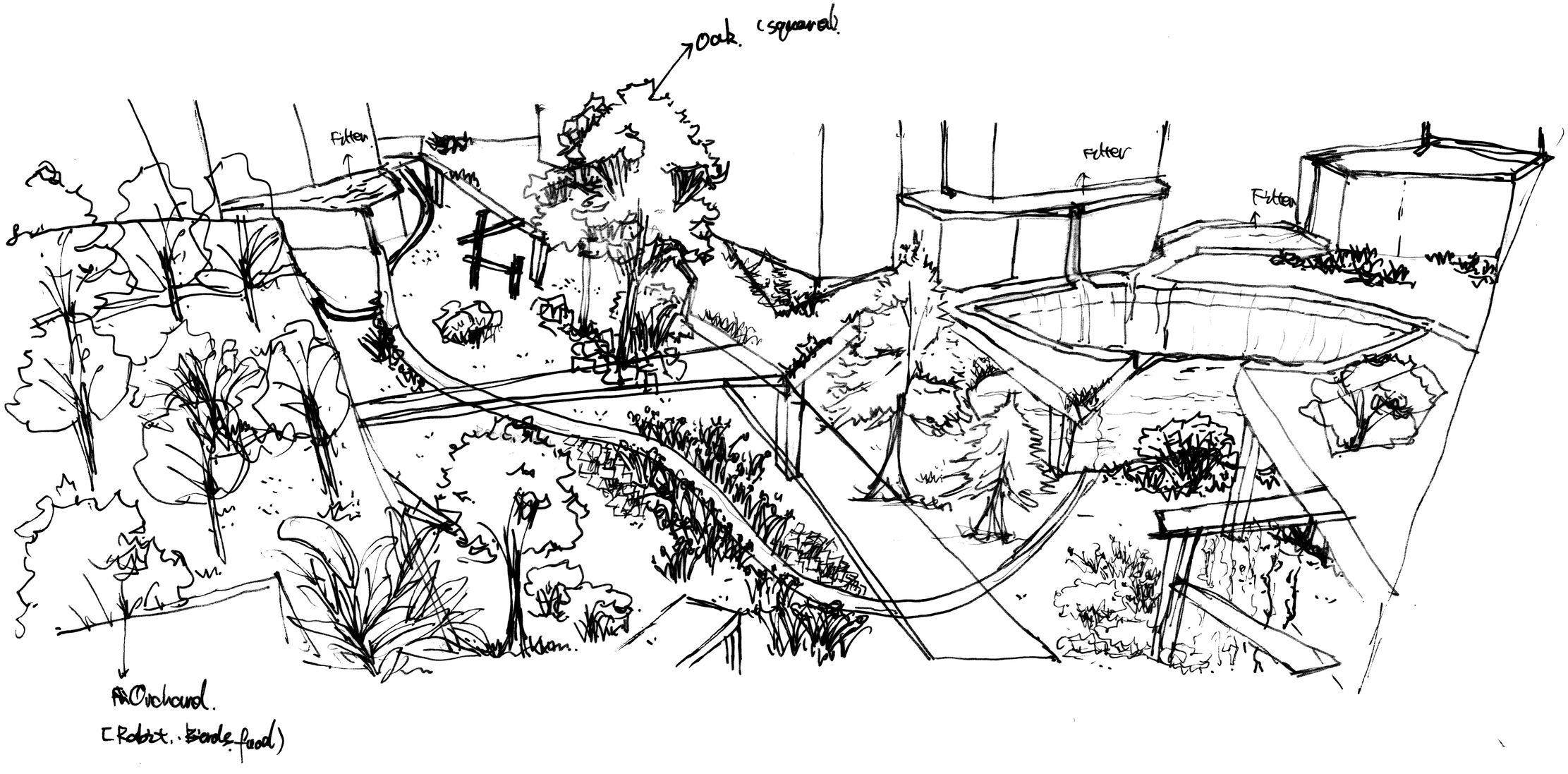




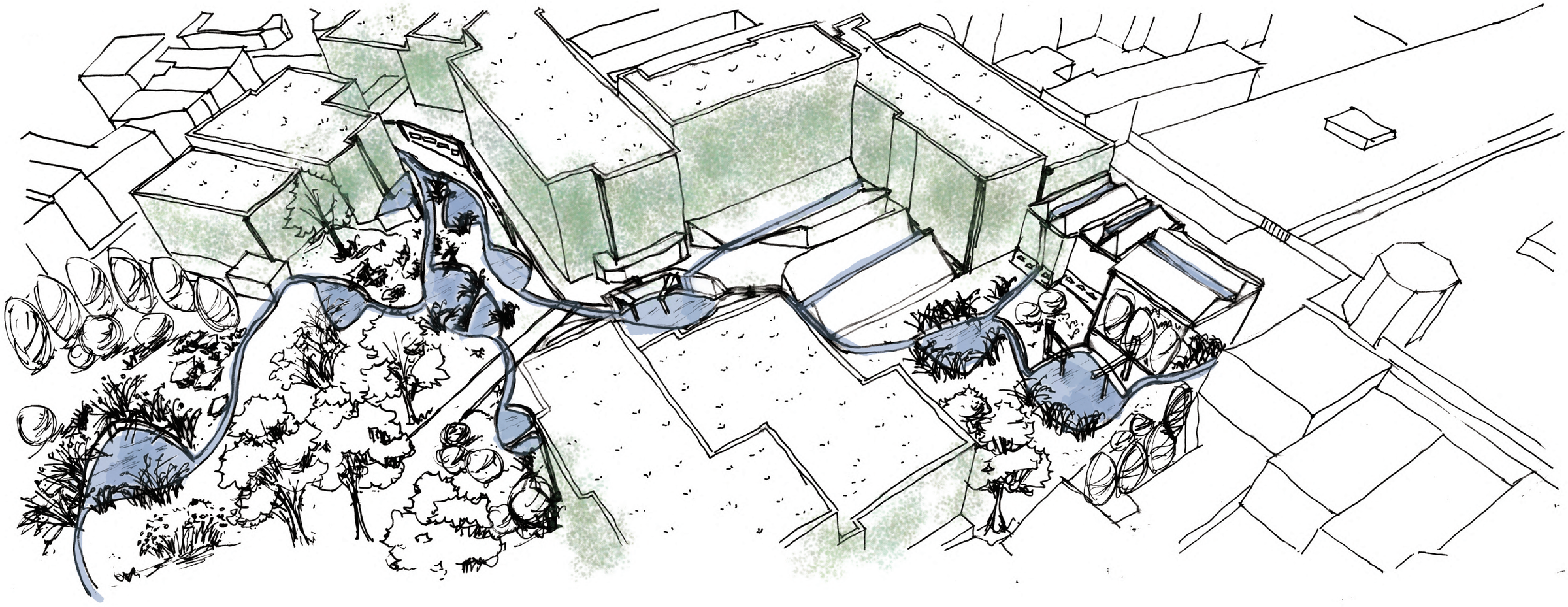
4 Test design-Owl



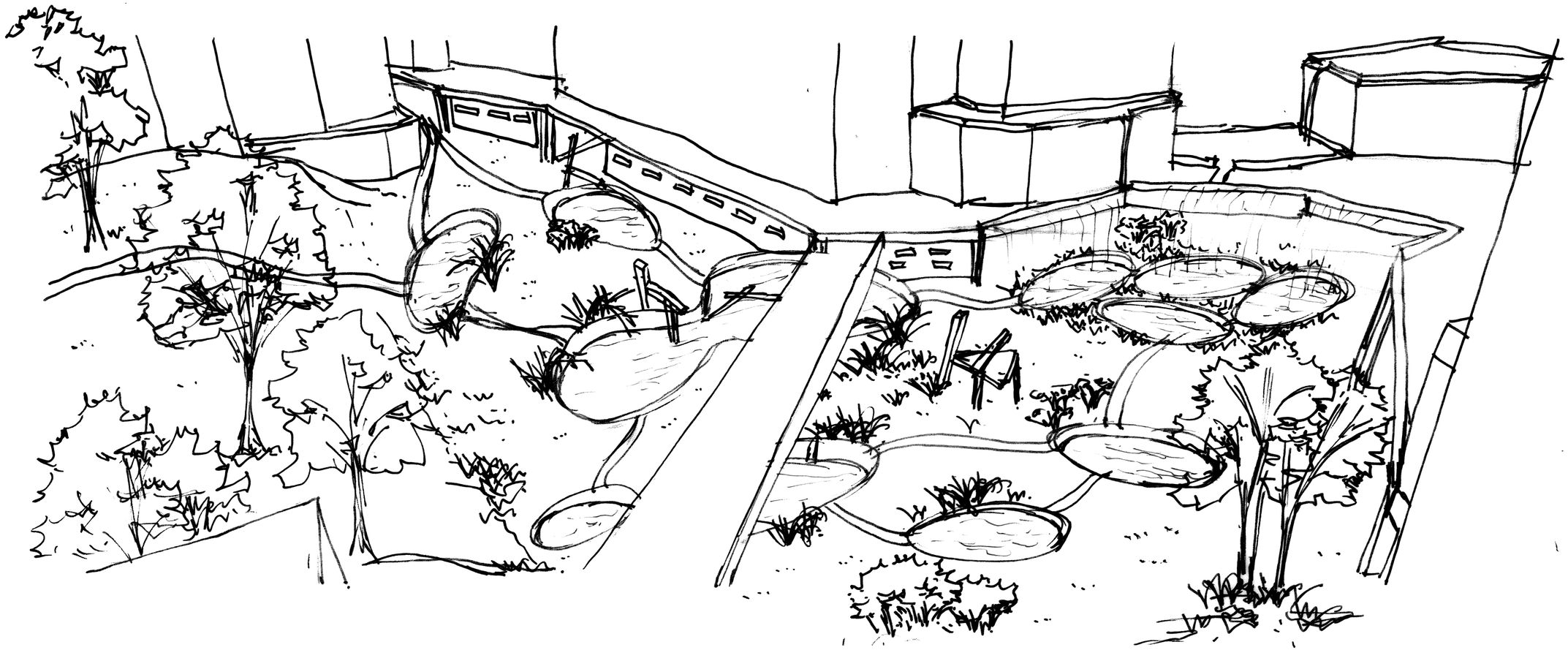
4 Test design-Owl



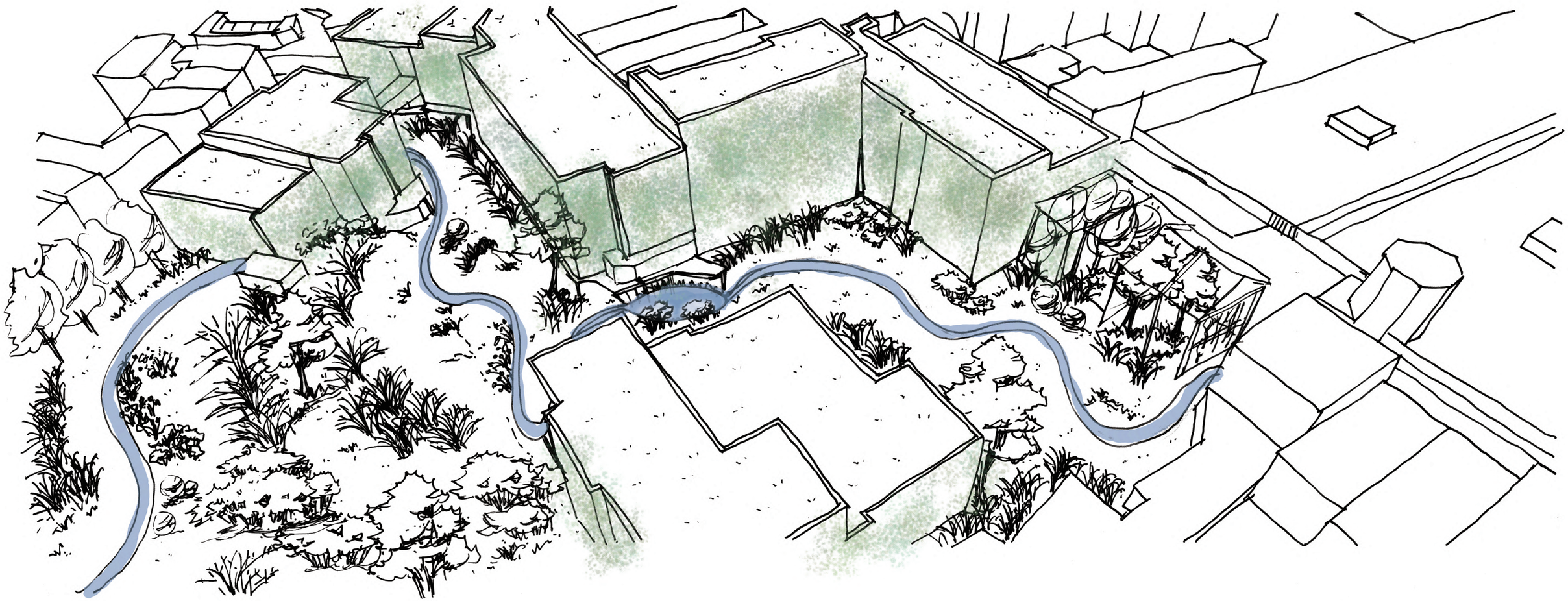
4 Test design-Kingfisher



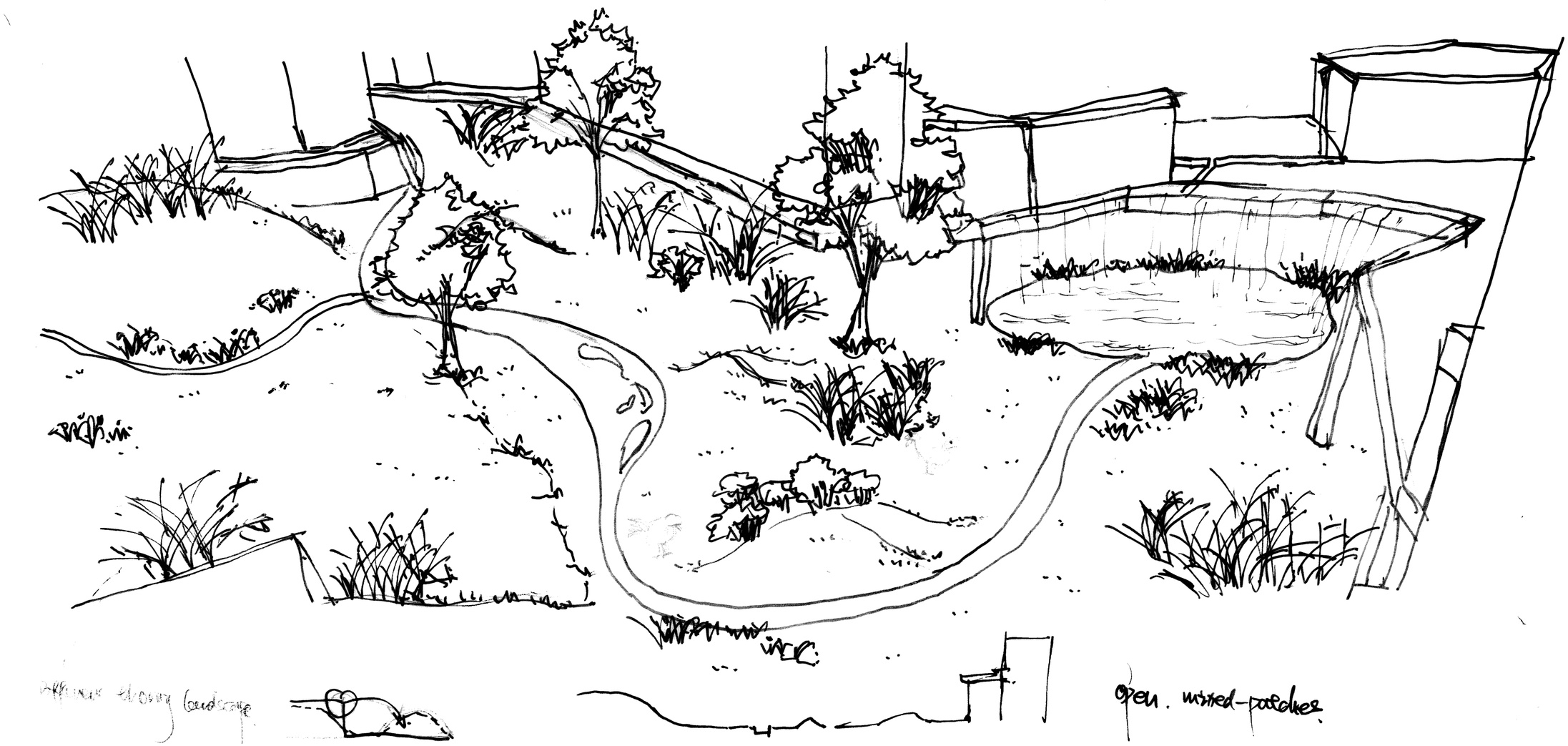
4 Test design-Kingfisher



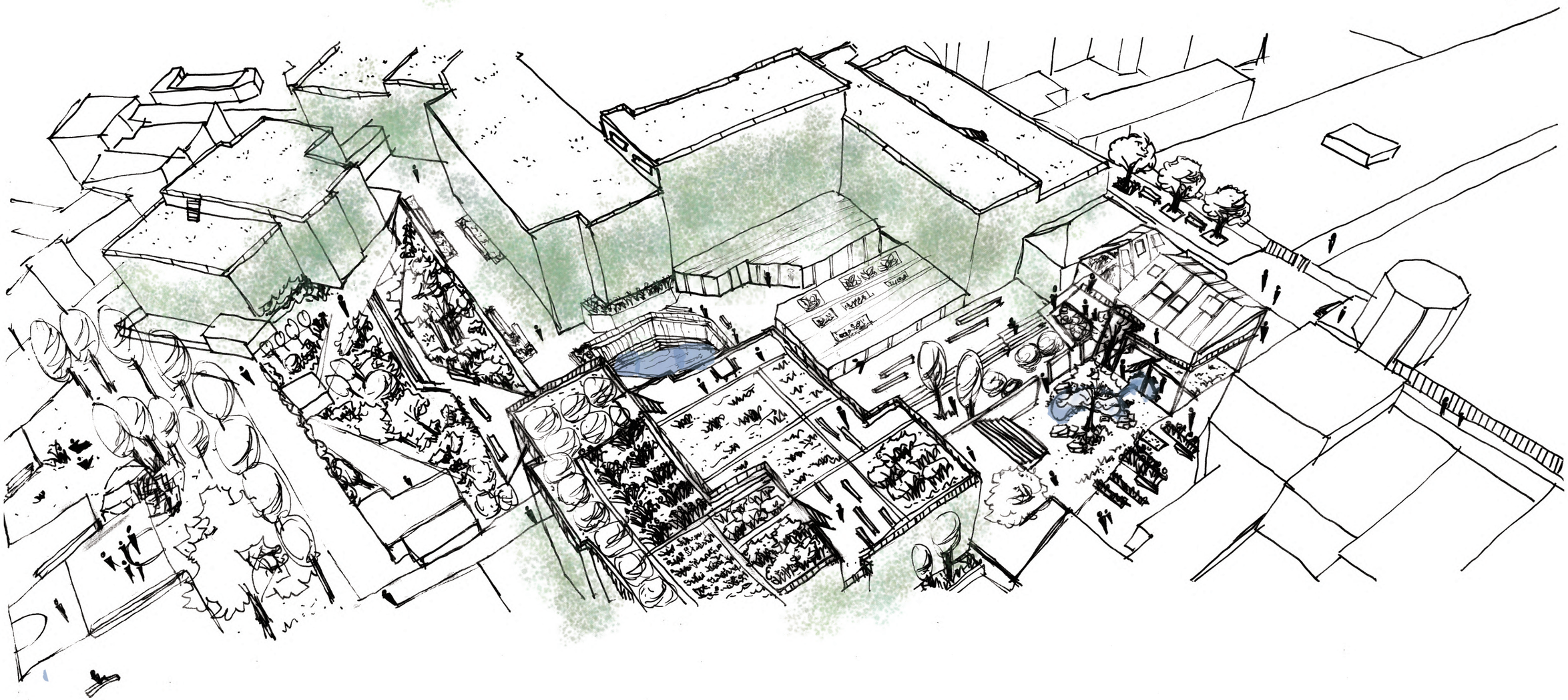
4 Test design-Red-back Shrike



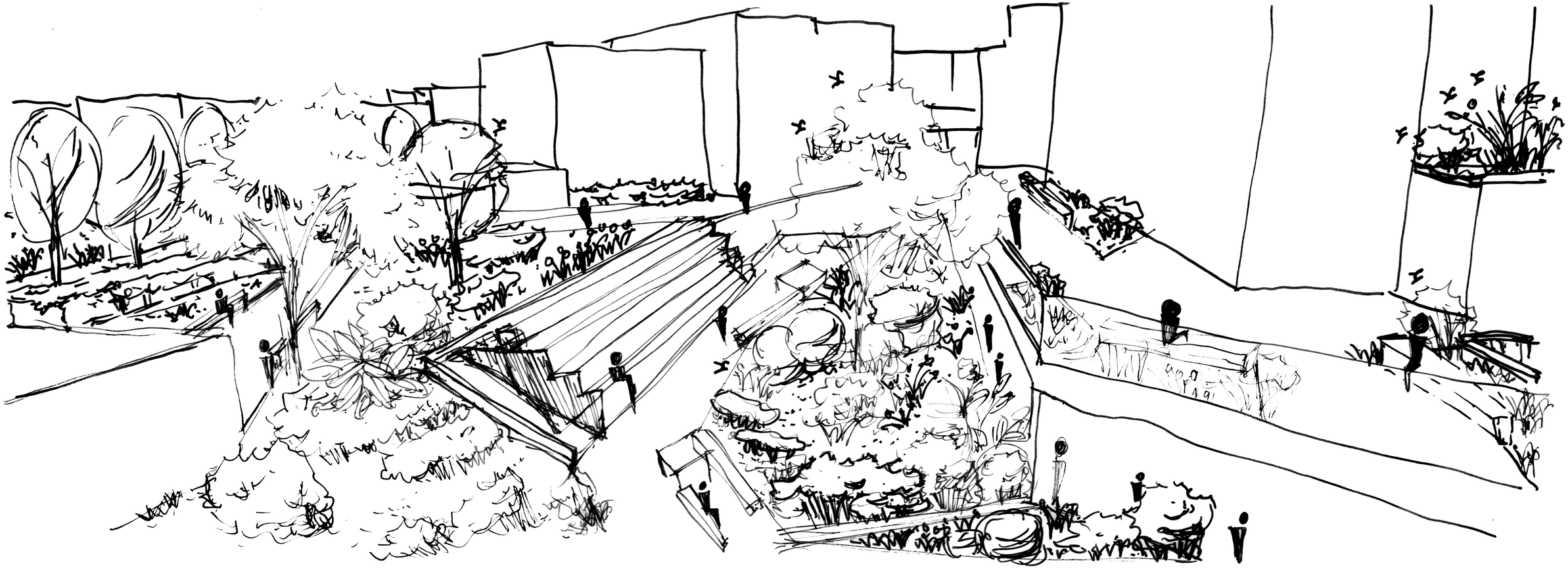
4 Test design-Red-back Shrike



4 Test design-People



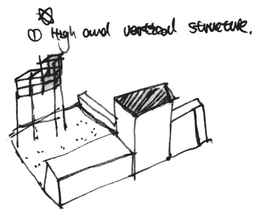
4 Test design-People

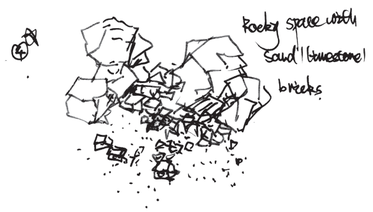


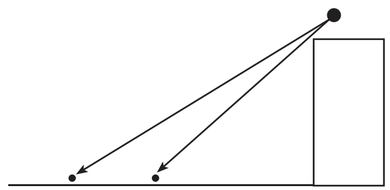
4 Test design

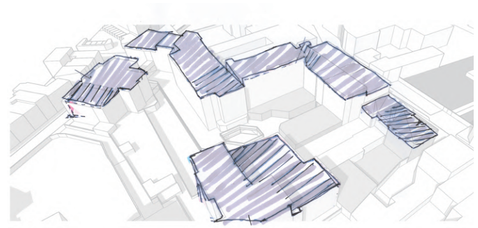
Conclusion

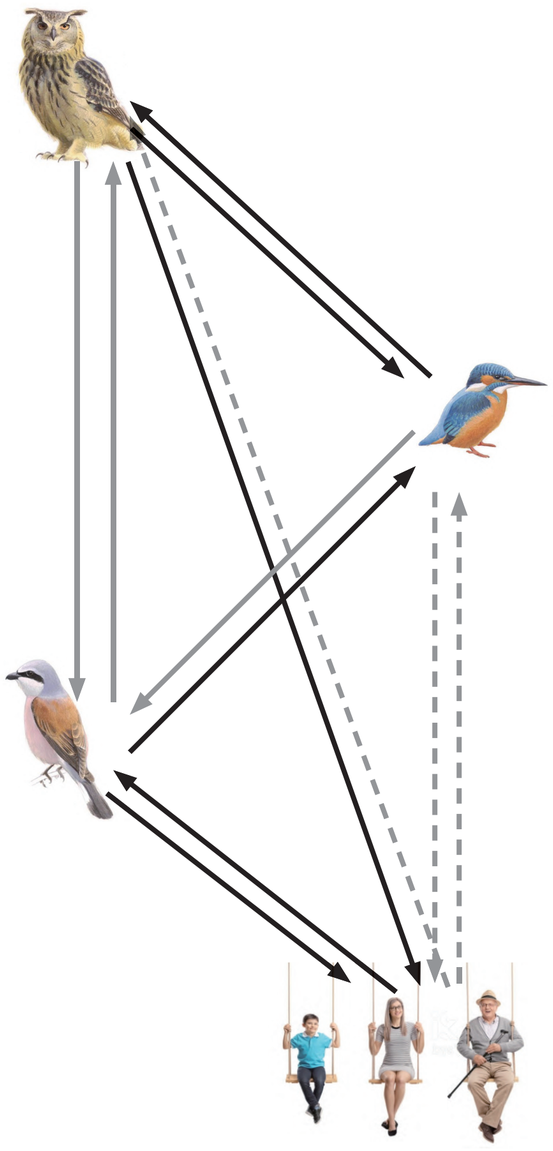
Owl





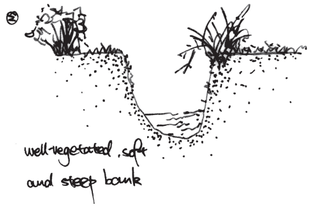


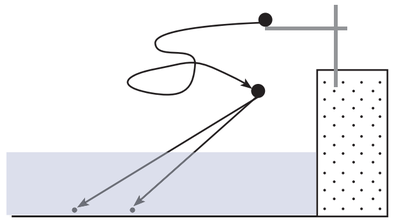


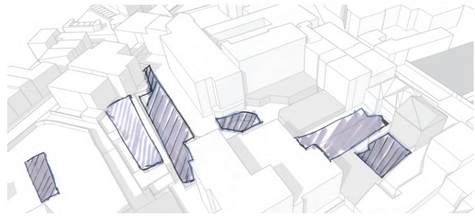


Kingfisher

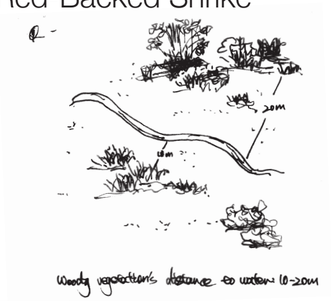


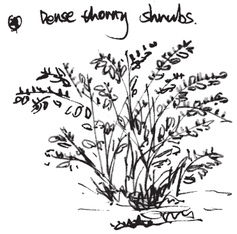


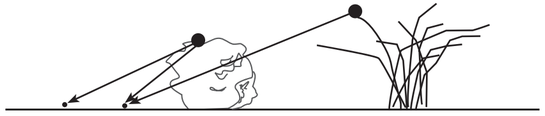


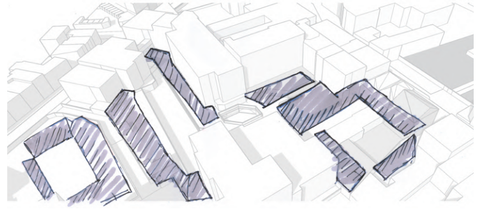


