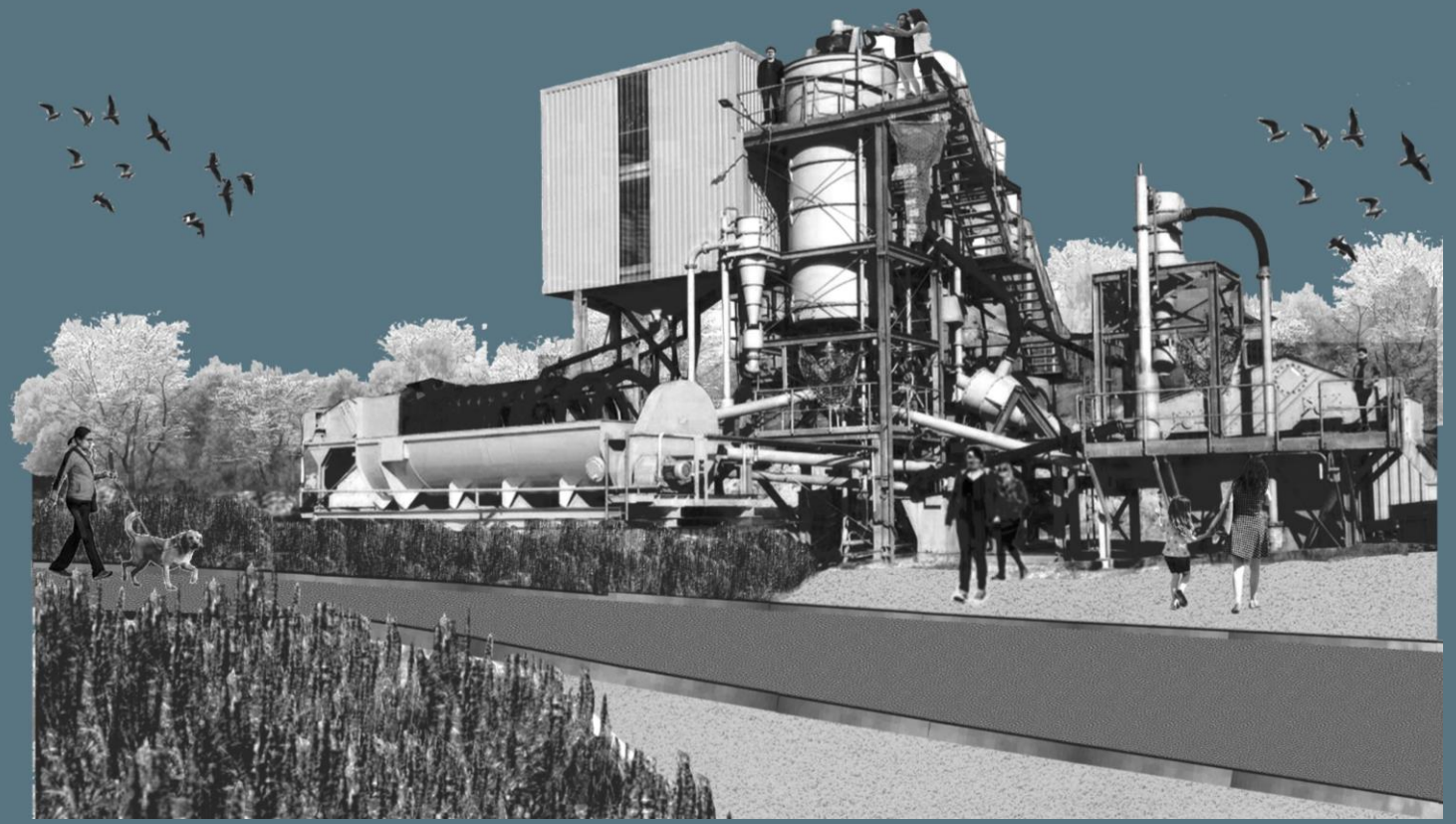


REVIVING THE DEGRADED

Planning the unplanned spaces in unproductive landscape

Introduction

Method

Analysis

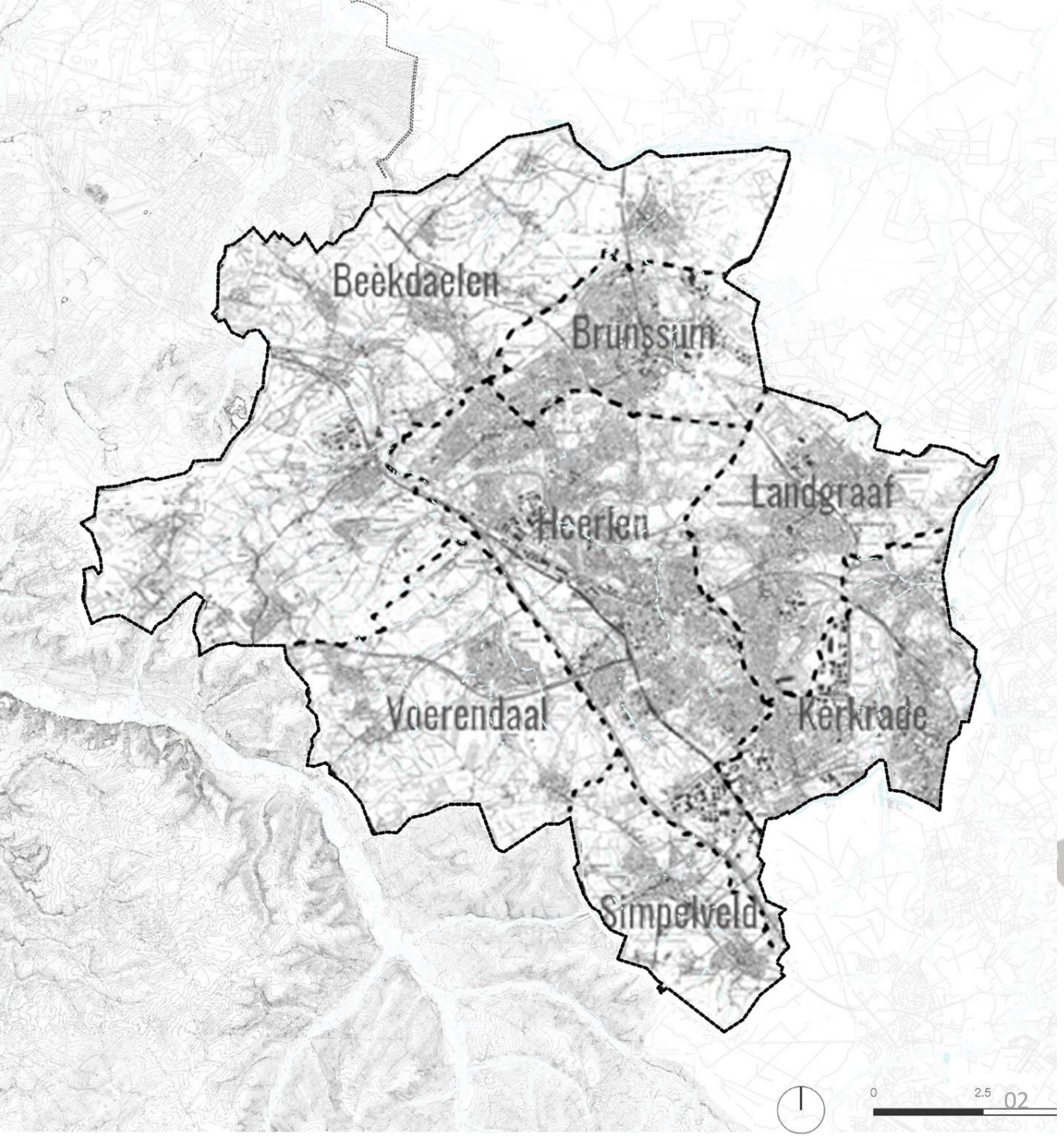
Challenges and opportunities

Design proposal

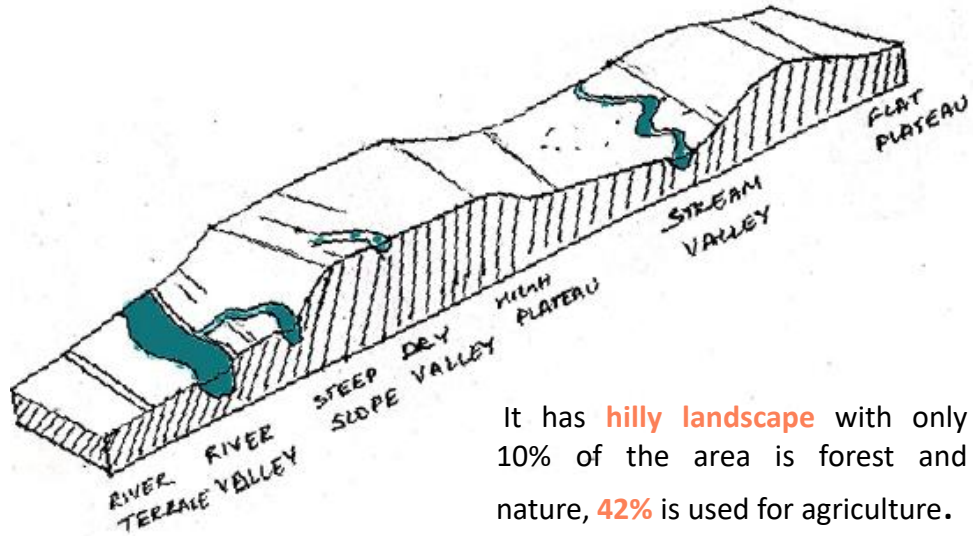
Conclusion

Land degradation is a process in which the value of the biophysical environment is affected by a combination of human-induced processes acting upon the land. It is viewed as any change or disturbance to the land perceived to be deleterious or undesirable. Natural hazards are excluded as a cause; however human activities can indirectly affect phenomena such as floods and bush fires.

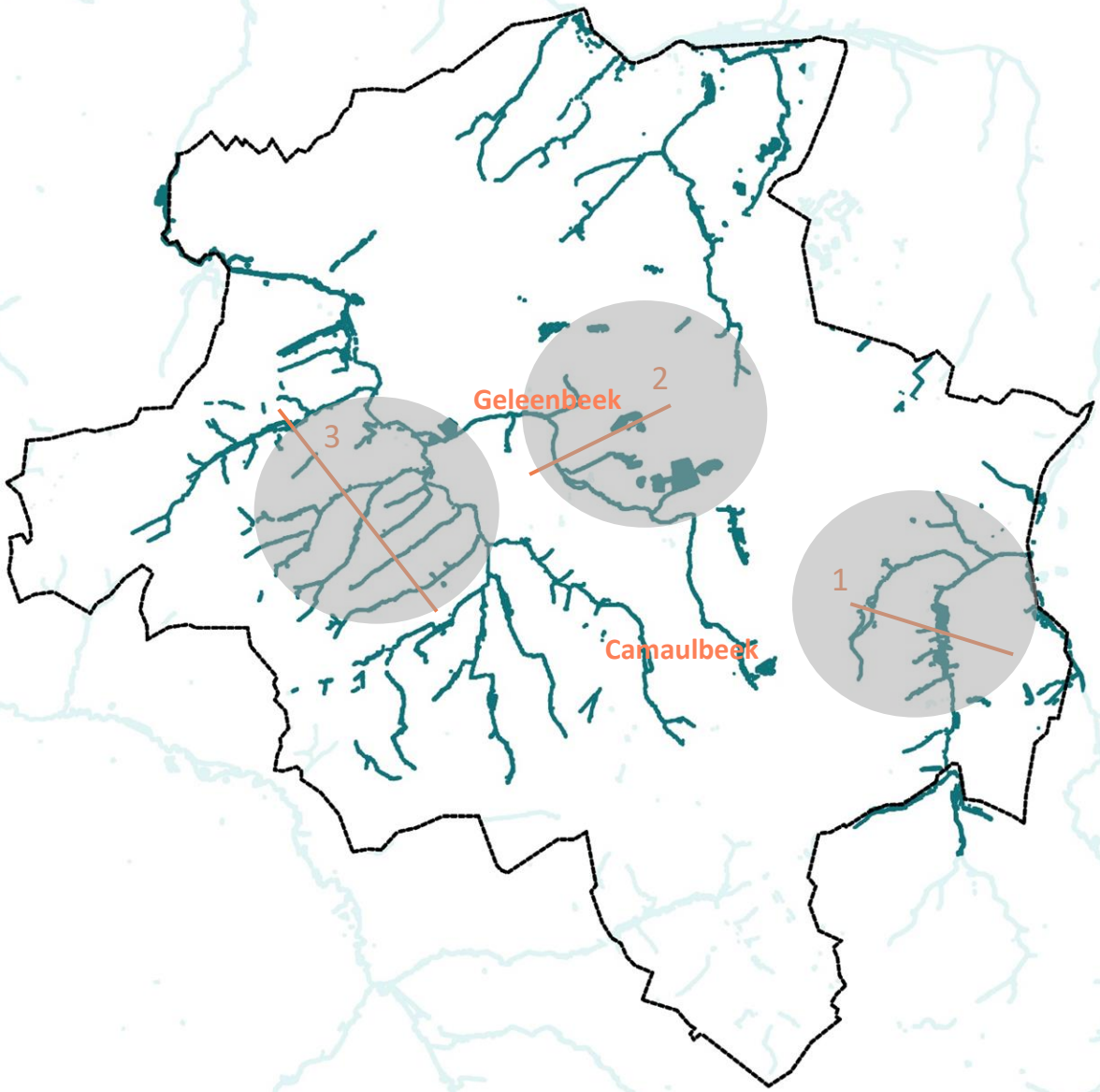
Source: https://www.internationale-bauausstellungen.de/geschichte/2013-2020-iba-parkstad-parkstad-in-bewegung/

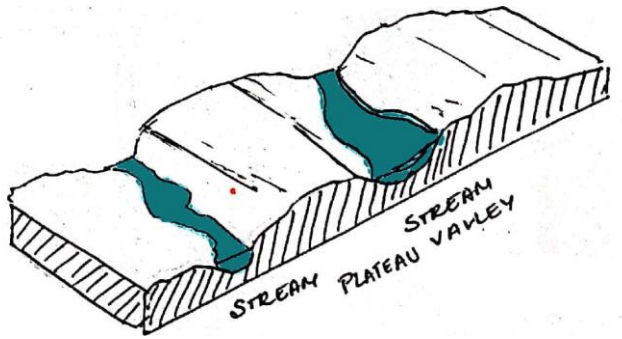


Parkstad is in the Southern part of Netherlands. It is divided into 7 municipalities for administration.

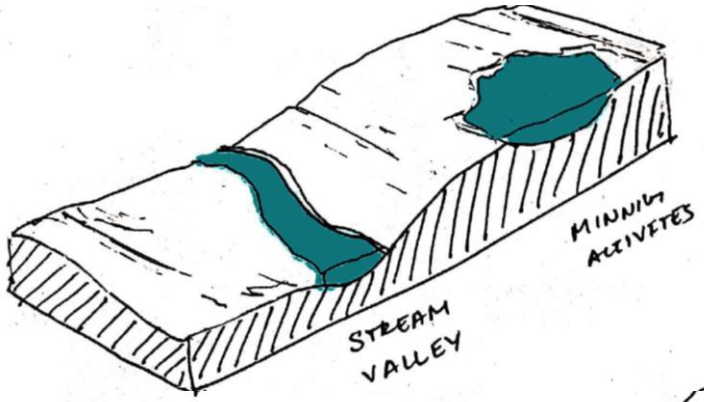


It has **hilly landscape** with only 10% of the area is forest and nature, **42%** is used for agriculture.





Section 1



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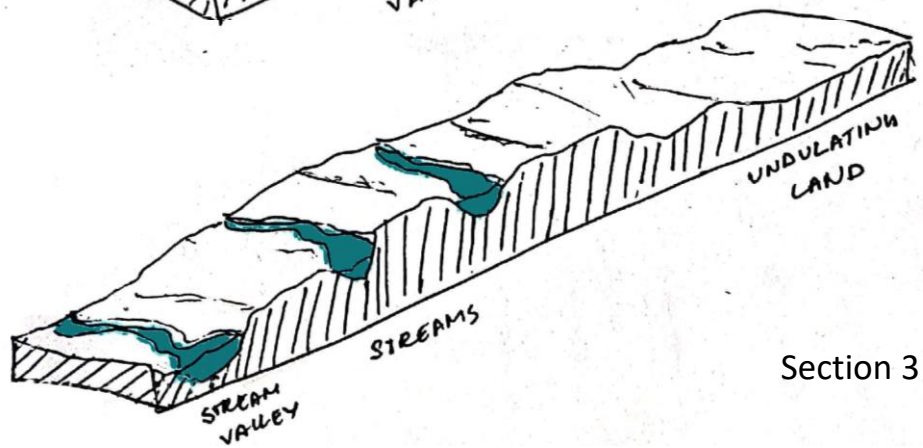
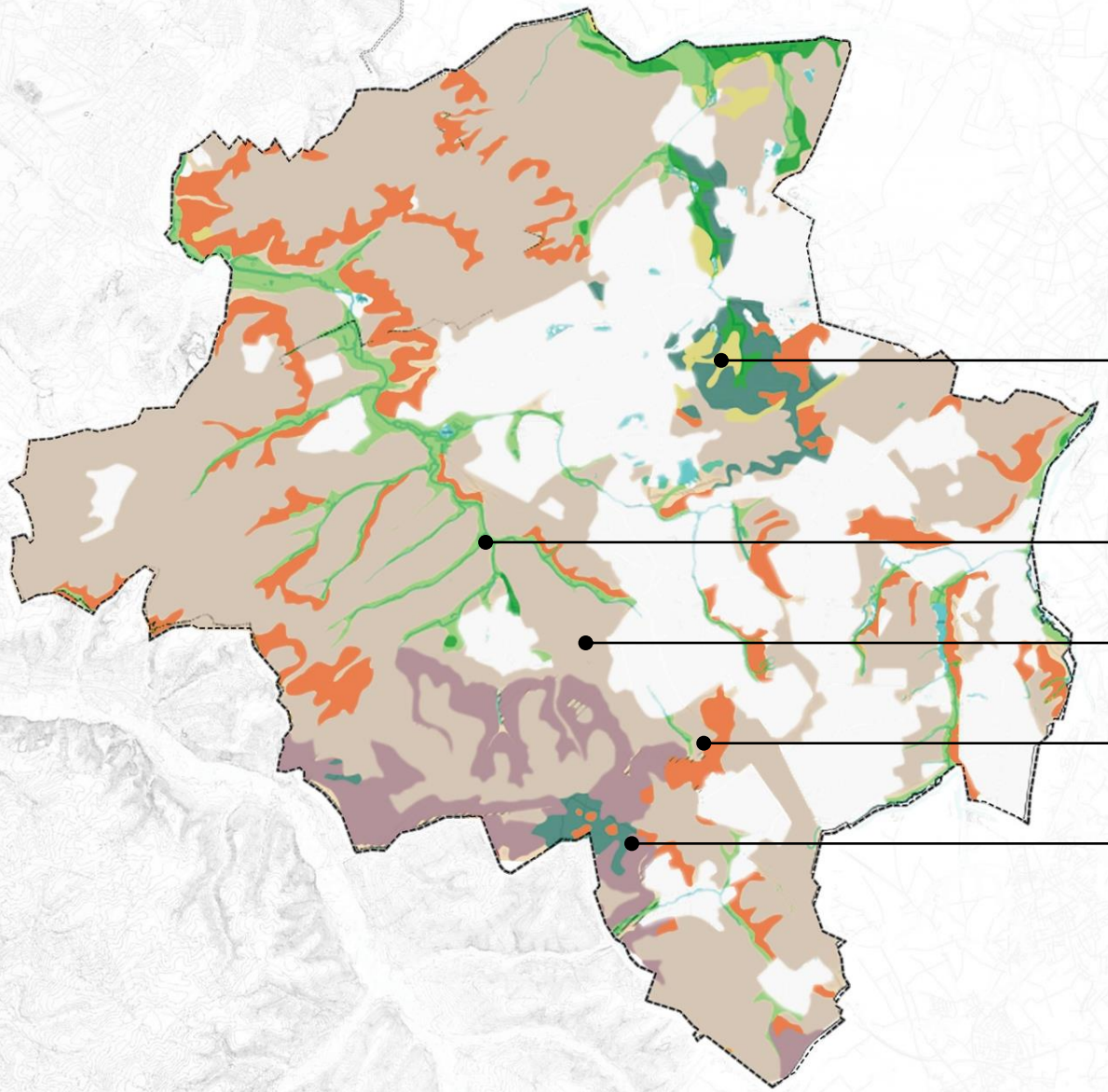


Section 3

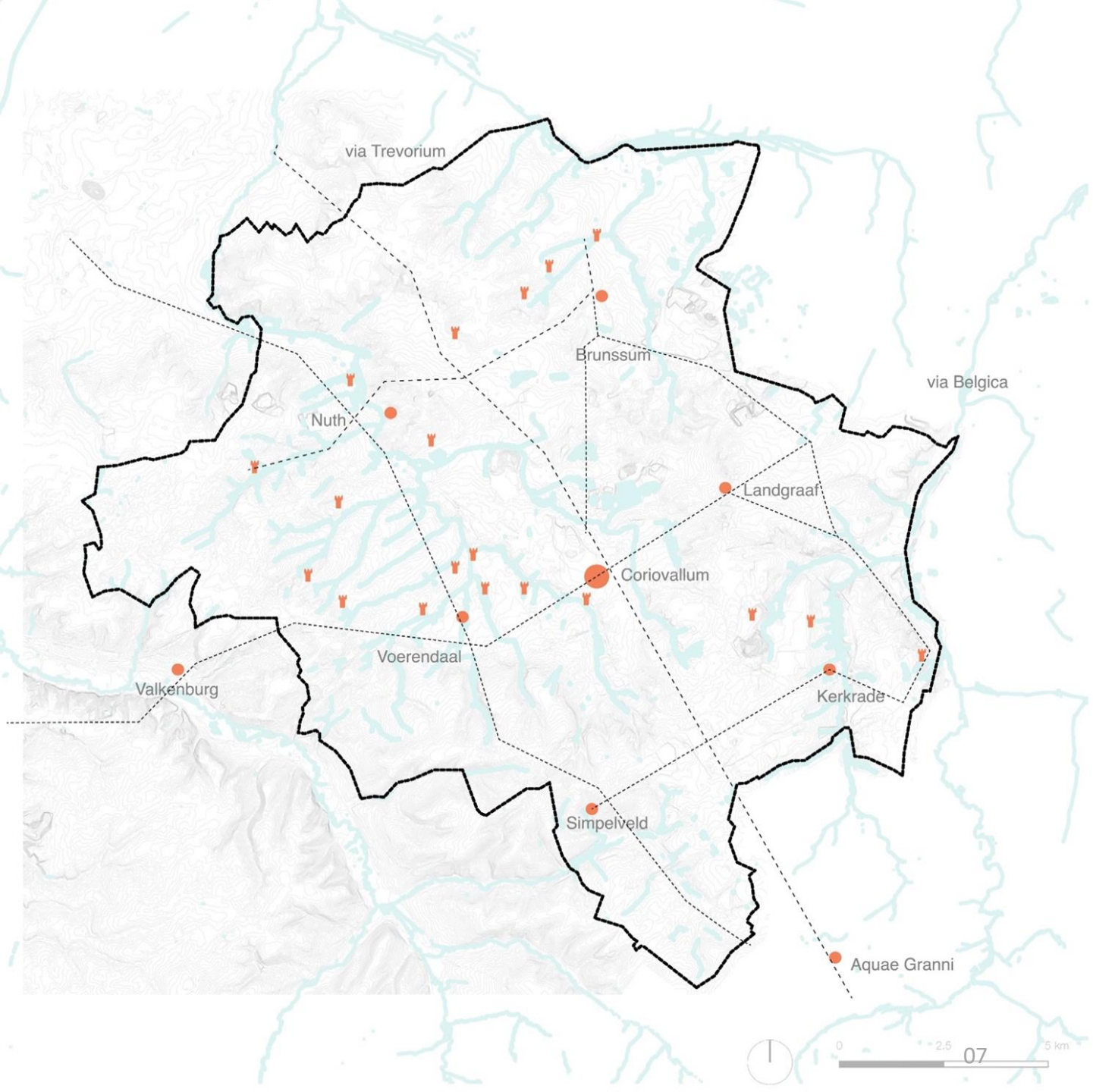


Soil types

Brunsummerheide

Heerlen was one of the dominant fortified towns in South Limburg under the Roman commonwealth and served as a transit town between Cologne and Tongeren.

