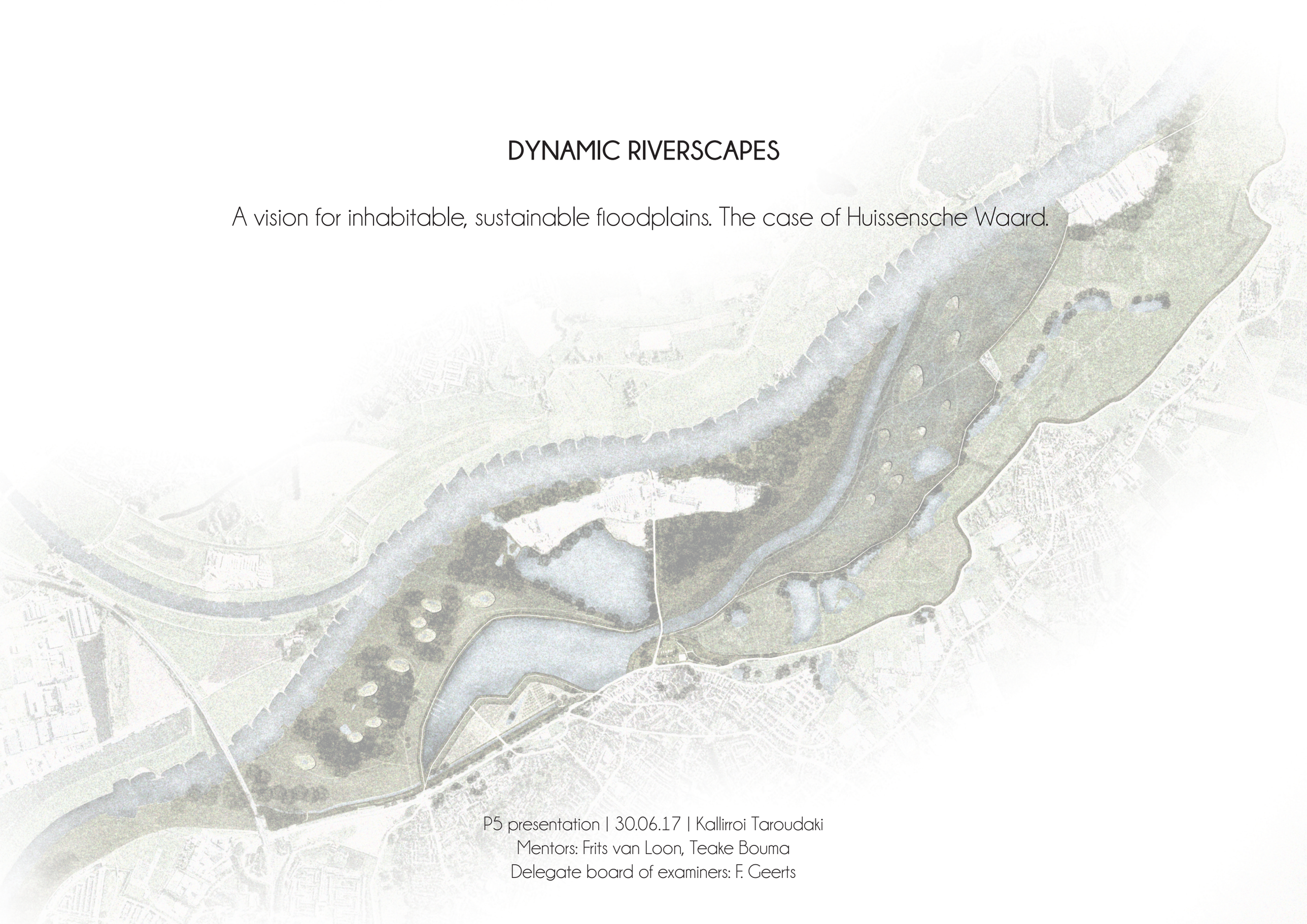
DYNAMIC RIVERSCAPES

A vision for inhabitable, sustainable floodplains. The case of Huissensche Waard.



P5 presentation | 30.06.17 | Kallirroi Taroudaki
Mentors: Frits van Loon, Teake Bouma
Delegate board of examiners: F. Geerts

Floodplains, Westervoort

Floodplains, Westervoort

Floodplains, Westervoort

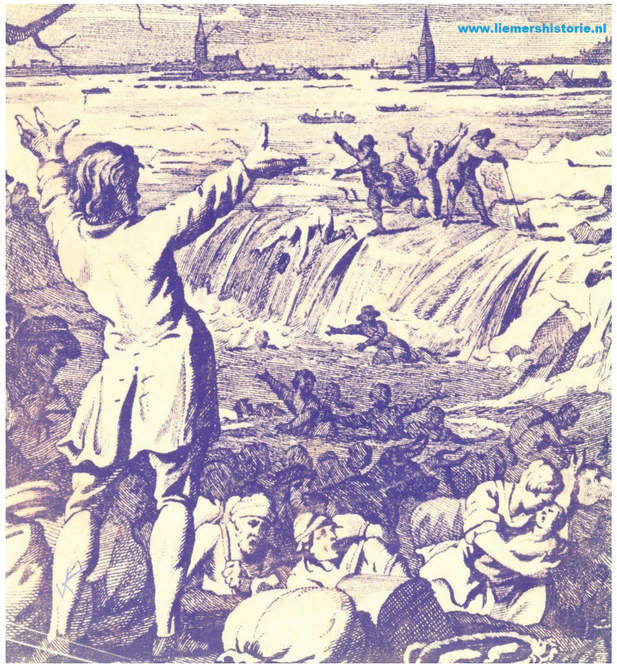
Proposal: living on the floodplains

Venice, Italy

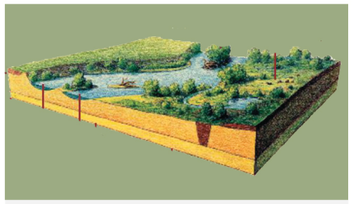
THE DUTCH RIVER LANDSCAPE

Water supply and distribution

Part of the Netherlands below sea level



TIMELINE - river and floodplain development



Earliest river inhabitants on elevated former rivers channels

Forest in floodplains

10th c.

12th-13th c.

Most of the forest on floodplains was gone

16th c.

Dike construction for reclaiming land

↓

Reduced water capacity in floodplains

↓

Dikes increase in height and number

19th c.

vicious circle

Agrarian spirit

Economic importance of area behind the dikes

Technological improvements, strategy resisting water

With summer dikes we have enhanced silting

Channels straightened (reduced width for shipping routes)