Red-Backed Shrike



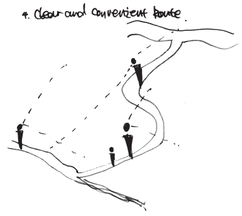


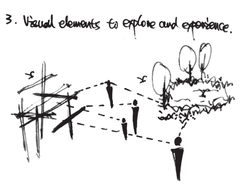


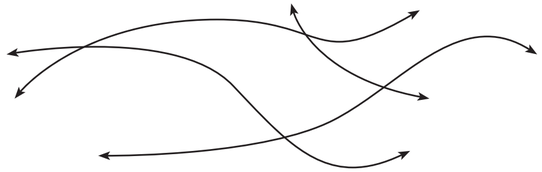


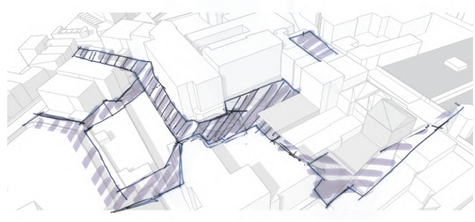
People









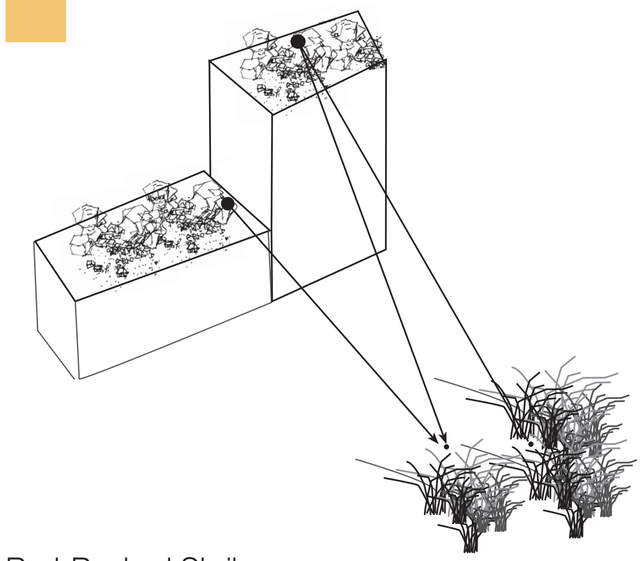


Design Community Scale

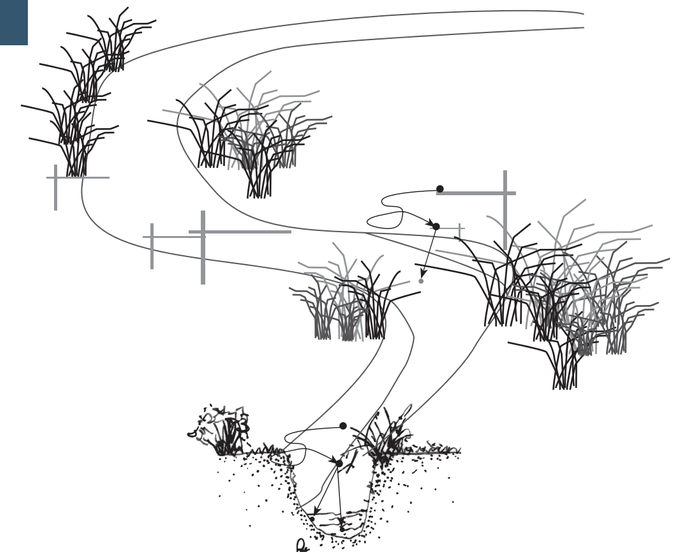
How to Integration?

Basic space composition of each group

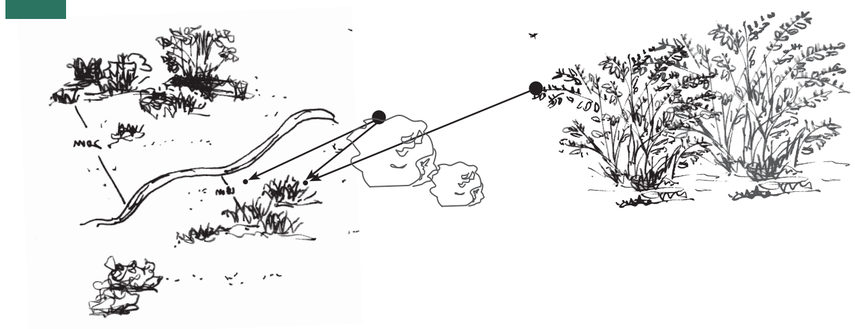
Owl



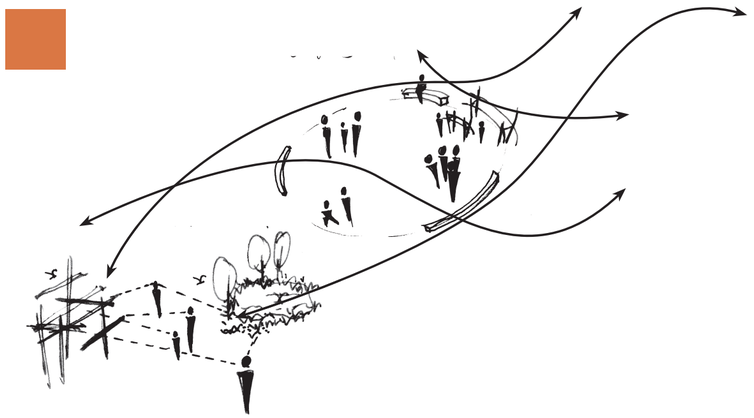
Kingfisher



Red-Backed Shrike

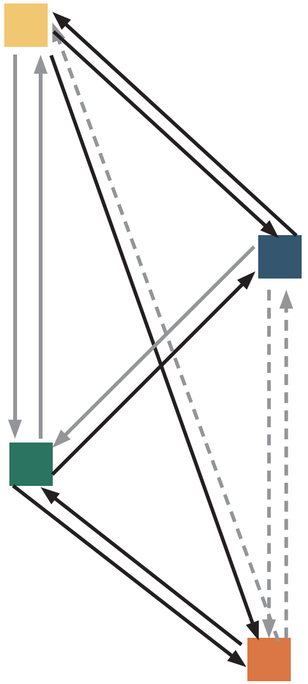


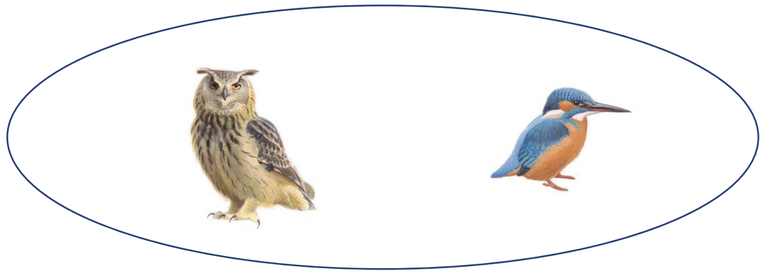
People



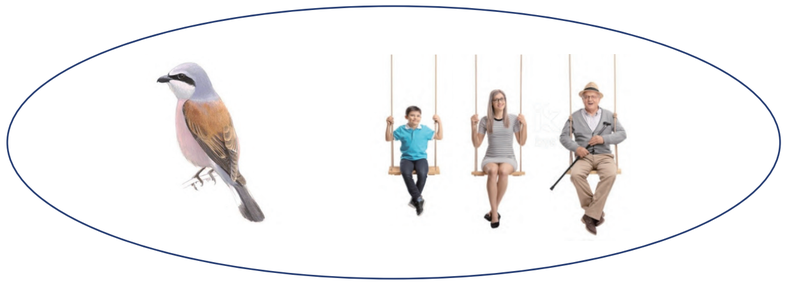
Design Community Scale

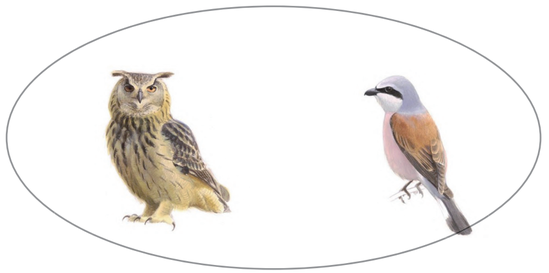
How to collaboration



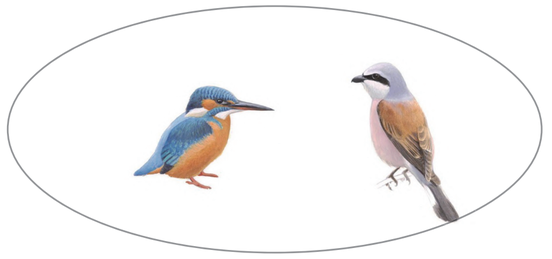


Live together



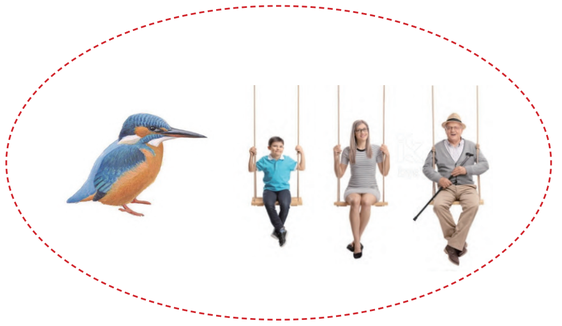


Interaction





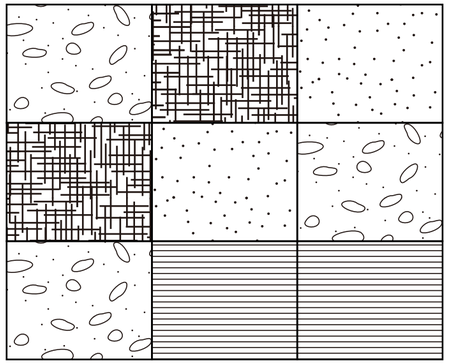
Disturbance



Need the Boundary | Barrier to protect

Design Community Scale

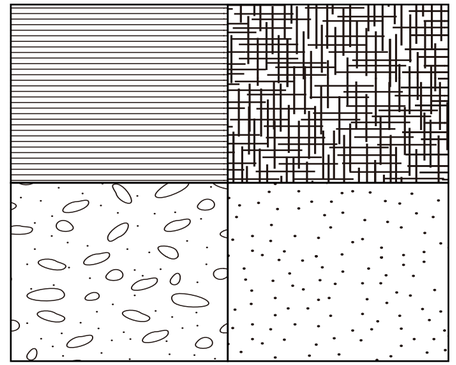
How to Integration?