Source: https://www.demijnen.nl/mijnen

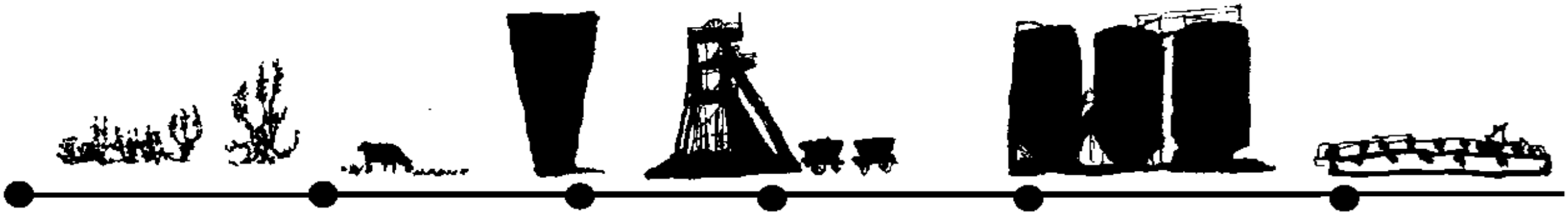


Majority of settlements were situated along the brooks and also **strategically along trading routes.**

Tea worm castle

Hoensbroek castle

Source: https://www.demijnen.nl/mijnen



1700
Undisturbed Heather fields

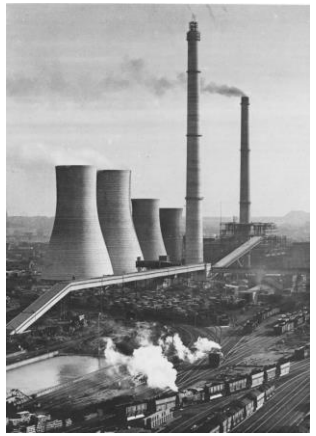
1800
Agriculture and cow breeding

1900
Oranje Nassau IV

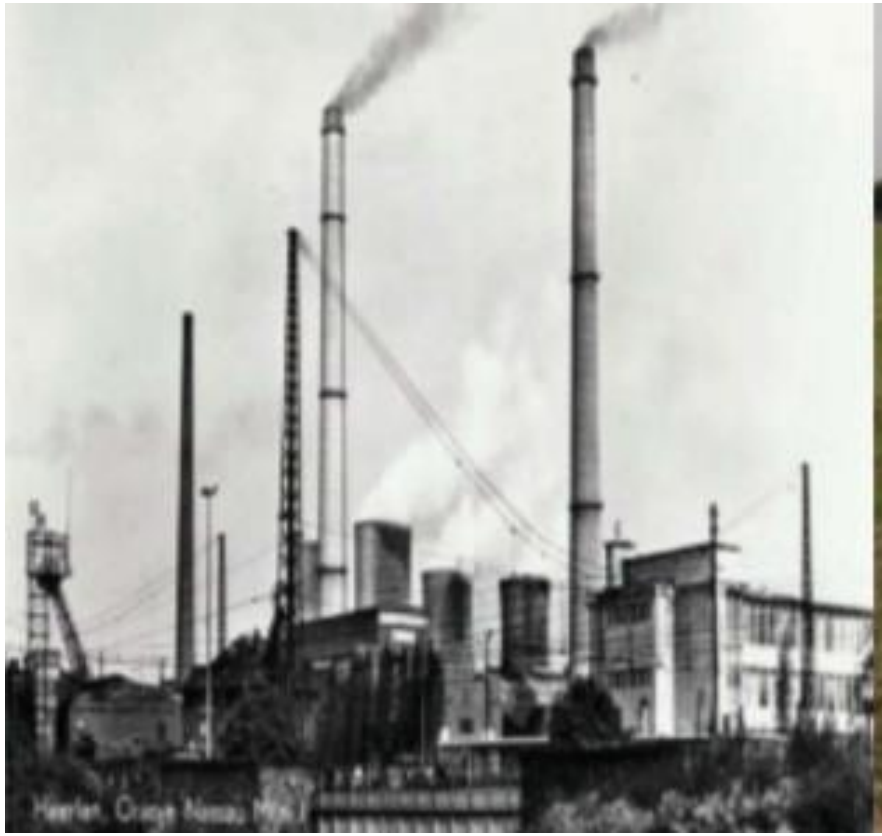
1920
Heksenberg

1960
Sigrano quarry

1973
Oranje Nassau III-
mining activity ends



Source: Sketch adapted from maria kaik
https://www.demijnen.nl



Oranje Nassau 1

Current situation - demolished

Source: https://www.demijnen.nl

Crowded public spaces in 1962

Unoccupied public transport

Source: https://www.demijnen.nl

Panorama of Heerlen in 1962

Panorama of Heerlen in 2016

Source : https://www.demijnen.nl

PROBLEMS

Shrinking

degraded landscape
unemployment
vacancy

Fragmentation

spatial segregation
fragmentation in ecological network
urban and rural fragmentation

Water issues

Polluted water
Open pit mining
drying out streams
drinking water extraction

SHRINKING

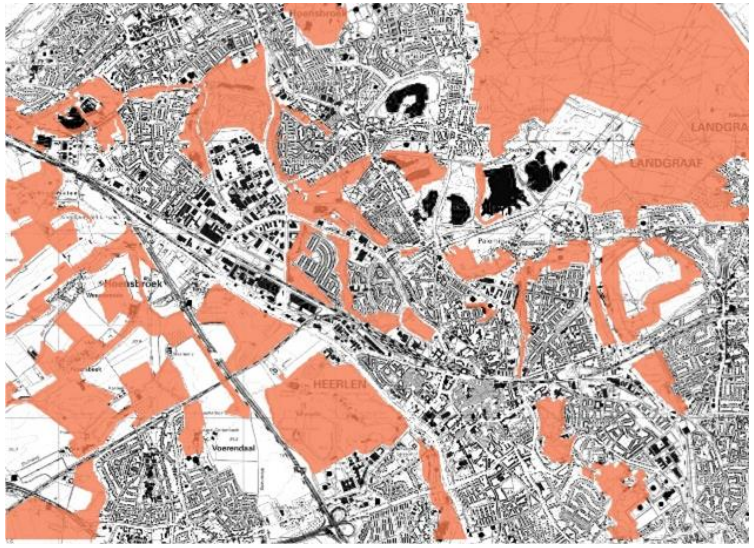
Degraded landscape

Unemployment

Vacancy

FRAGMENTATION

Spatial segregation



Fragmentation in ecological network

Urban and rural fragmentation

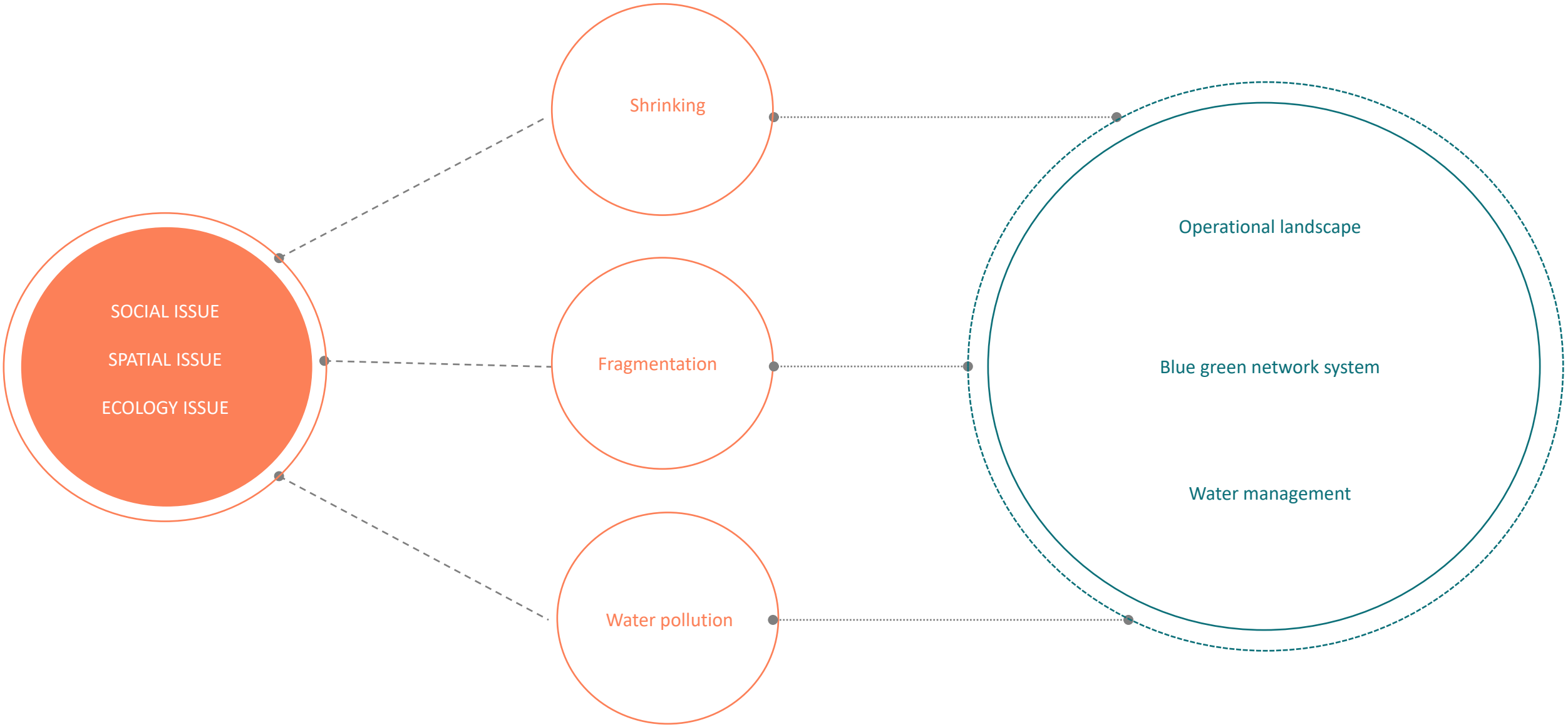
WATER ISSUES

Polluted water

Open pit mining

Drying out streams

Drinking water extraction


SOCIAL ISSUE
SPATIAL ISSUE
ECOLOGY ISSUE
Shrinking
Fragmentation
Water pollution
Operational landscape
Blue green network system
Water management

RESEARCH QUESTION

What are **circular water design strategies** and spatial framework in the **degraded** and **fragmented** landscape to reduce water pollution (mine, agriculture, waste) in Parkstad?

1. How to integrate the fragmented region and improve **spatial quality**?
2. How can **waste nutrients** in water and soil be used to develop sustainable landscape?
3. Explore spatial design principles for making the area **adaptive** and **resilient.**
4. Explore the potential of network to improve the quality of water.
5. Is it possible to use the **principles** in future designs for similar locations?

Introduction

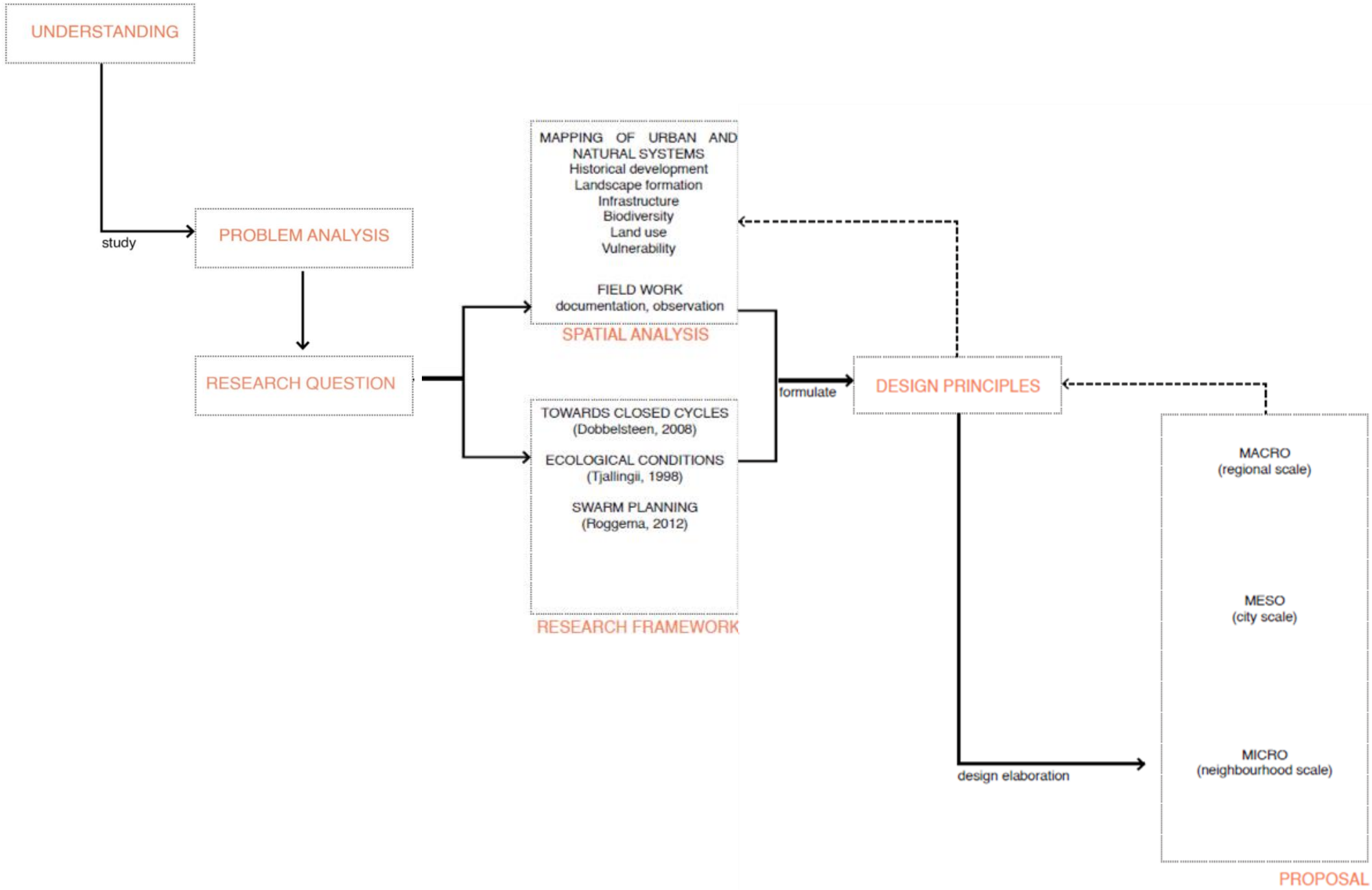
Method

Analysis

Challenges and opportunities

Design proposal

Conclusion



1. How to integrate the fragmented region and improve spatial quality?

4. Explore the potential of network to improve the quality of water.

2. How can waste nutrients in water and soil be used to develop sustainable landscape?
3. Explore spatial design principles for making the area adaptive and resilient.

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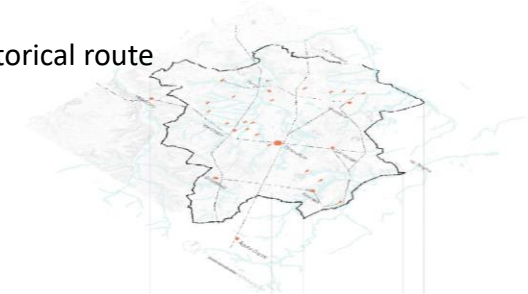
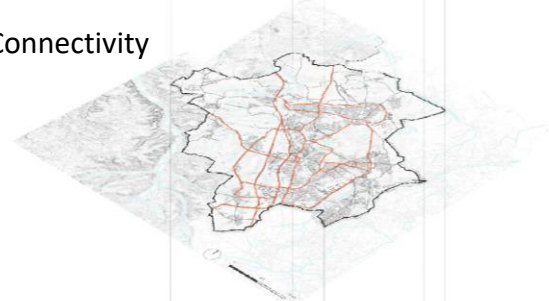
INFRASTRUCTURE

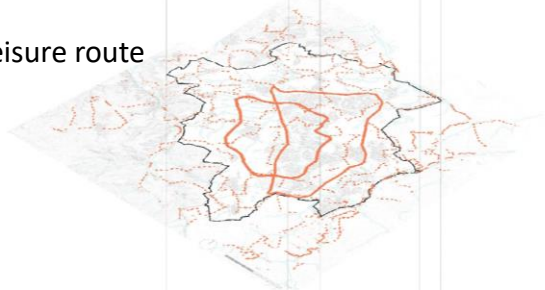
Historical route



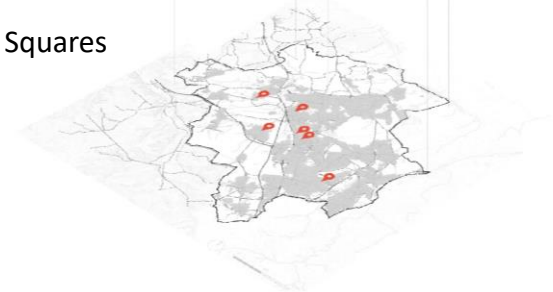
Connectivity



Leisure route



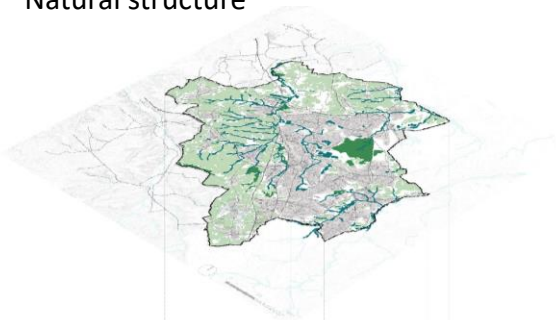
Squares



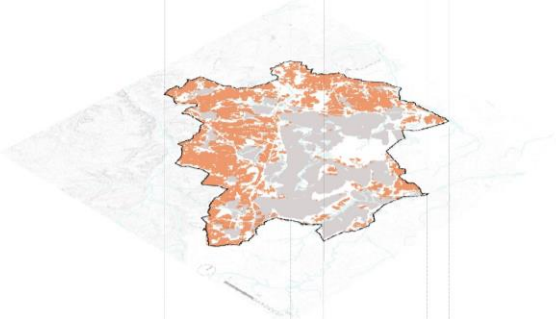
DISCONNECTED CYCLE NETWORK

GREEN SYSTEM

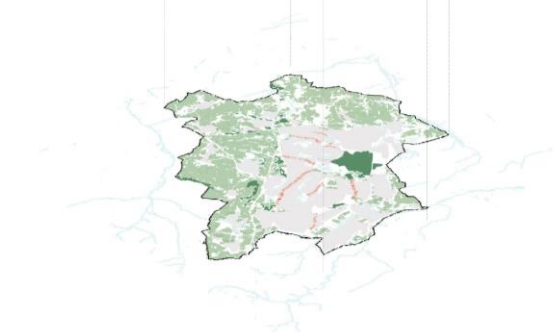
Natural structure



Agriculture



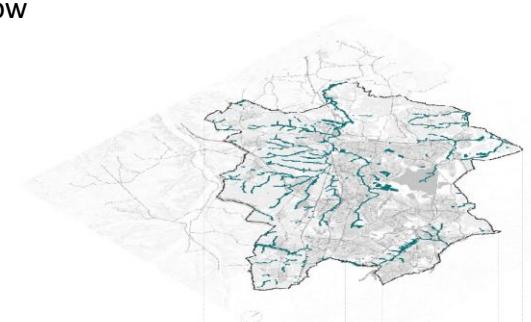
Fragments



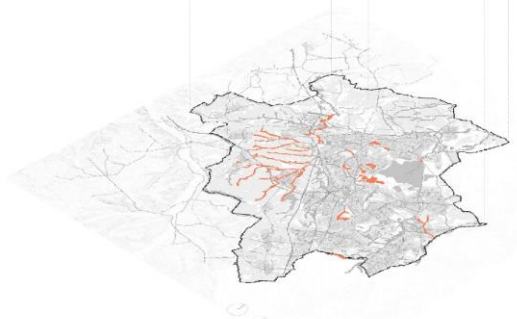
FRAGMENTED GREEN STRUCTURE

BLUE SYSTEM

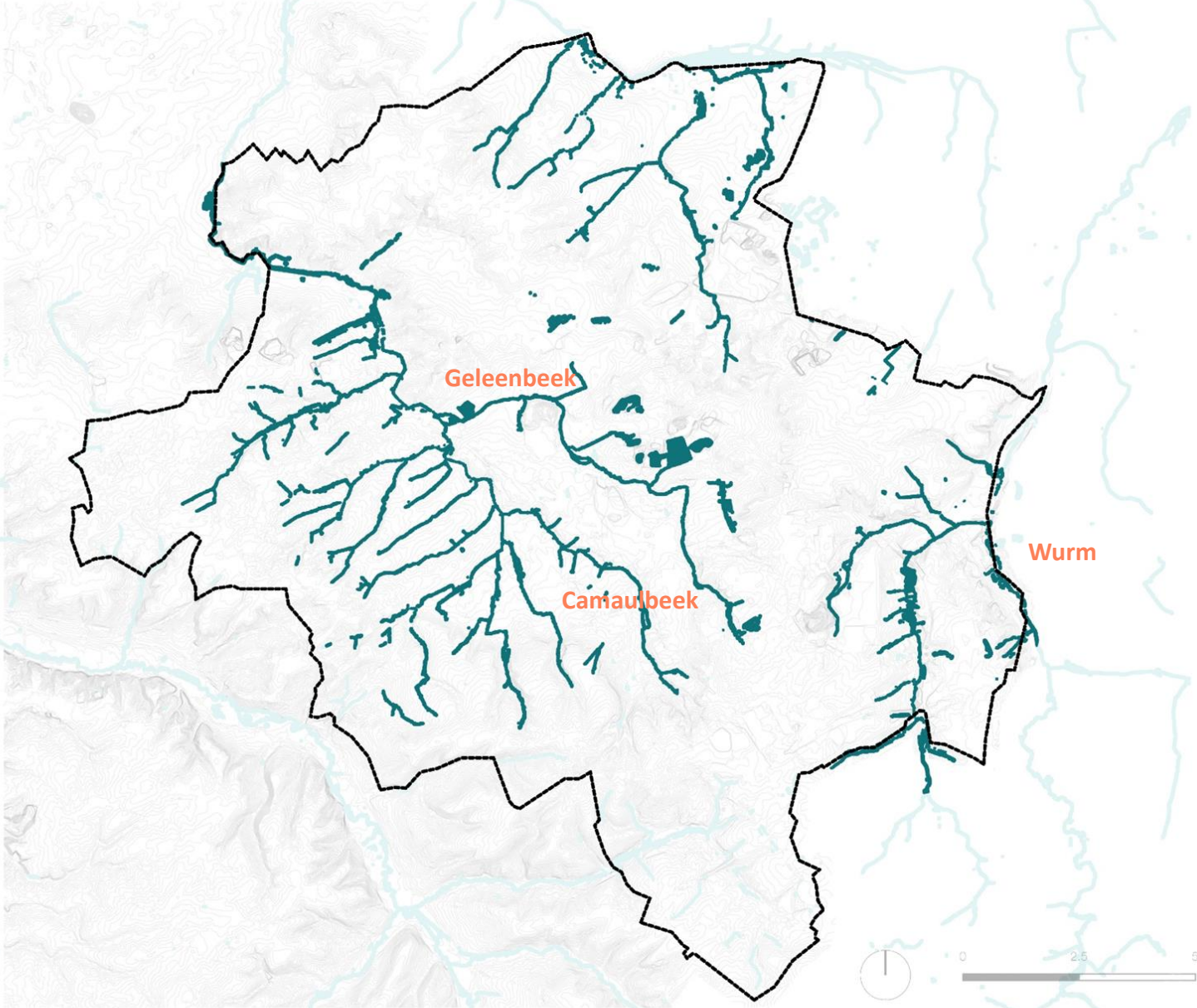
Water flow



Polluted



POLLUTED AND DRYING OUT

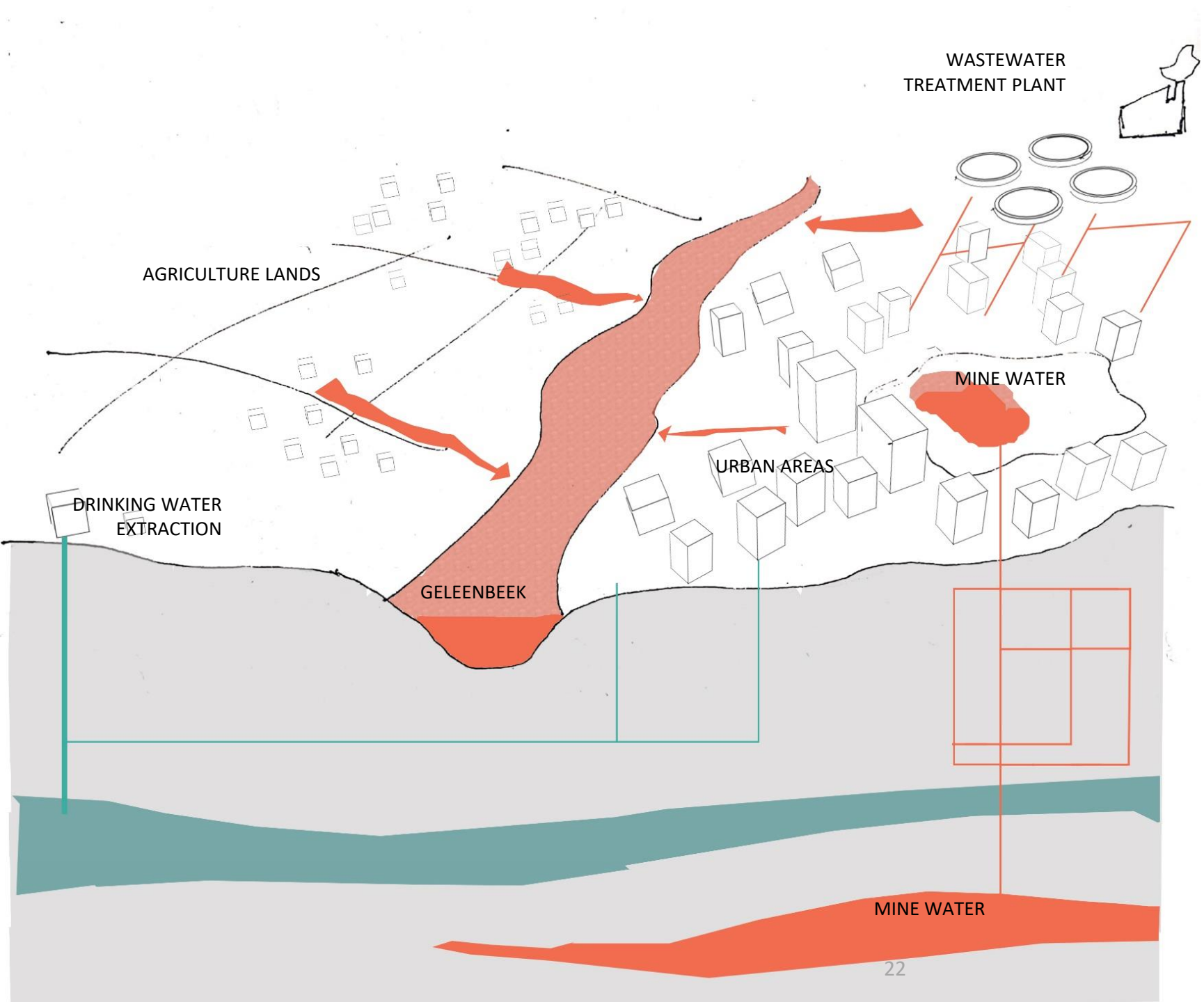

Geleenbeek
Wurm
Caumalbeek
0
2.5
5 km

VULNERABLE WATER BODIES

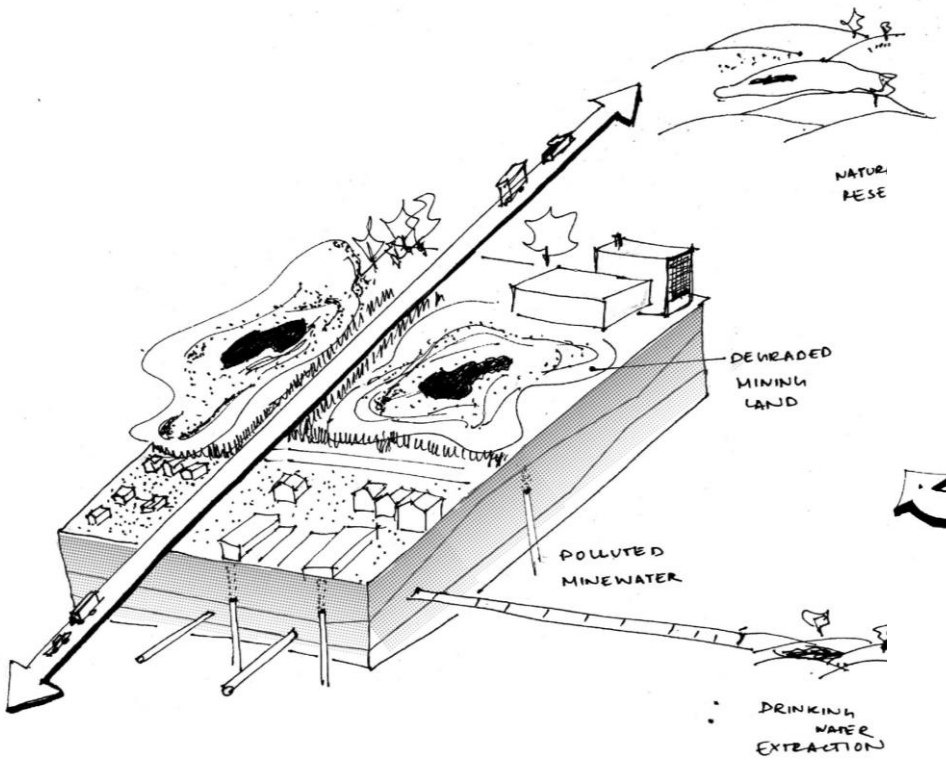
ANALYSIS

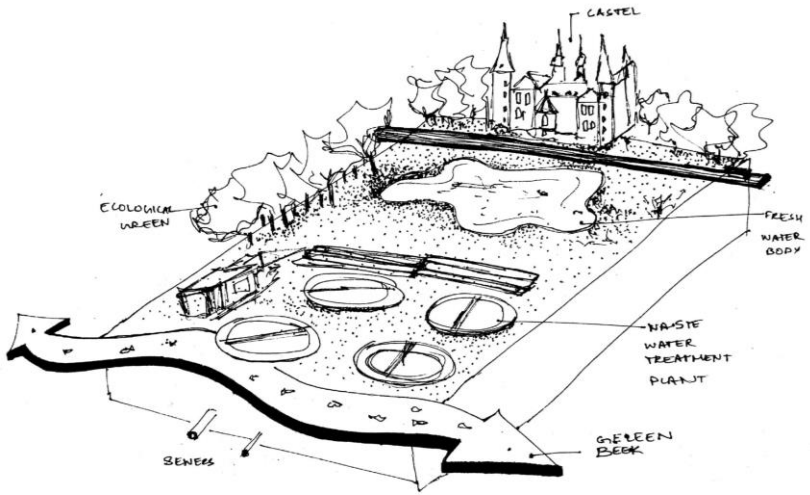
WATER MANAGEMENT

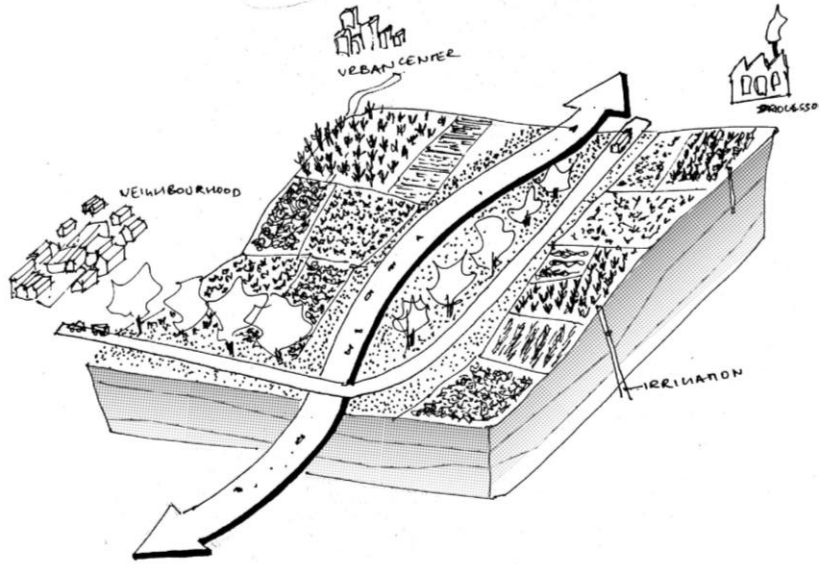
Graphic depiction of how the aesthetic perception of water differs to contamination



Graphic depiction of how the water differs to contamination







W1 - Mine water Generally contains heavy metals or additives used in mining industry. Rising mine water can lead to an increase in groundwater level in the overburden. Due to this groundwater is at risk.