Pollution

Break in flood chain and species dissapeared

1953

Severe flood in Dutch coast - 1800 people lost their lives

Delta Plan

Slower river discharge from rivers to North Sea

Accumulation of sediments-

Need for higher river dikes

Today

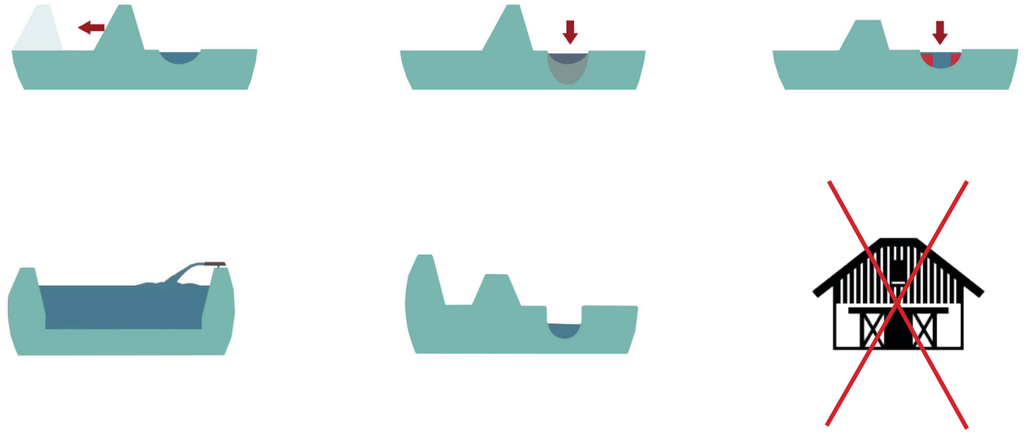
More space for rivers

Focus on natural development of floodplains

PLAN OOIEVAAR & ROOM FOR THE RIVER

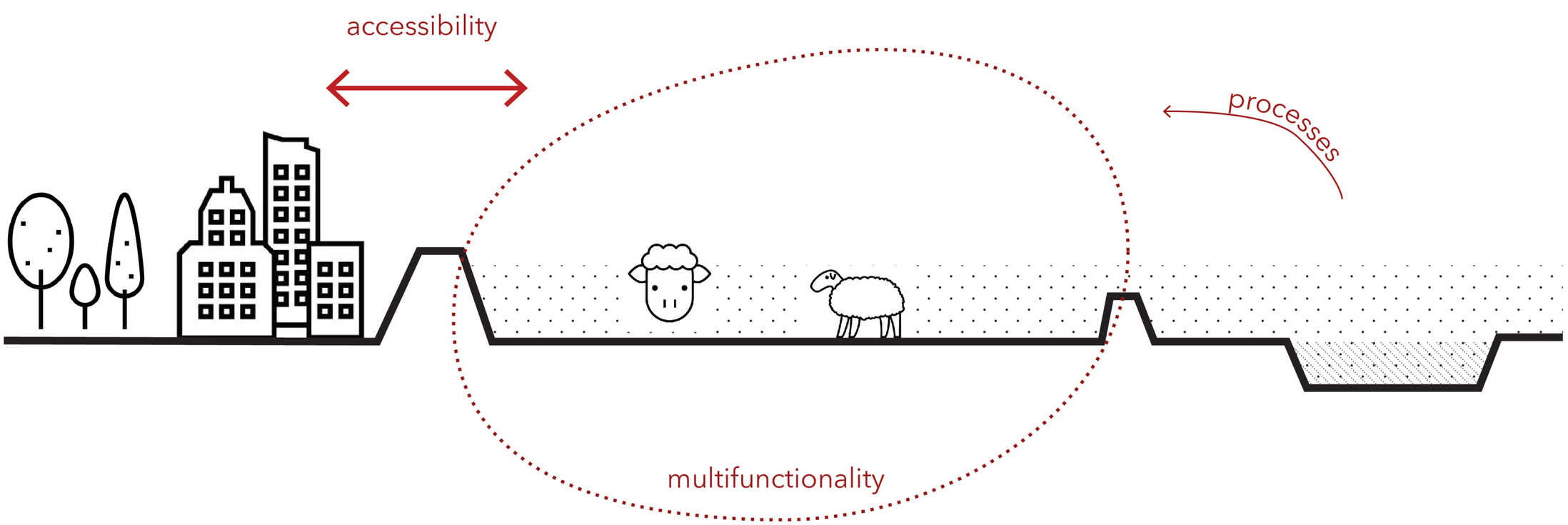
Plan Ooievaar (1987)

Room for the River (1996-today)



PROBLEM STATEMENT

Due to the flooding risk and the fighting of river dynamics, the floodplains are large monofunctional areas of **mainly (or only) agricultural use,** while housing and high vegetation are mostly restricted. The **dikes** of the Dutch defense system form **strong borders between the urban fabric and the river landscape**, allowing little to no interaction between them.



RESEARCH OBJECTIVE & QUESTIONS

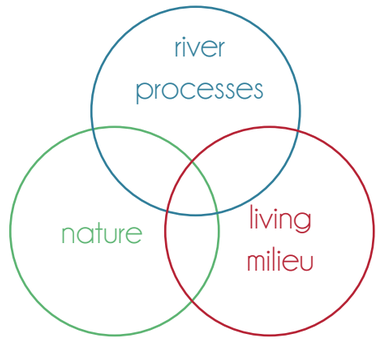
The objective of this project is to use the potentials of the natural river processes (inundation, sedimentation) as a condition for the creation of a multifunctional and sustainable landscape, focusing on a new living environment in the floodplains and allowing for more interaction between the two sides of the dike.

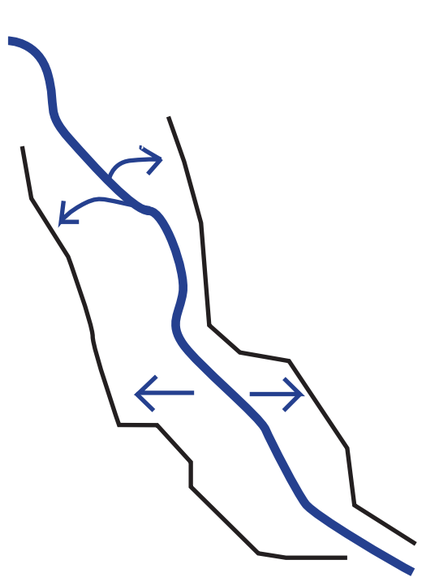
1. What are the potentials and restrictions of the special context of the floodplains and how has the current situation been formed?

2. What kind of mechanisms can be developed to utilize the potentials of natural processes in creating conditions for other functions?

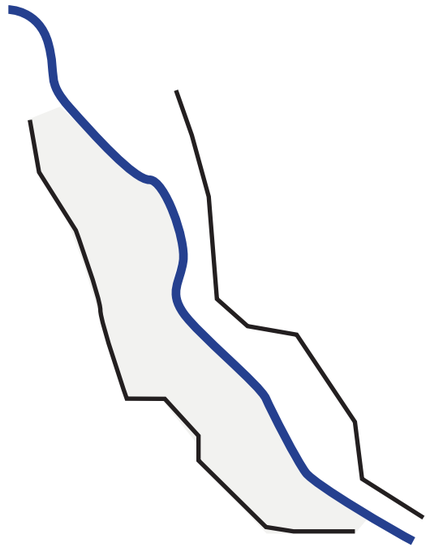
3. How can a new living environment be in balance with nature, natural processes and flooding, given the tension between processes and forms?