Random distribution



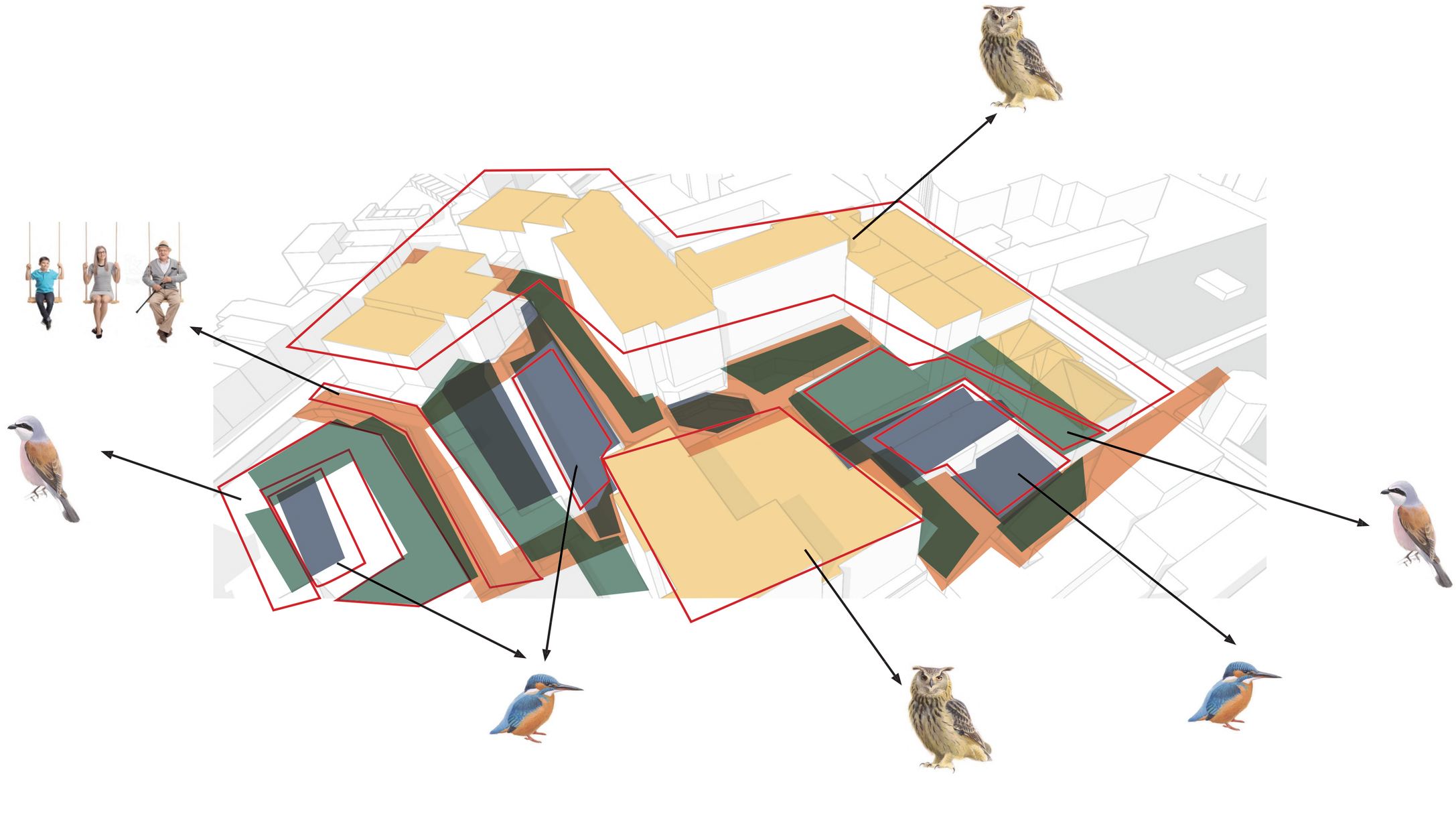
Mixed together



Evenly distribution

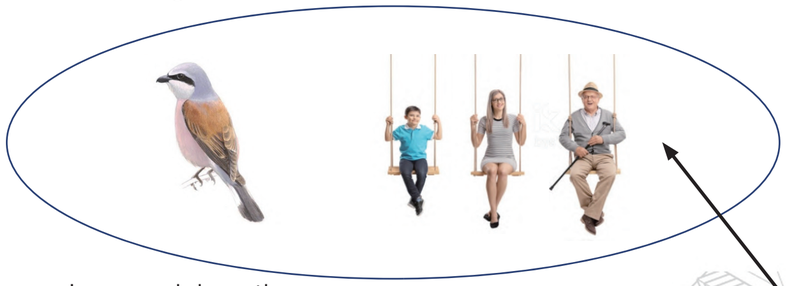
Design Community Scale

How to Integration?

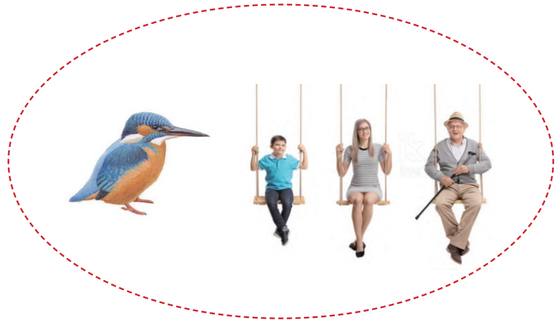


Design Community Scale

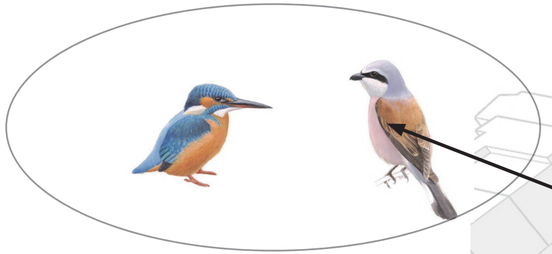
How to Integration?



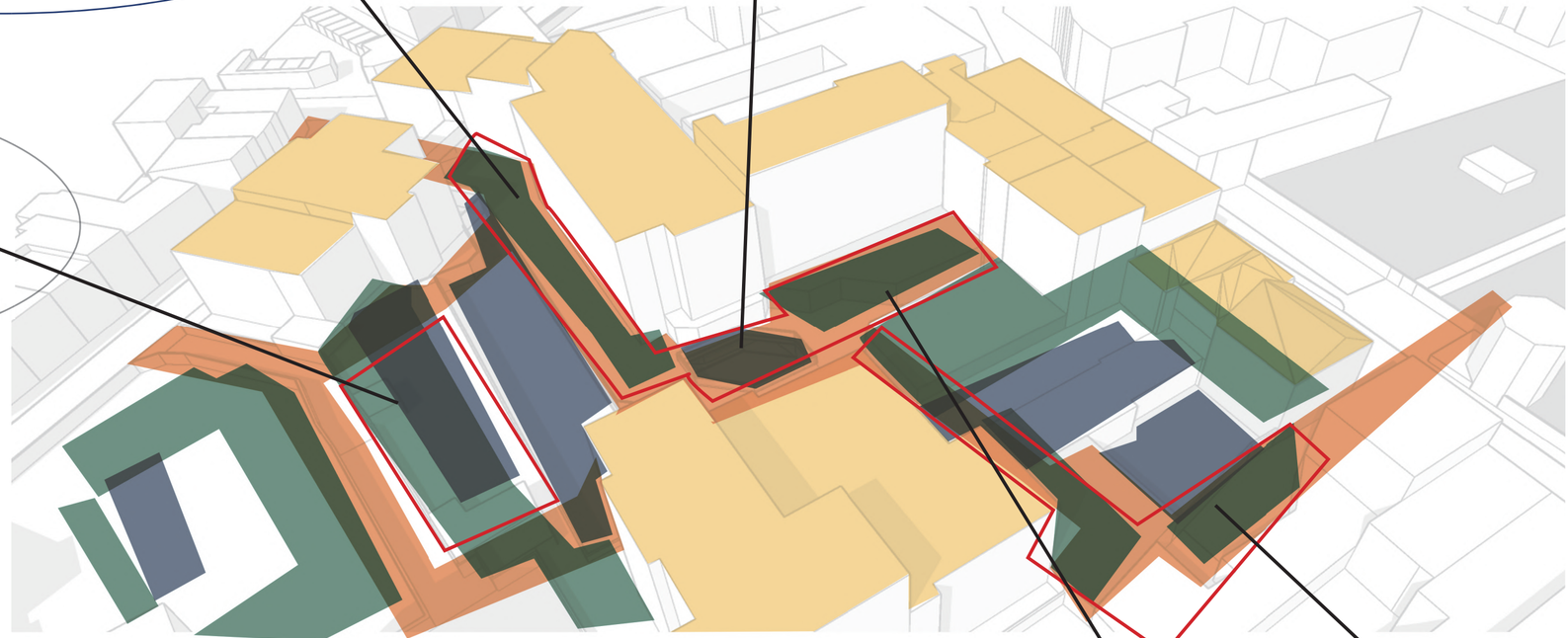
Lose quick path

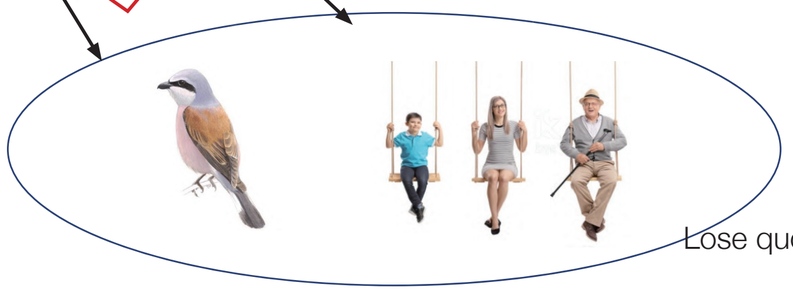


Clear boundaries to protect



The distance need to be design

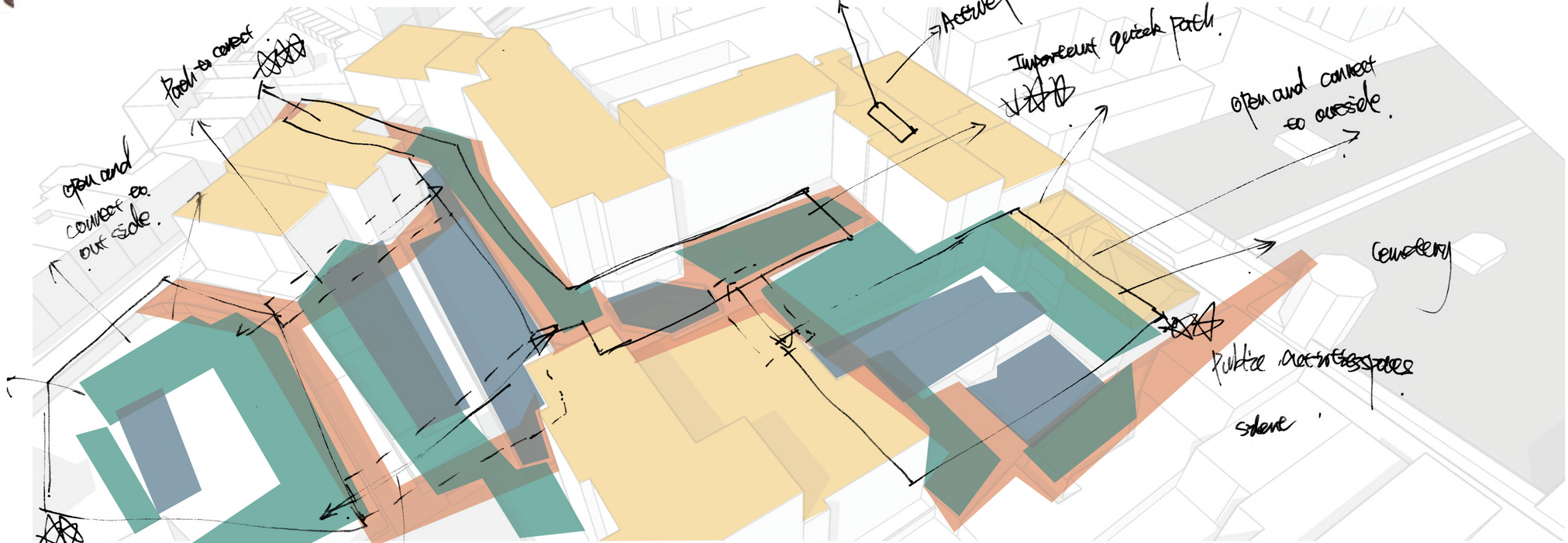




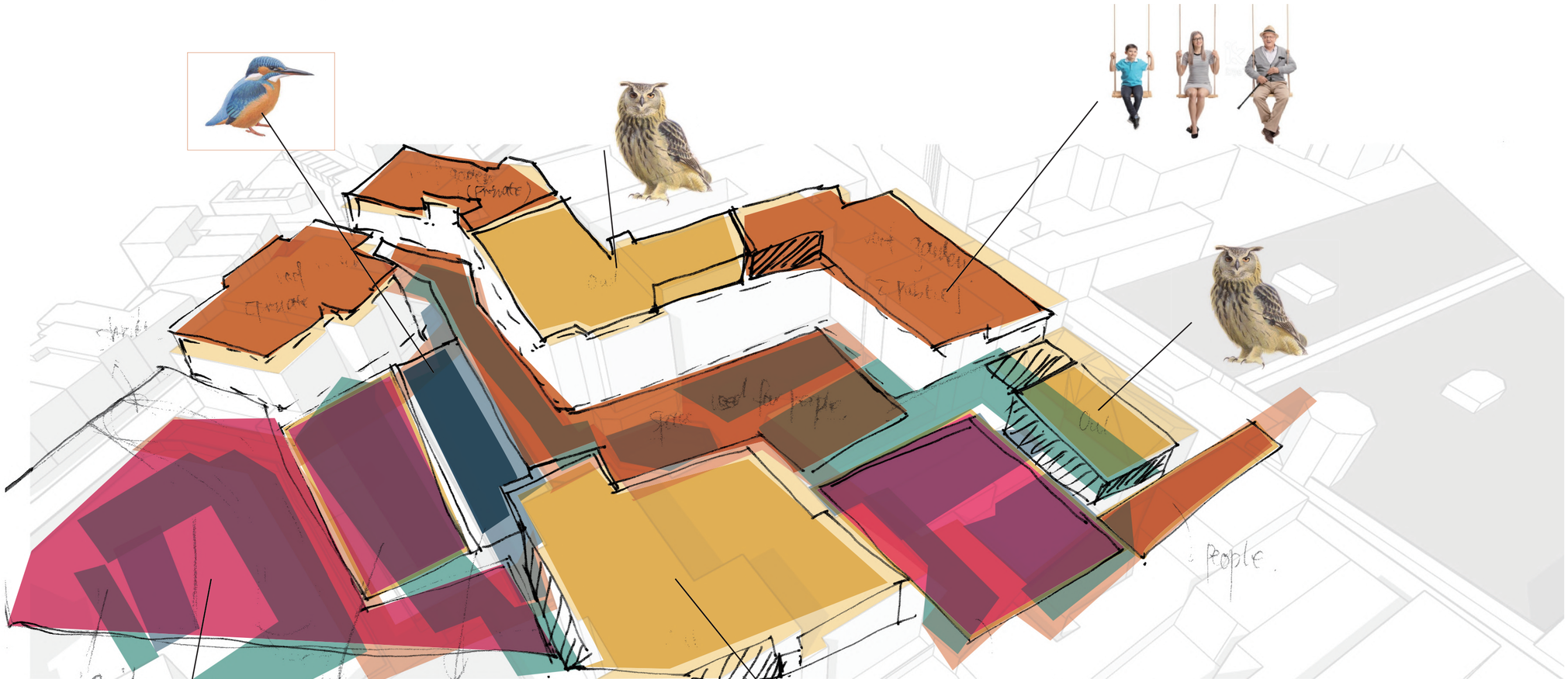
Lose qucik path

Design Community Scale





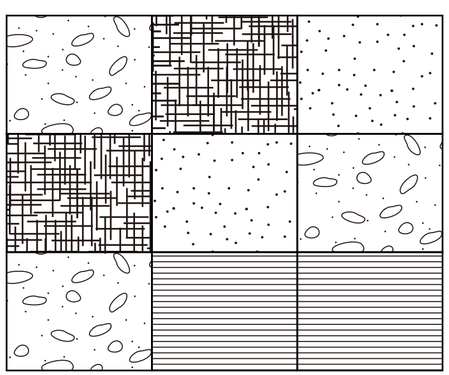
Design Community Scale



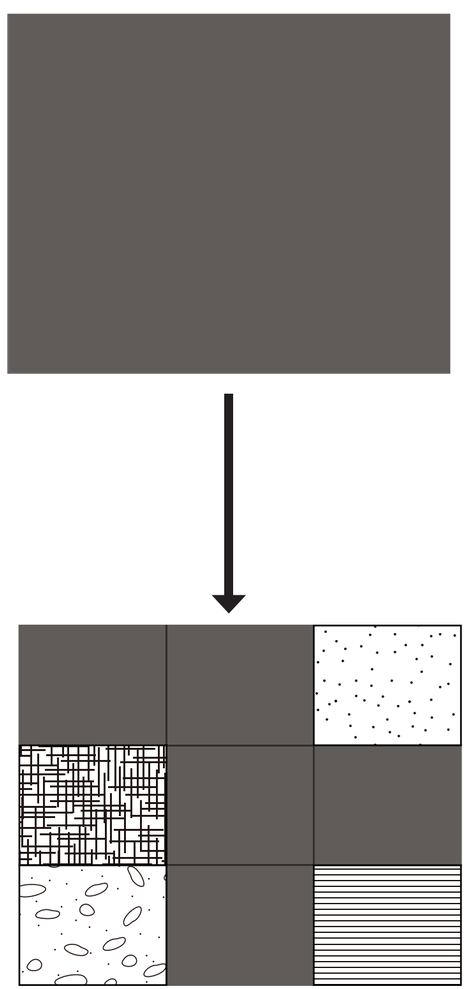
Design Community Scale

How to Integration?