Water pollution | Waste landscape | Demolition waste

W2- Waste Water treatment plant N, K and P there are main nutrients contained in wastewater. pathogens (including bacteria, viruses and protozoa). Helminthes, oils and greases, runoff from streets, parking lots and roofs.

Less recreation value | Waste landscape

W3- Waste water in **agriculture** area NHy and NOx in atmospheric depositions, various pesticides, Cd, N and P in inorganic fertilizers, and for Cu, Zn, N and P in animal manure. Theses causes acidification, eutrophication and leaching .

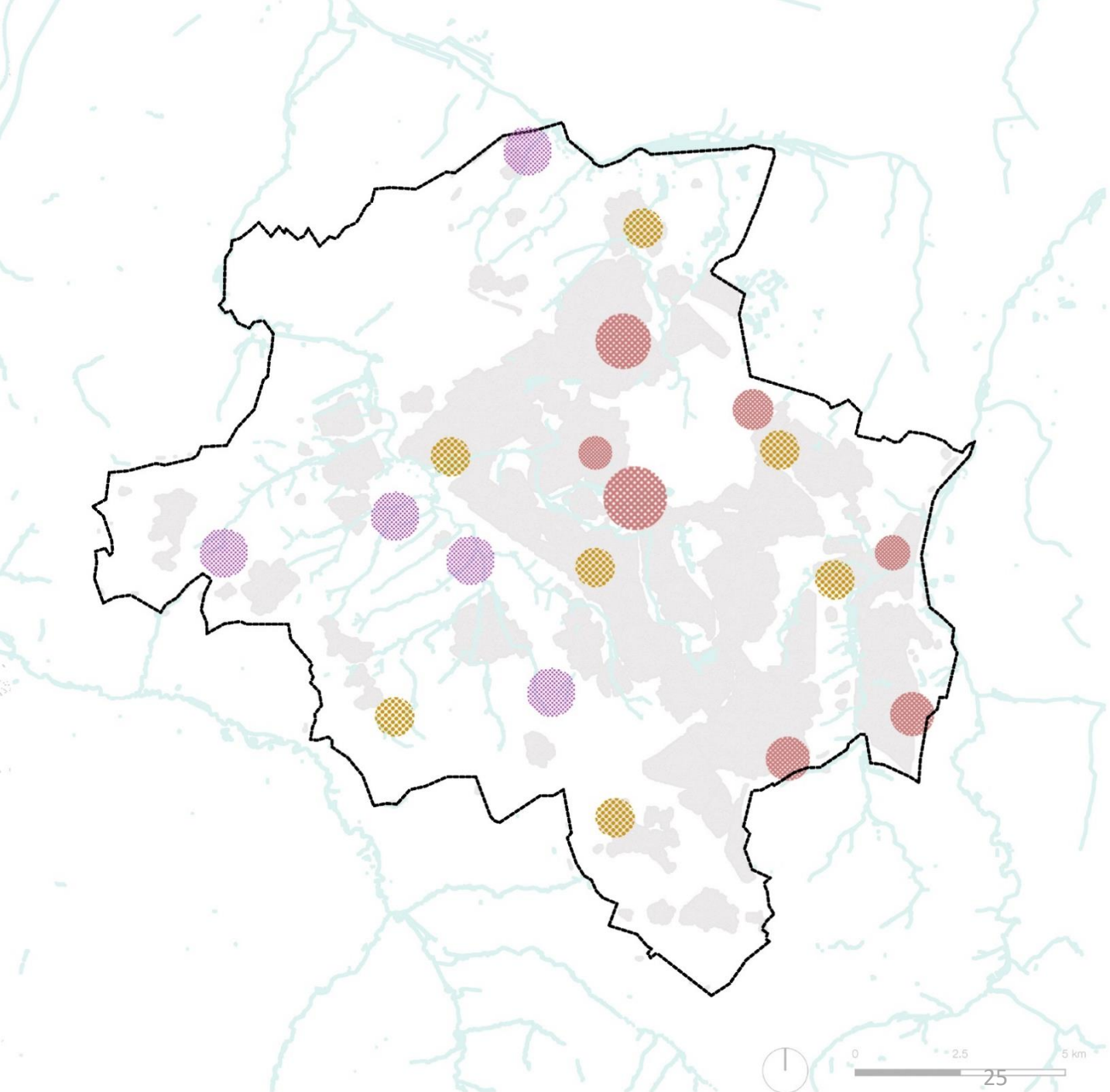
Waste landscape | Unproductive | Water pollution

LOCATION

W1- Mining water

W2- Waste water treatment plant

W3- Agricultural water



ANALYSIS

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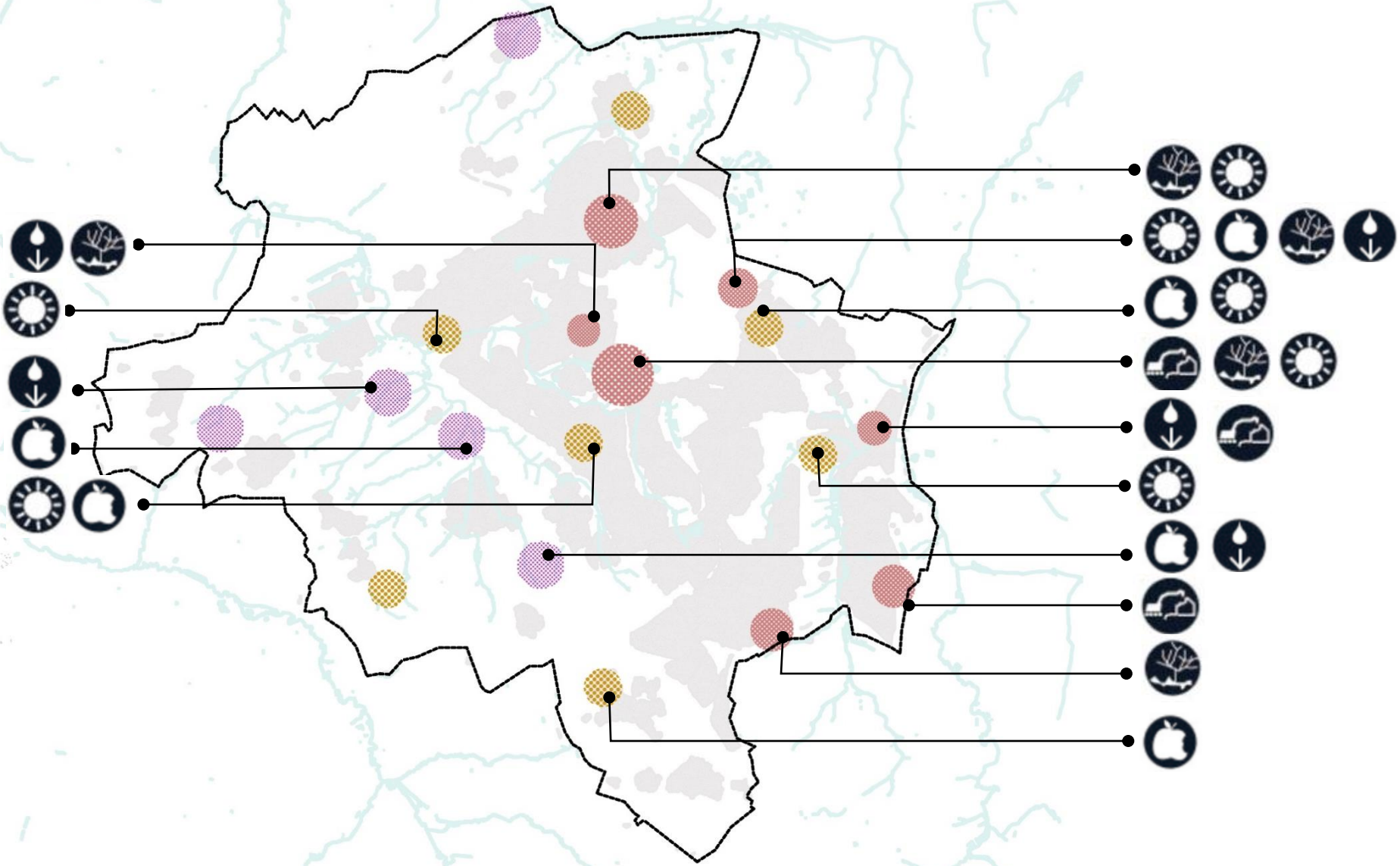
CHALLENGES MAP



Water pollution

Less recreation value

Waste landscapes

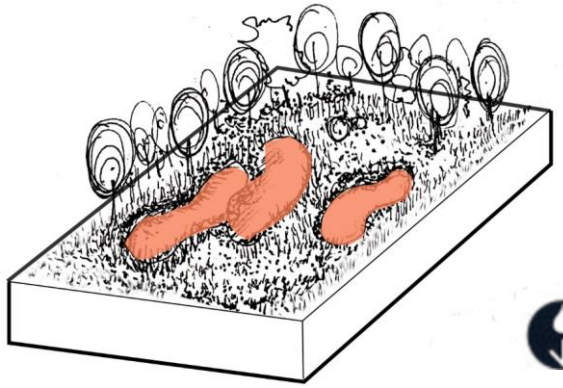
Demolition waste

Unproductive

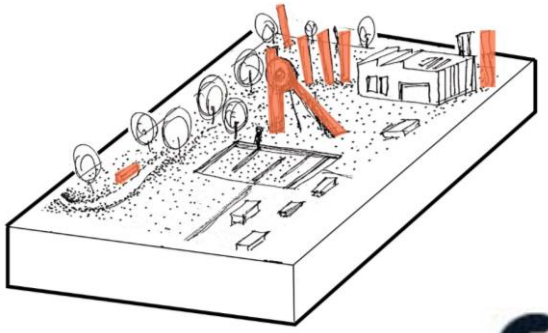
W1- Mining area

W2- Waste water treatment plant

W3- Agricultural area

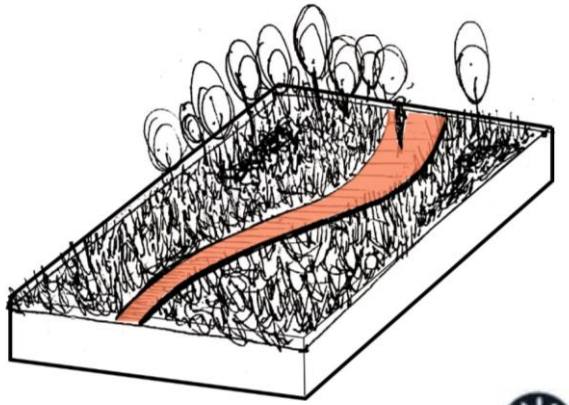


Design for adaptability and reusing water

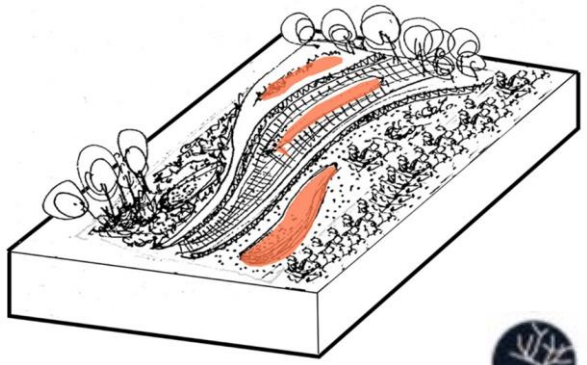


Protect industrial heritage

-To create identity
-To protect the culture
- reuse industrial waste

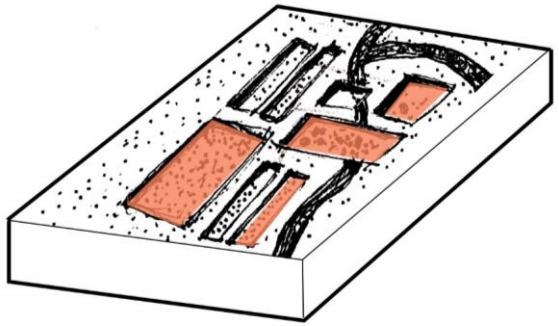


Create spaces for people

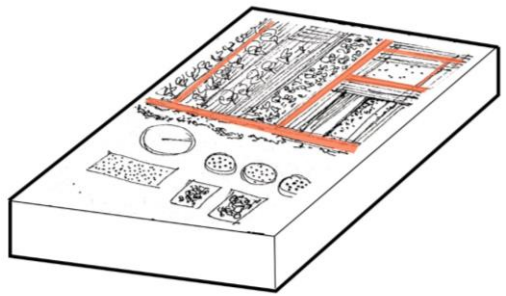


Design for resilient landscape

- To adapt for climate change
- Storing water to reduce droughts



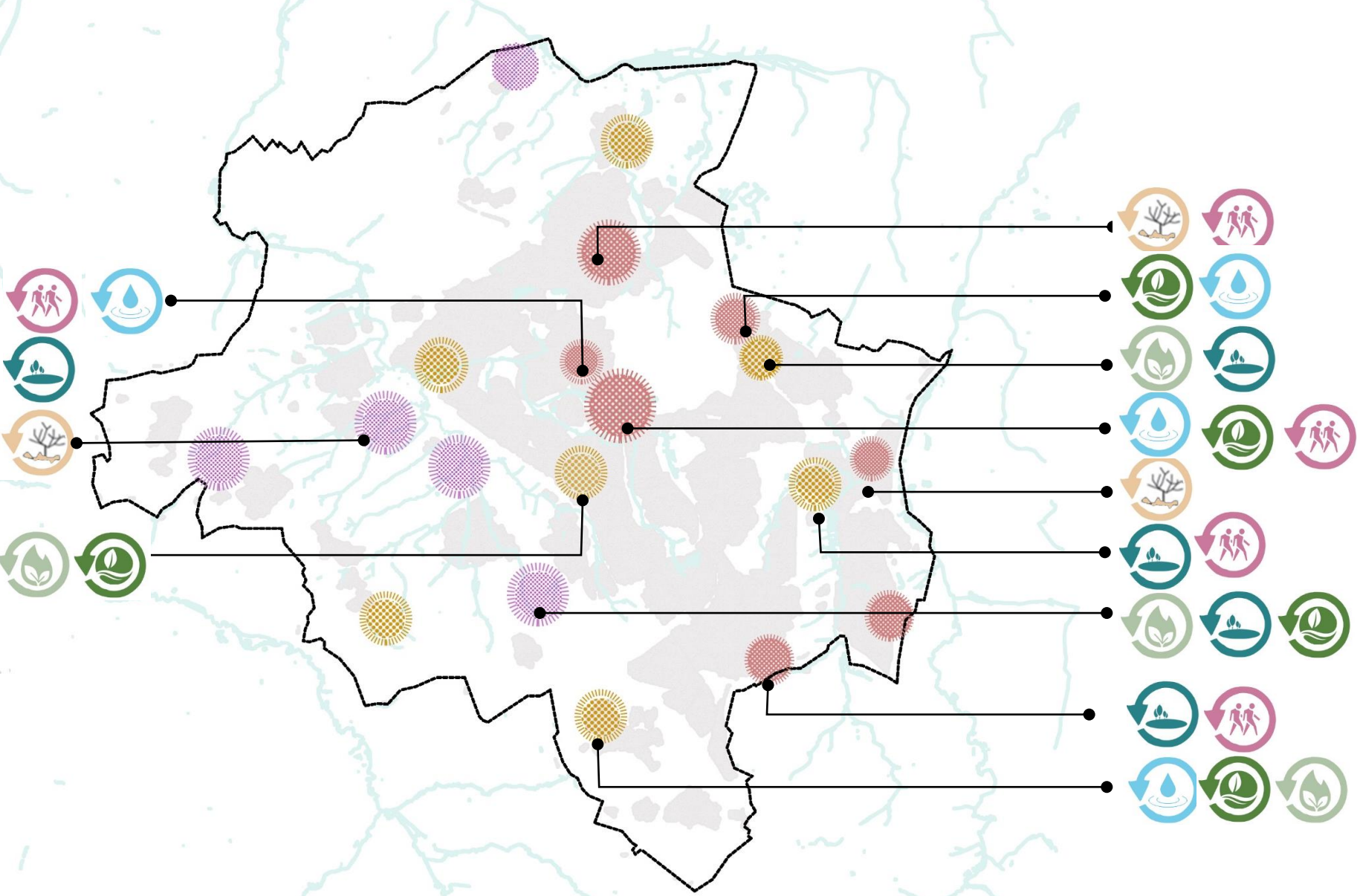
Multifunctionality and diversity



Continuity and ease of movement

- - To create a network
- To make it easily accessible and connected

POTENTIAL MAP



Water purification

Local circular production

Recreation

Ecological value

Energy production

Retention of water

W1- Mining area

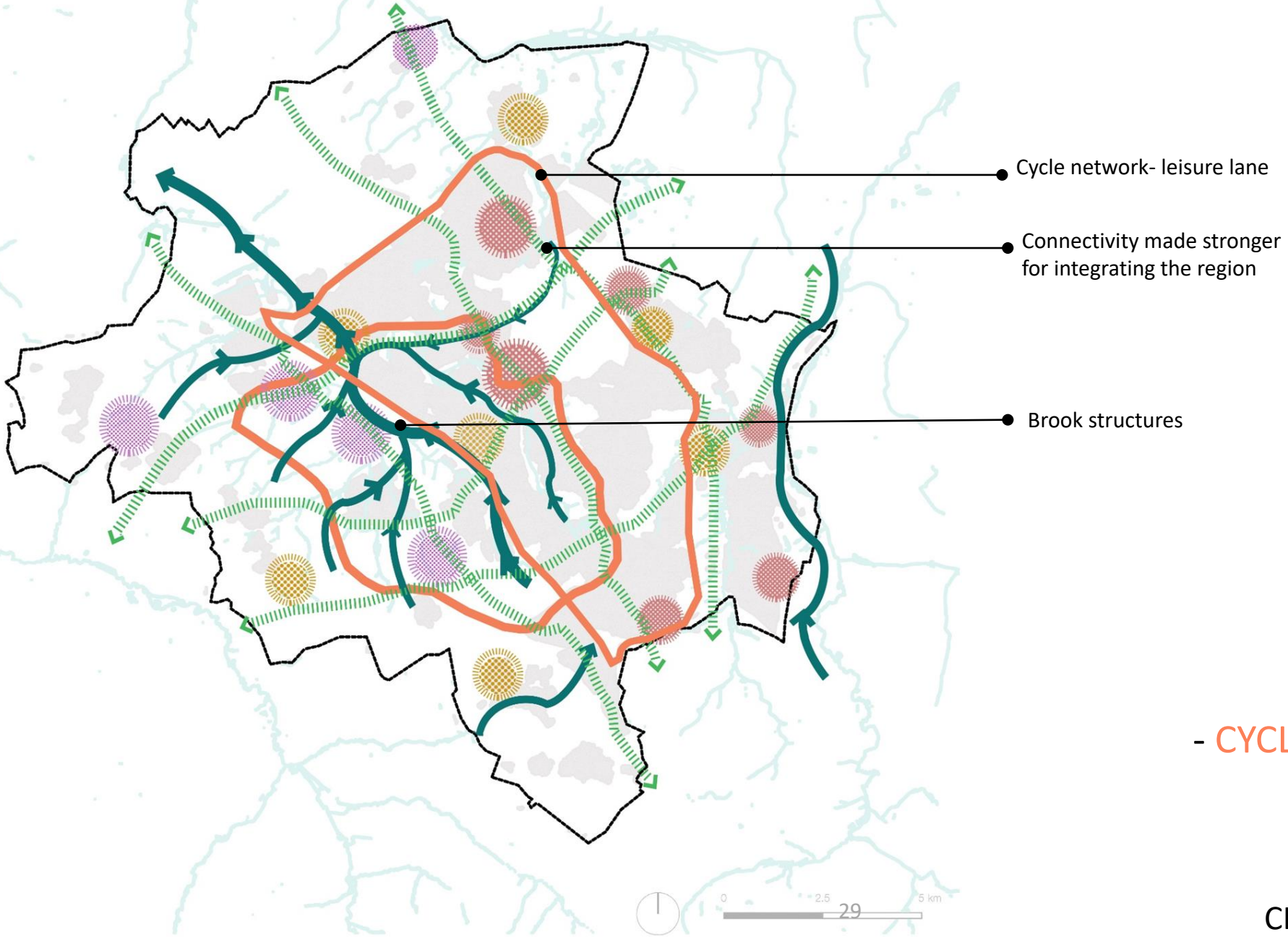
W2- Waste water treatment plant

W3- Agricultural area

CHALLENGES AND OPPORTUNITITY

POTENTIAL MAP

Based on swarm planning theory there is sustainable interventions in few strategic points then a pattern could be created the networks

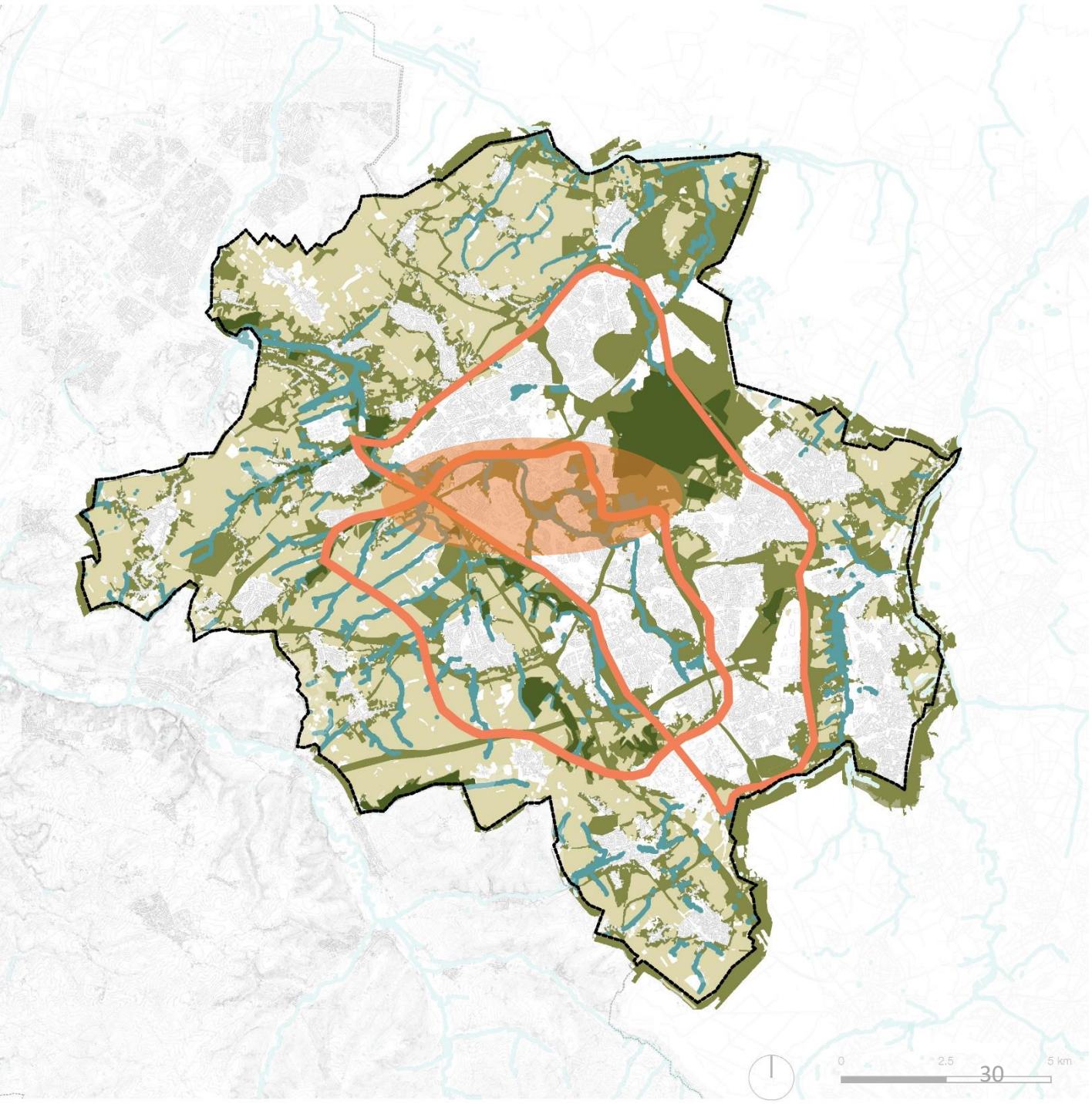


NETWORK SYSTEM

- BLUE-GREEN STRUCTURE
- CYCLE NETWORK(LEISURE LANE)

CHALLENGES AND OPPORTUNITITY

How to **integrate** the **fragmented region** and improve spatial quality?