4. How is this interrelated mosaic beneficial in all scales, from local to regional?

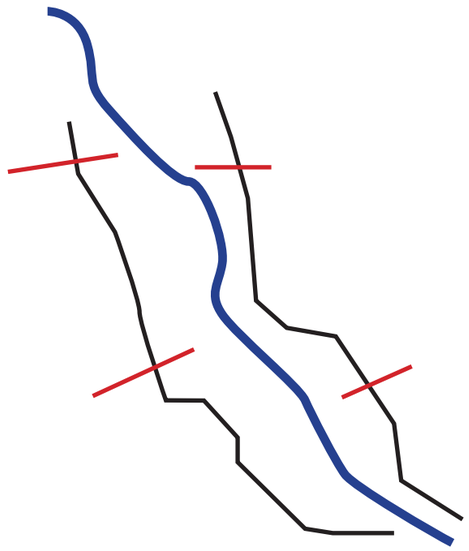




1. embrace processes- more space for water



2. multifunctionality - a new living environment



3. connect floodplains with urban fabric

RESEARCH OBJECTIVE

PROJECT AREA ANALYSIS

METHODOLOGICAL FRAMEWORK + PRINCIPLES

theory + design research

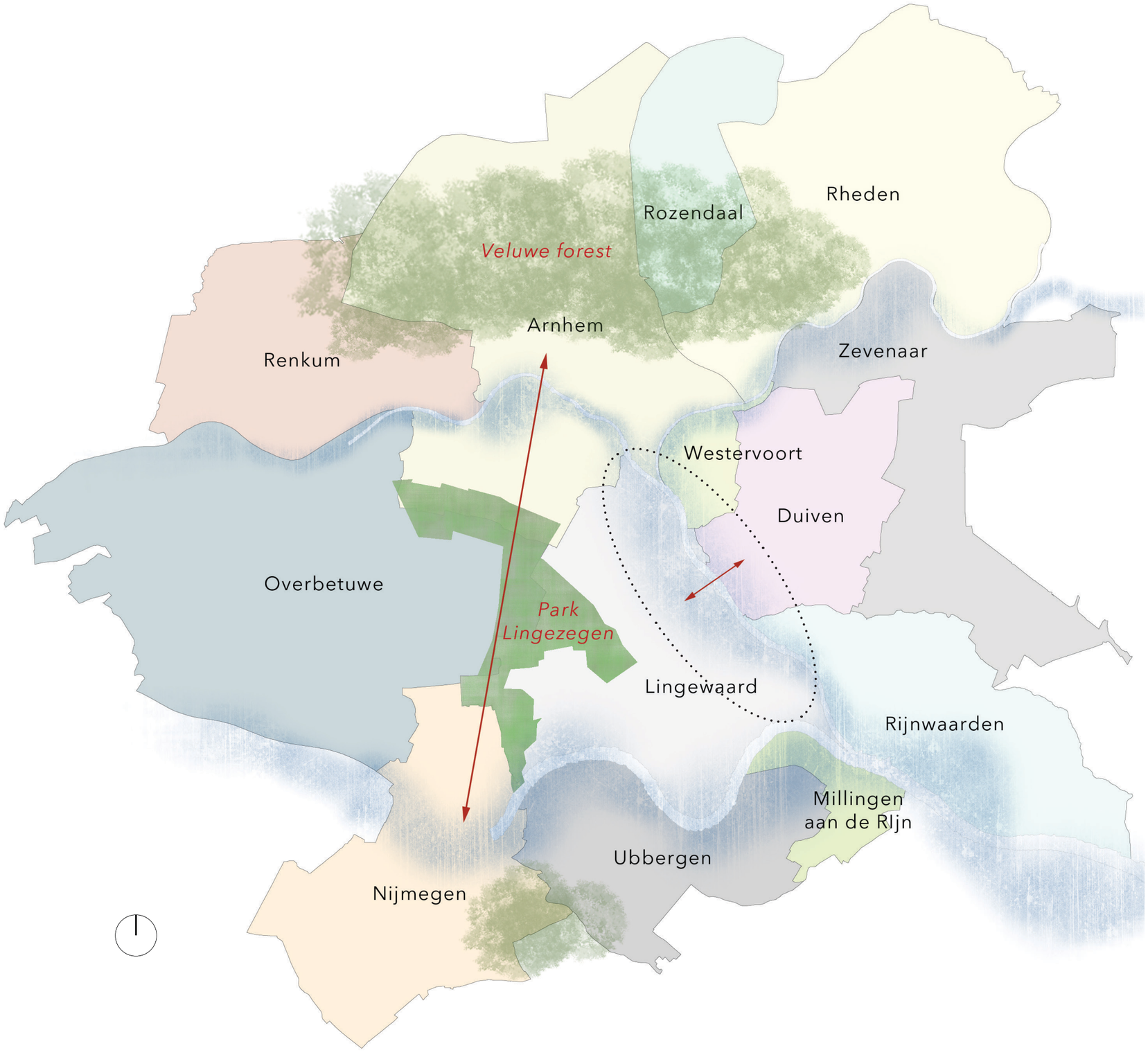
THE VISION FOR THE AREA