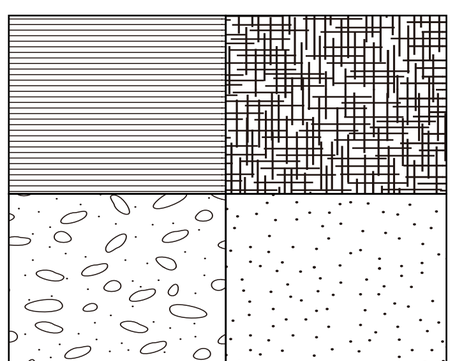
Random distribution



Mixed together



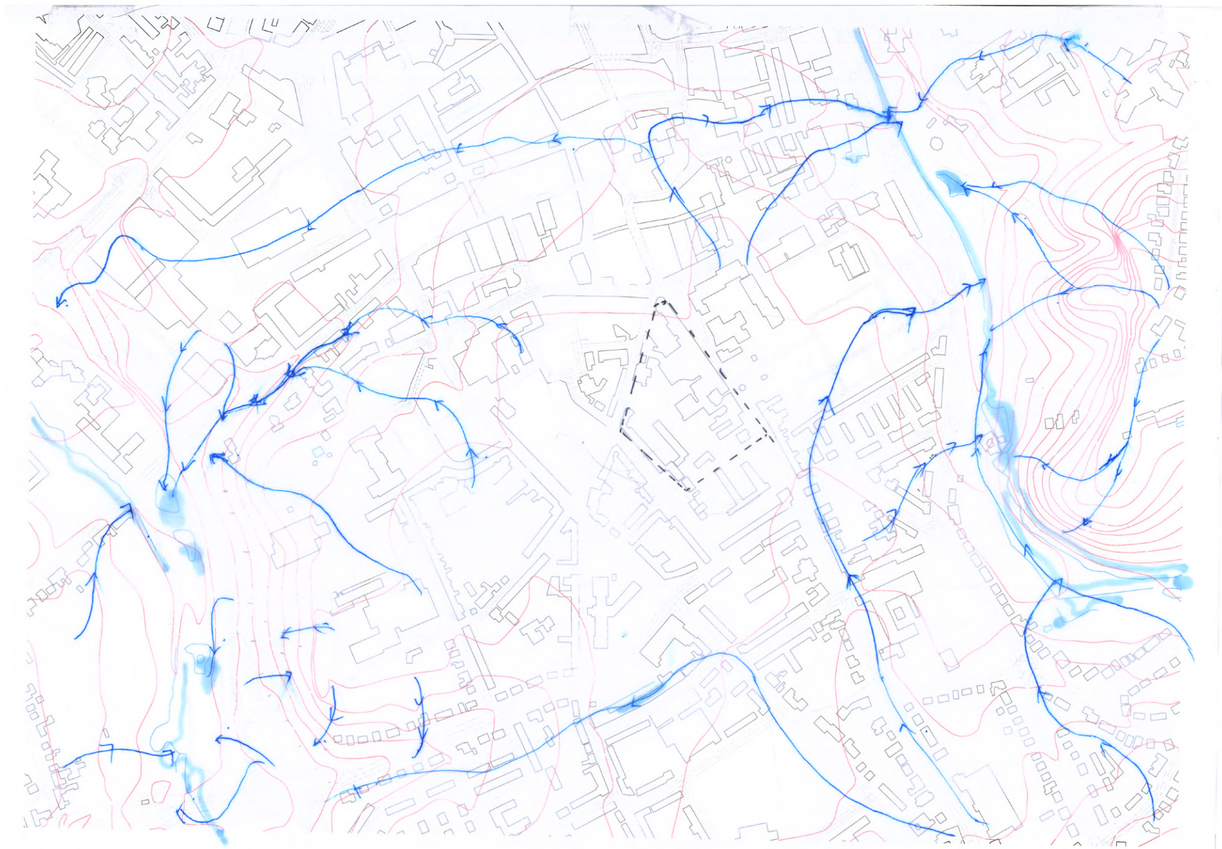
Evenly distribution

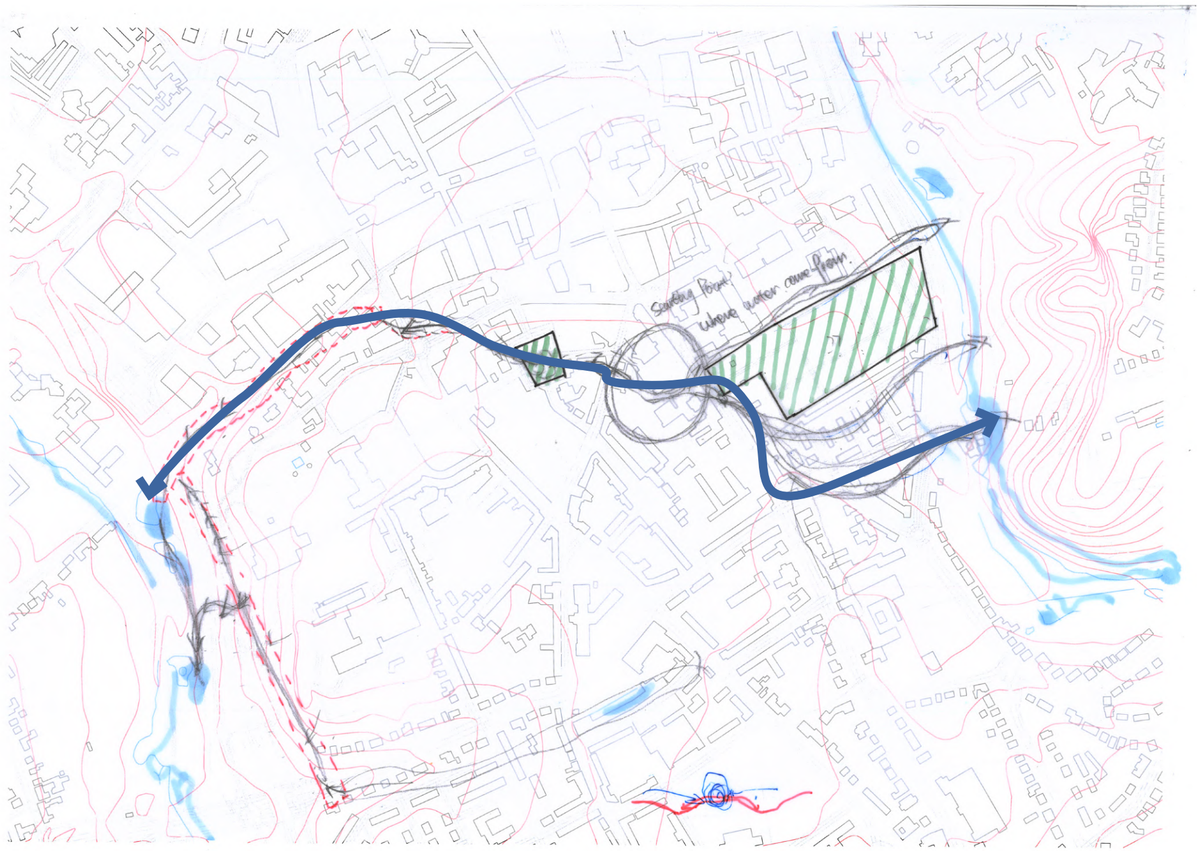


Core area mixed together | Some part single occupied

Design Community Scale

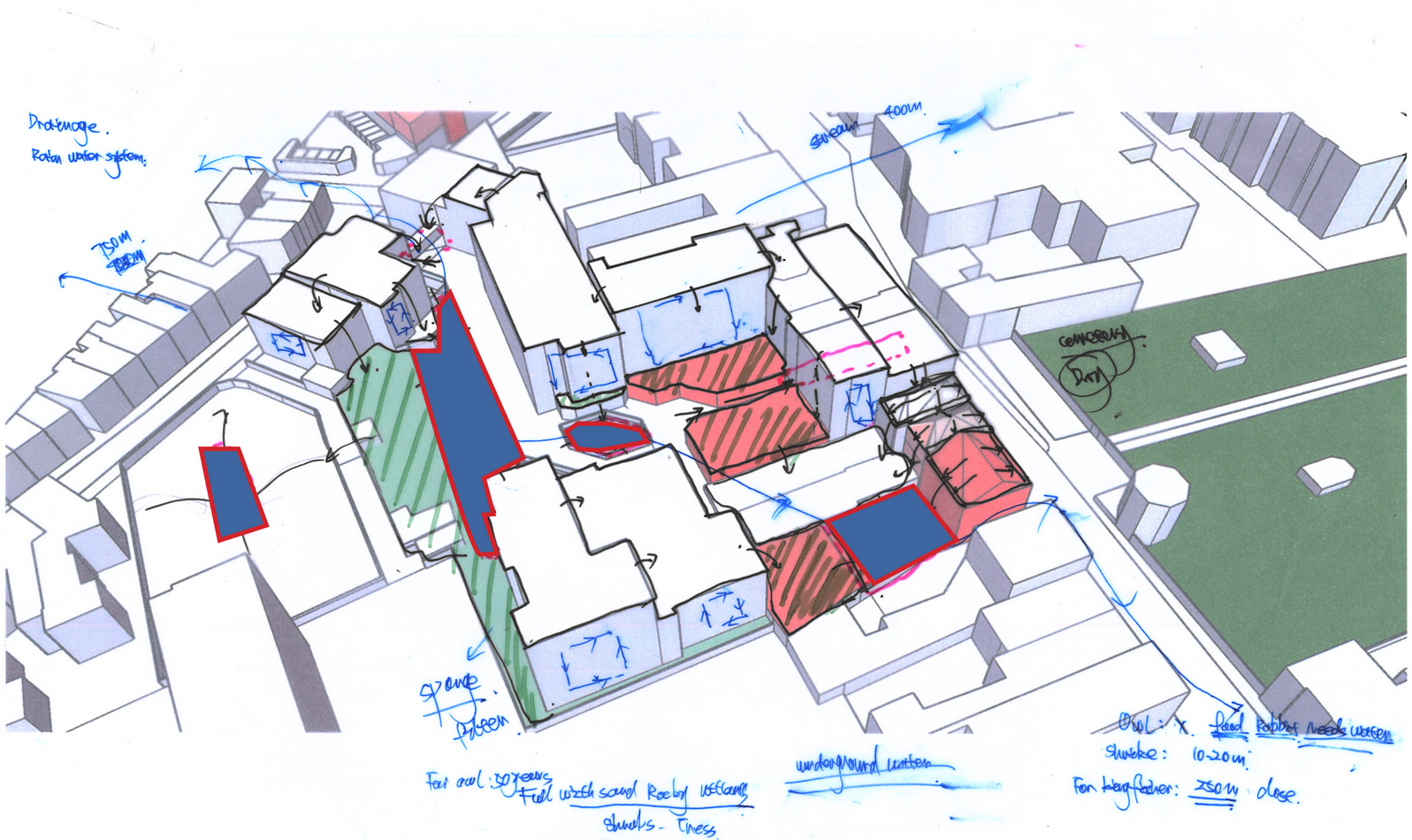
Water Collection





Design Community Scale

Water Collection



Design Community Scale

Create new water







Kingfisher needs as much as possible soft water banks, so the water is curved to create more edges. Also, offer nesting sites with more distance to the water system for Red-backed shrike.





Because the Red-backed shrike need to nest at the place where10-20m far from the water, so the green line is the boder at 10m to water, which decide the distribution area for Red-backed shrike.