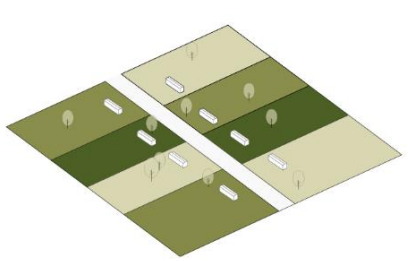


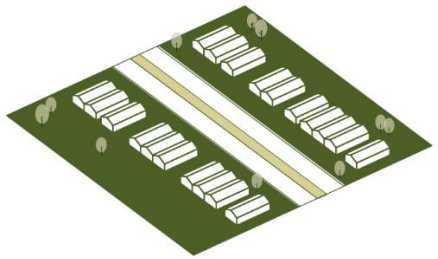
Residential neighborhood

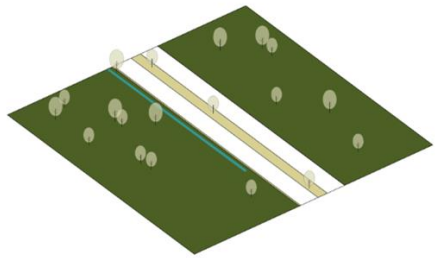
Offices and industries

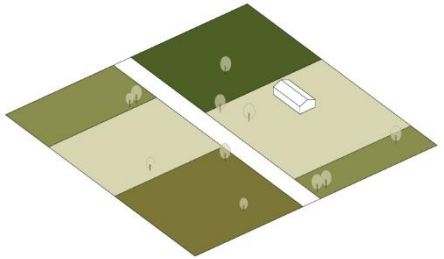
Highway

Agriculture area

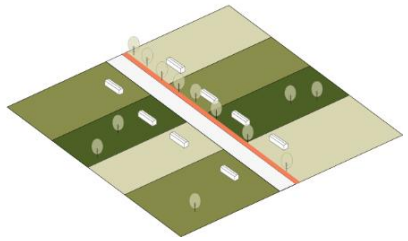


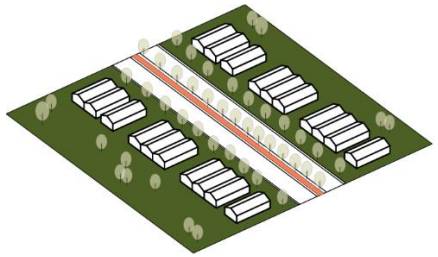


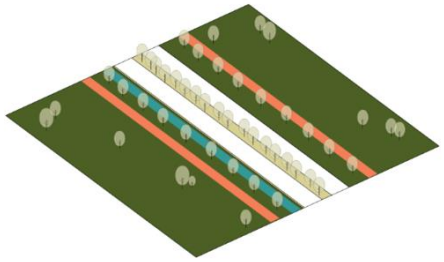


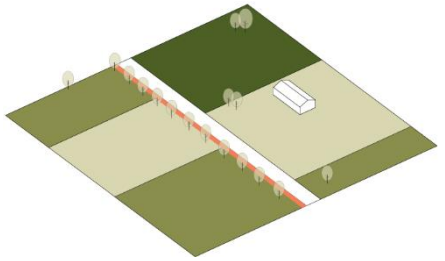


Existing









Proposal

Introduction

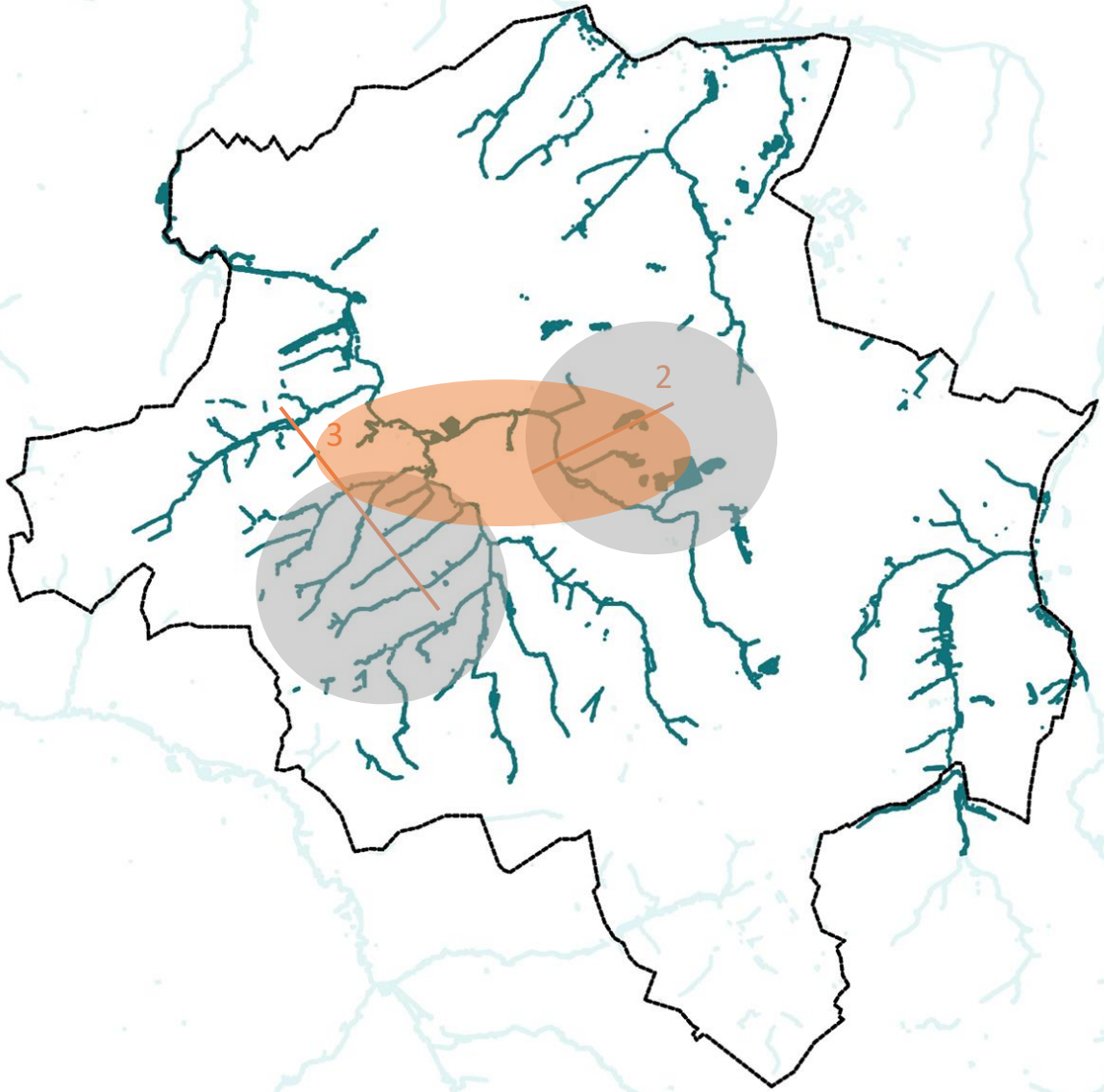
Approach and methodology

Analysis

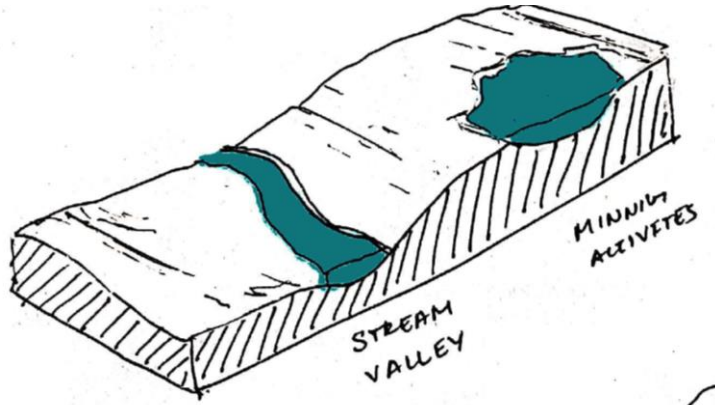
Challenges and opportunities

Design proposal

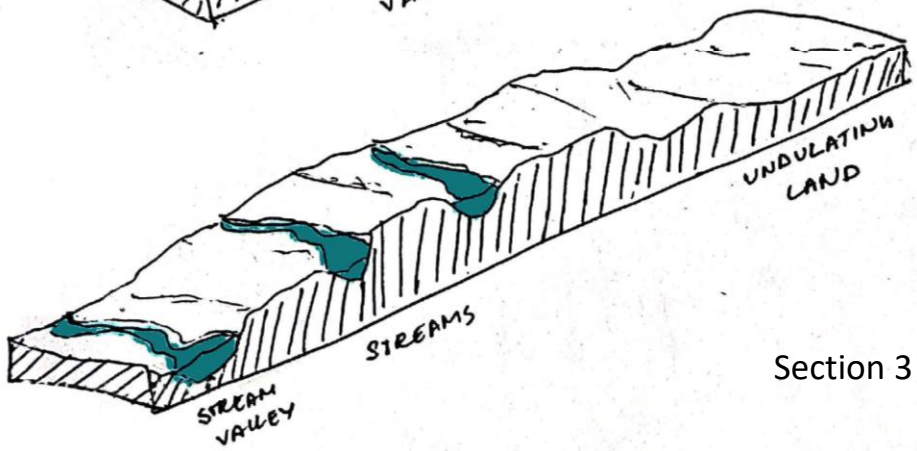
Conclusion



Based on topography and water catchments each part has its own feature terrain.



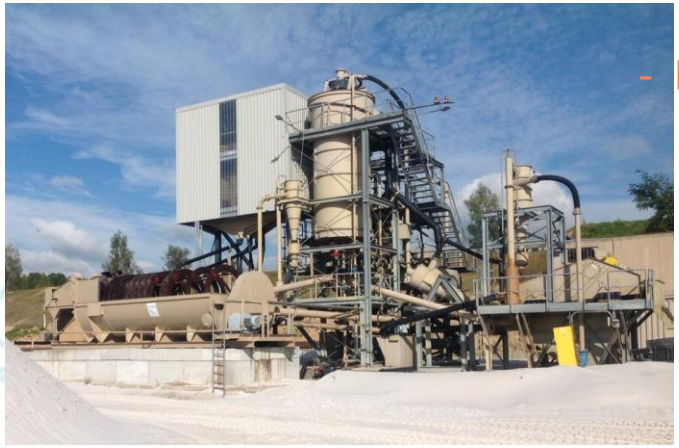
Section 2



Section 3

SITE LOCATION

- LANDSCAPE TYPOLOGIES
- 3 WATER ISSUES
- UNPLANNED SPACES



Mine water

Wastewater

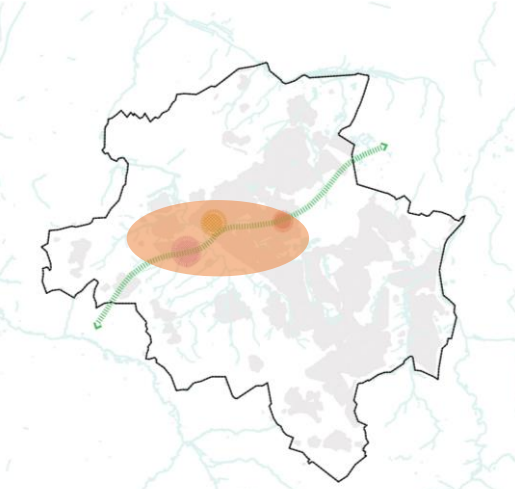
Agricultural water

DESIGN PROPOSAL

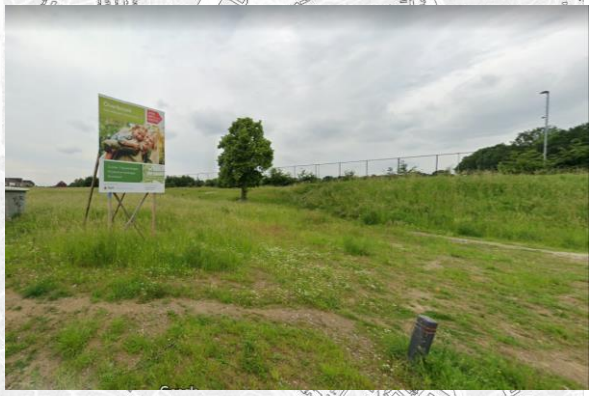
Unused
Abandoned land
Green open spaces
Unproductive areas
Demolished areas

SITE LOCATION

UNPLANNED SPACES



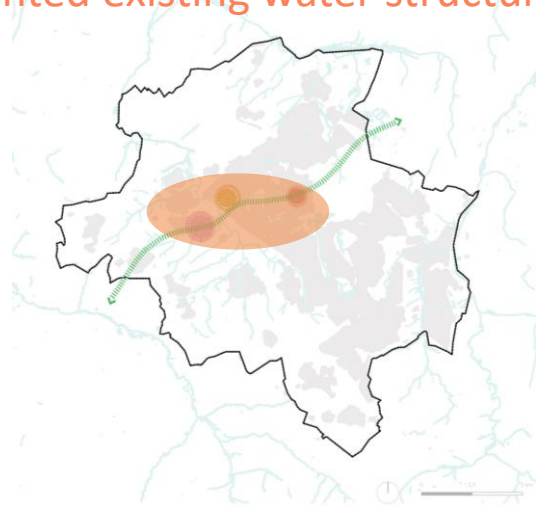
Opportunity to revive the degraded and unplanned



DESIGN PROPOSAL

EXISTING WATER SYSTEM

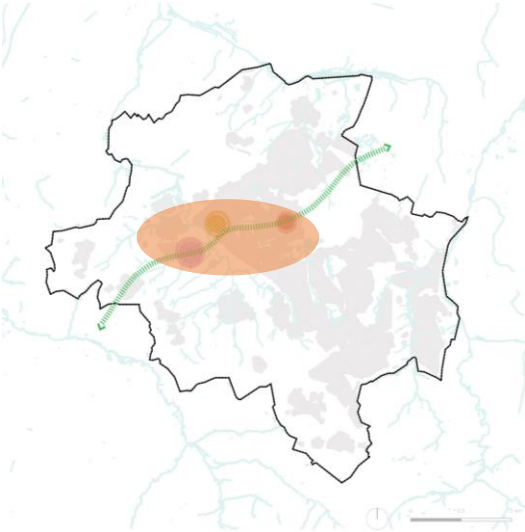
Fragmented existing water structure



DESIGN PROPOSAL

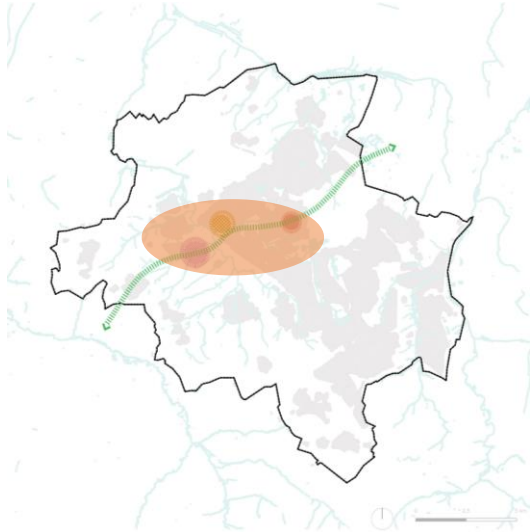
NEW WATER SYSTEM

Reconnecting the existing water structure

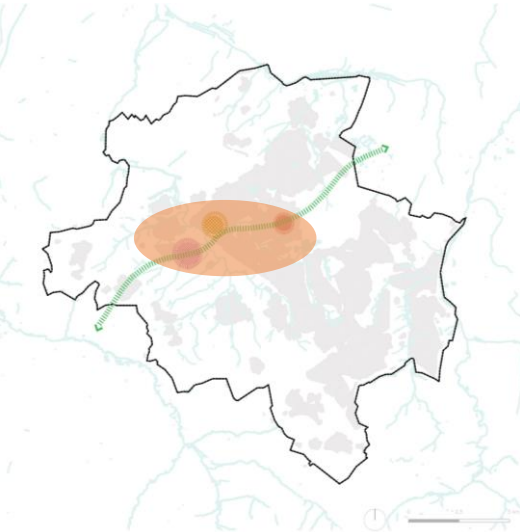


WATER MANAGEMENT

Reconnecting the existing water structure



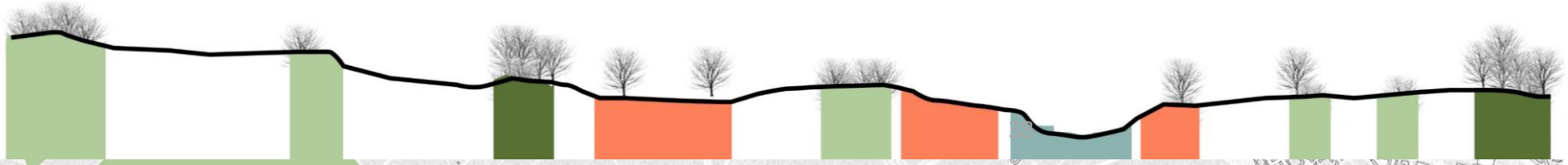
GREEN STRUCTURE



Blue green network

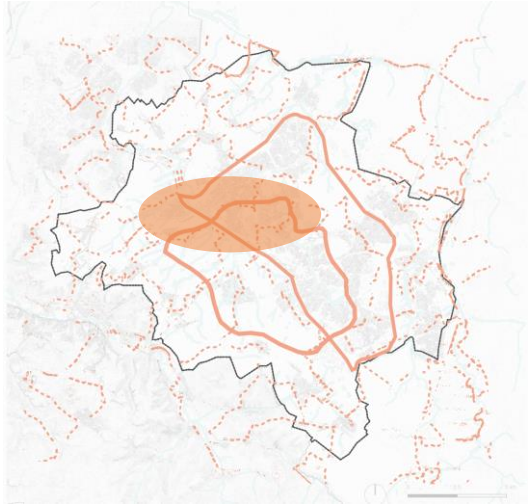
The aim is to elaborate on the **potential** of the **unused spaces** that could become **high quality places** – the backbone of urban- landscape fabric, spatially and **programmatically revitalized.**

Water purification, Storage of water, Water management, Energy production.



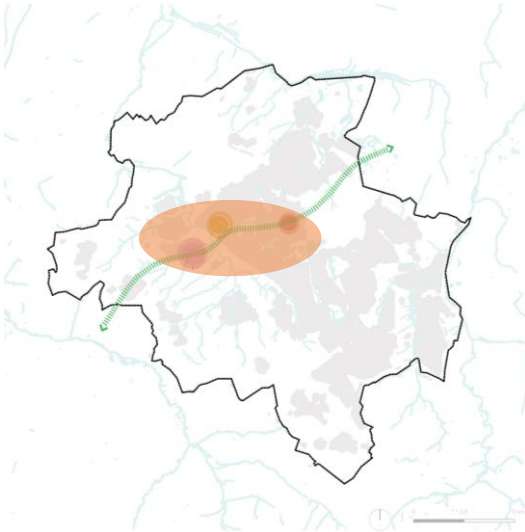
DESIGN PROPOSAL

CYCLE ROUTE



-Connecting different landscape types

- Connected to the node system
- knooppunten route



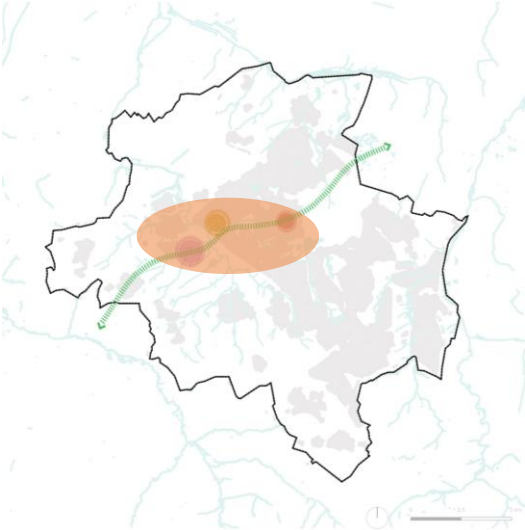
Heritage areas

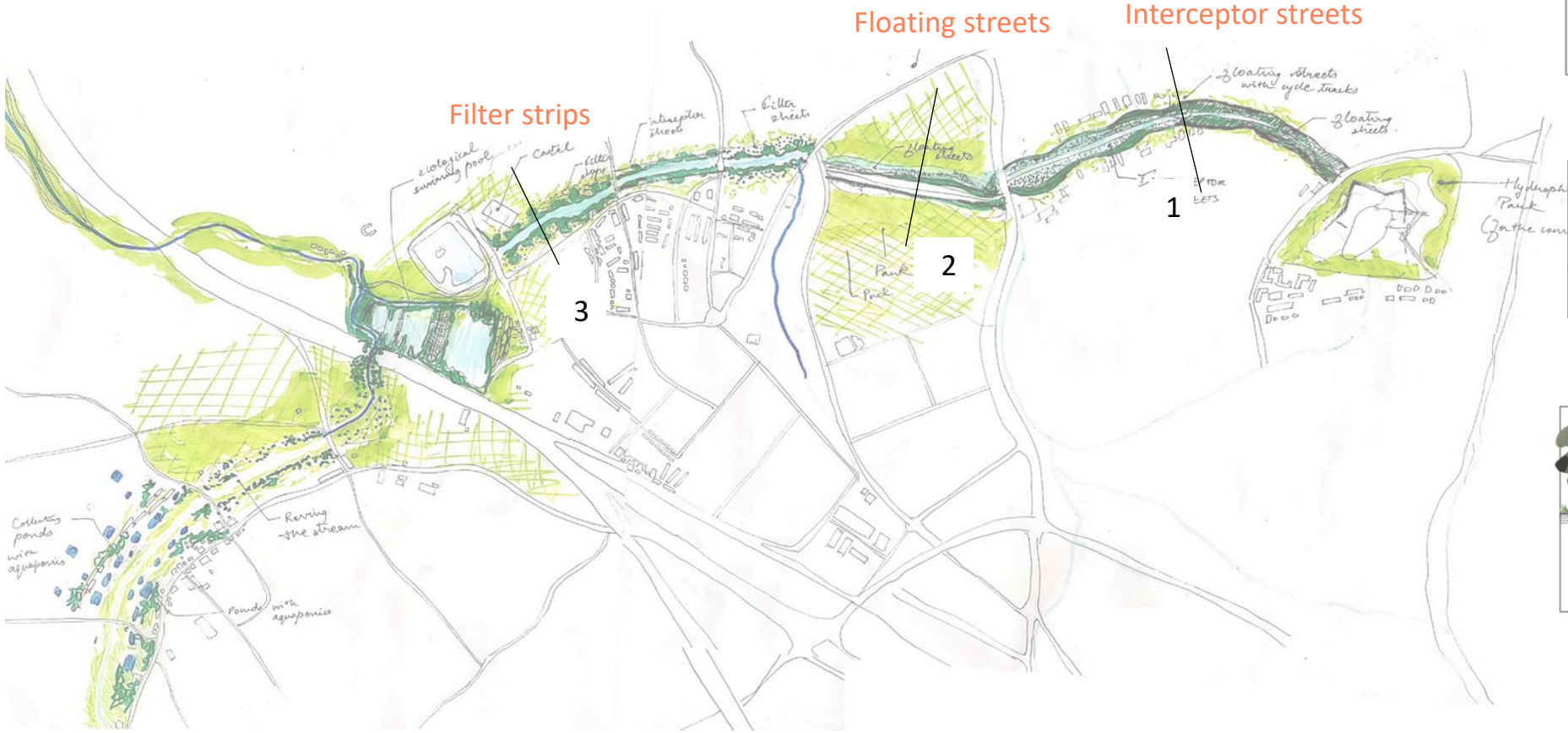
Residential

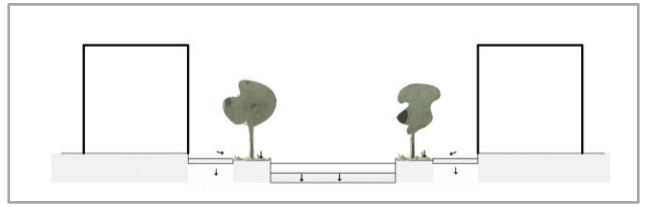
Polluted water

Unplanned areas

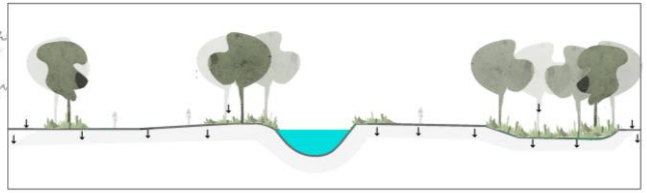
Urban areas



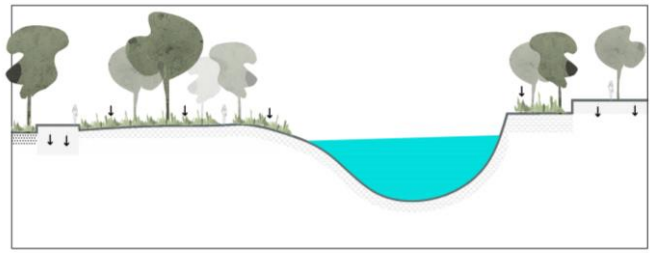

Filter strips
Floating streets
Interceptor streets
1
2
3
Floating streets with cycle tracks
Floating streets
Park
Park
Hydroph
Park
Rerving the stream
Pond with aquaponics



1



2



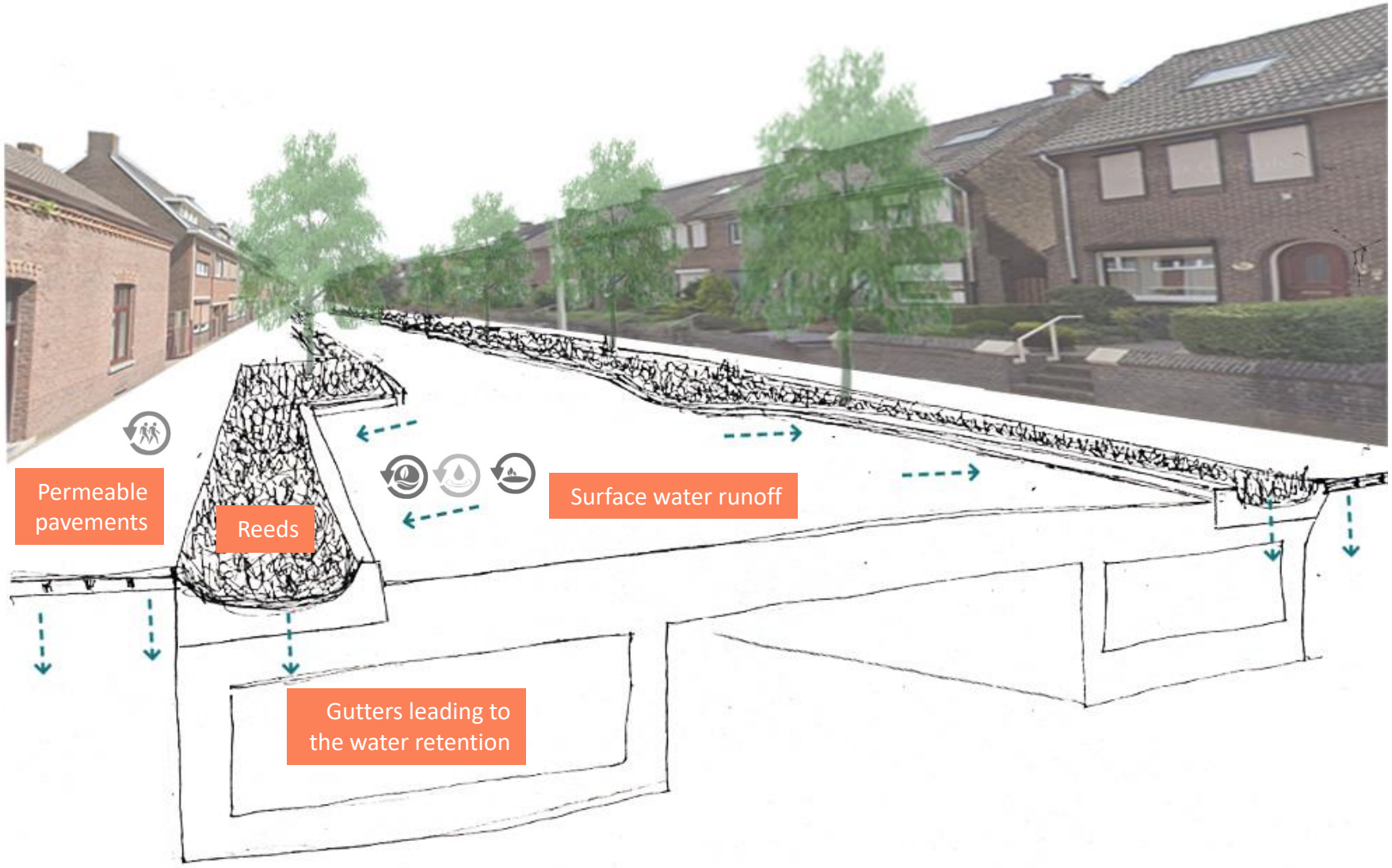
3

INTERCEPTOR STREETS

Small scale retrofit in public streets to **collect rainfall**.