DESIGN PRINCIPLES + APPLICATION

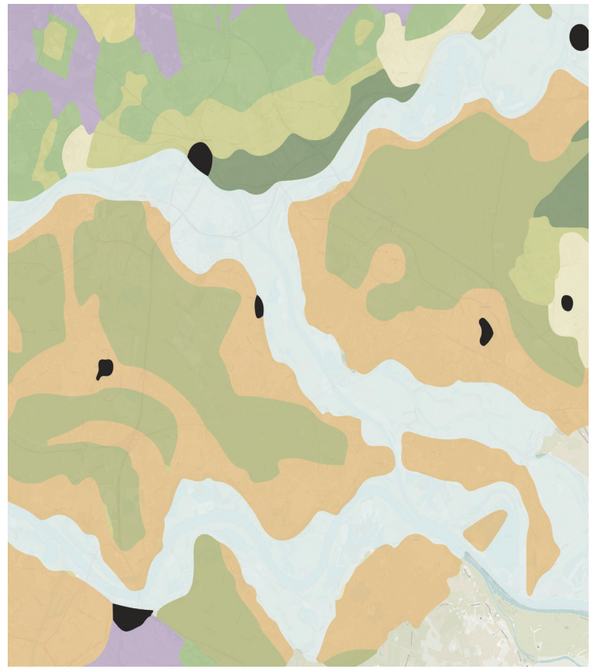
research by design

REFLECTION

PROJECT AREA

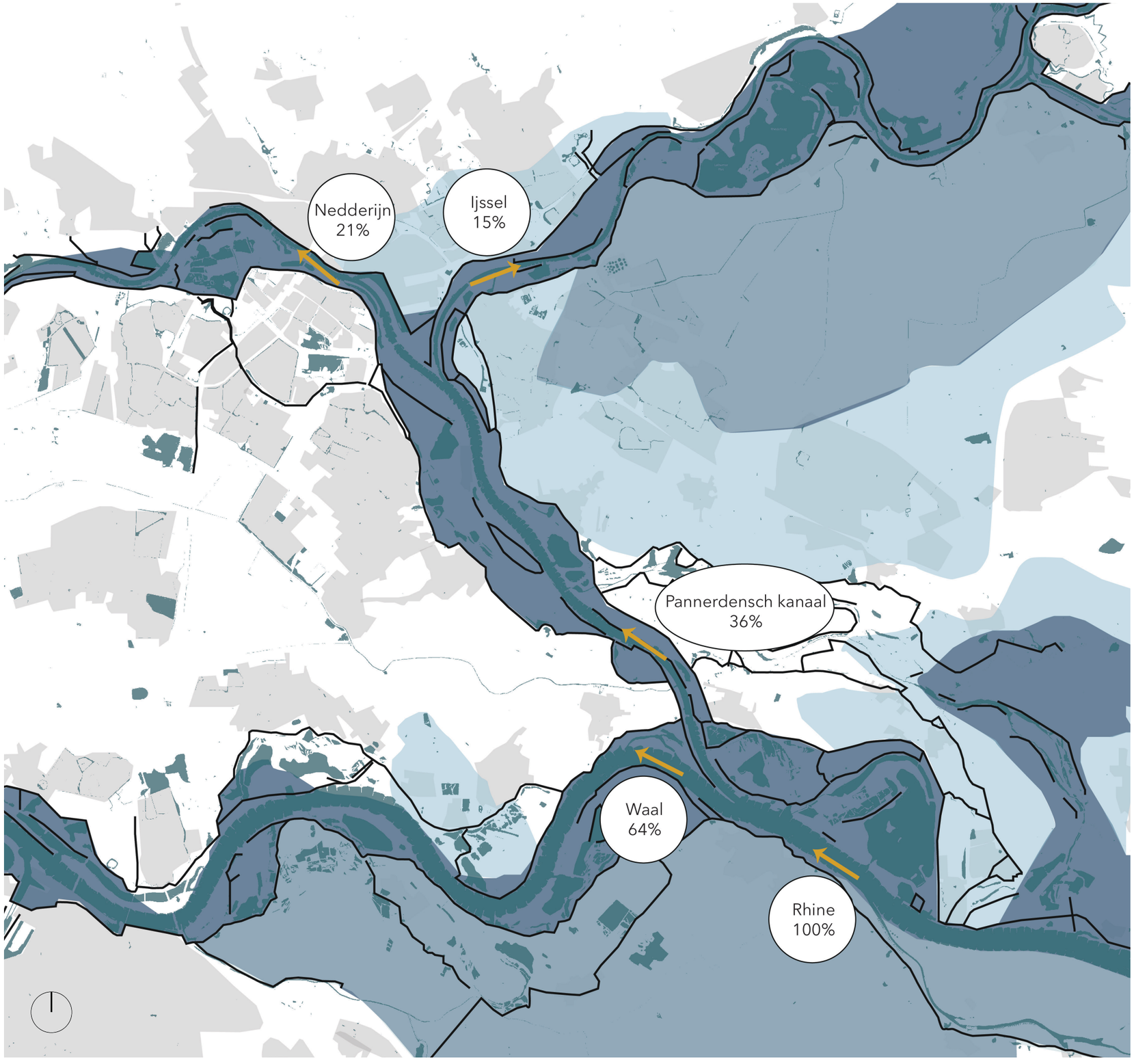


Landscape types - 1850

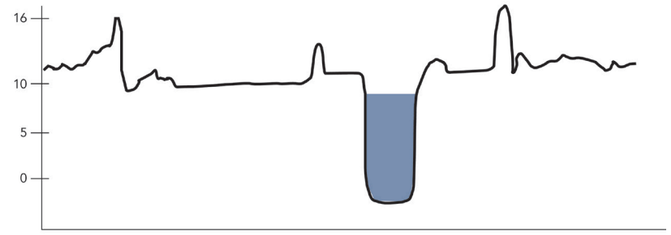


Landscape types - current

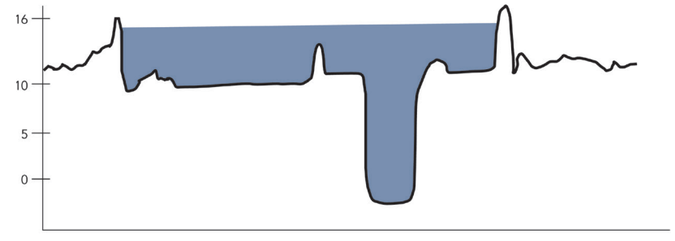
FLOODING AND WATER DISTRIBUTION



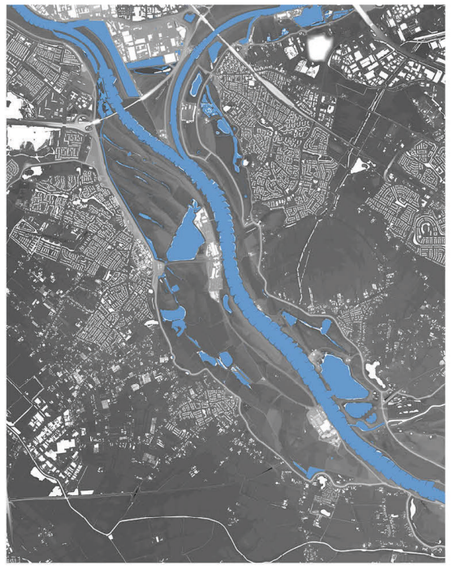
Average water level 8.5 +NAP



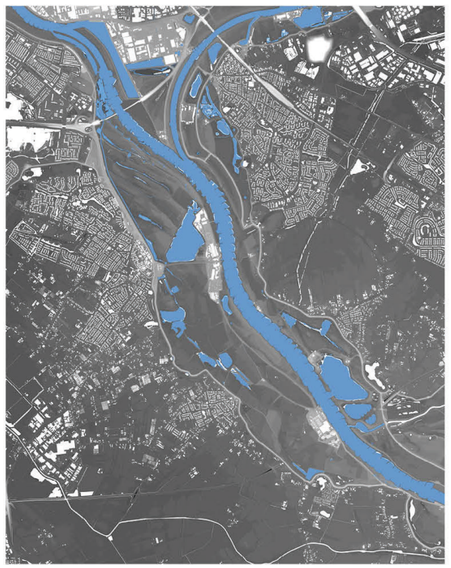