Design Community

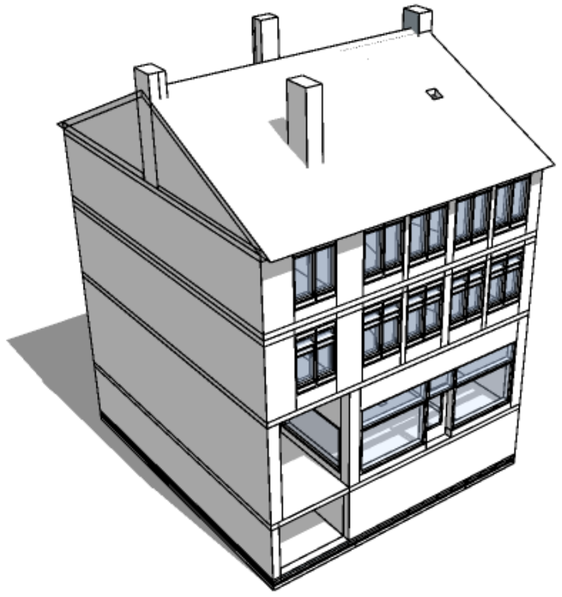
Master plan

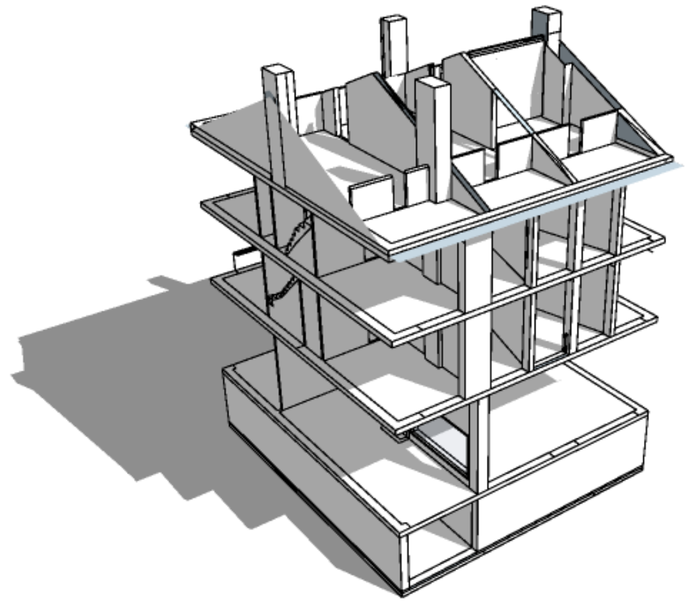


Design Community Scale

Vacant building









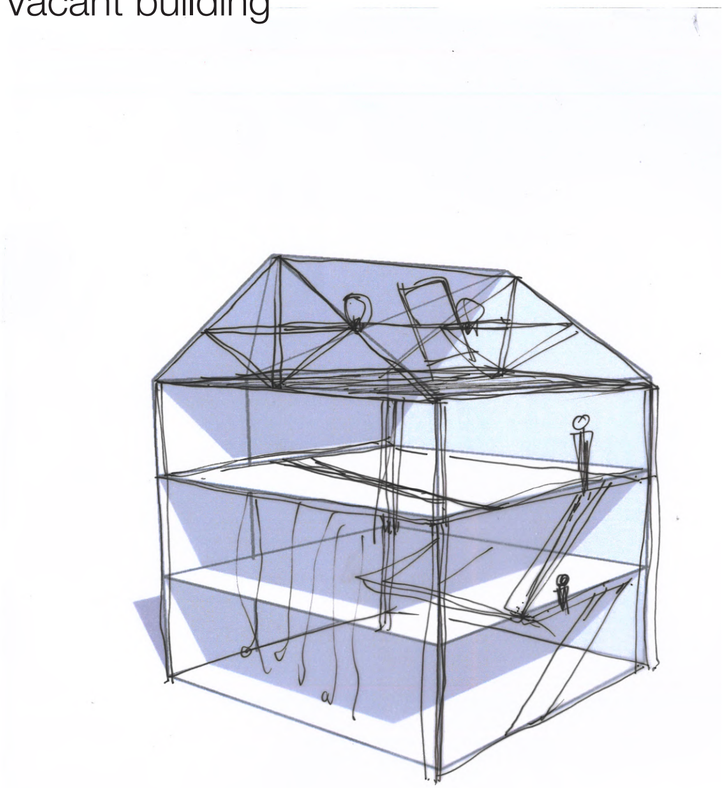




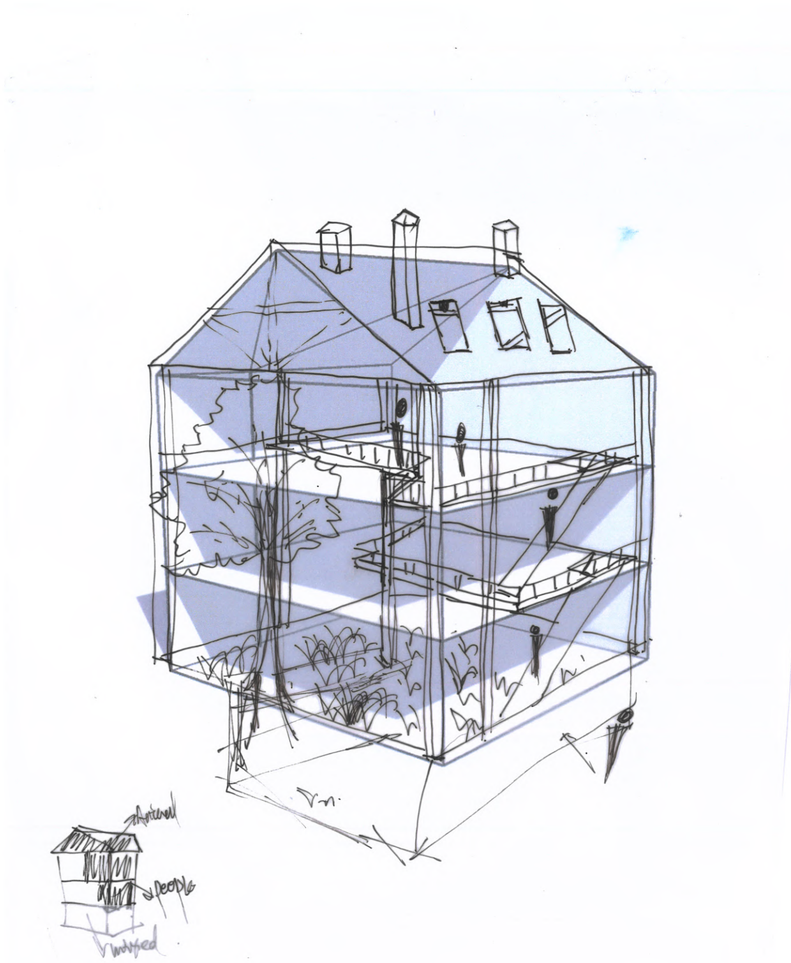


Design Community Scale

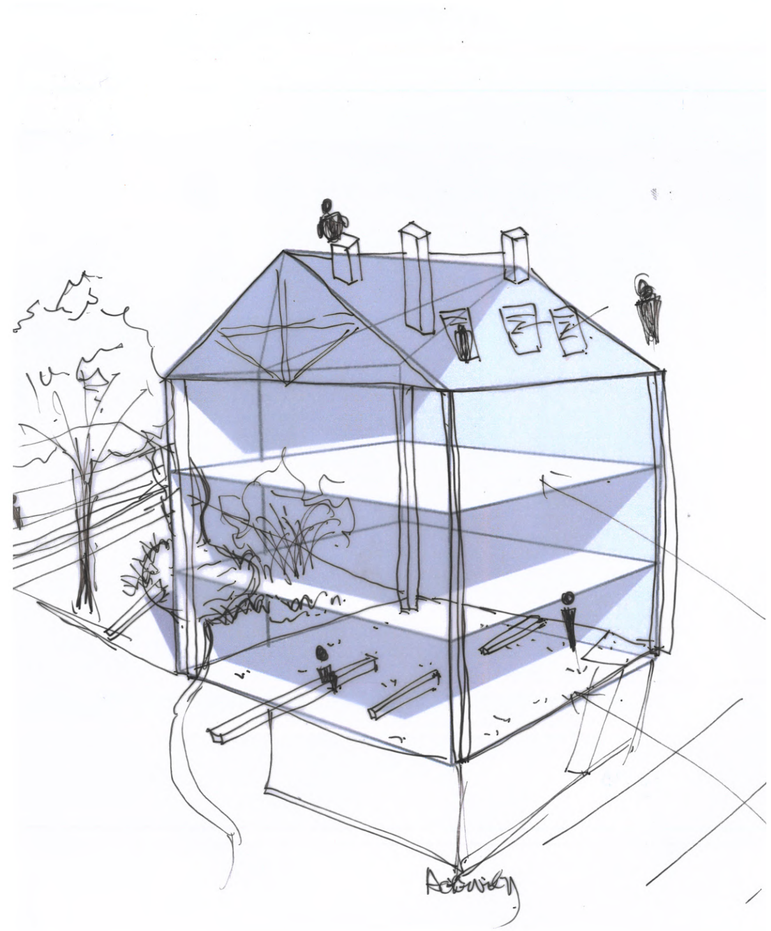
Vacant building



How can different users use the building



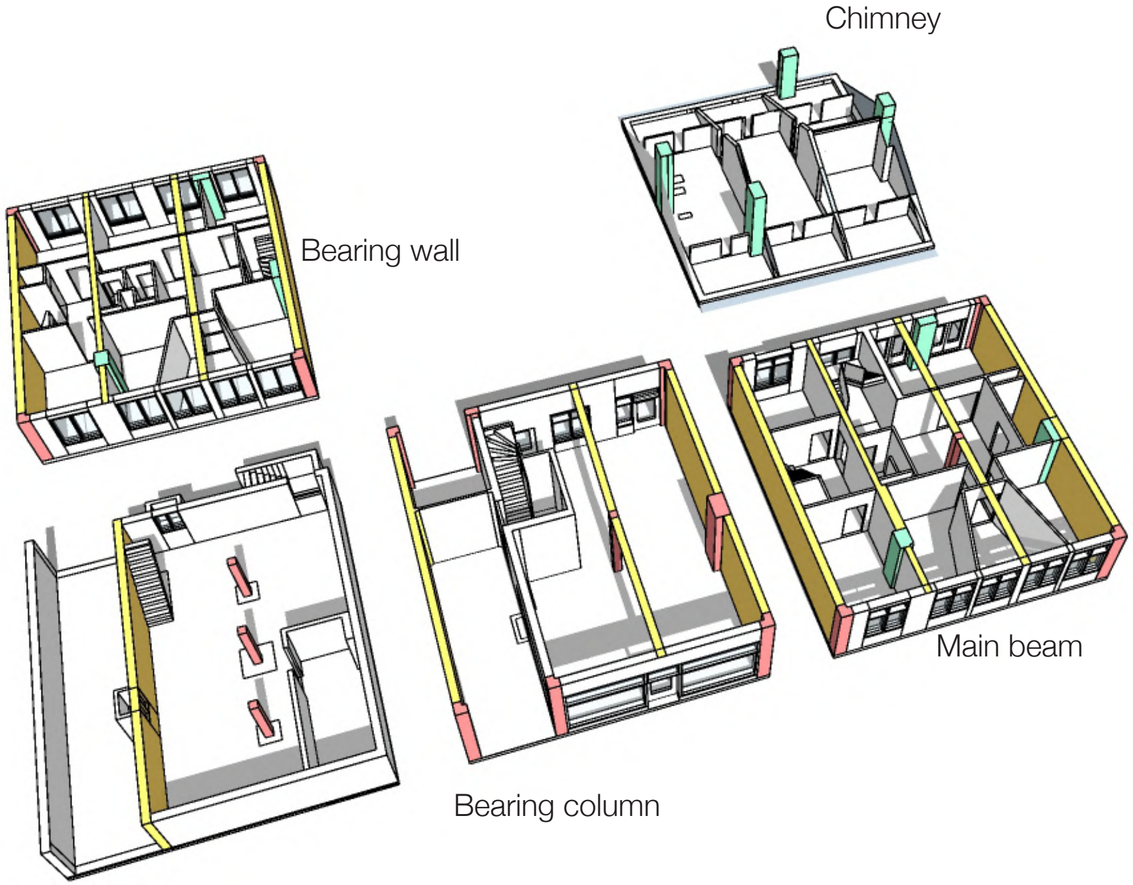
How can Flora use the building

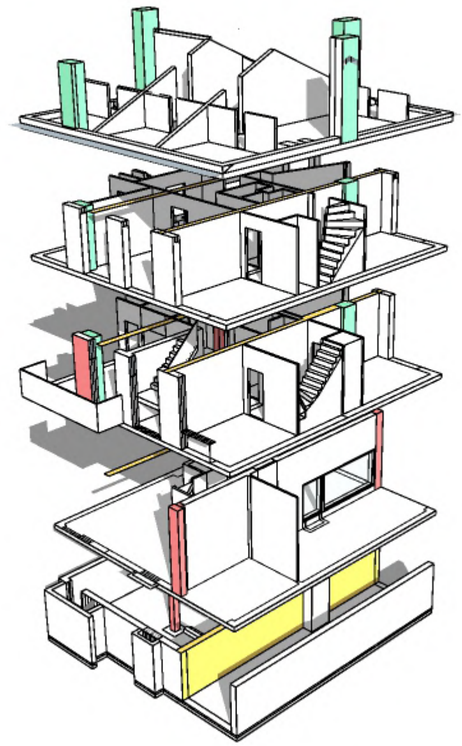


How the building connect with outside space

Design Community Scale

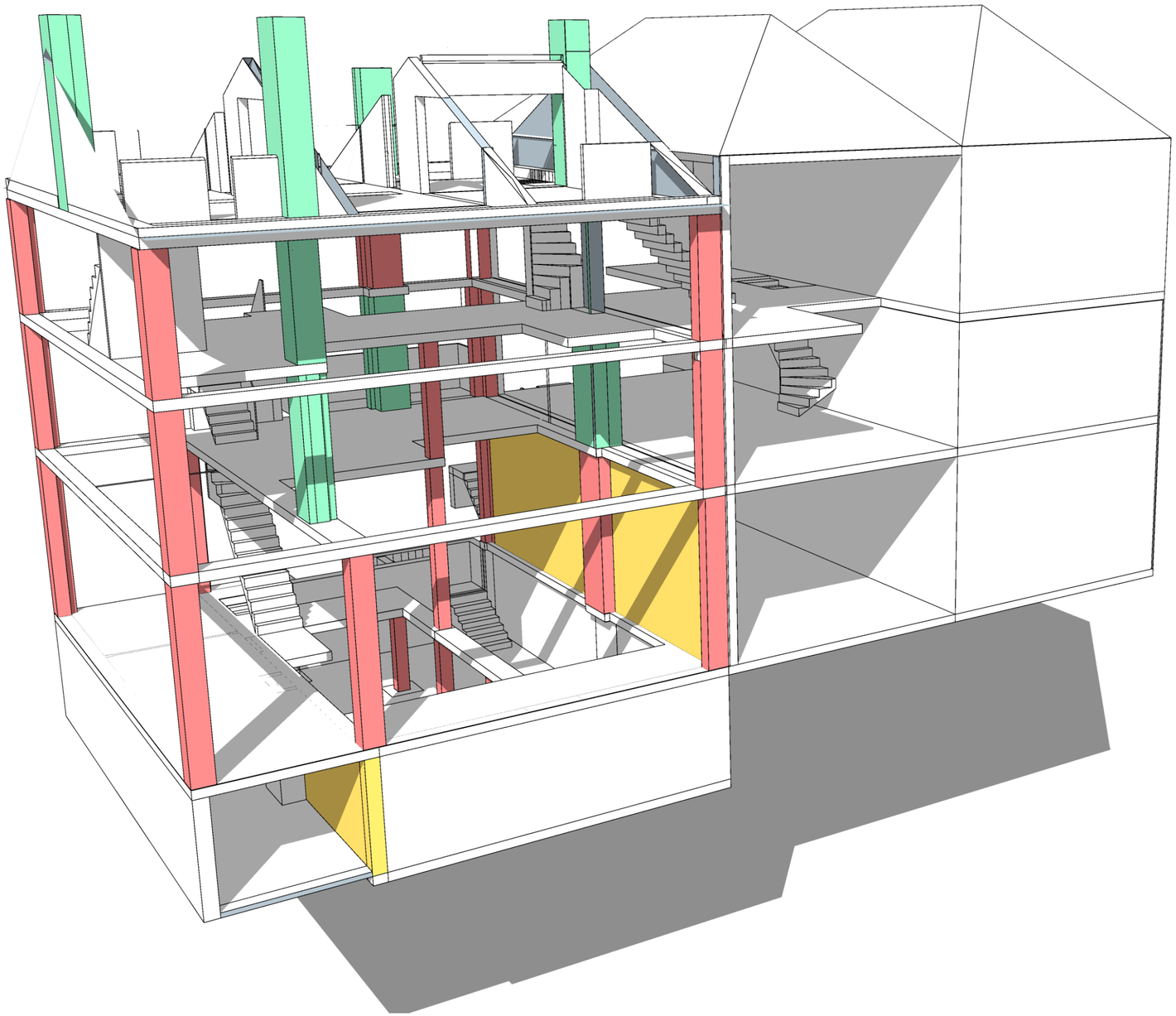
Vacant building





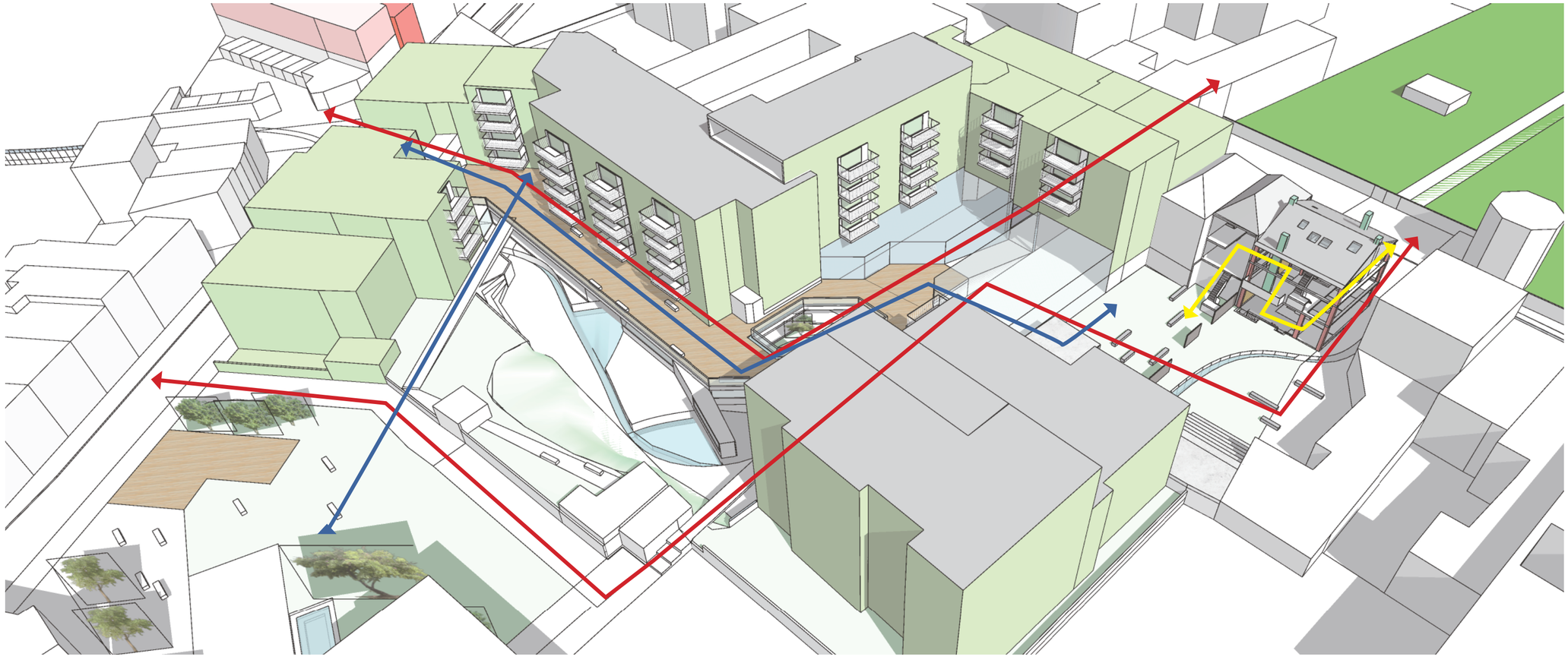
Design Community Scale

Vacant building

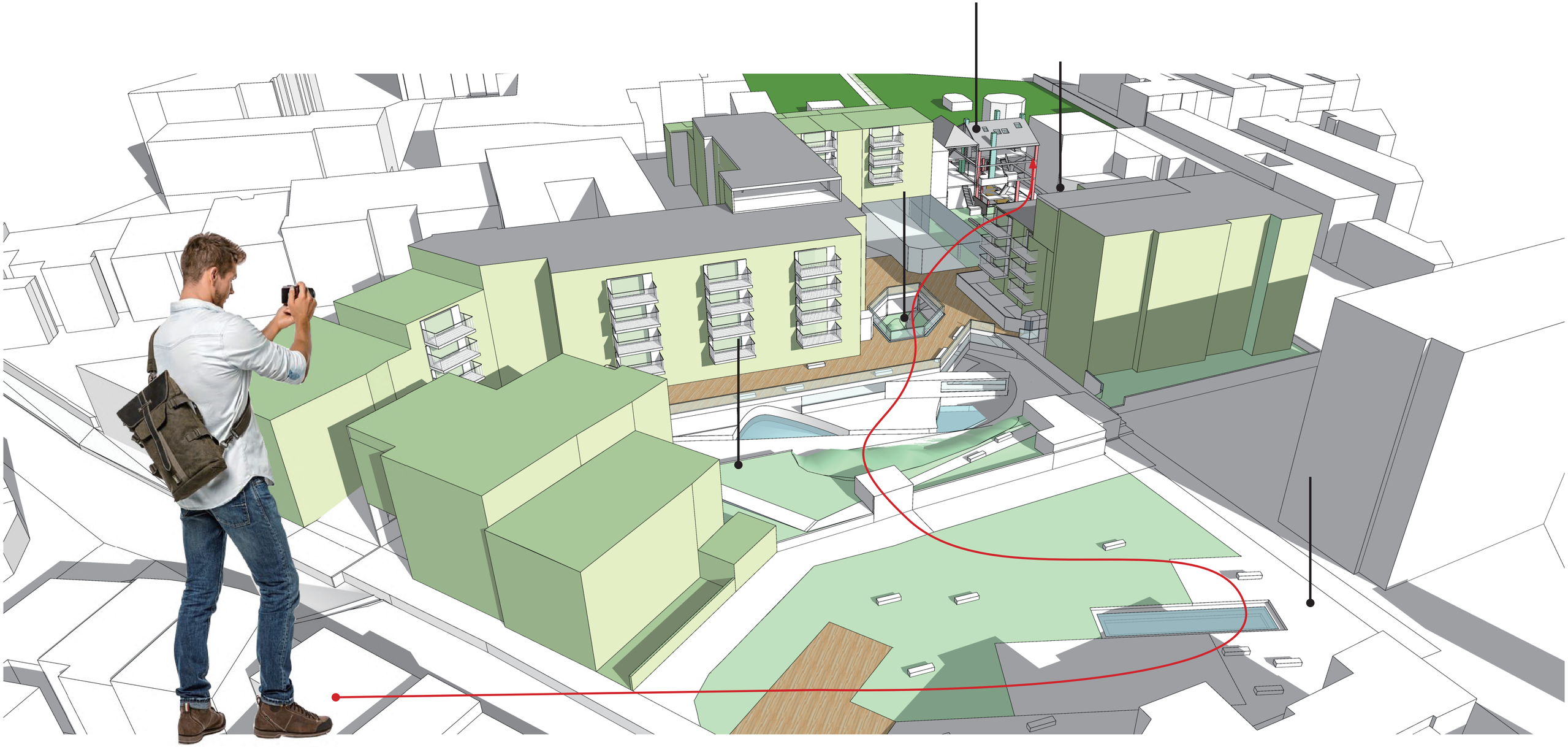


Design Community Scale

Road systems

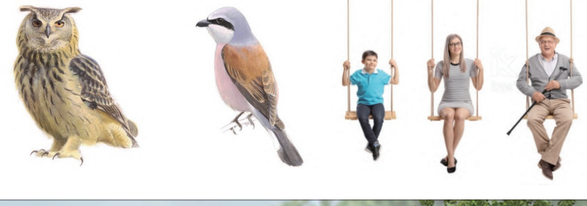


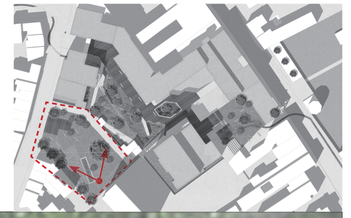
Design Community Scale



Design Community Scale

Activity Plaza





Design Community Scale

Activity Plaza

Flowers & Oak



Pine tree & Oak



Thory shrubs & Oak



Design Community Scale

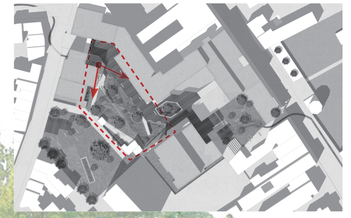
Hard surface parking plot





Design Community Scale

Soft nature green space





Design Community Scale

Hanging plant & Vine

Herb & flowers

Flowers&Pine tree

Grassland & Shrubs

Shrubs & Oak

Thory shrubs & Oak



Design Community Scale



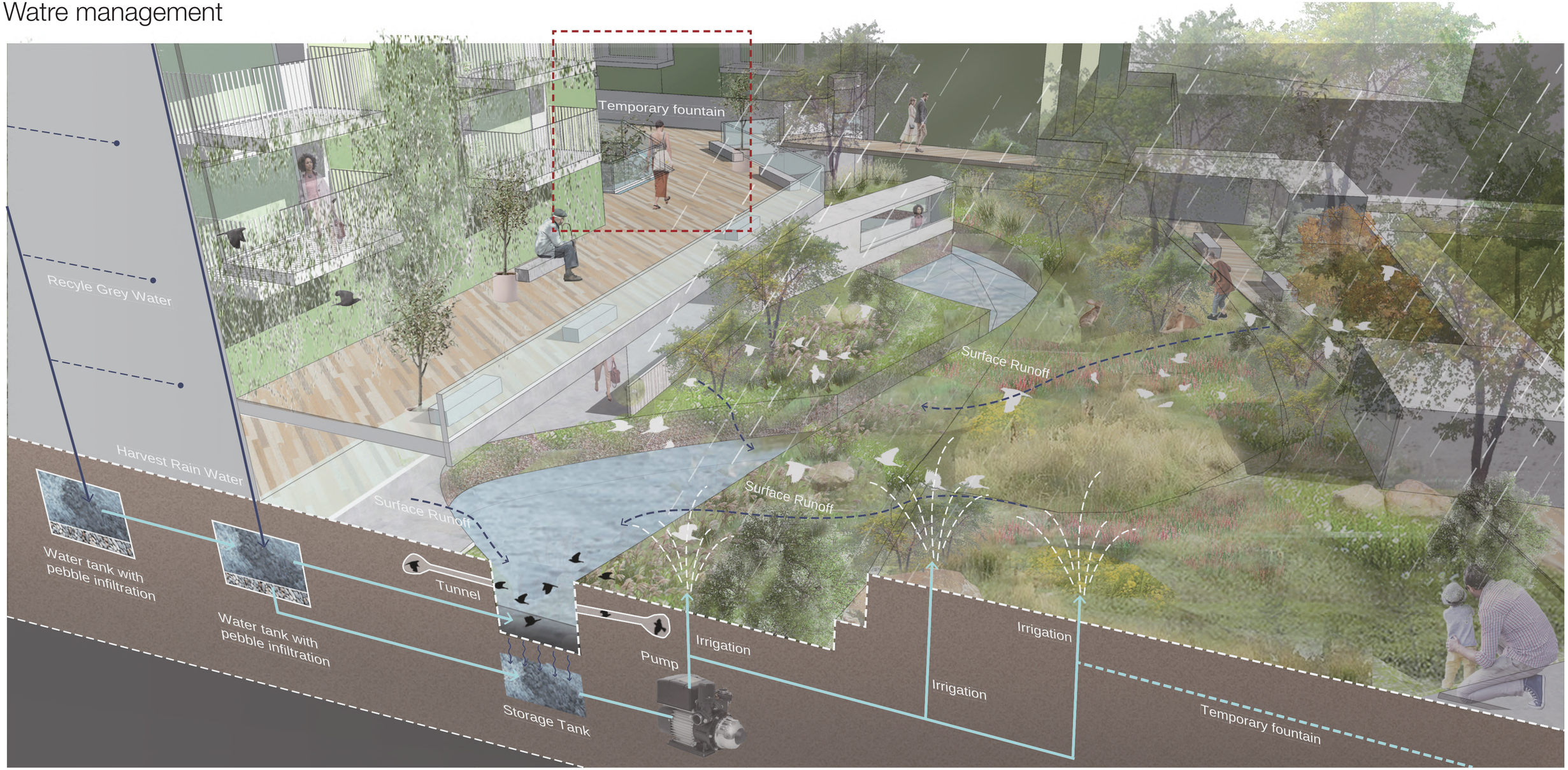
Design Community Scale

Watre management



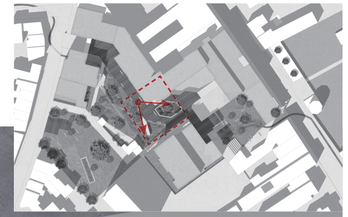
Design Community Scale

Watre management



Design Community Scale

Green Island & Temporary Foutain





Design Community Scale

Green Island & Temporary Foutain