Urbanized area with **flooding issue**
and cycling paths not connected
High land

Current situation



DESIGN PROPOSAL

Polluted water and no well-connected cycle routes, low land

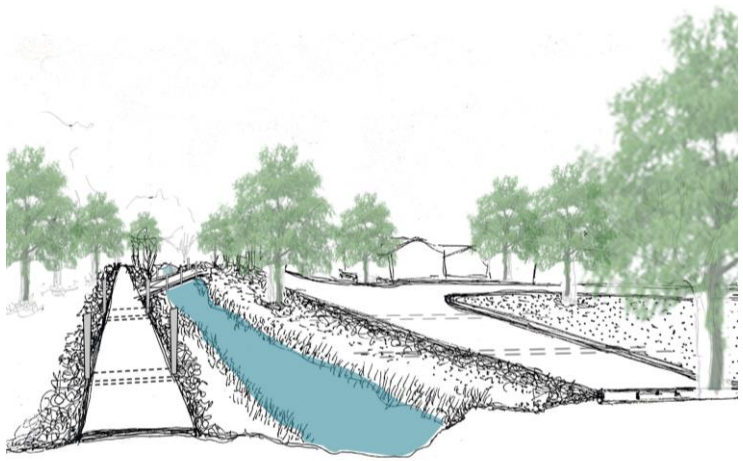
FILTER STRIPS

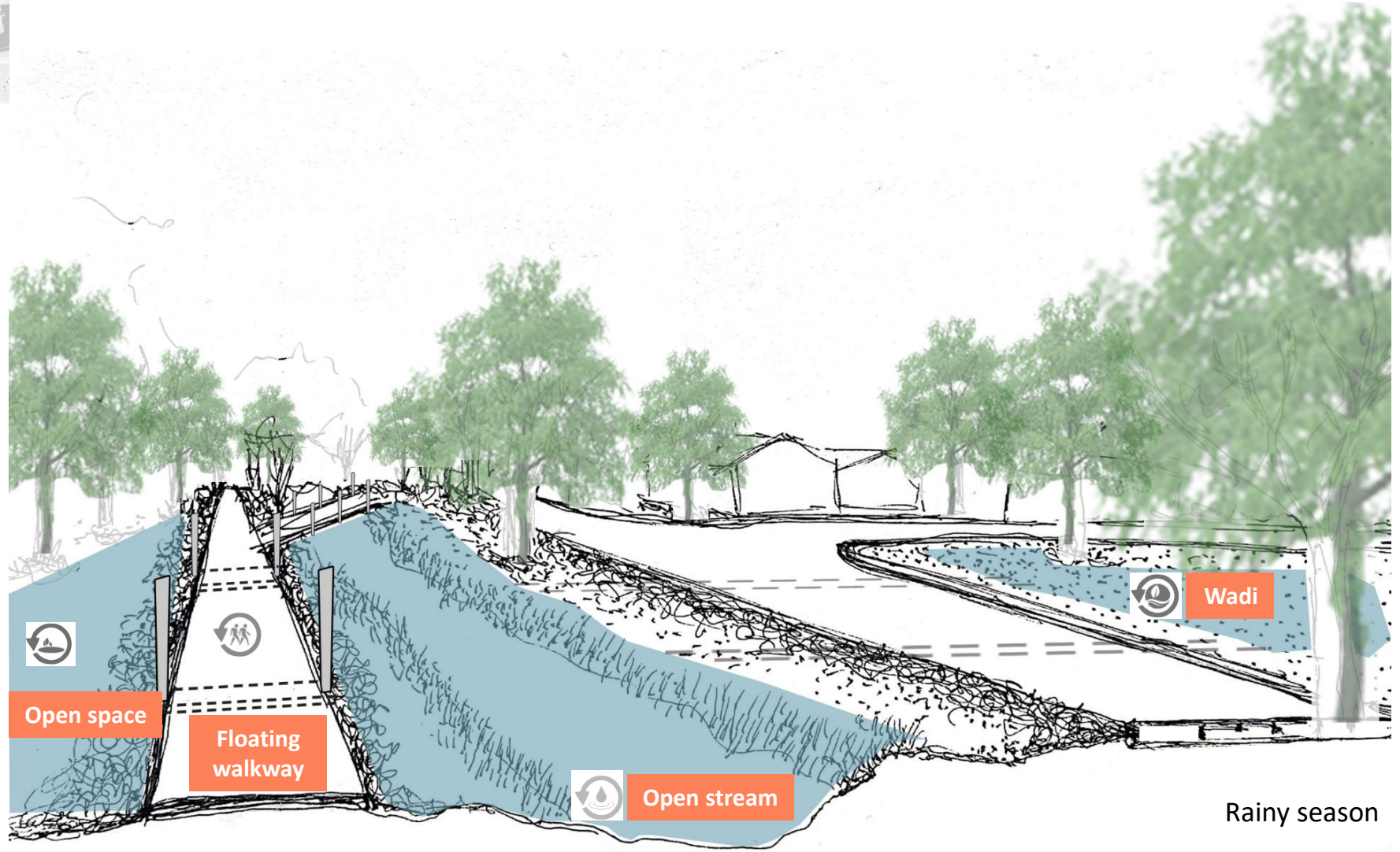
To clean the water using **duck weeds**. Low lands need improved ground water management in order to maintain soil stability.

FLOATING STREETS

Walkways adaptable due to the change in the level of water and spaces to **retain water.**

Use of unplanned spaces, Low lying areas



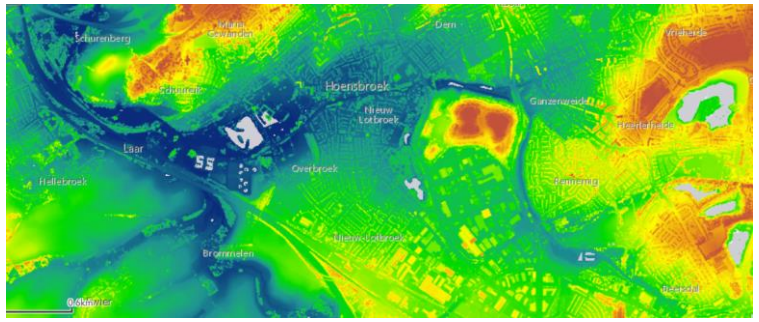


Rainy season

DESIGN LOCATION 2
WASTEWATER

DESIGN LOCATION 1
MINE WATER

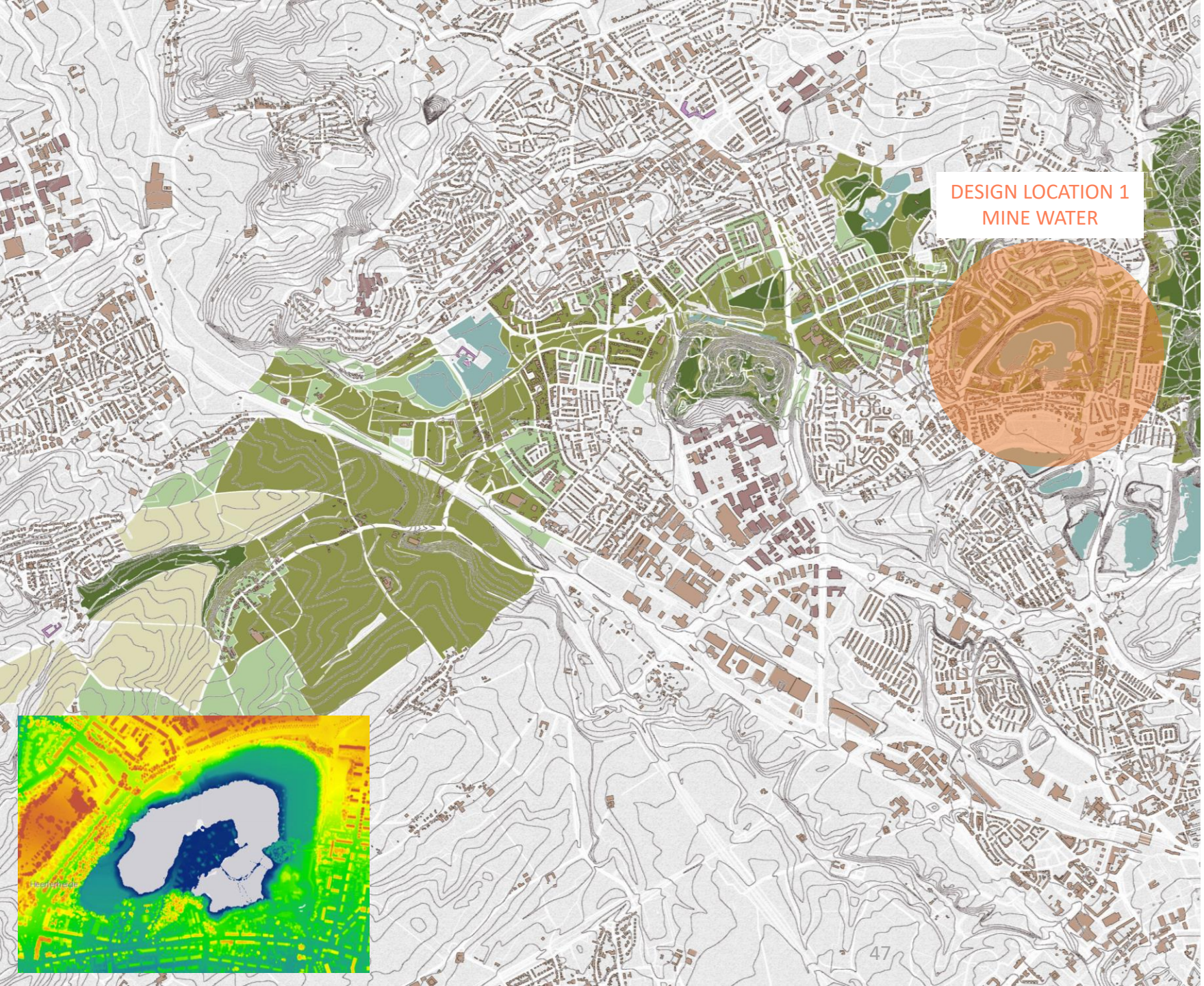
DESIGN LOCATION 3
AGRICULTURE WATER



AHN3 ruw - Blauw / Groen / Oranje (Dynamische opmaak)

High : 70

Low : -15



MINE WATER - DESIGN LOCATION 1

HIGH LAND, HIGHLY CONTOURED

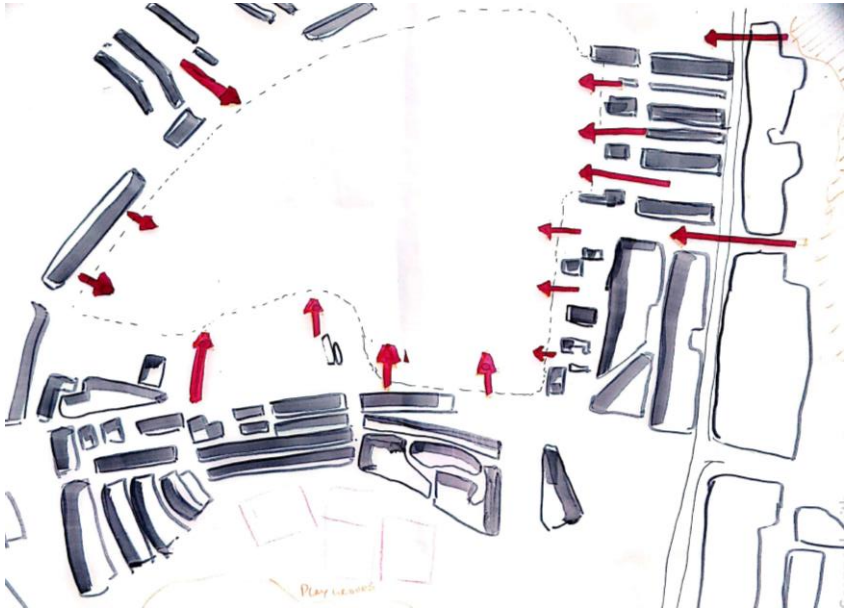
ABANDONED LAND

MANY NEIGHBOURHOODS AROUND

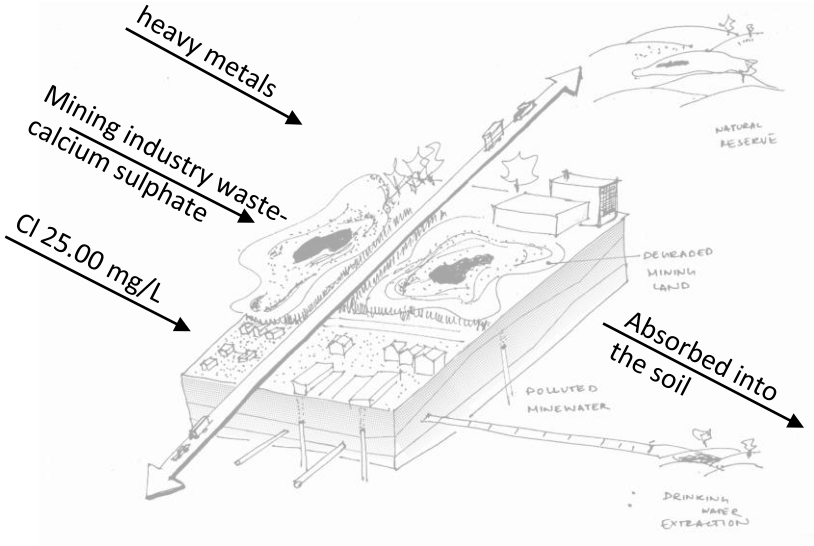
NEXT TO FOREST AREA

INDUSTRIAL WASTE

DESIGN PROPOSAL



Disconnected to the neighborhood
- **fenced** open spaces



Water **pollution**

Generally contains heavy metals or additives used in mining industry. Rising mine water can lead to an increase in groundwater level in the overburden. Due to this groundwater is at risk.

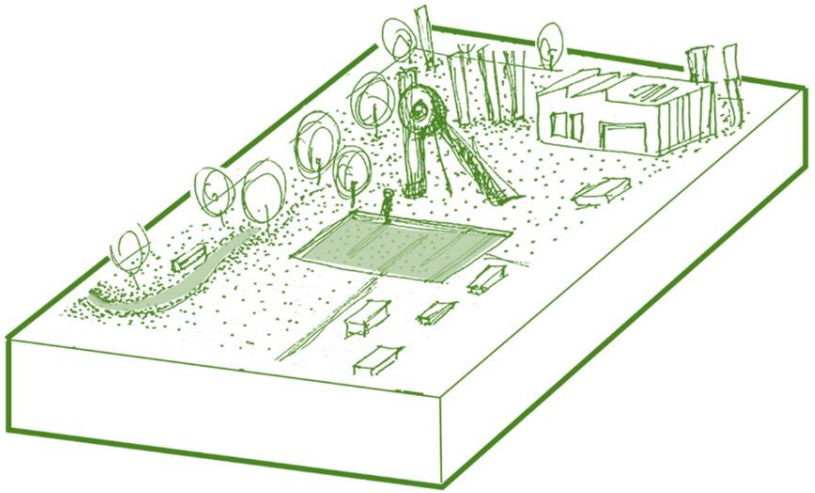
Ecologically degraded
- mining activities **no vegetation**
-disconnected with ecological area
-pollution

Next to the high ecological area (Brumssum heide)
Can act as steppingstone in ecological structure

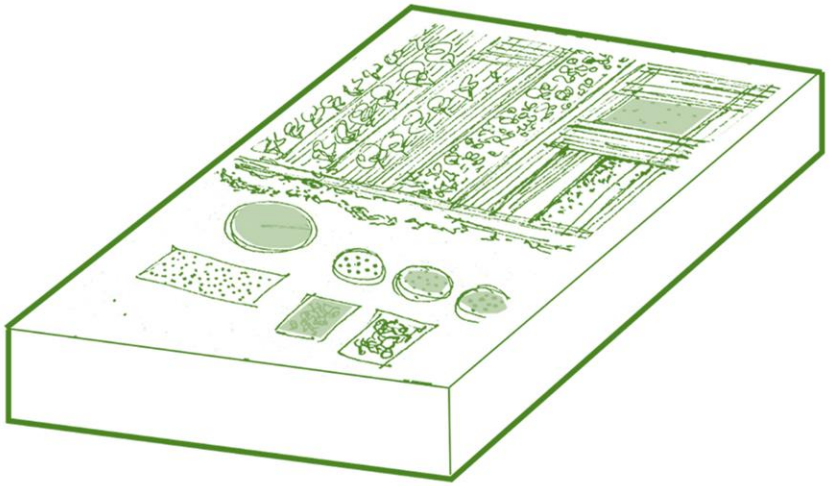
Landmark structures

Case study:
Landschaftspark Duisburg-Nord

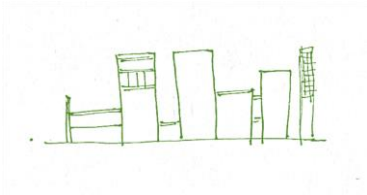
Source:https://de.wikipedia.org/wiki/Landschaftspark_Duisburg-Nord



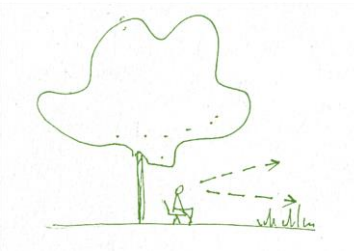
Protect industrial heritage



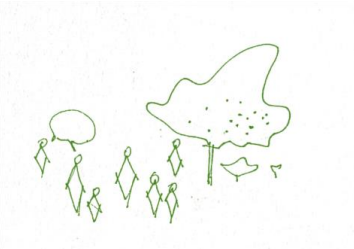
Continuity and ease of movement



Industrial heritage



Park facilities

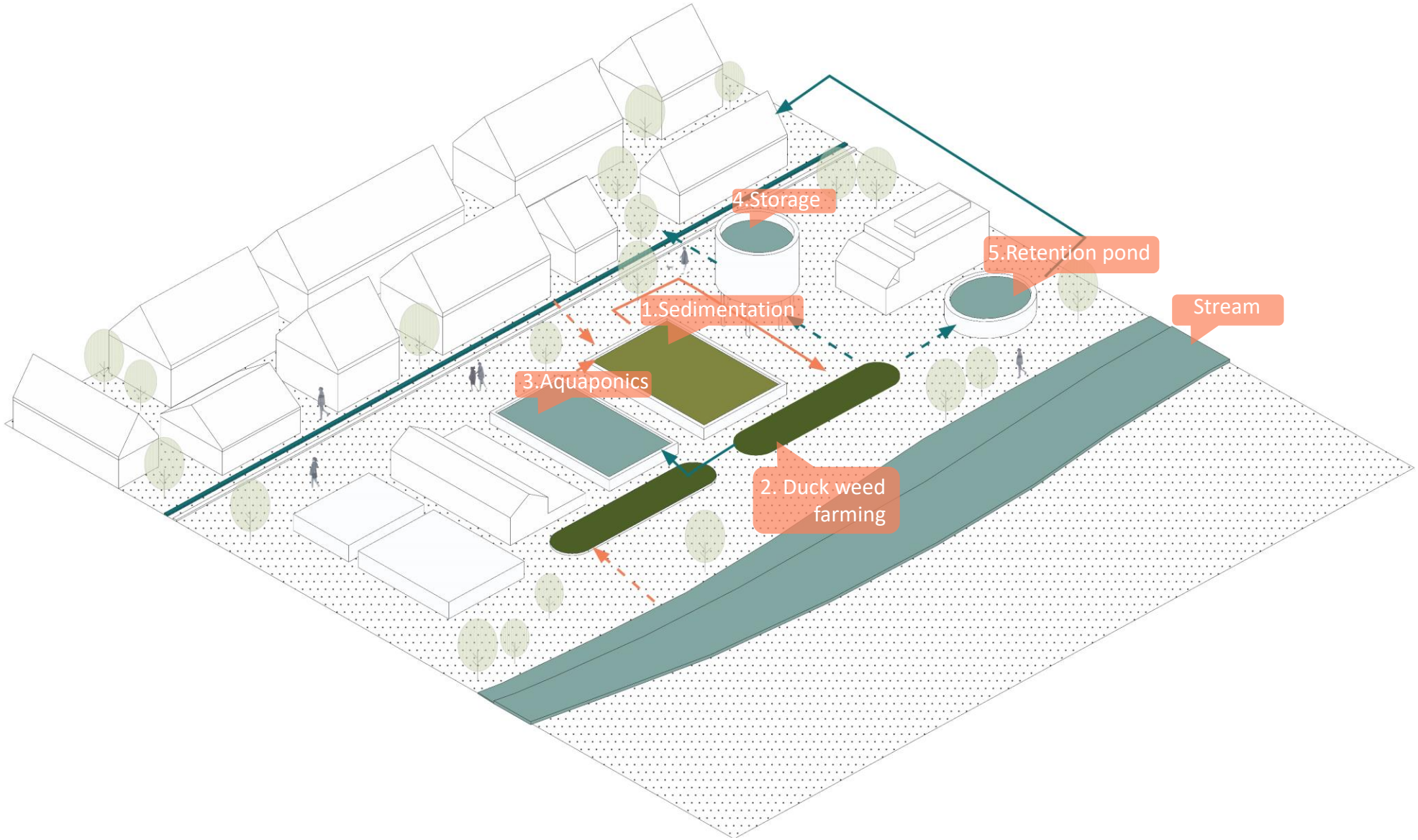


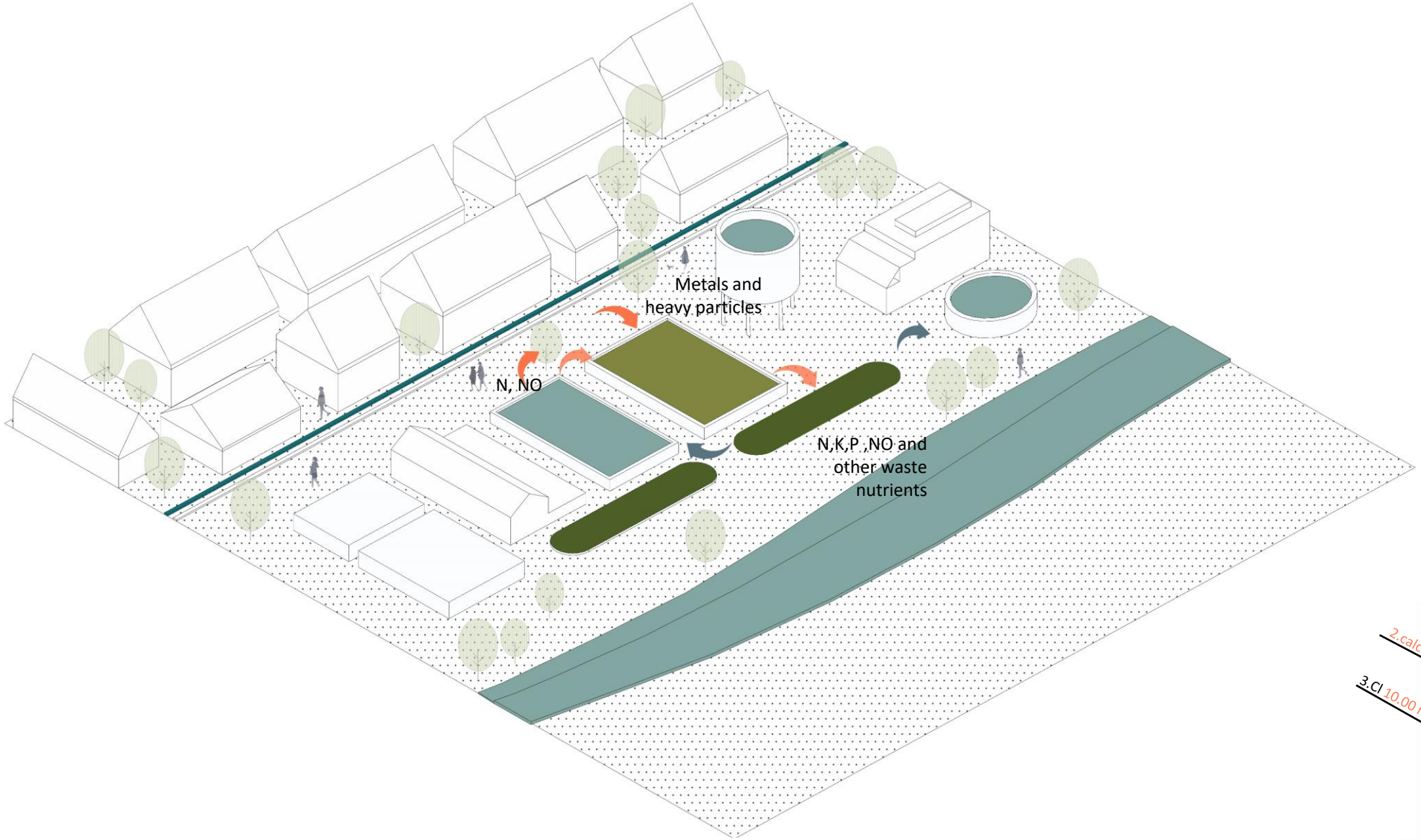
Community gathering

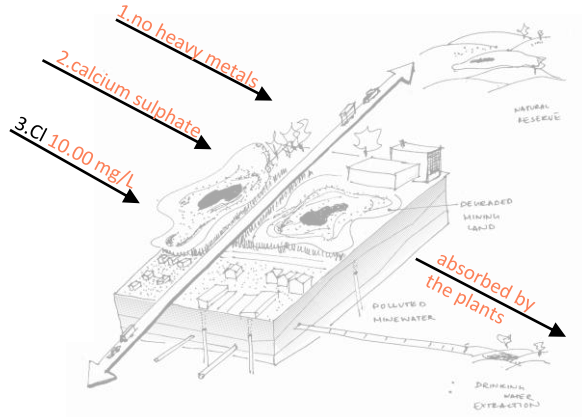
For the community

Hydrophilic park

Water purification




Metals and
heavy particles
N, NO
N,K,P ,NO and
other waste
nutrients


1.no heavy metals
2.calcium sulphate
3.Cl 10.00 mg/l
absorbed by
the plants

ACCESSIBILITY

-Easily **accessible** from the neighbourhoods
-Removed physical barriers
- creating **visual connect**

Secondary access

Mainly accessible for neighborhoods

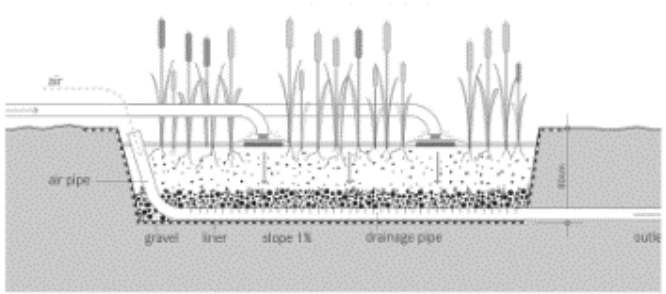
Main entry access

ACCESSIBILITY

- Main pathway is shafts which are underground
- creating **visual connect**

Walking stroll

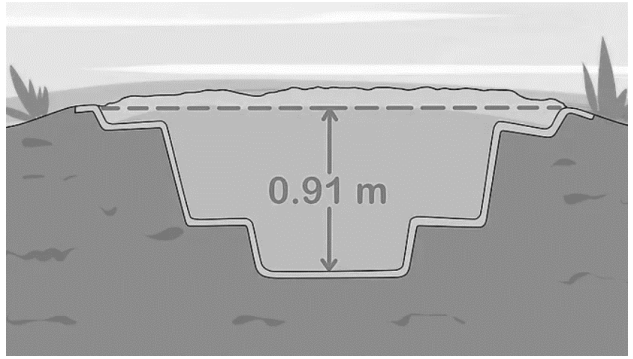
Main pathway

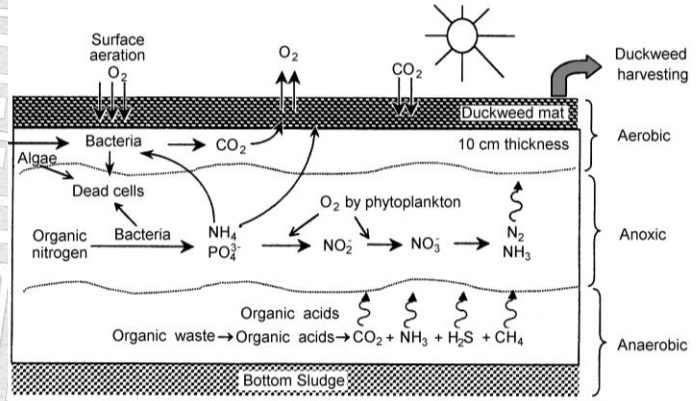


Minimum Area: 490 m^2

In the lowest area and are closet to the inlet

DESIGN PROPOSAL





Biological Processes in Duckweed-Based Wastewater treatment

DESIGN PROPOSAL

Energy for water production and distribution: 33.060 kWh(+/- 12 households)

0.47kWh/m3 drinking water produces

Source: WaterKIP (2008) Op weg naar een klimaatneutrale waterketen.