Maximum water level 14.73 +NAP



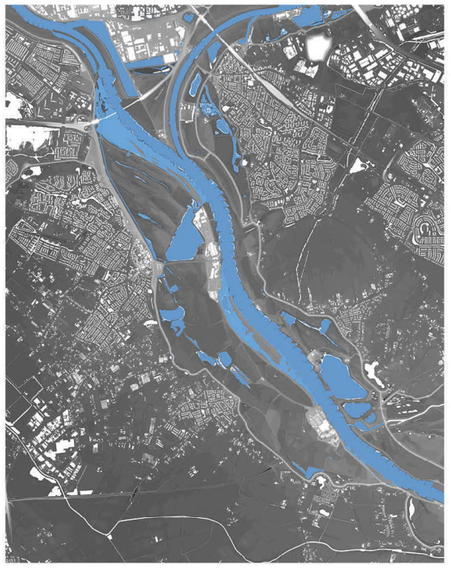
FLOODING AND WATER DISTRIBUTION



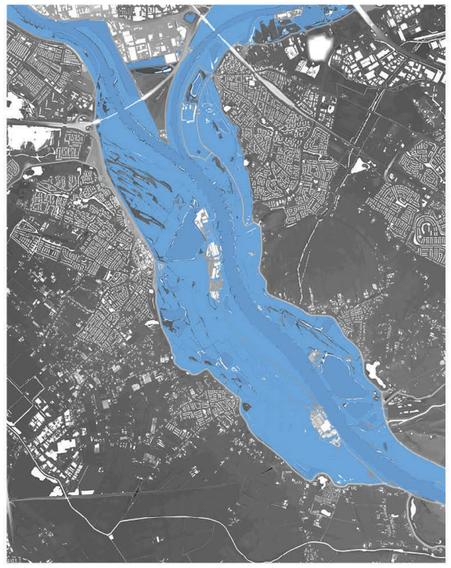
+8.11 NAP



+9.50 NAP

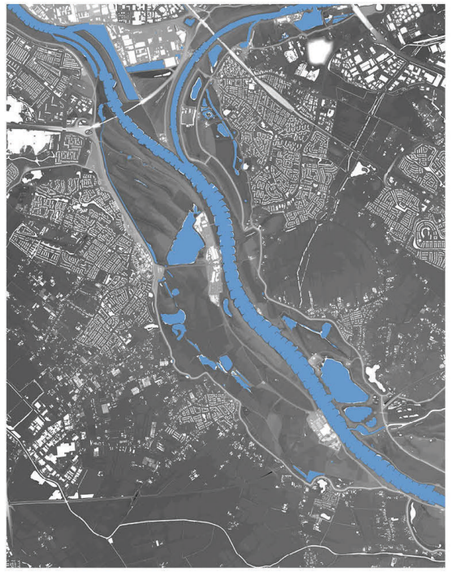


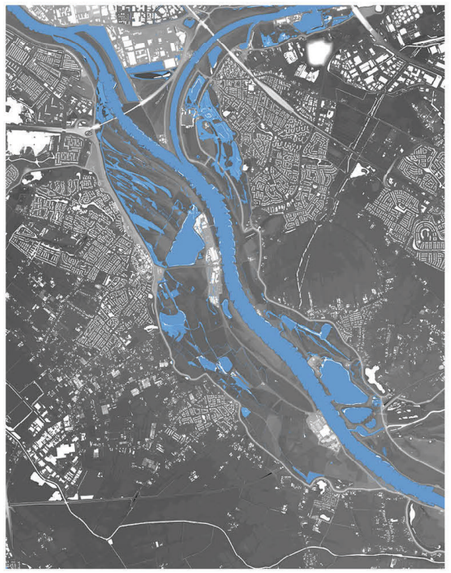
+11.27 NAP

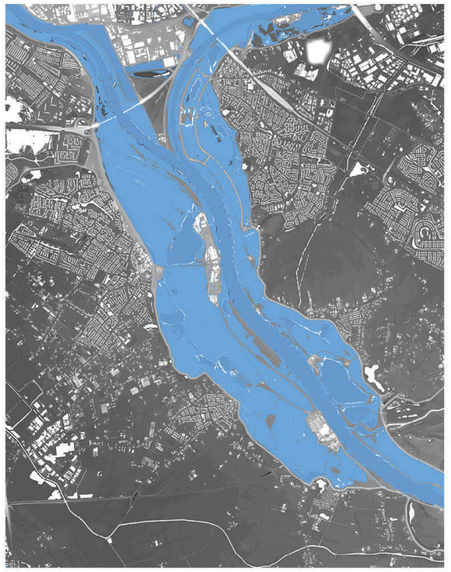


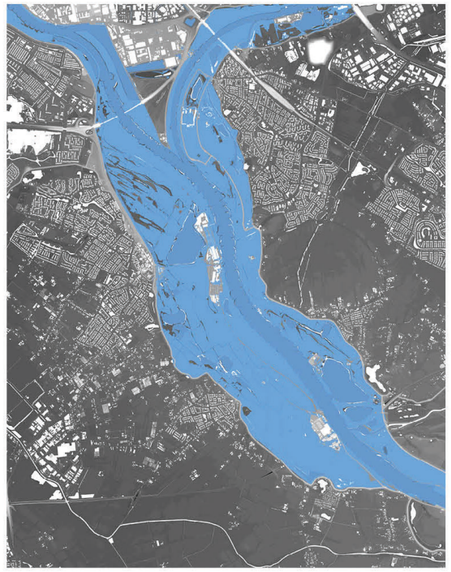
+13.91 NAP

Current situation with summer dike +13 NAP









Extreme situation without summer dike