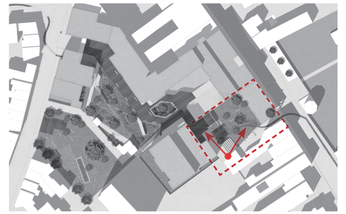
Design Community Scale

Backyard open gardens











Design Community Scale

Hanging plant & Vine

Herb & flowers

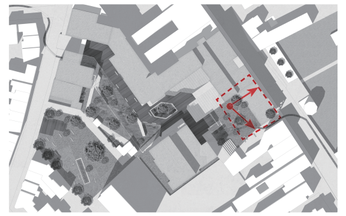
Thory shrubs & Oak

Open grassland & Oak & Pine tree



Design Community Scale

Building gardens





Design Community Scale



Pine Tree

Hanging plant&Vine



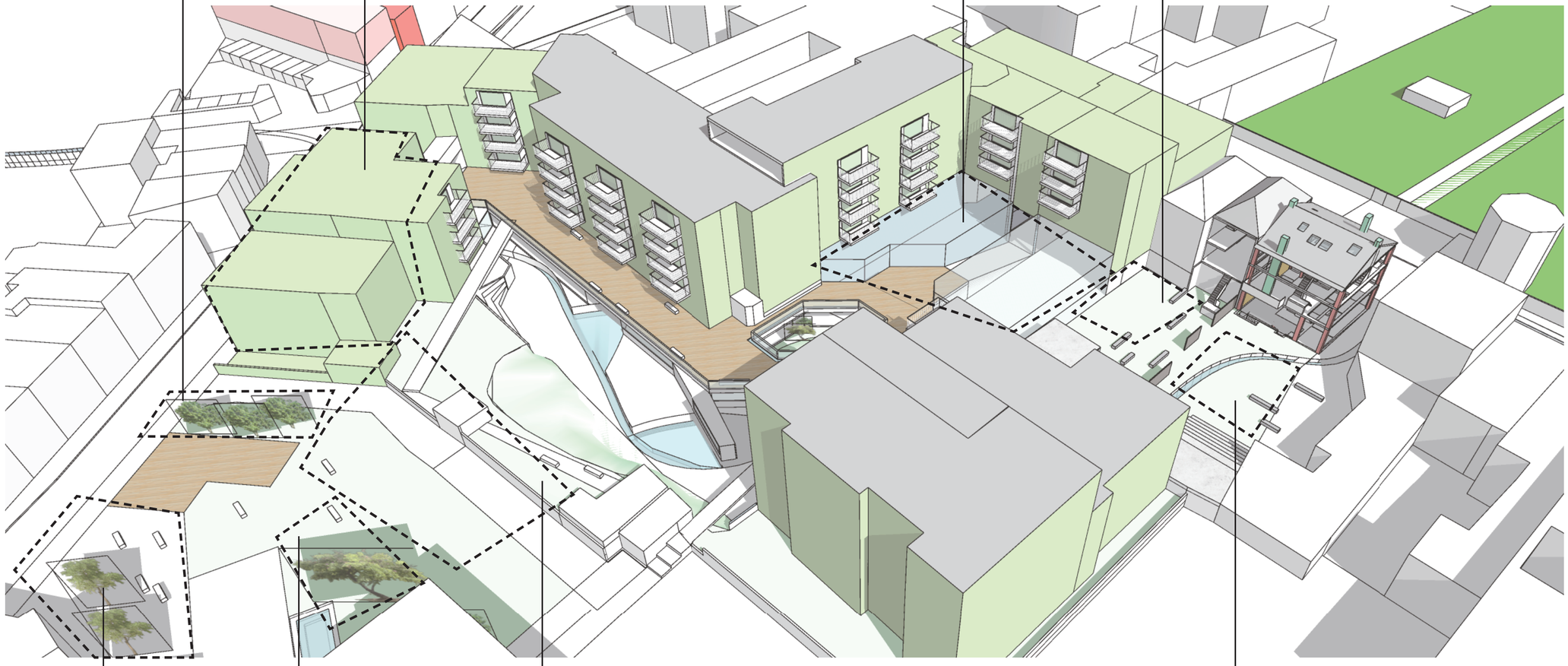


Herb&flowers green house

Thorny shrubs&trees









Oak

Oak&Pine

Thorny shrubs&trees





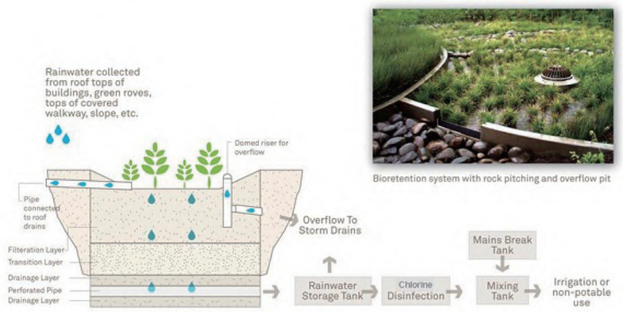


Oak&Pine



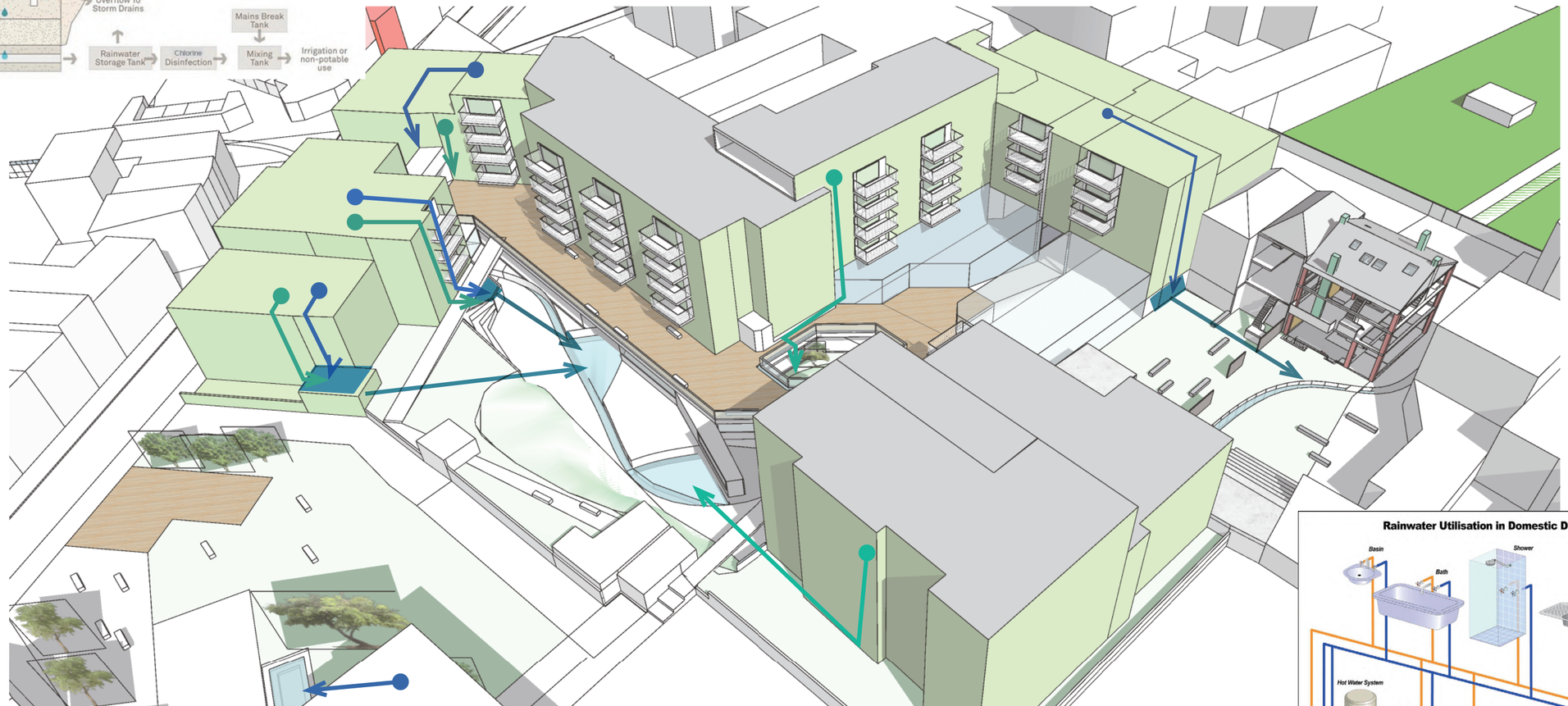


Design Community Scale

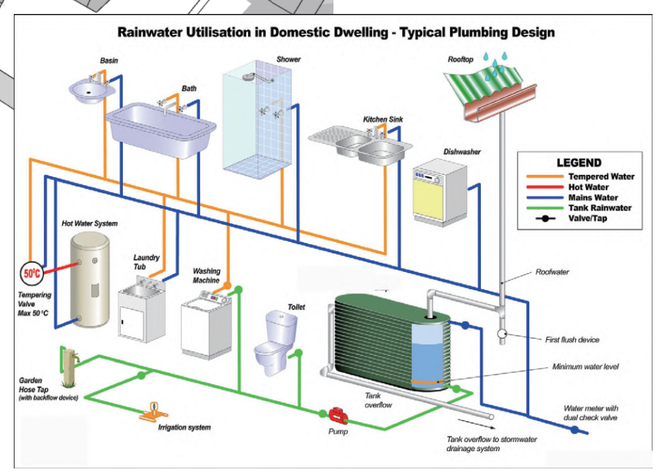


Bioretention system with rock pitching and overflow pit

Harvest rainwater



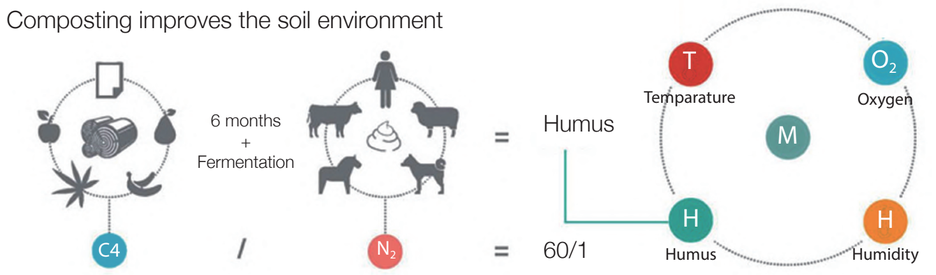
Grey water recycle



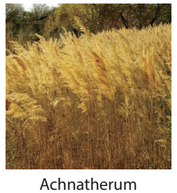
Design Community Scale

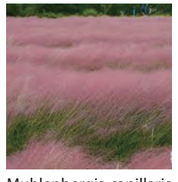
The soil of the site was originally Loess, which became barren after the construction of the city of severe decades. It lacks of trace elements now, which is not conducive to plant growth. The transformation plan aims to transform the hard pavement into a new regeneration vegetation system by controlling soil moisture, planting selective vegetation, improving the soil environment, and etc., to offer more opportunities for biodiversity and increase its sustainability.

Composting improves the soil environment



vegetation improving soil environment


Achnatherum


Muhlenbergia capillaris (Lam.) Trin

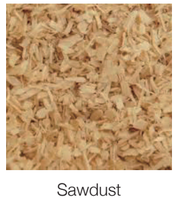

Ophiopogon japonicus

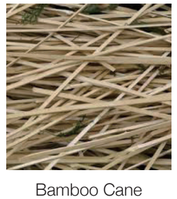

Panicum virgatum L.