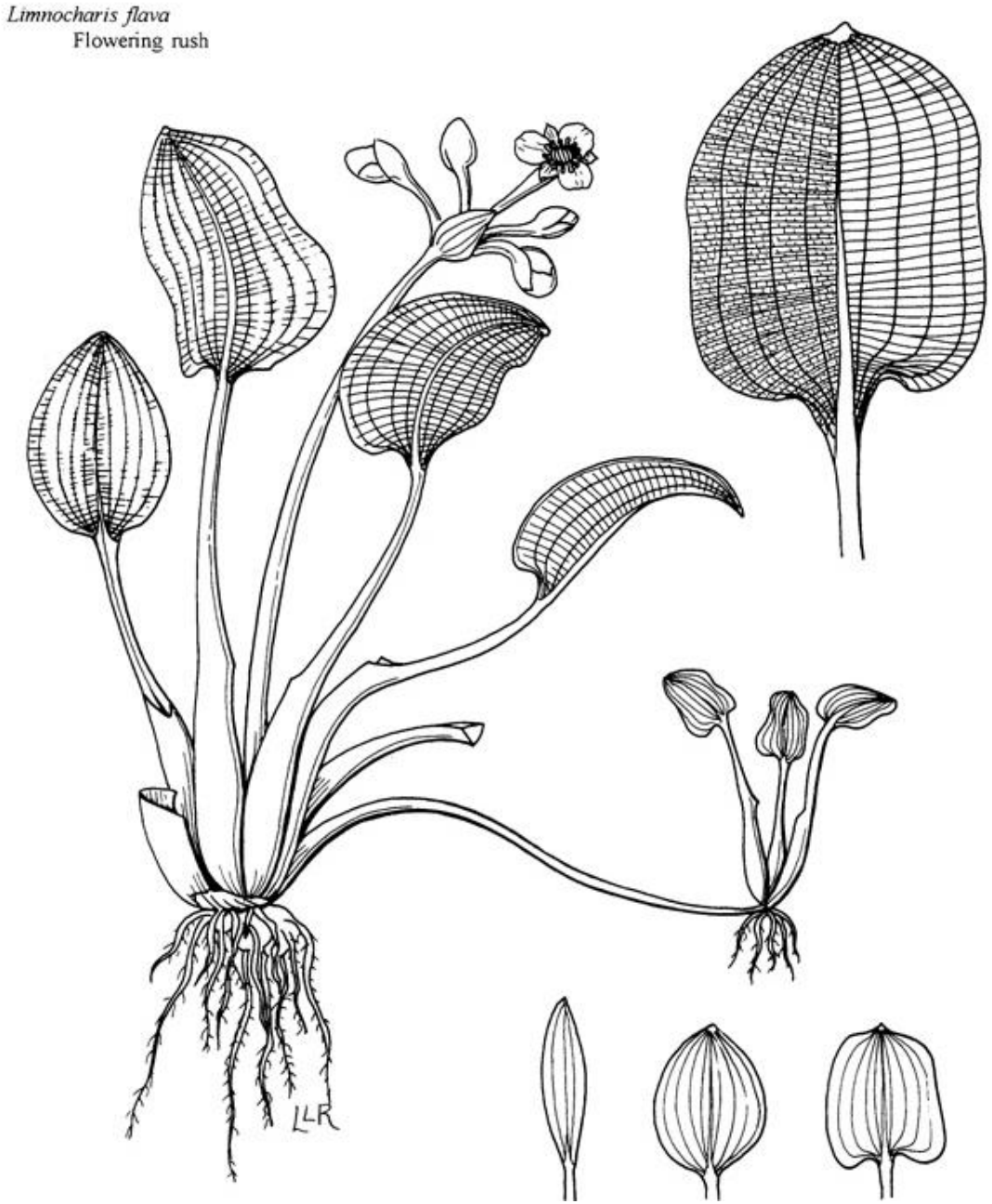
Energy for water treatment*

Active treatment

- Water treatment plants
- Chemical treatment

Passive treatment

- Constructed Wetlands
- Algae (Isola – duck weed)



NUTRIENTS ABSORBED- AMMONIA, NITRATE, PHOSPHOROUS

DUCKWEED AS FEED

BIOGAS PRODUCTION

COMPOST FOR URBAN FARMING

PRODUCTION OF WATER

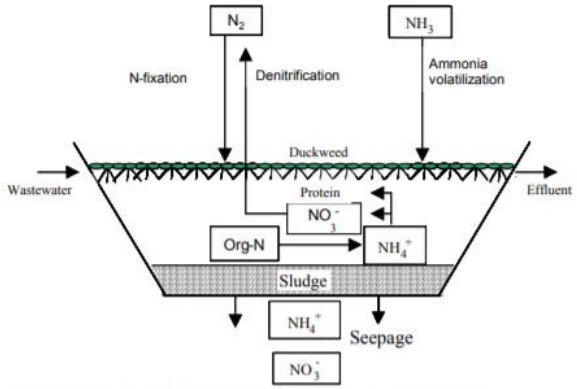
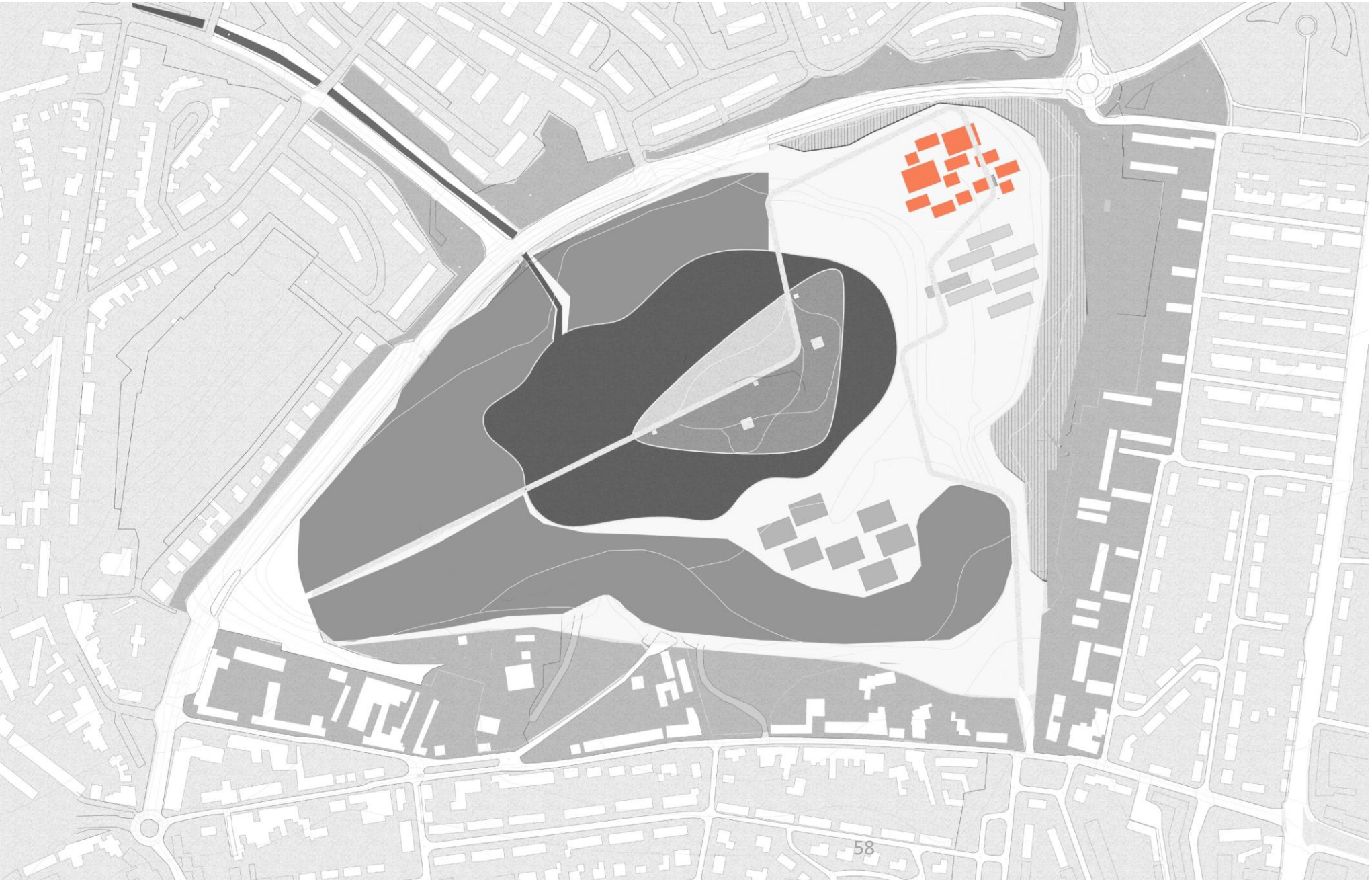


Fig. 5. Nitrogen transport and transformation mechanisms in a Duckweed Pond.

Source: https://edepot.wur.nl/21921

DESIGN PROPOSAL



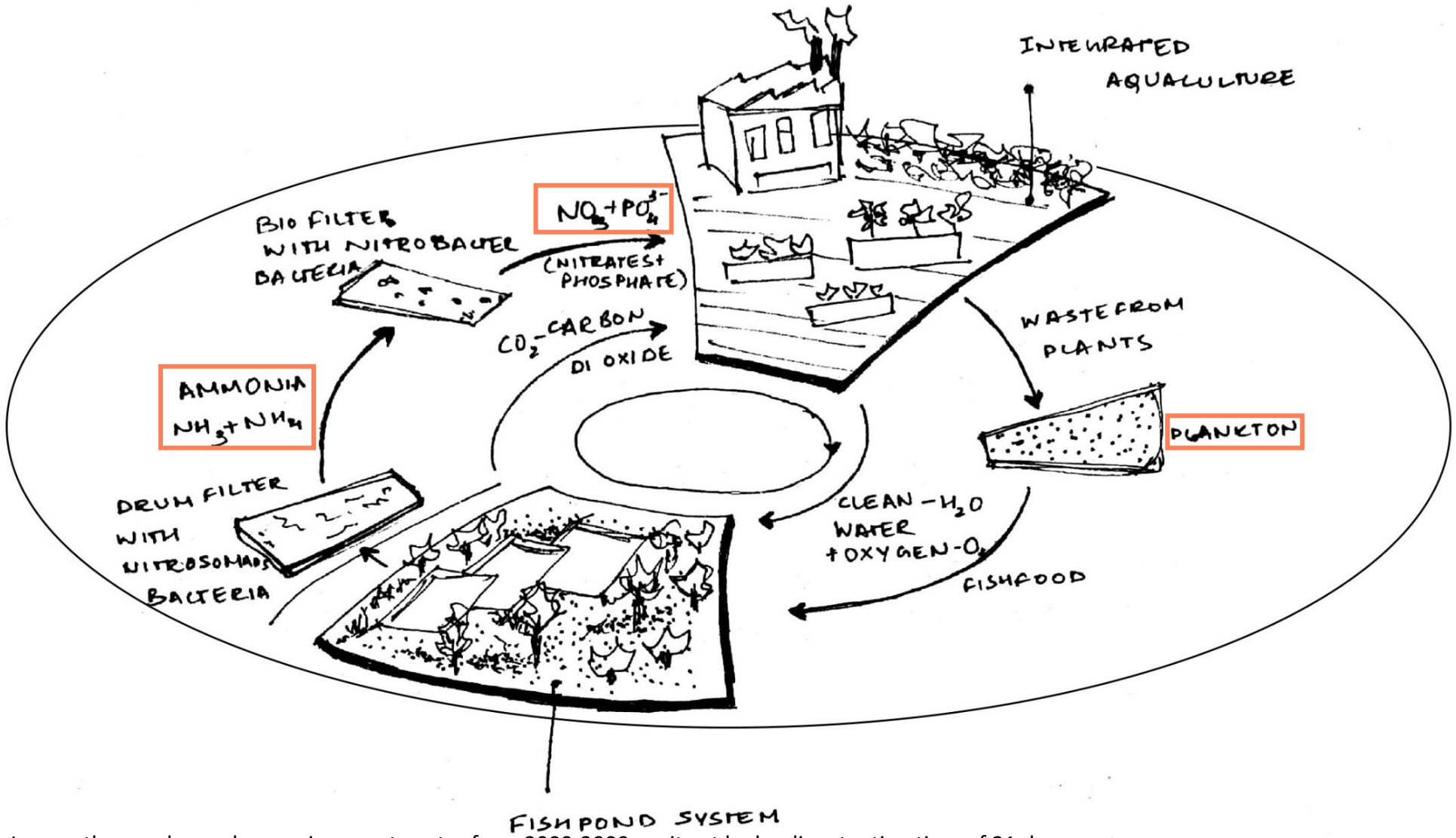
1 fish- 30 -40 liters
Growing medium 1000 liters – 40 sq
number of growing medium
25 fishes

Ph water 6-6.5
Fish size 4- 5 inches

Highest level fish tank

DESIGN PROPOSAL

How can **waste nutrients** in water and soil be used to develop sustainable landscape?



In case the pond complex receives wastewater from 2000-3000 capita at hydraulic retention time of 21 days.
The results demonstrated that the combined wastewater and fish aquaculture system produced over 12 tons fish/ha/year, yielding a net annual profit of about US$ 2000/ha (Gijzen and Ikramullah, 1999; ICDDRB, 1995).

ECOLOGY CONNECTIONS


Epilobium angustifolium
Wilgenroosje

Typha latifolia
Grote Lisdodde

Digitalis purpurea
Vingerhoedskruid


Achillea millefolium
Duizendblad


Salix nigra
Zwarte wilg


Lolium perenne
Raaigras


Agrostis capillaris
Struisgras


Festuca arundinacea
Rietzwenkgras

Dense planting
To connect to the
neighborhood

Linking to
the forest

Forest areas

Dense planting
along the road

Plants to absorb
the pollution
Phytoremediation

DESIGN PROPOSAL

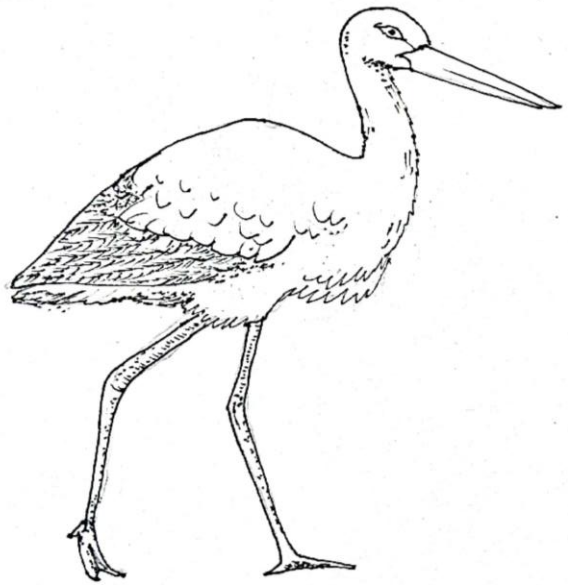
Hydrangeas

Reeds

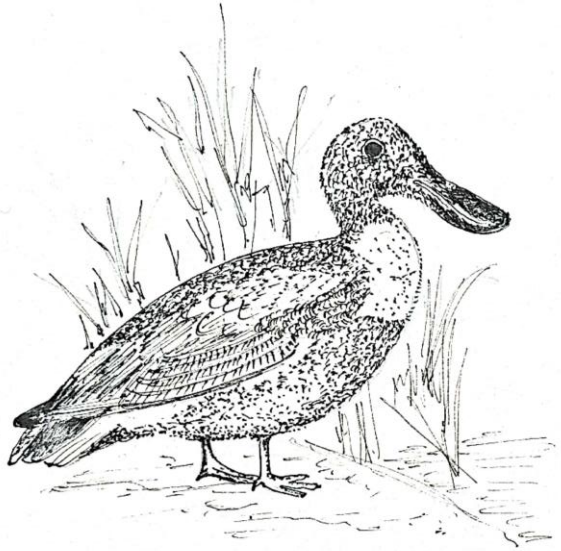
Salix alba

Pine trees

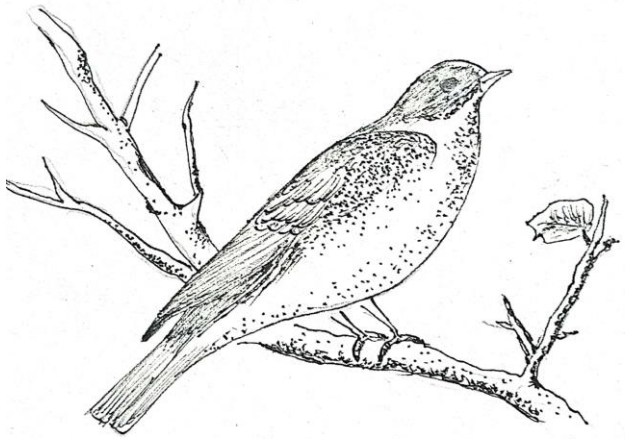
Most birds have threat of **habitat loss** whereas some also due to mining and nests predators.