90%

50%

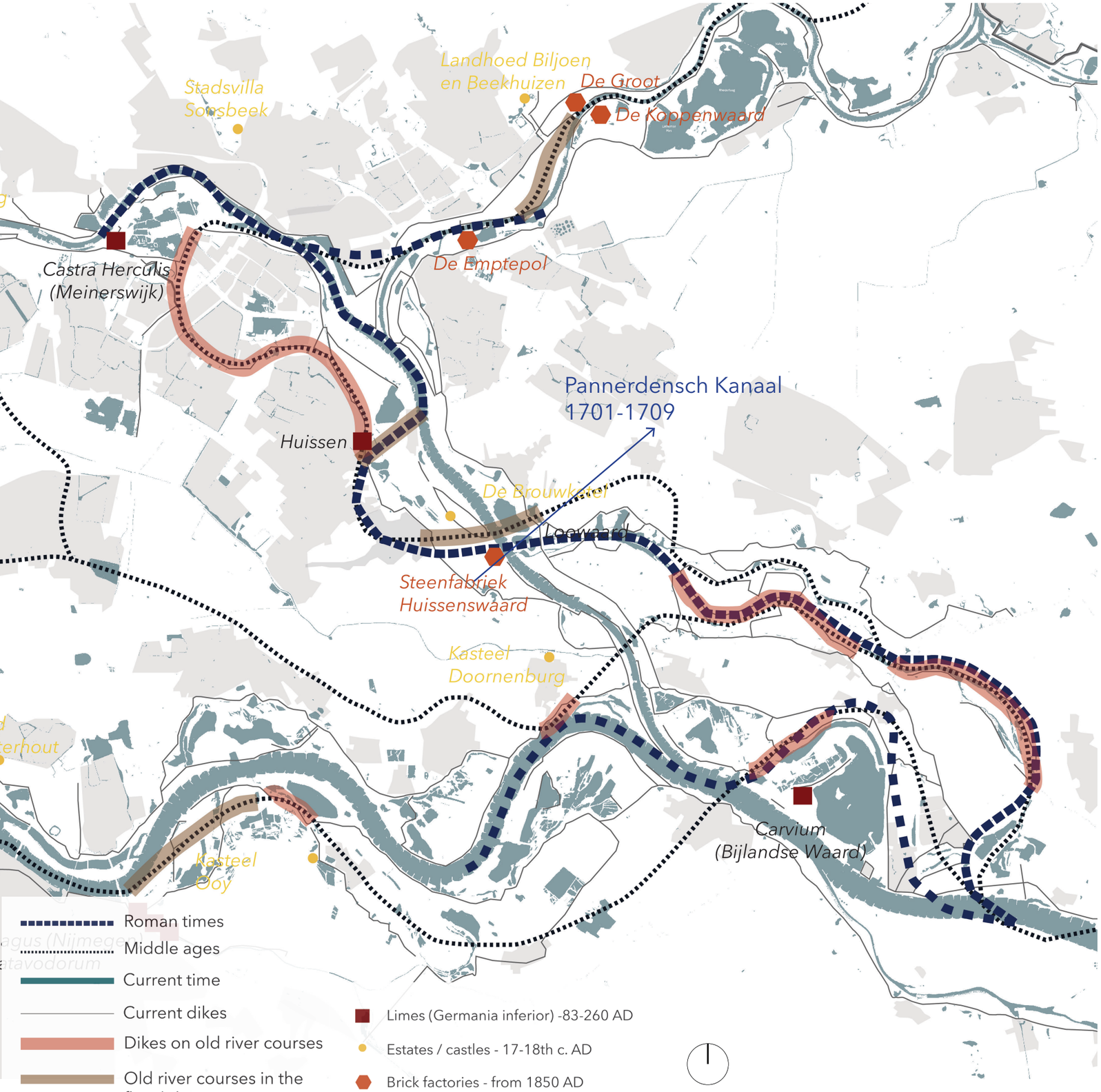
10%

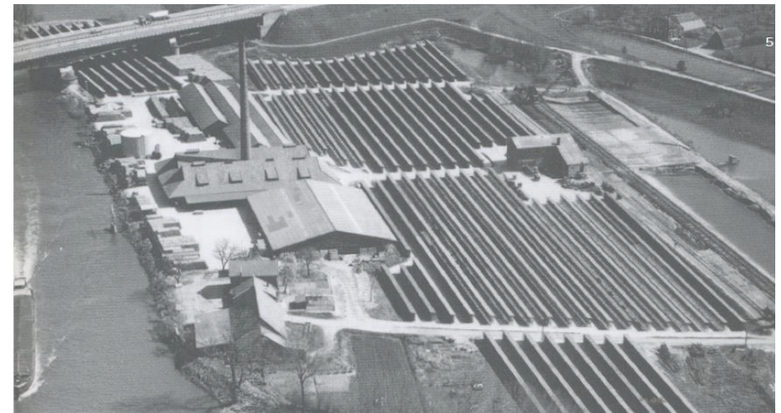
1%

% of time in a year

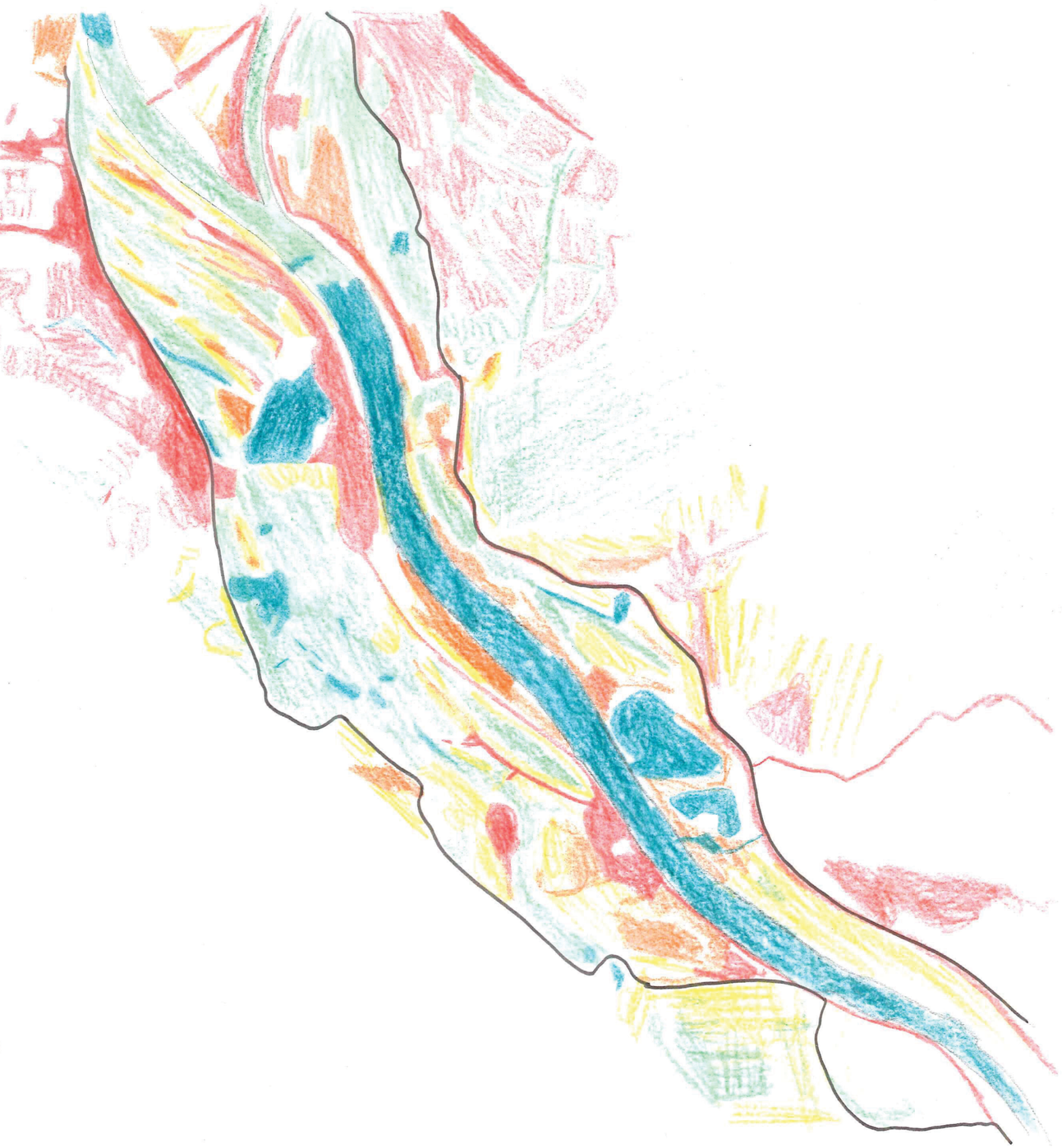
PALIMPSEST

Old river courses & cultural elements





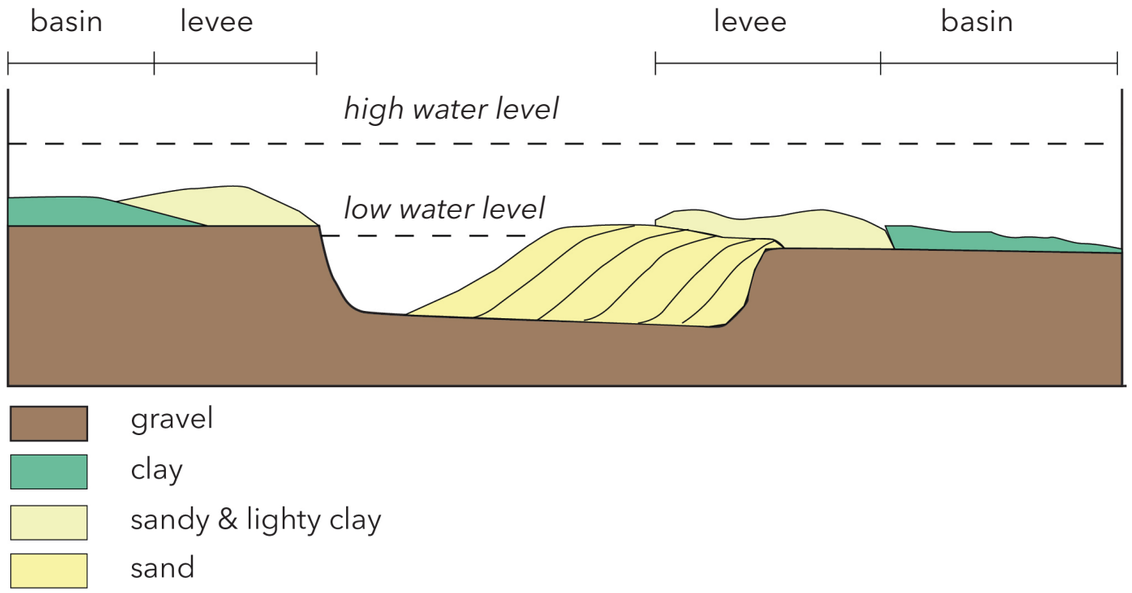
SEDIMENTATION



RHINE
2,5 million
tones of
sludge
(annualy)

RHINE
500.000 m3
of sand and
gravel
(annualy)

In the long term,
maintenance
of the sediments
will be important.