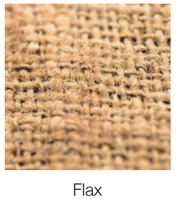

Cyperus papyrus

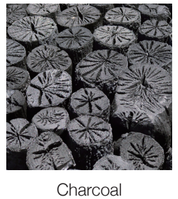
Cover material controls soil moisture


Volcanical Foundation

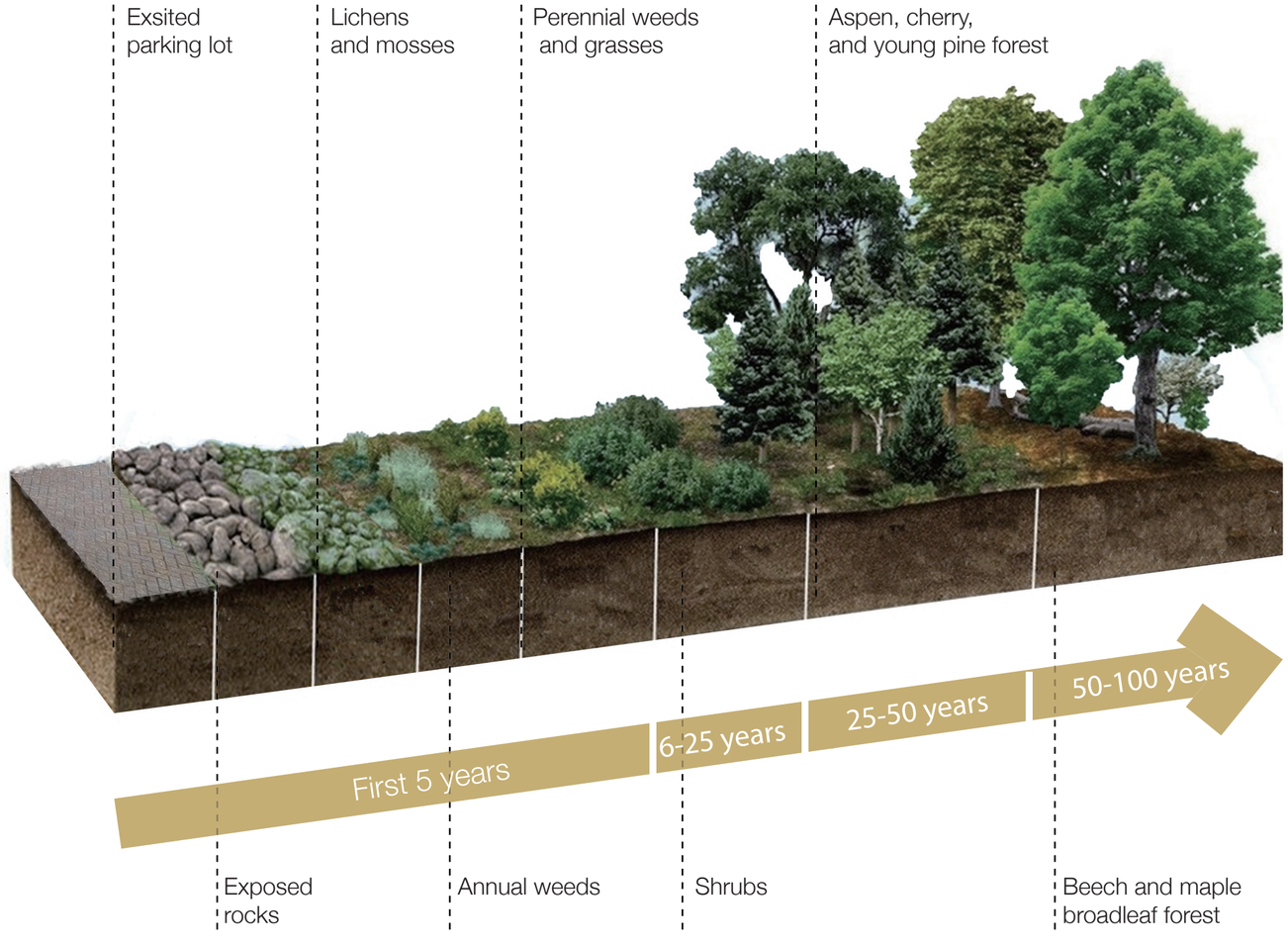

Sawdust


Bamboo Cane


Flax


Charcoal

Composting improves the soil environment



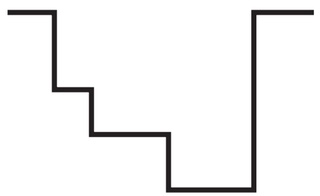
Design Community Scale

Conclusion



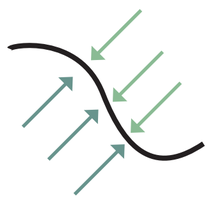
Water System

For most species and habitats, the water system is the most important factor that determines the user's drinking water and growth of vegetation. It is the basic but most important requirement for enhance biodiversity.



Gradients

Applicable to all elements, terrain, moderate, vegetation height, community structure, vertical structure and so on. The richer gradient changes mean more diverse environments, attracting more kinds of creatures, and being more adaptable to challenges.



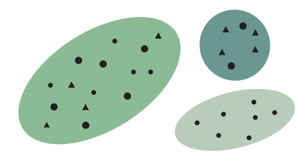
Boundary

For multi-species collaboration habitats, boundary (animal and animal | human-to-human) establishment is very important. There will be conflicts between species because of the sensitivity and disturbance to the environment are different.



Process

Enhance biodiversity must be a long process: the cultivation of vegetation, the nutrition of the soil, the succession of the environment, and the changes of the city all require time to achieve.



Capacity

Depending on the site's own conditions and scale, the design should consider the capacity of the site. Although the creatures themselves are live together in nature, the environment itself is constantly adjusting its limits. The number of goal species in the design should not exceed the capacity of the site itself.

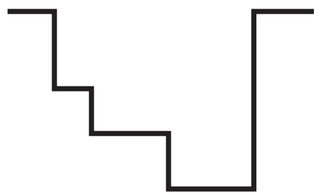
Design Community Scale

Conclusion



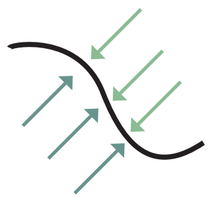
Water System

For most species and habitats, the water system is the most important factor that determines the user's drinking water and growth of vegetation. It is the basic but most important requirement for enhance biodiversity.



Gradients

Applicable to all elements, terrain, moderate, vegetation height, community structure, vertical structure and so on. The richer gradient changes mean more diverse environments, attracting more kinds of creatures, and being more adaptable to challenges.



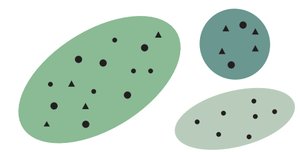
Boundary

For multi-species collaboration habitats, boundary (animal and animal | human-to-human) establishment is very important. There will be conflicts between species because of the sensitivity and disturbance to the environment are different.



Process

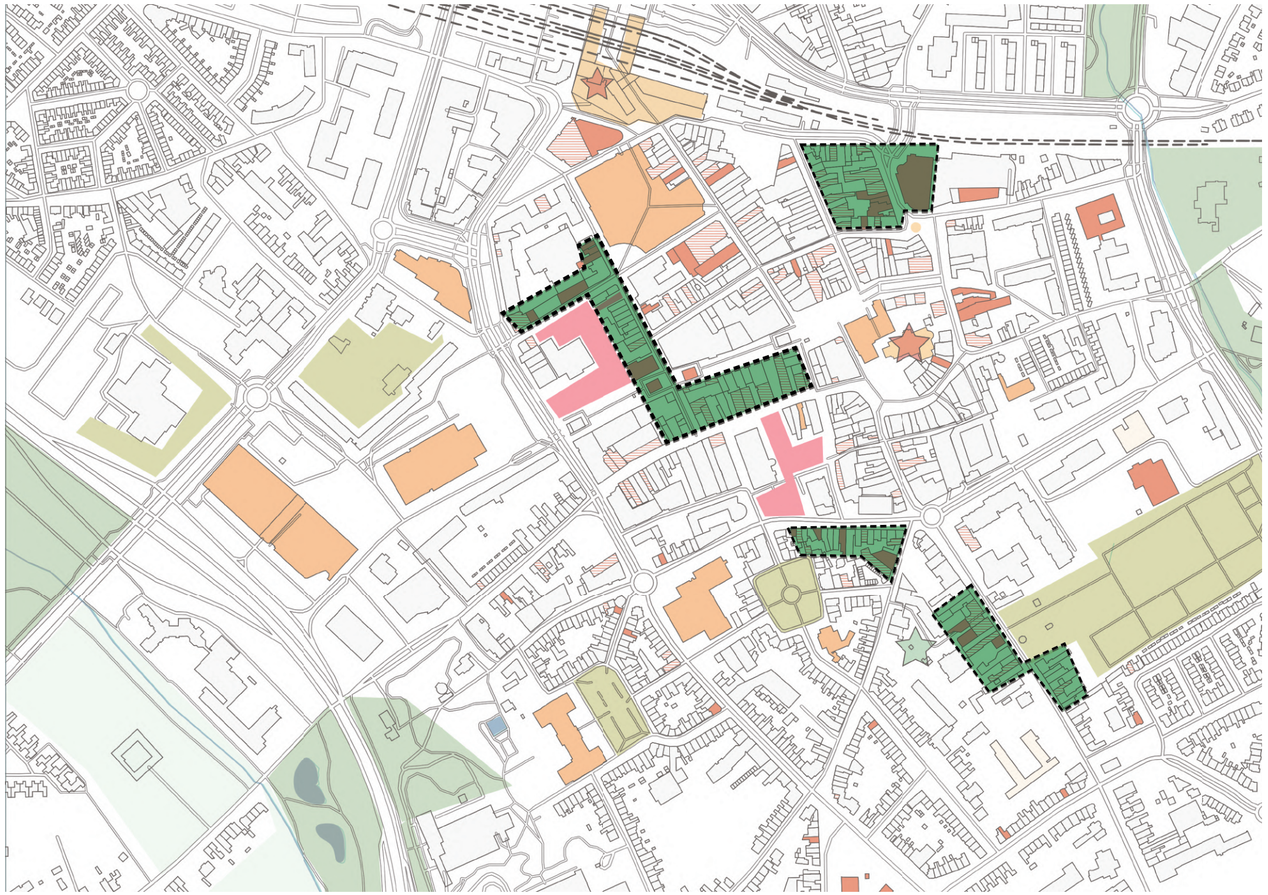
Enhance biodiversity must be a long process: the cultivation of vegetation, the nutrition of the soil, the succession of the environment, and the changes of the city all require time to achieve.



Capacity

Depending on the site's own conditions and scale, the design should consider the capacity of the site. Although the creatures themselves are live together in nature, the environment itself is constantly adjusting its limits. The number of goal species in the design should not exceed the capacity of the site itself.

Design Urban Scale

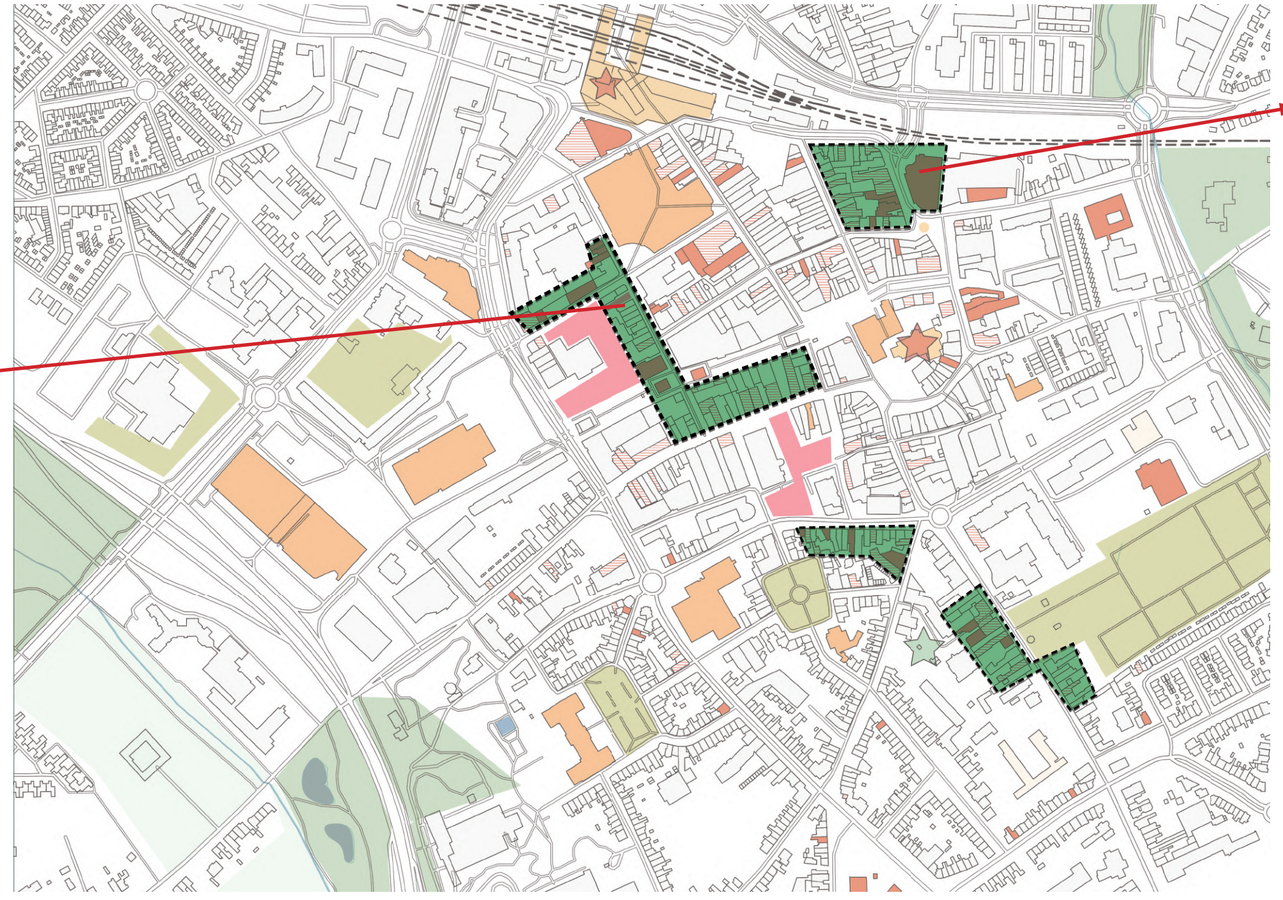


Design Urban Scale



Stripe |
Scattered |
Partially vacant buildings |







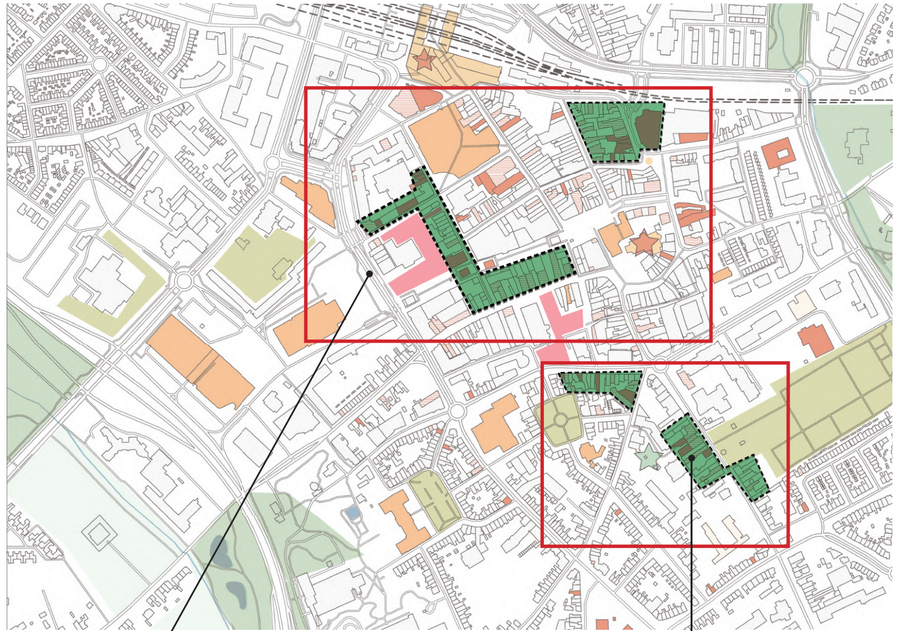
Block |
Dense |
More totally vancant buildings |



Design Urban Scale





Commercial center |
More human disturbance |

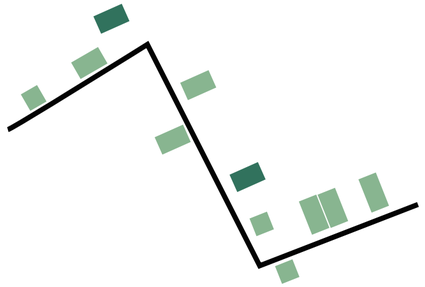
Not suitable for kingfisher



Residential community |
More silence and privacy |

Suitable for kingfisher

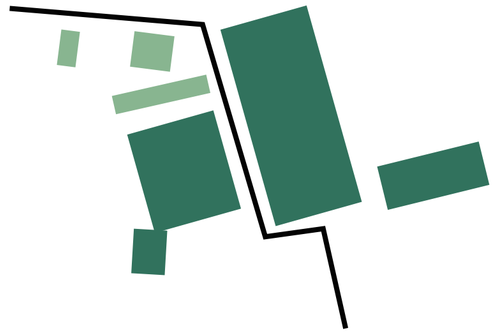




Scattered block|
Material for rocky landscape |
Box to protect and offer high structure |