Winter stork



Northern Hover



Collared sand martin

Grassland

Aquatic

Artificial terrestrial

SITE PLAN

Ecological island

Fishponds

Duck weed farming

Community gardens

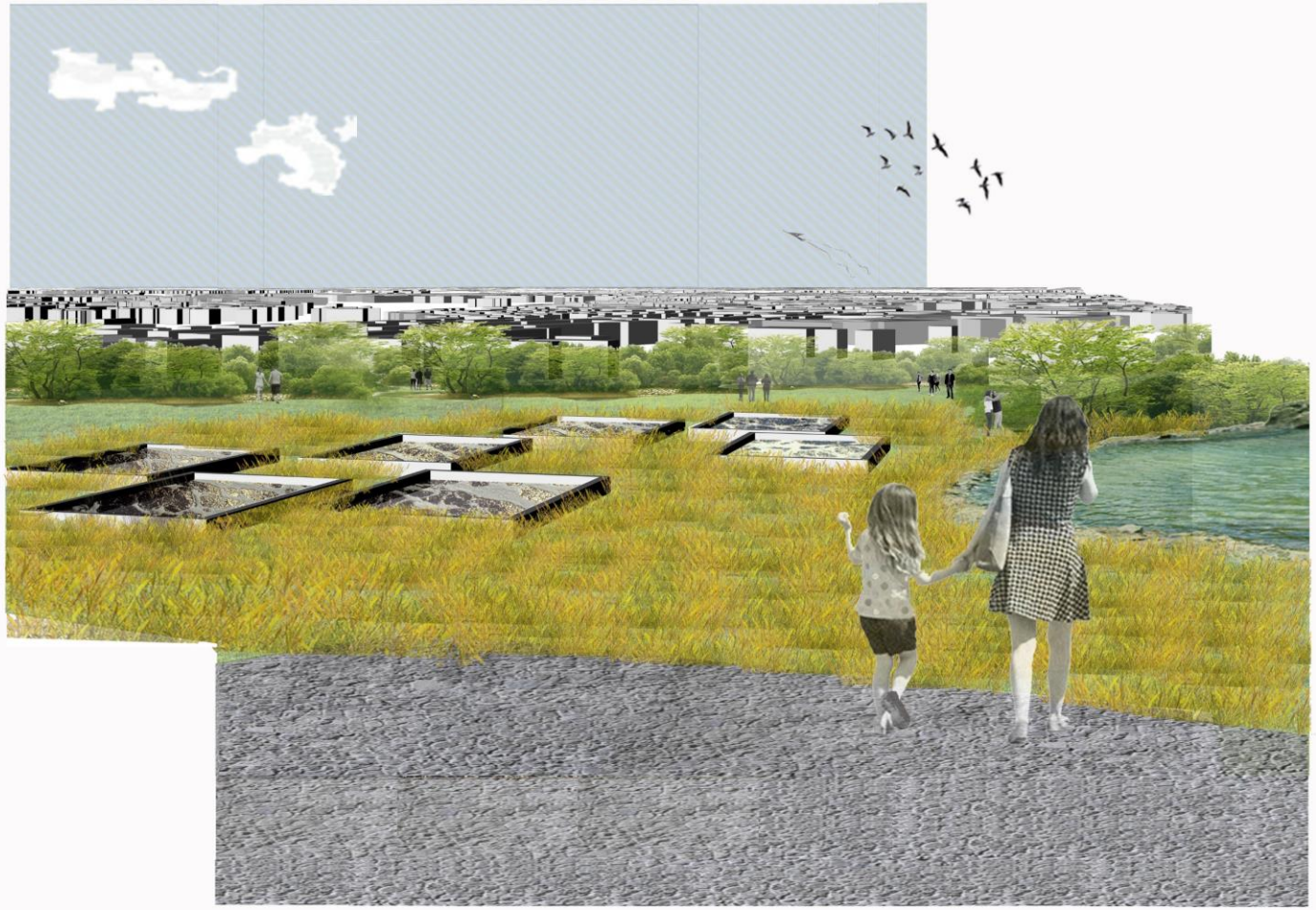
Orchard

Sedimentation ponds

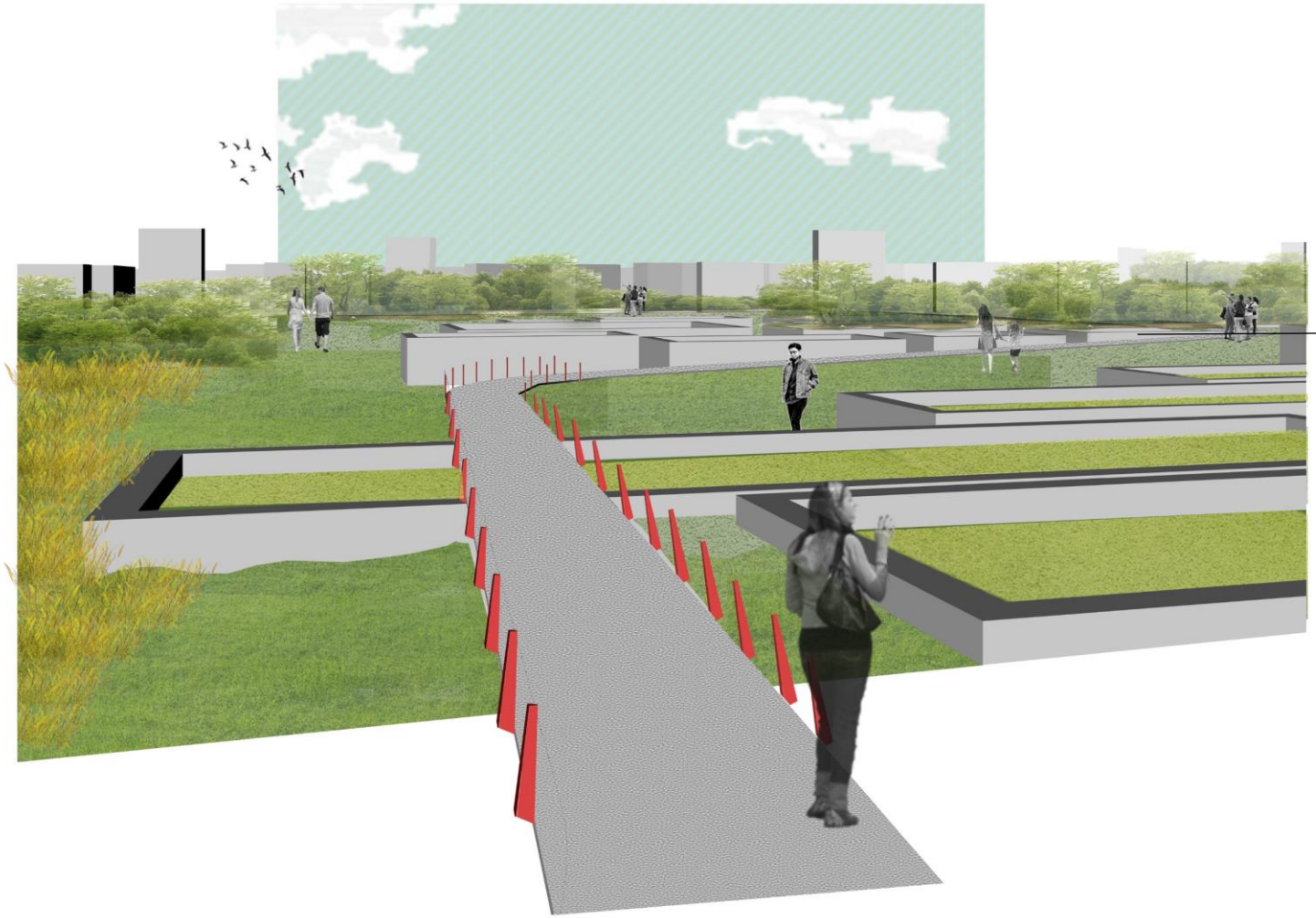
Cycling and walking

Entry

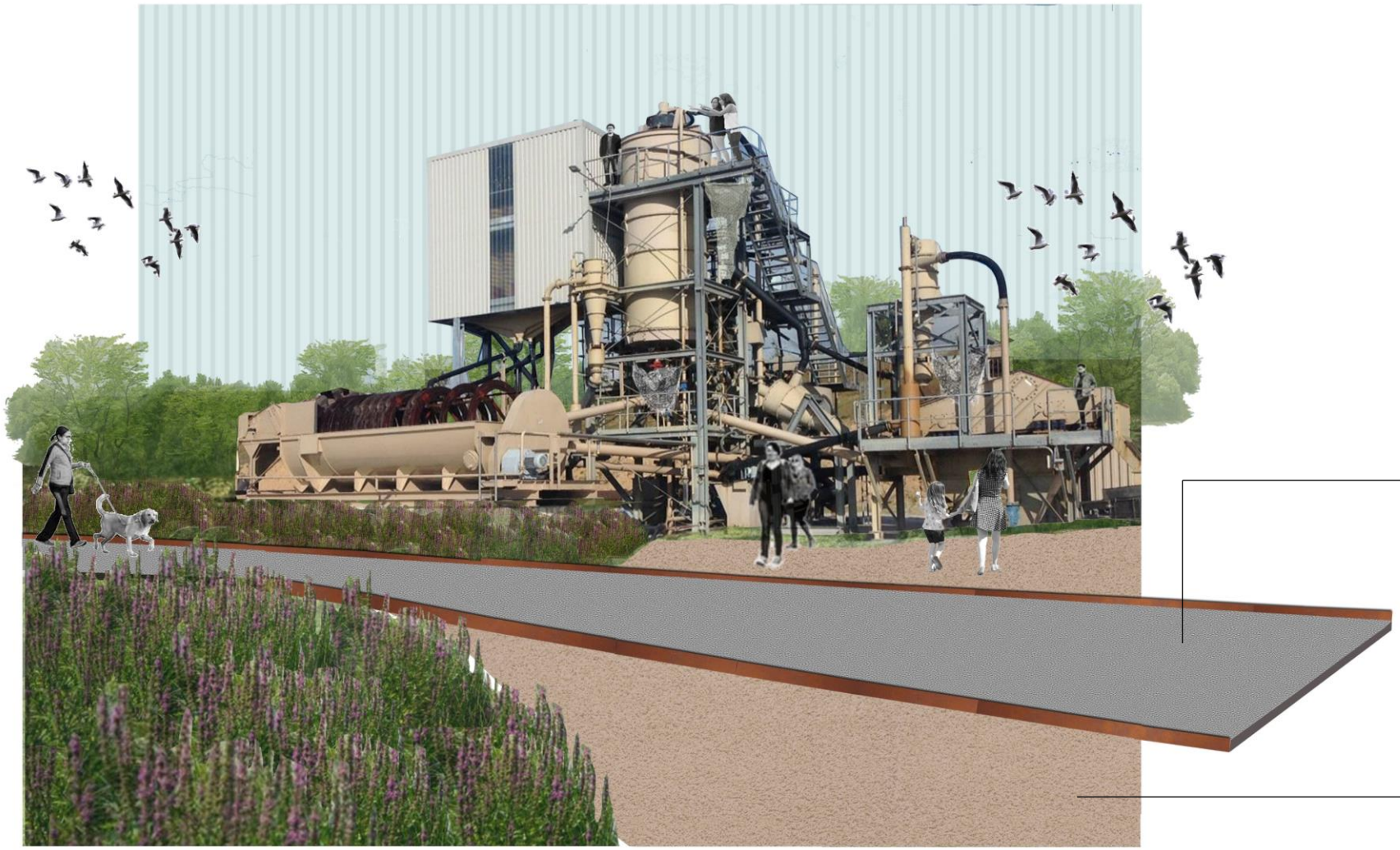
DESIGN PROPOSAL



Sedimentation ponds



Duck weed farming



Corten steel

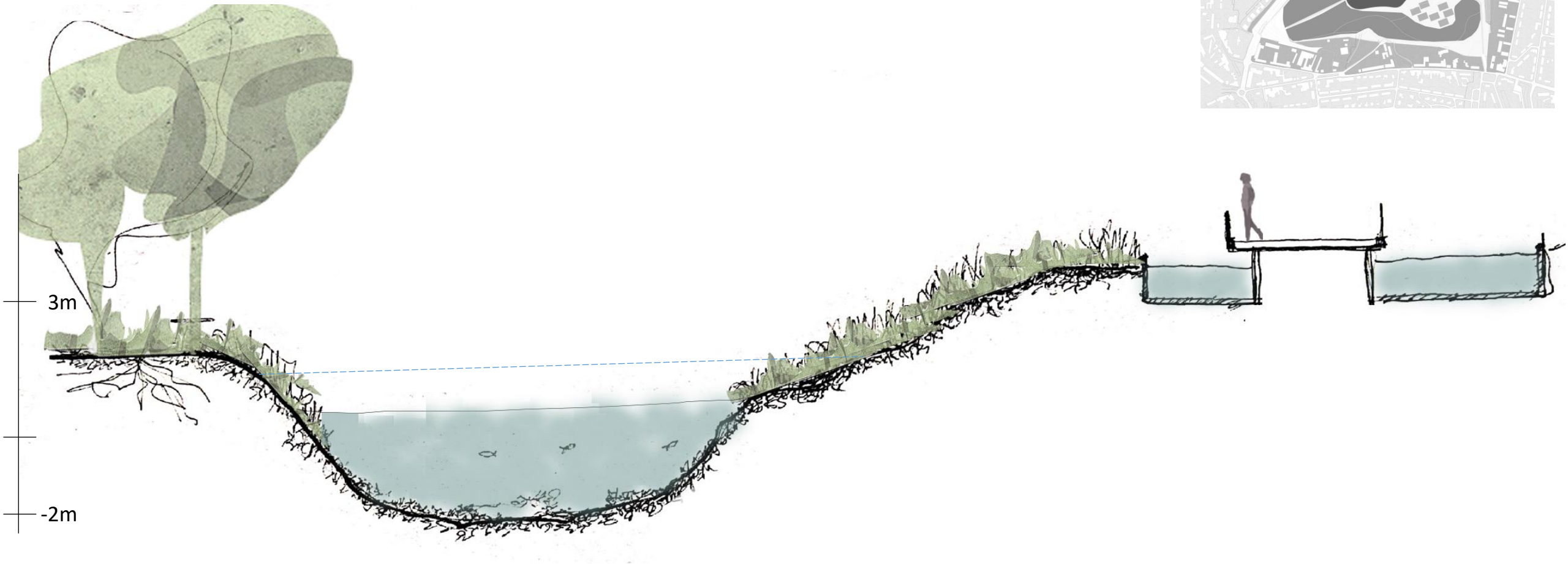
Local stone
-mergel lime stone
-Veldbrand bricks

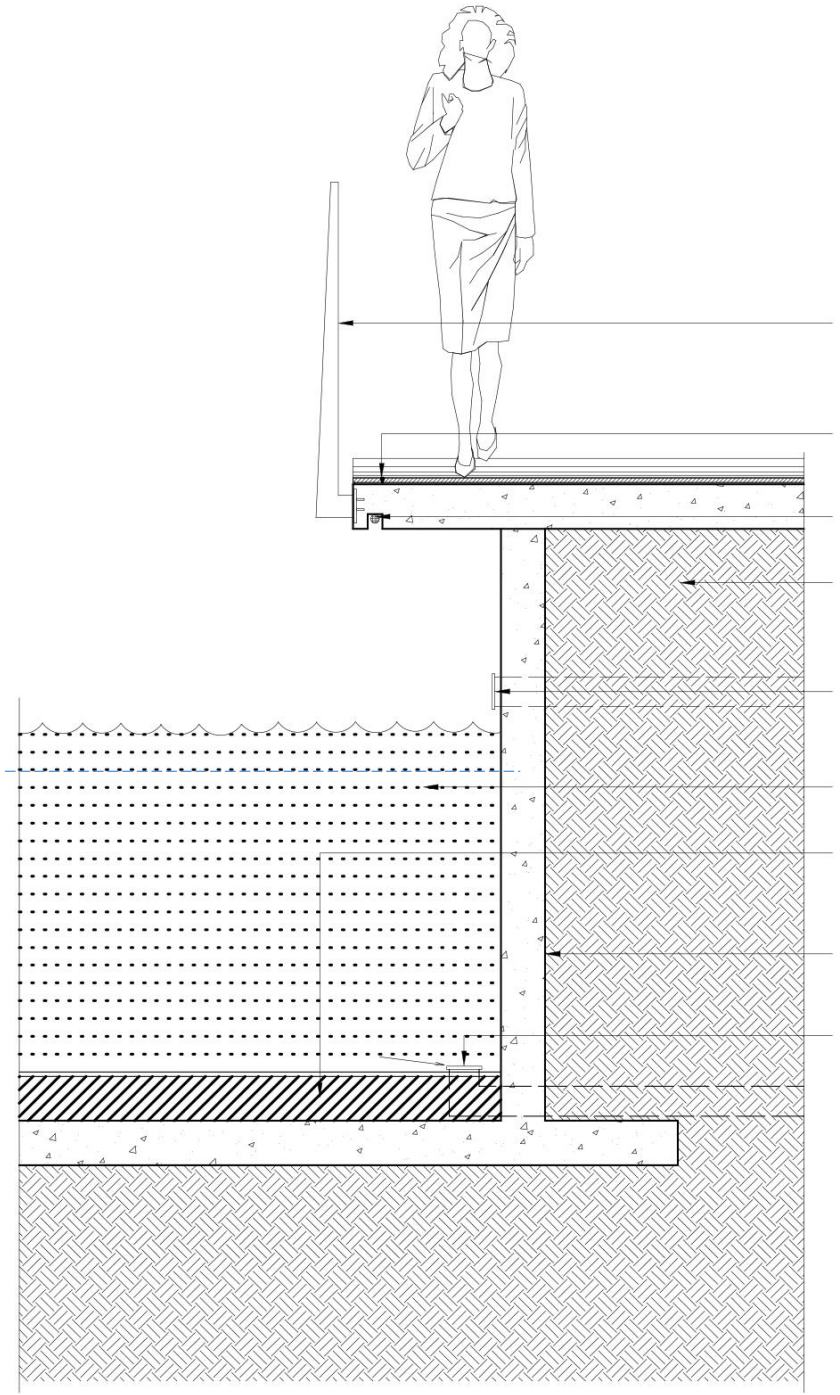
Gravel

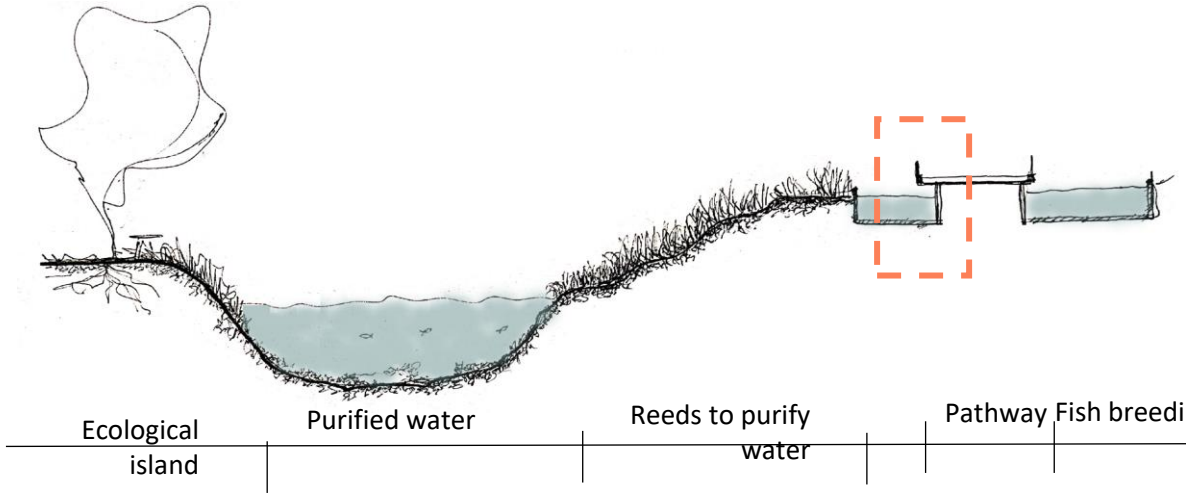
1-3 years

3-6 years

7-10 years


3m
-2m
Ecological island
Purified water
Reeds to purify water
Pathway
Fish breeding





Corten steel

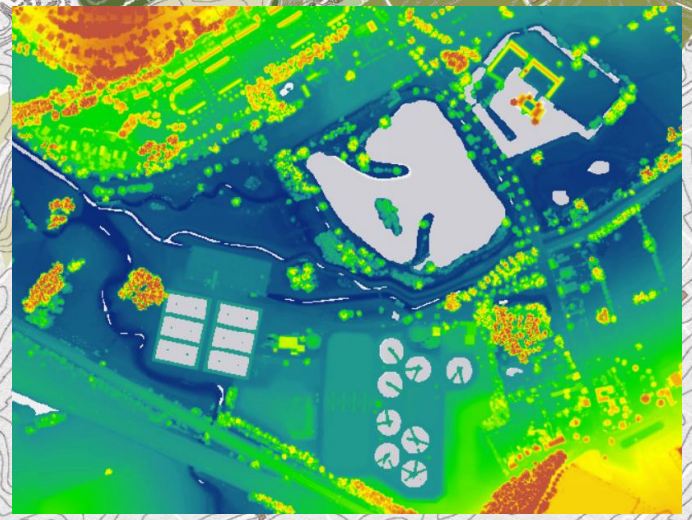
Local stone
-mergel lime stone
-Veldbrand bricks

Exposed concrete

Salix alba
Poular
Ash
alus
Hawthorn hedges

Craetgus monogyna

DESIGN LOCATION 2
WASTEWATER



DESIGN LOCATION 2 - WASTEWATER

WATER TREATMENT SITE

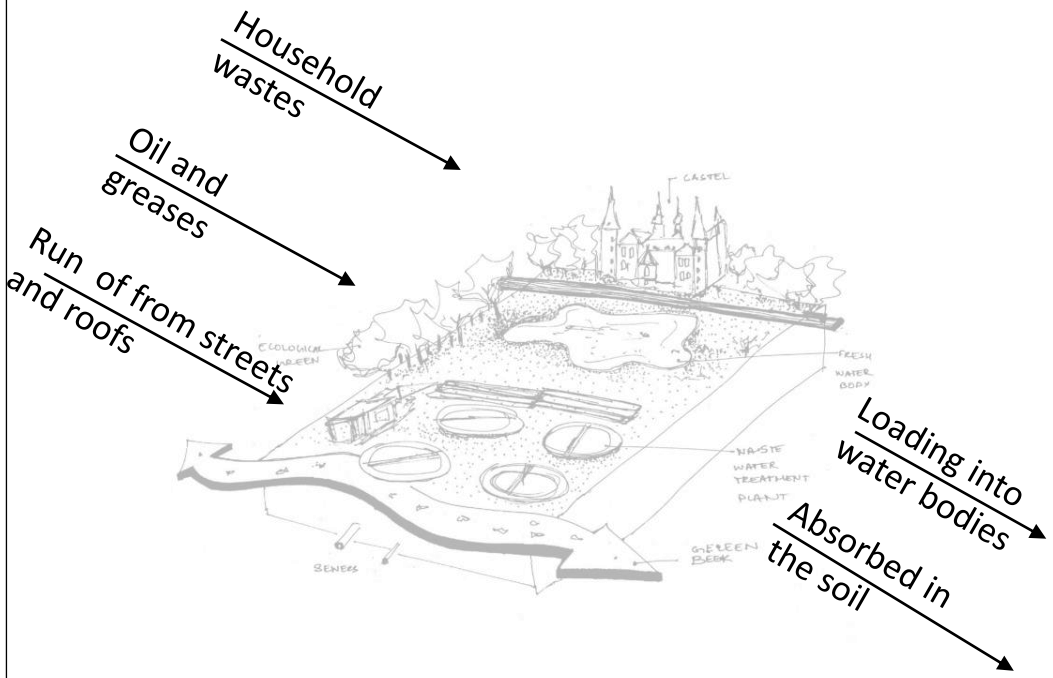
LOW LAND, WATER CATCHMENT AREA

CASTELS NEXT TO THE SITE

DESIGN PROPOSAL

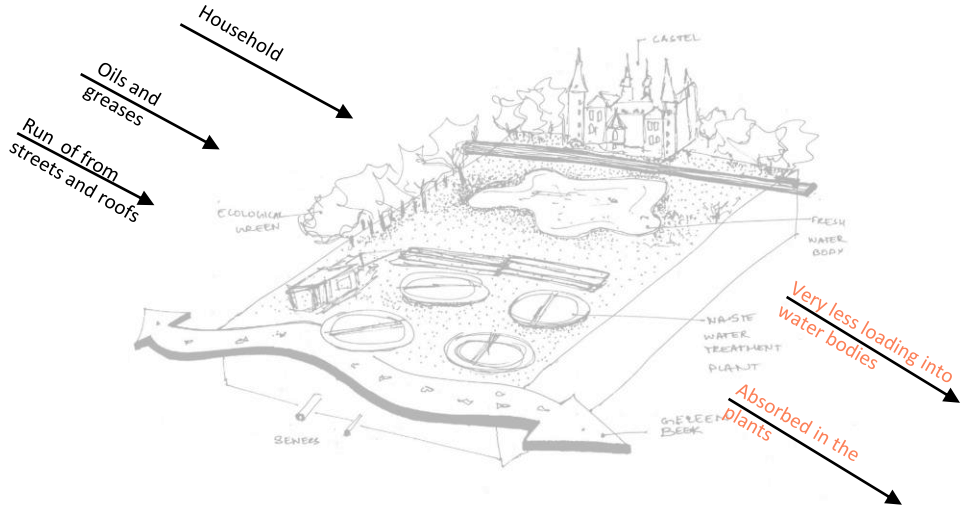
Unplanned areas

Low ecology value



Wastewater treatment plant

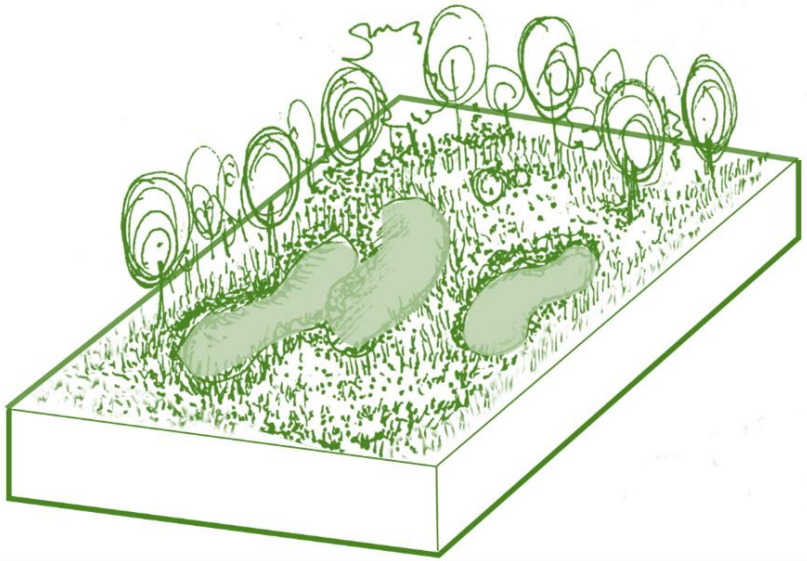
Tourist attraction



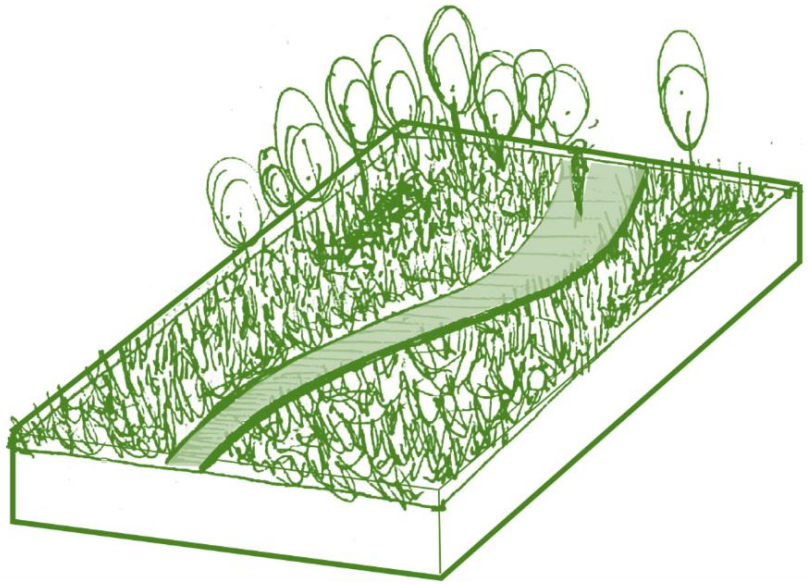
Production of clean water

Case study: Antwerp park- Ecological swimming pools

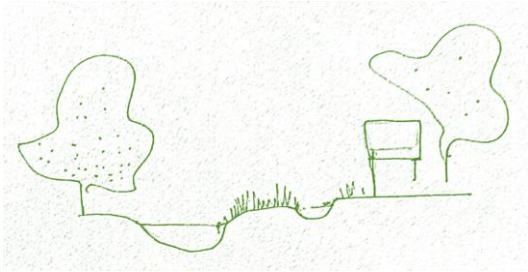
Source: https://www.antwerpen.be/



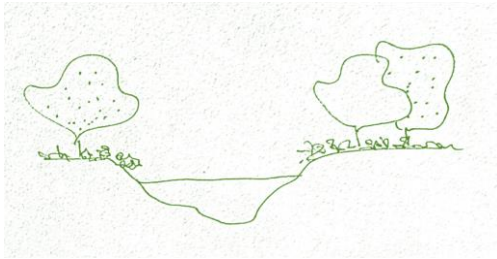
Design for adaptability and reusing



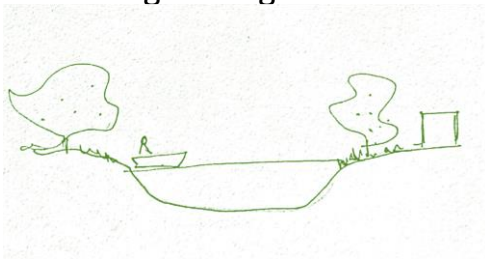
Create spaces for people



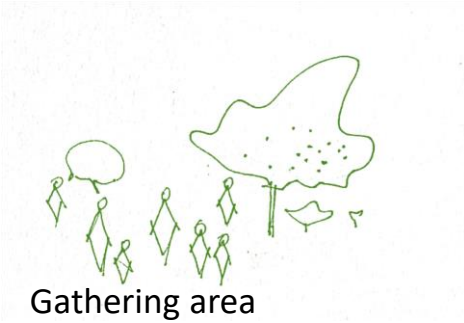
Reuse of water



Ecological edges

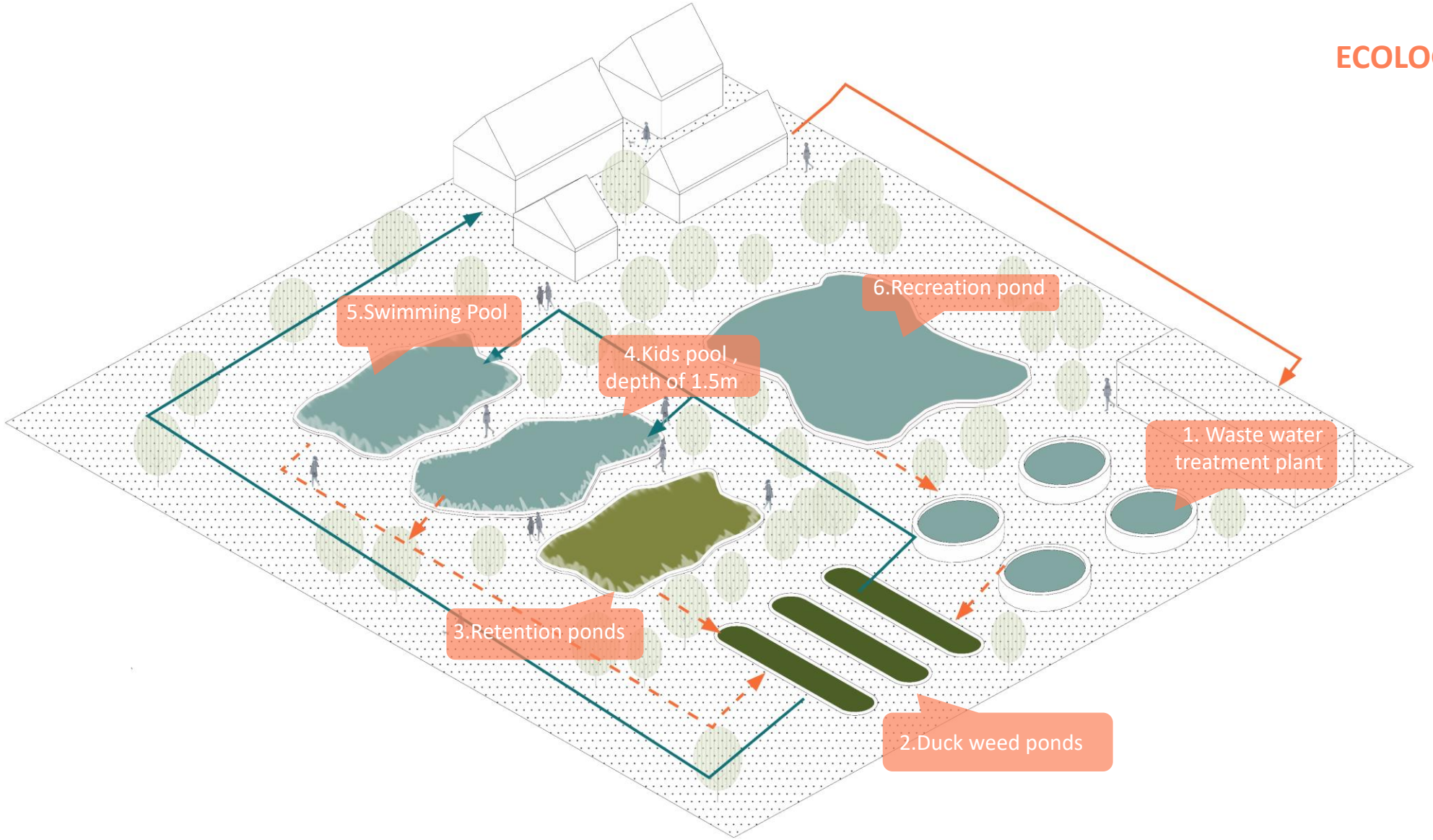


Recreational activities



Gathering area

OPPORTUNITIES IN WASTEWATER TREATMENT SITE
FOR THE VISITORS
ECOLOGICAL SWIMMING POOL



Public area

Semiprivate area

Private area

Recreation pond

Retention pond

Kids pool

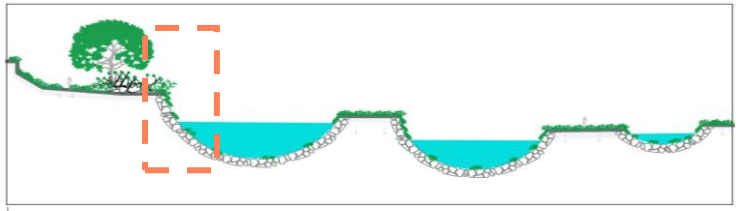
Deck pathways

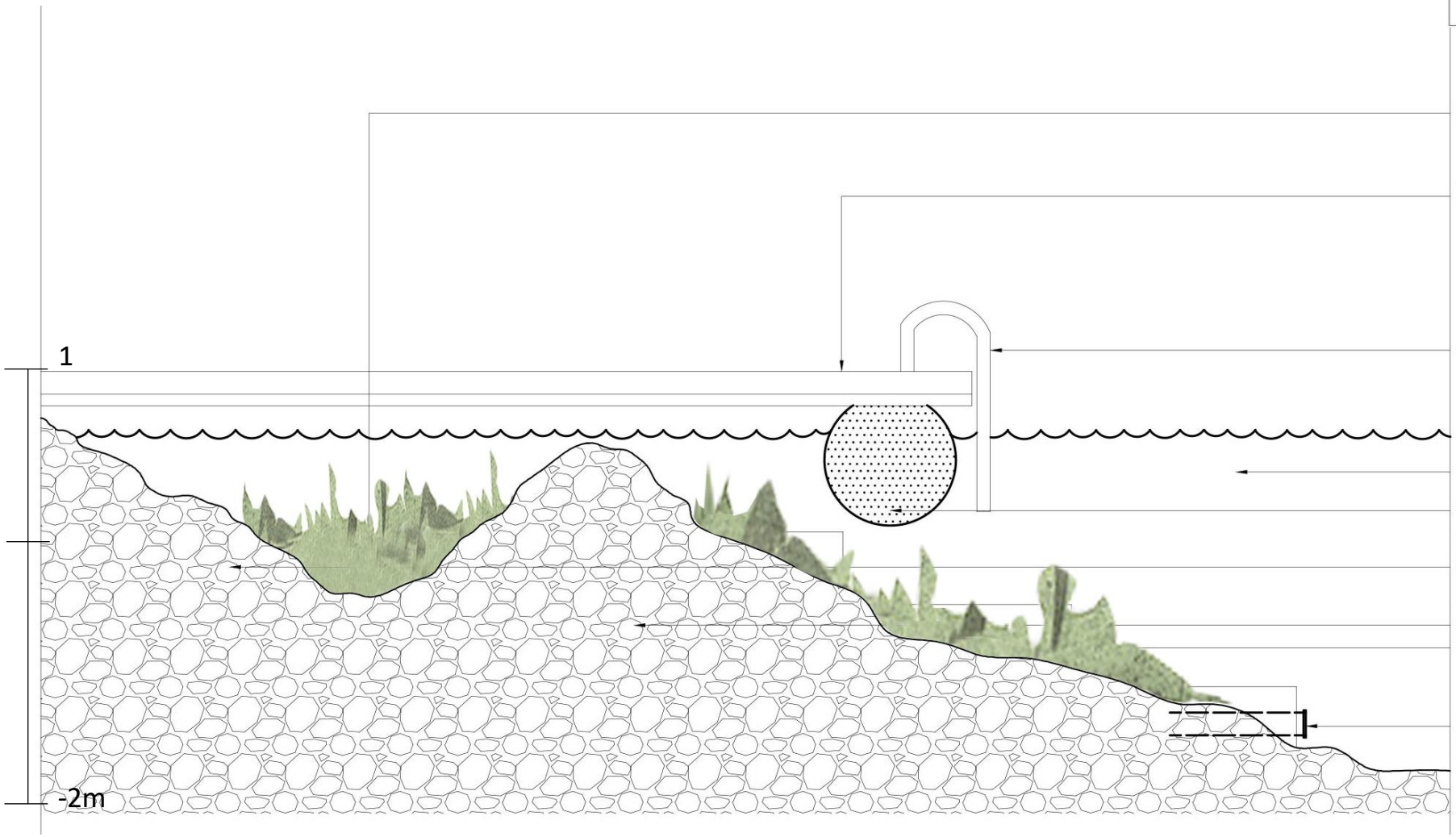
Sedimentation (heavy metals, oils and greases removed