FLORA AND FAUNA

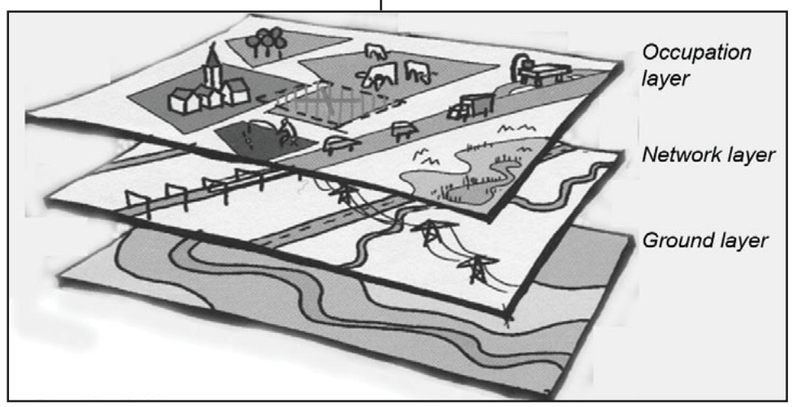
Flora value

- very high
- high
- medium
- low

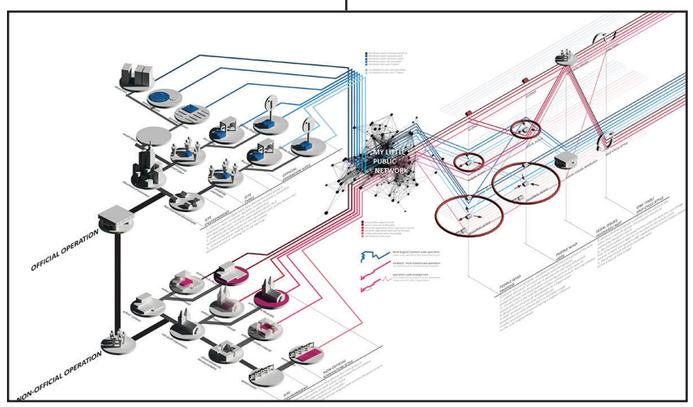
Existing and missing species

THEORETICAL BACKGROUND

landscape as a process



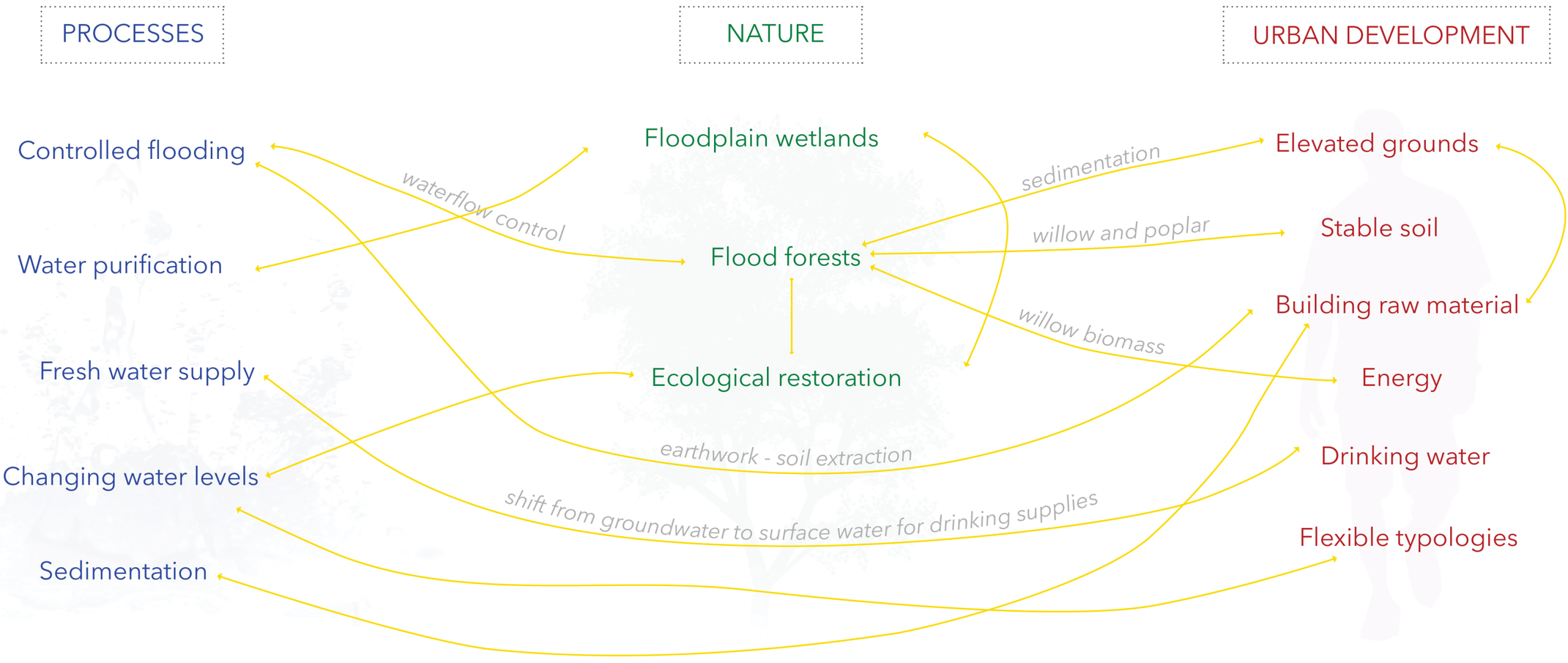
3 layer approach



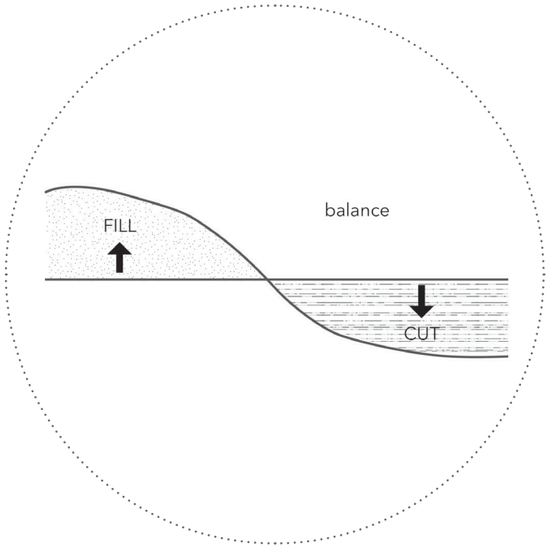
flow perspective

framework concept
(Casco model)

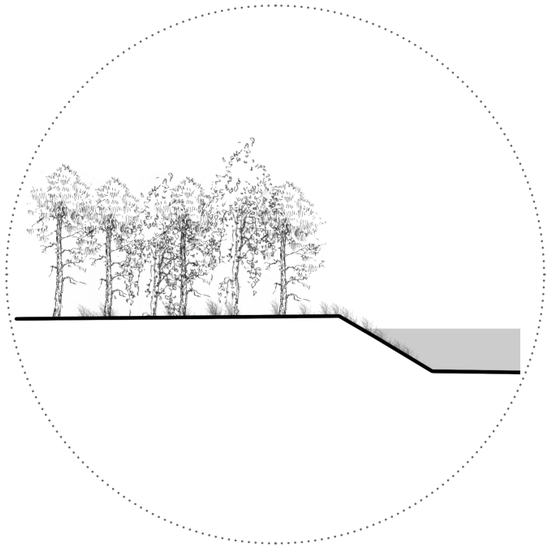
METHODOLOGY



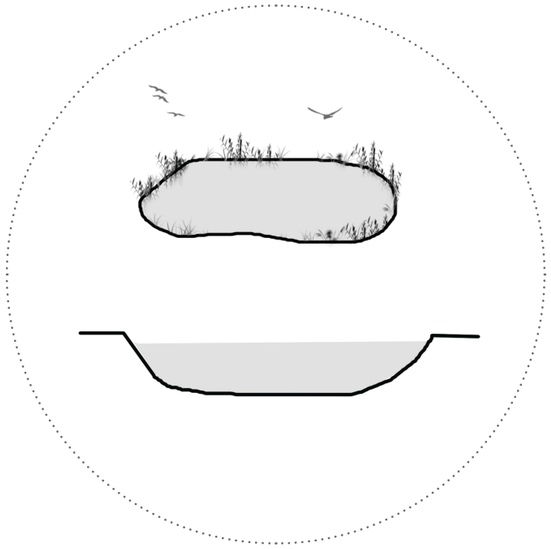
BASIC PRINCIPLES - large and small scale



cut and fill



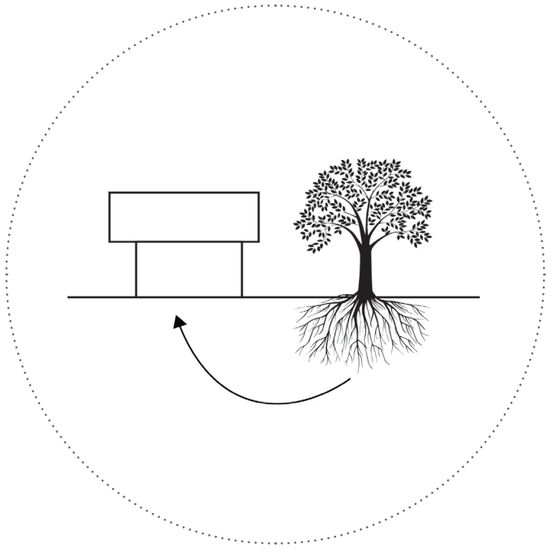
flood forest



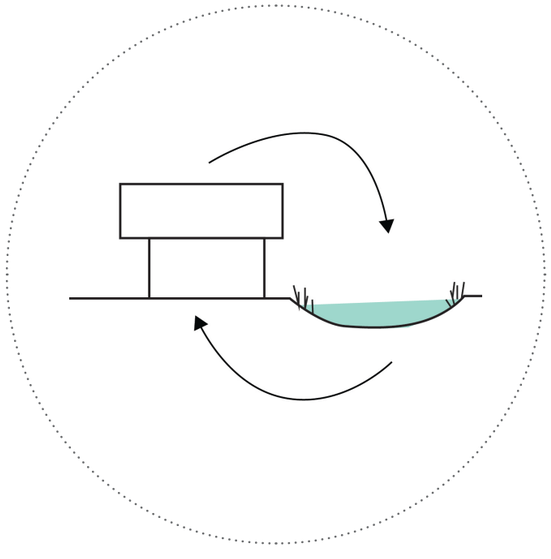
water functions

L

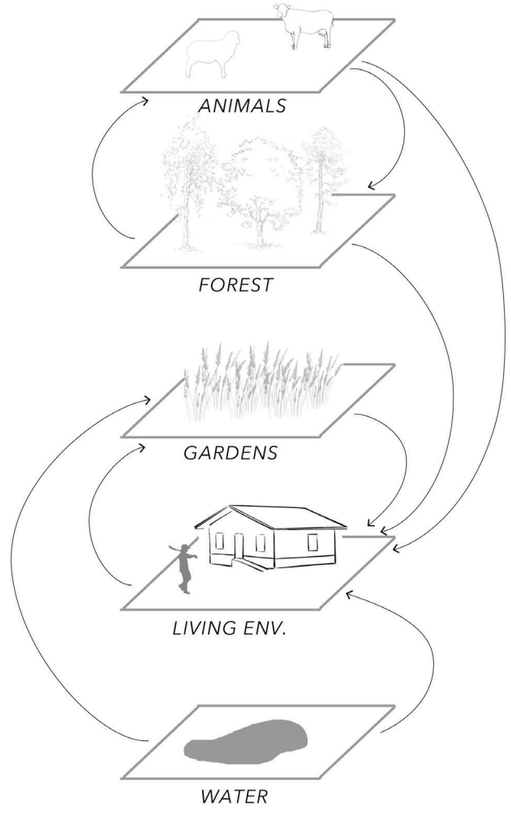
S



willow biomass
for energy

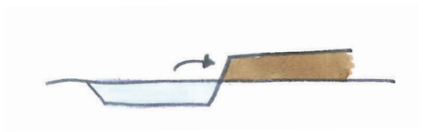


waste water purification
and reuse



MAIN MECHANISMS - STRATEGIES

1

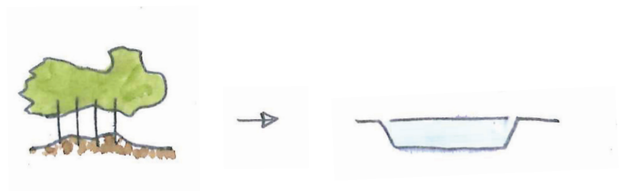


"Cut & fill" in close distances
(easier material transportation)