Suitable for Owl



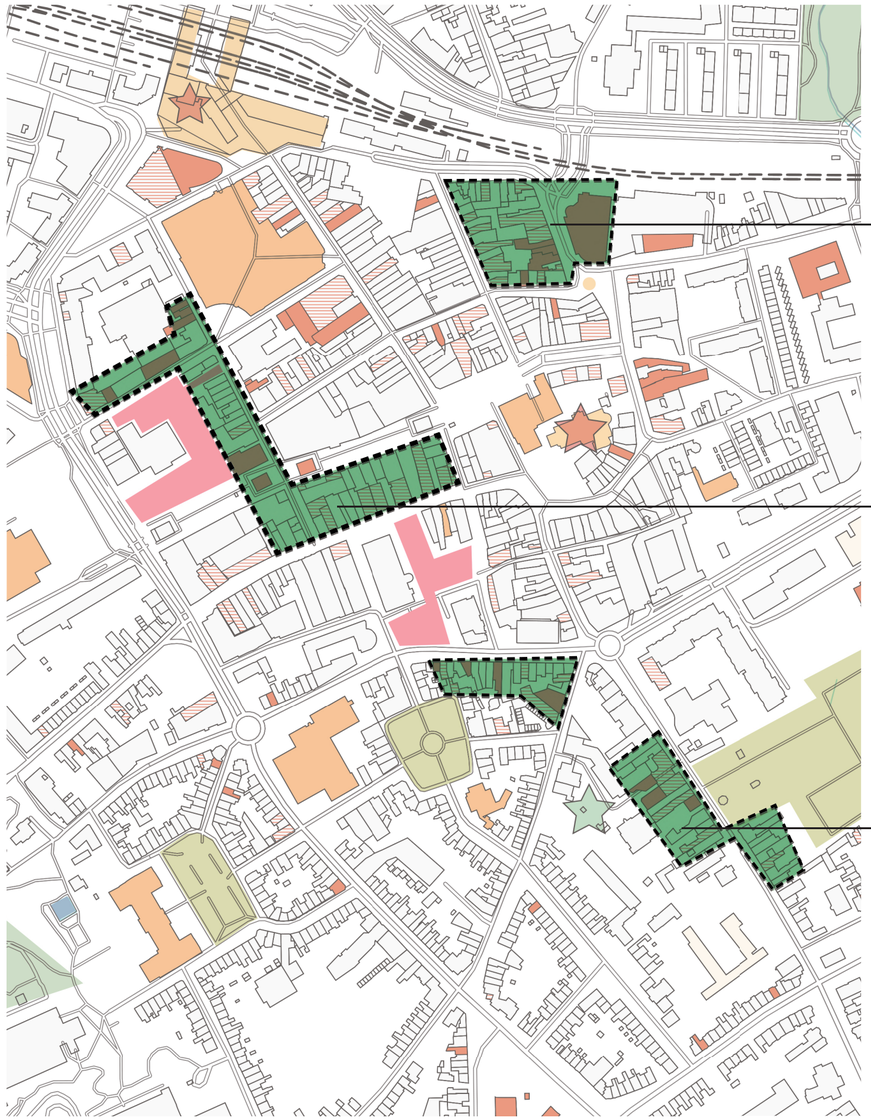


Big open space|
More different distance to water |

Suitable for Red-backed shrike



Design Urban Scale





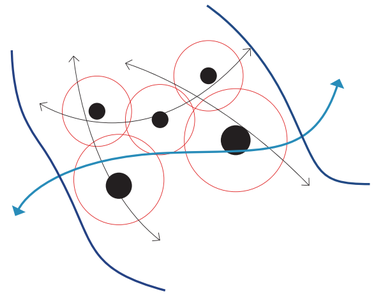






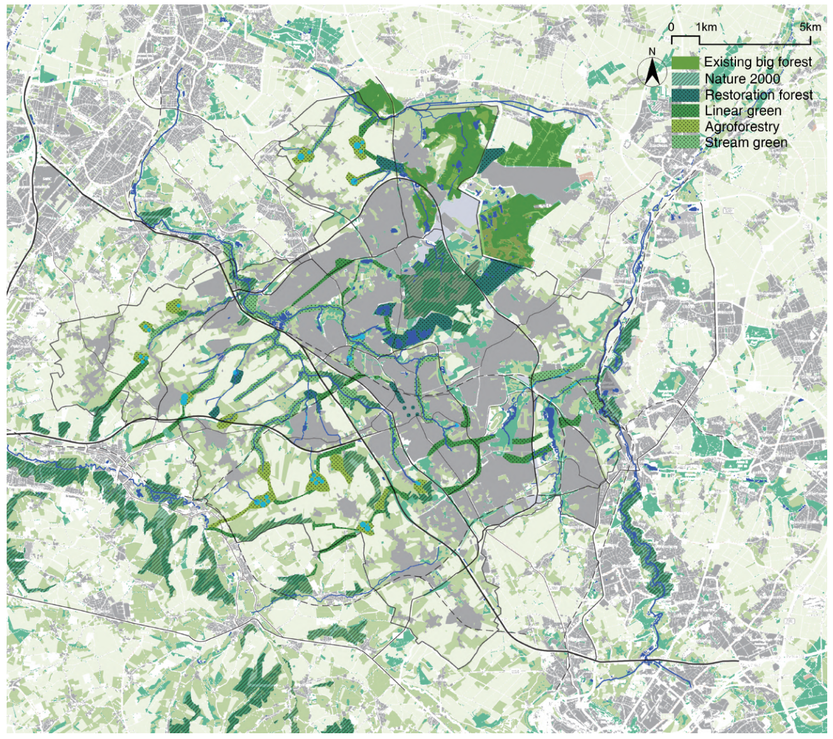




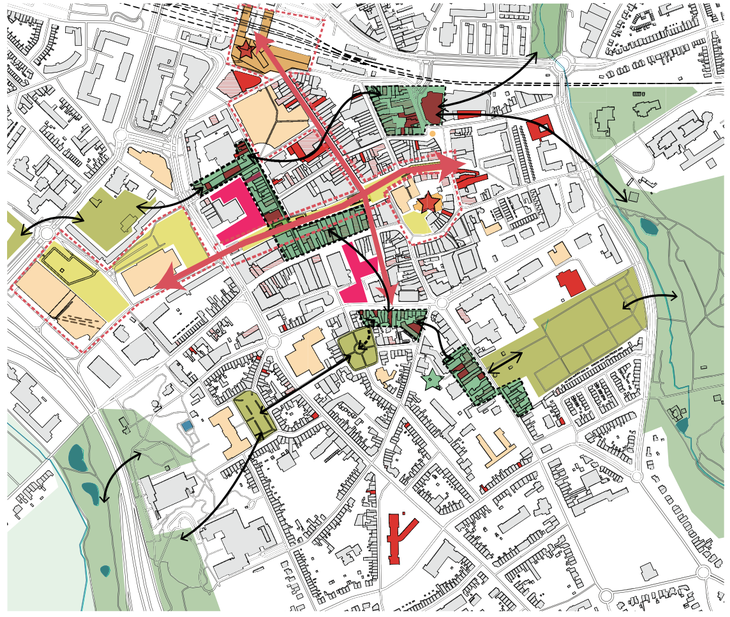


DESIGN

Parkstad scale



Urban scale

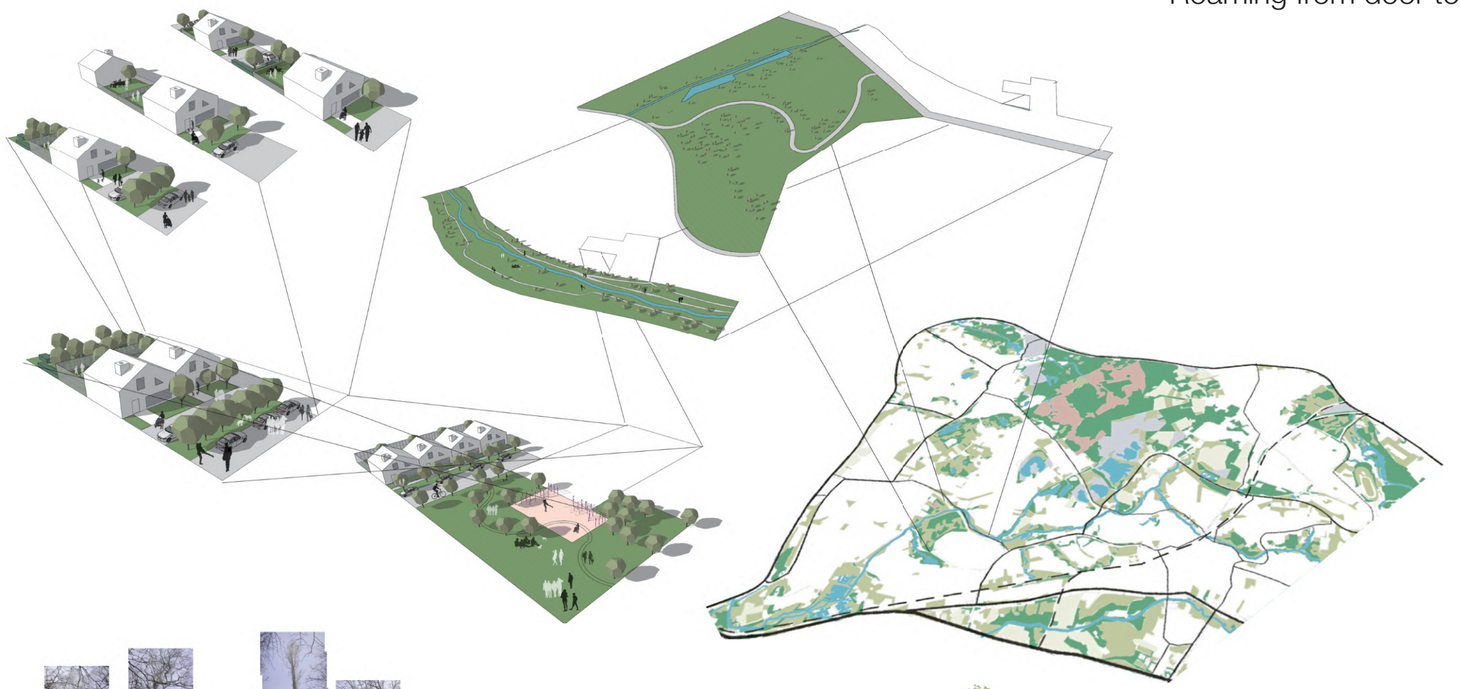


Community scale

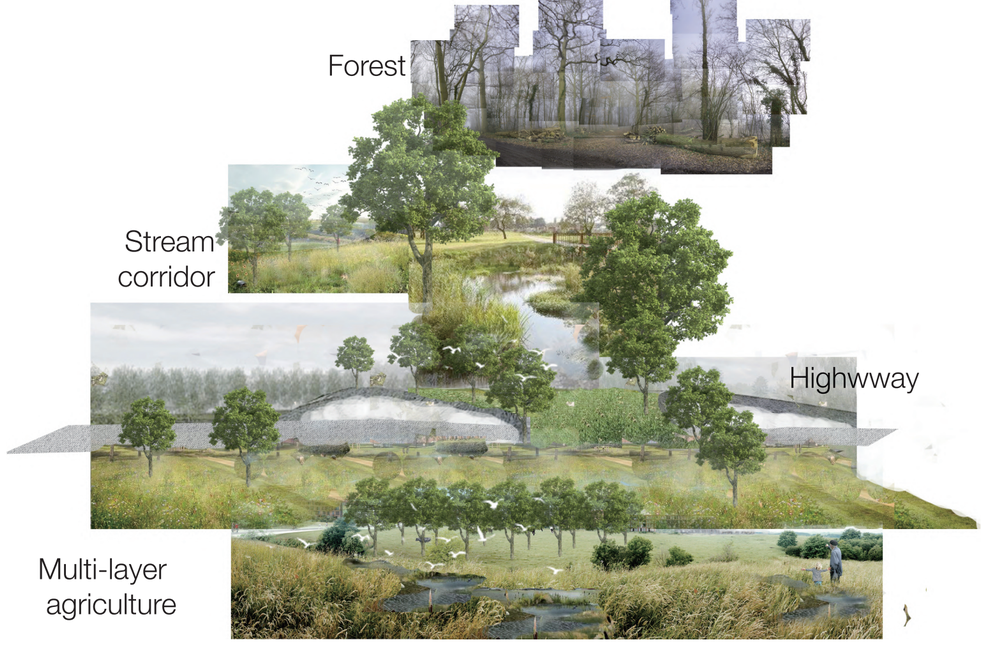


DESIGN

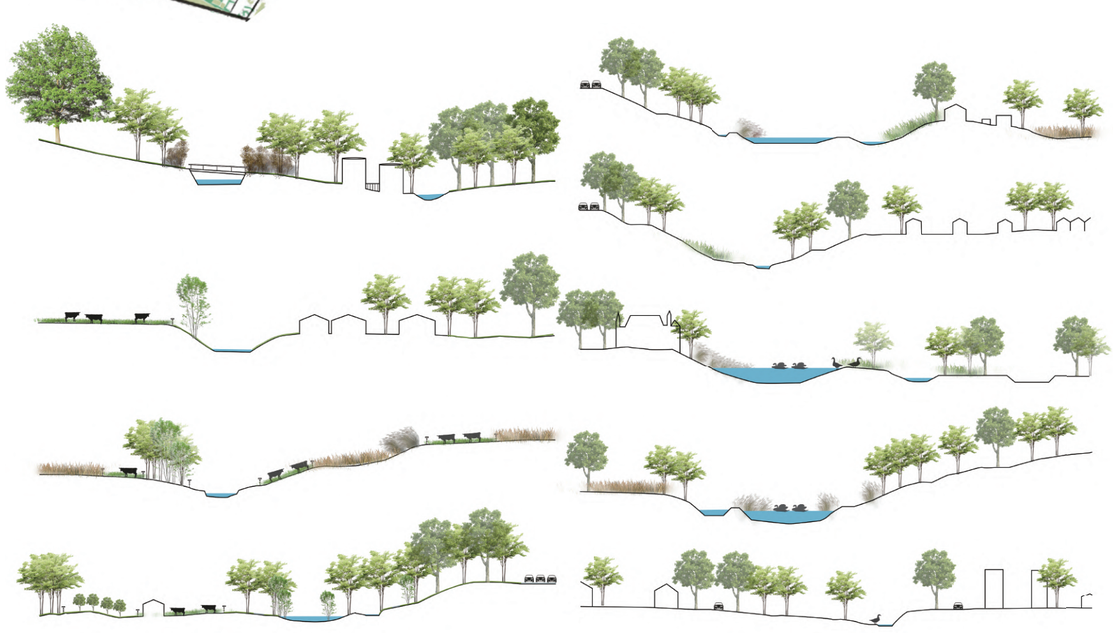
Roaming from door to the regional big green park



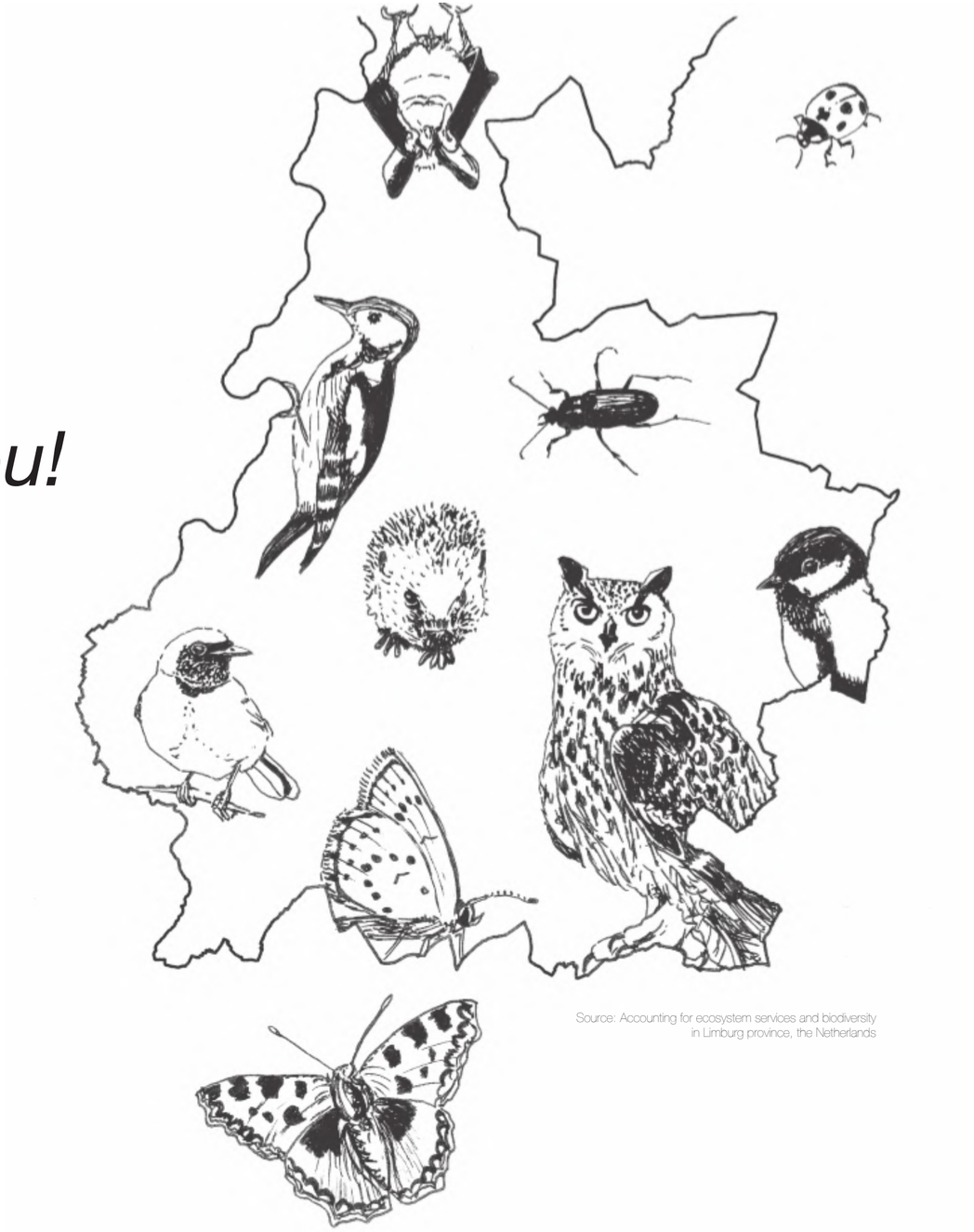
Green corridor landscape



More connection and interaction with water



Thank you!



Source: Accounting for ecosystem services and biodiversity
in Limburg province, the Netherlands