Duck weed farming (to purify water)

River stones

Wood deck




1
-2m
film develops on the filter grains, which reducesorganic impurities
100 mm wide wooden planks deck
stainless steel ladder
swimming area
tube for float
Mixture of river rock and lava rock provides a biofilter mediumfor the moving water and growth medium for water plants
compacted soil
600 mm wide stairs of local stone
Bottom flow stirs up water from the bottom to prevent untreated water

DESIGN LOCATION 3 - AGRICULTURE WATER

DESIGN LOCATION 3
AGRICULTURE WATER

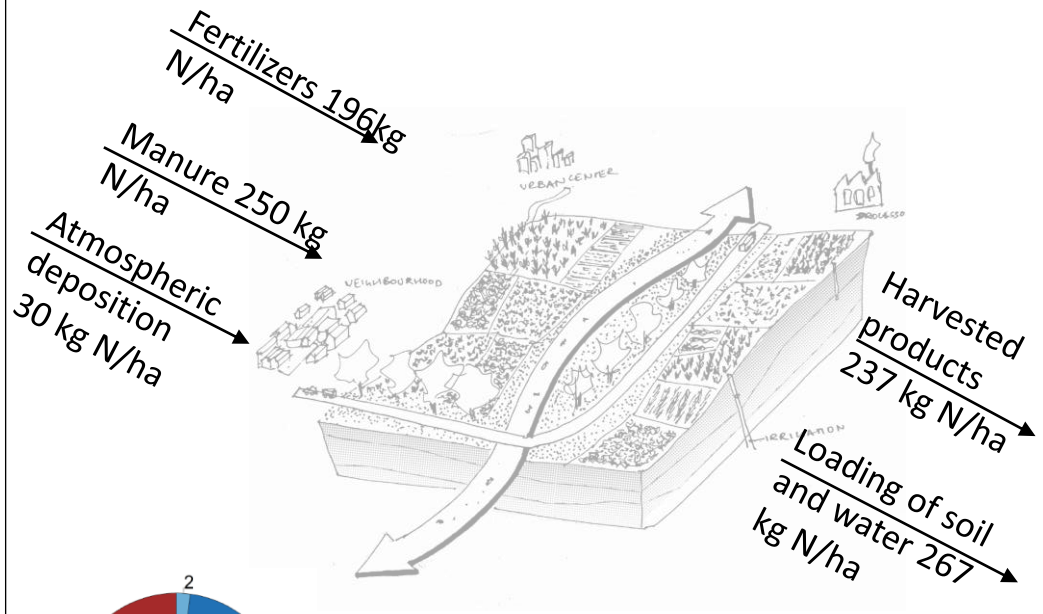
IN THE RURAL AREA

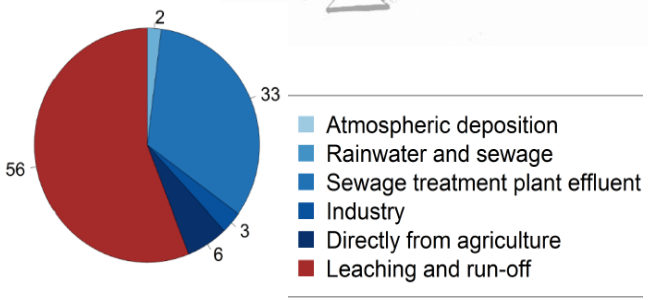
UNDULATING LAND , TERRACES

NEXT TO THE STREAM

DESIGN PROPOSAL

BROOK DRYING OUT





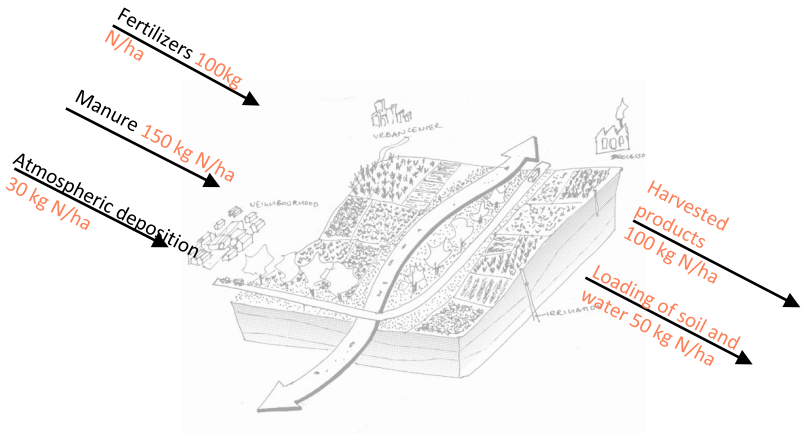
Source of value : oenemaetal,1997

WASTE NUTRIENTS

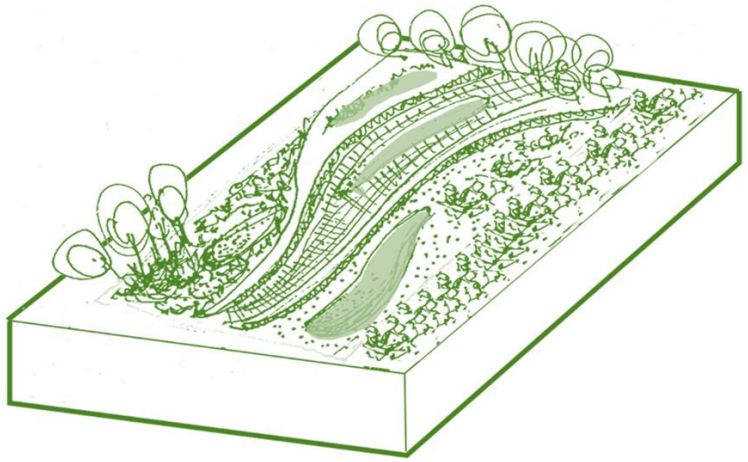
NHy and NOx in atmospheric depositions, various pesticides, Cd, N and P in inorganic fertilizers, and for **Cu, Zn, N and P** in animal manure.

LOW PRODUCTIVITY

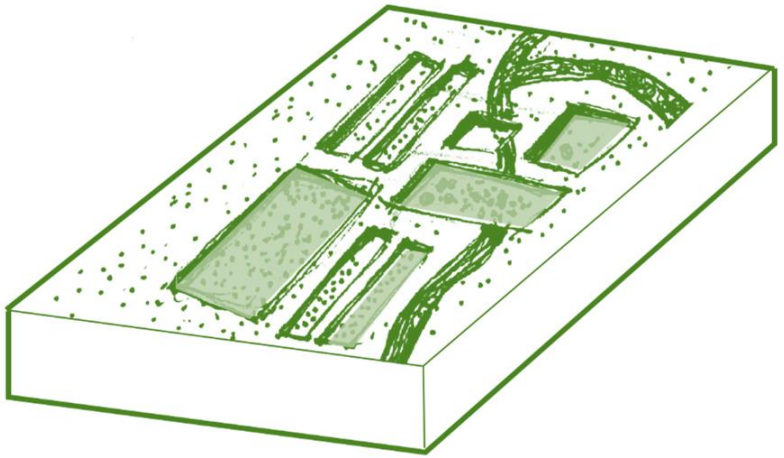
Natura 2000



Reuse of water and nutrients

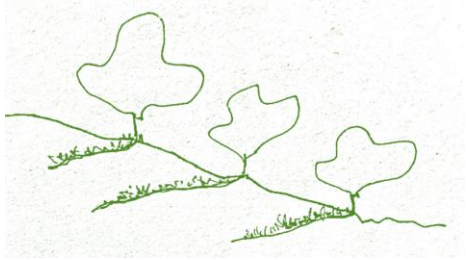


Design for resilient landscape



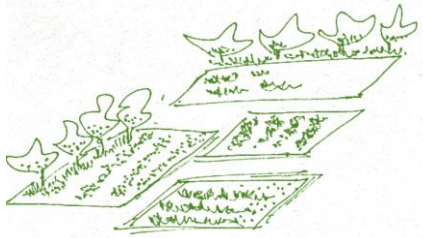
Multifunctionality and diversity

Species variety



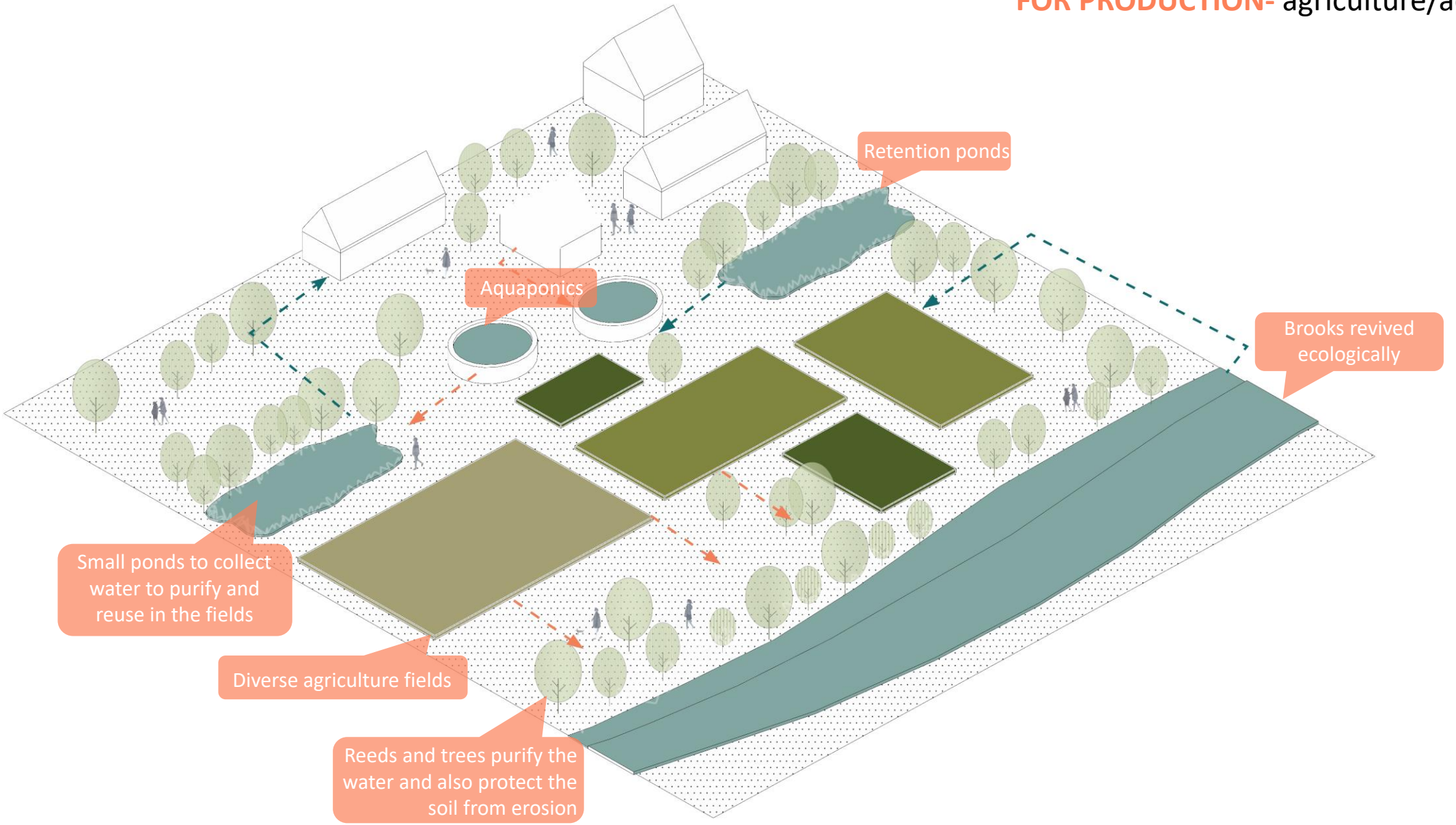
Prevent erosion

Ecological edges



Local production

FOR PRODUCTION- agriculture/aquaponic production



AGRICULTURE WATER

- **Smaller patches** diverse agriculture
- Minimum size 6m -12 m

- Using **crops** rotation which compliment each other and use the nutrients(companion planting)

- **Water retention** and reuse

SITE PLAN

Orchard- typical feature of this region

Source: https://www.waterschaplimburg.nl/@5563/vijf-organisaties/

Ecological edge
along the stream

Ponds to retain
water in the fields

Wetlands to
purify water

Aquaponics
production

Diverse farming
and native plants

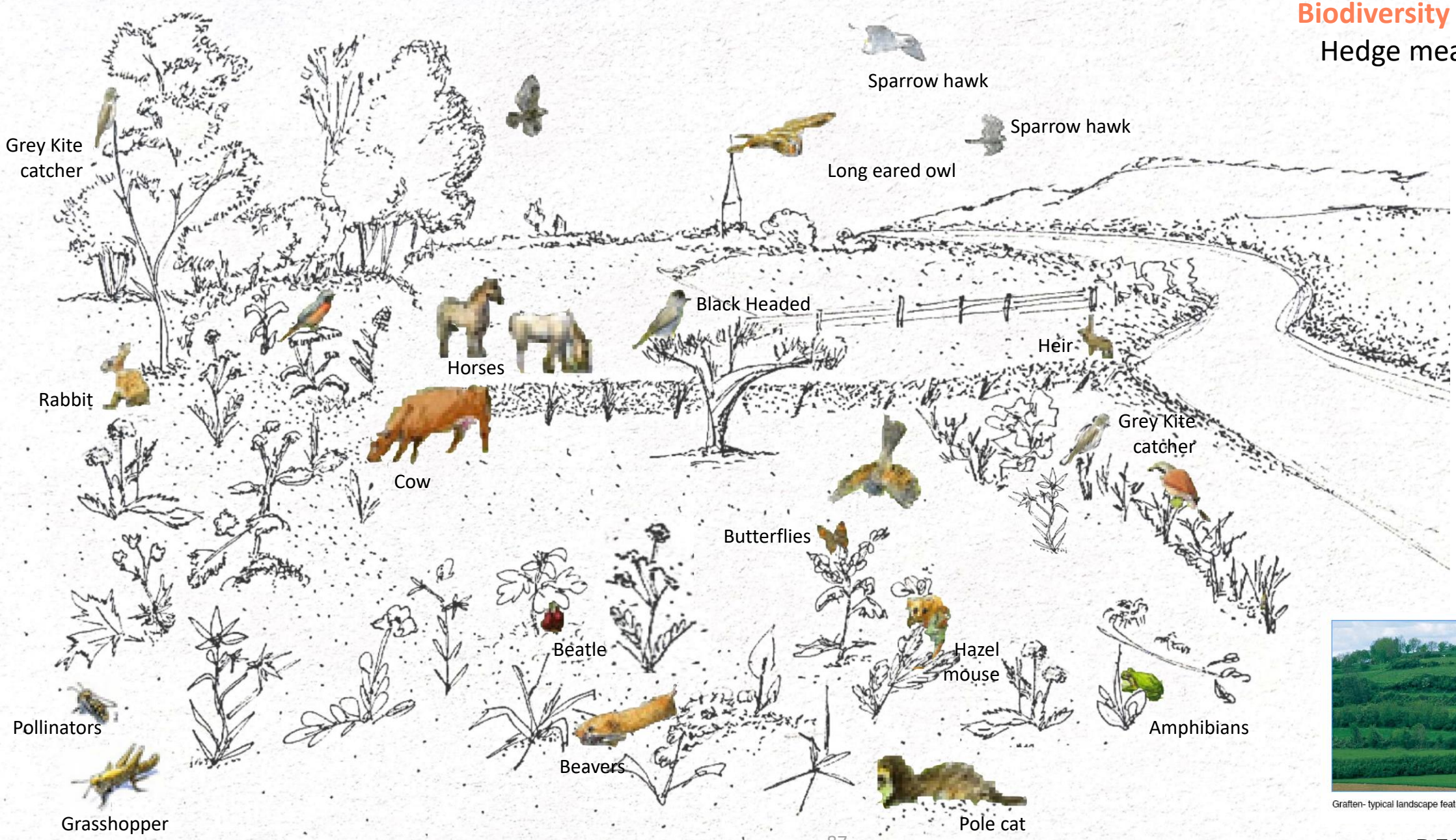
Forest patch to
absorb nutrients

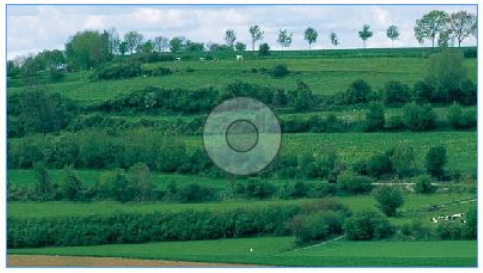
Graften
to reduce erosion

DESIGN PROPOSAL

Biodiversity in eco corridors

Hedge meadow landscape





Graften- typical landscape feature of this region


7

Introduction

Method

Analysis

Challenges and opportunities

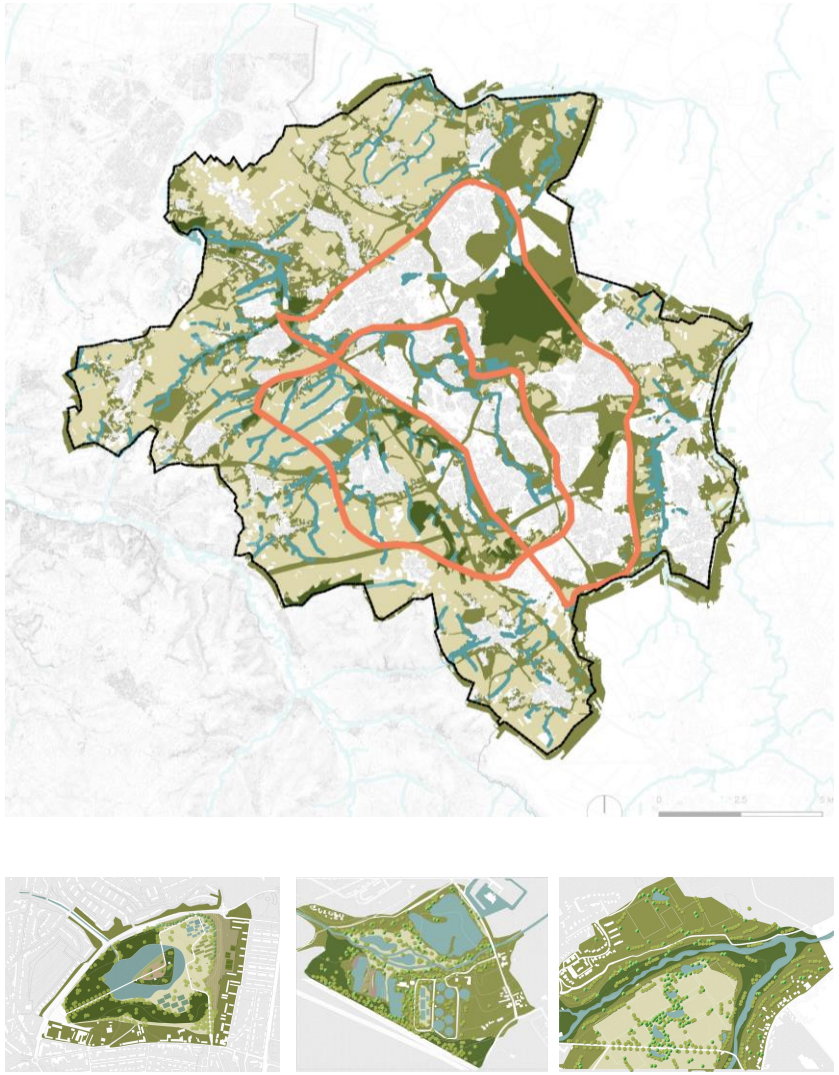
Design proposal

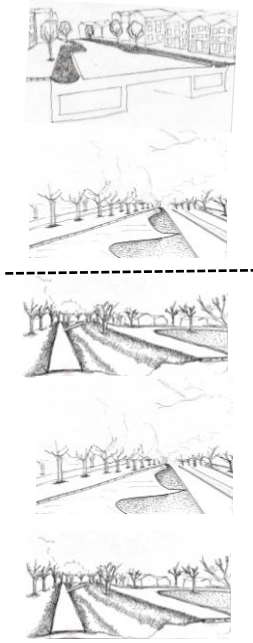
Conclusion

What are **circular design strategies** and spatial framework in the **degraded** and **fragmented** landscape to reduce water (mine, agriculture, wastewater) pollution in Parkstad?

Eco device

Swarm planning theory





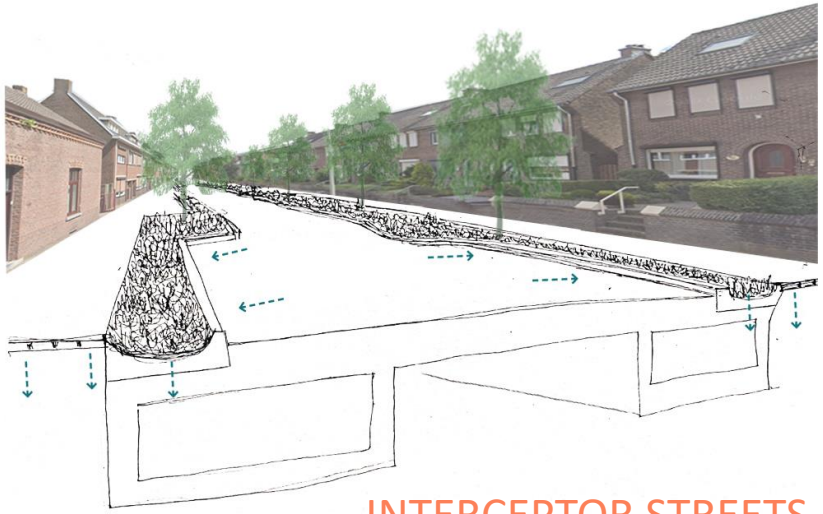
Operational landscape

Blue green network system

Socio-ecological balance

“Street is river of life”

-William(urban gorillas)

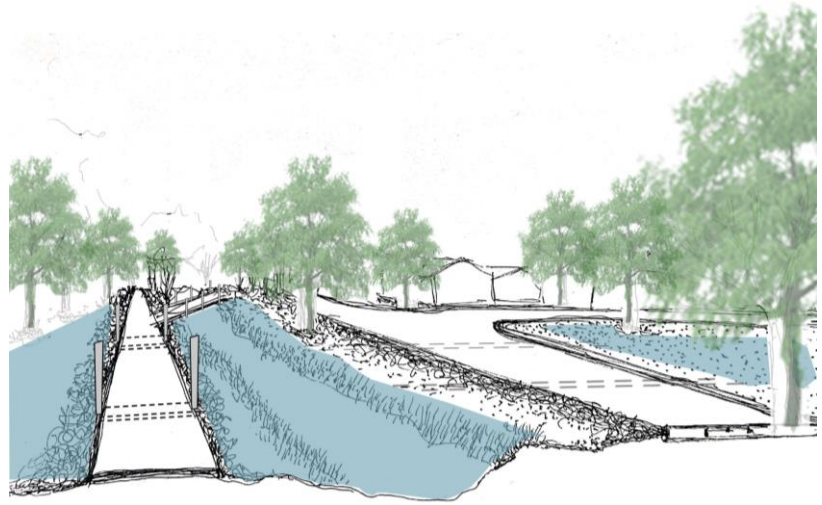


INTERCEPTOR STREETS

(reusing)

FILTER STRIPS

(purification)



FLOATING STREETS

(storing)

Mine water

Disconnected to the neighborhood

Mine Water pollution

Ecologically degraded

Hydrophilic park

Wastewater

Unplanned areas

Low ecology value

Wastewater treatment

Ecological pool

Agricultural water

Stream drying

Waste nutrients

Low productivity

Diverse agriculture

- Unplanned areas can create **multifunctional spaces** in urban and landscape fabric to cater sudden change and make the region adaptive.

- Green and blue structure creating a **network system** which acts as development of the region make it **resilient.**

Thank you for listening