2

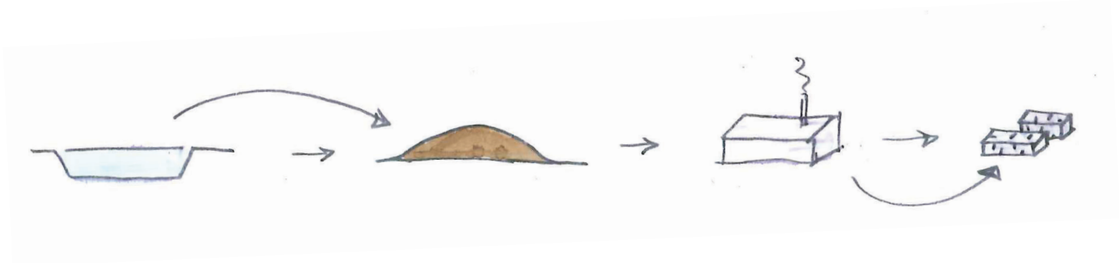
Plant forest for sediment
gain and higher grounds

3



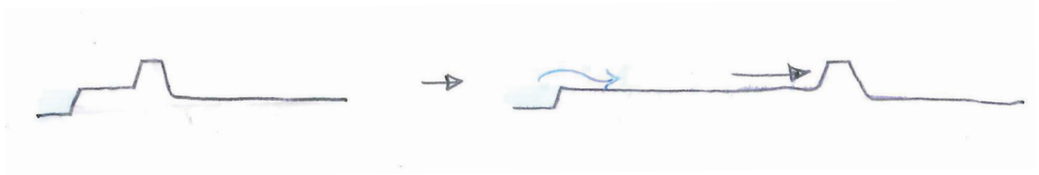
Compensation for flood forest water flow
resistance through water elements

4

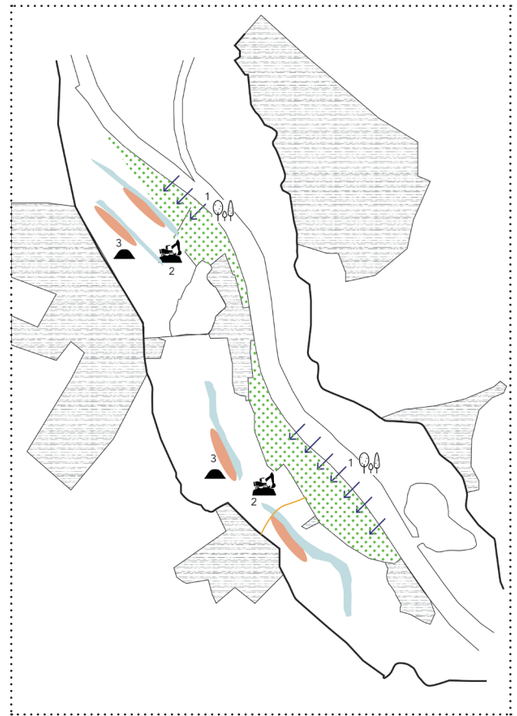


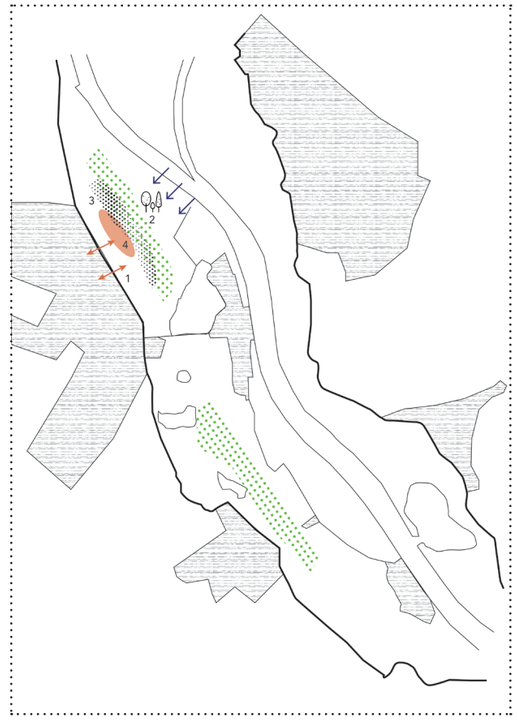
Produce building material using
local clay as raw material

5



Facilitate processes by
enhancing river dynamics





SITE ANALYSIS

17,615 inhabitants

- urban environment behind the dike
- agriculture inside
- stronger contrast between two sides

HUISSEN

Immerloo park

ditch

openness

distance

Zwanewater

Loveer industry

Grote Bloem

lake network

restricted space

Brouwketel

ANGEREN

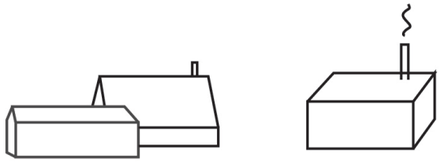
Stenfabriek Huissensewaard

2851 inhabitants

- agricultural environment behind the dike
- natural / cultural values inside

READING THE LANDSCAPE

[+]



Cultural elements

Water elements

Soil quality - suitable for crops

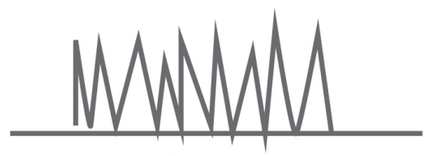
Temporary water levels

[-]

Flatness

Levels

Static

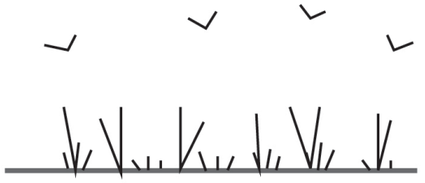


Dynamic

Nothing pops out

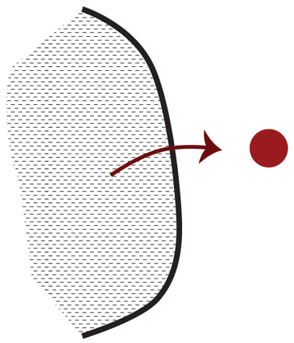
Landmarks

Low ecological value

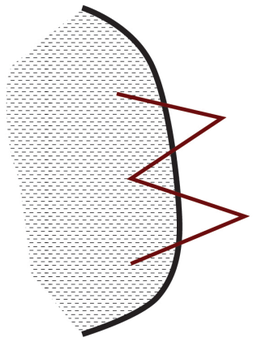


Ecological restoration

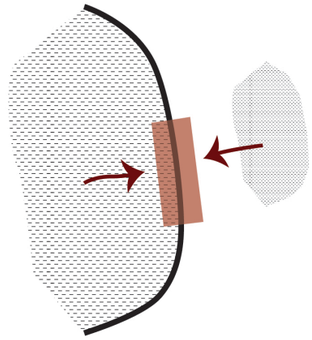
PRINCIPLES ON ACHIEVING THE CONNECTION



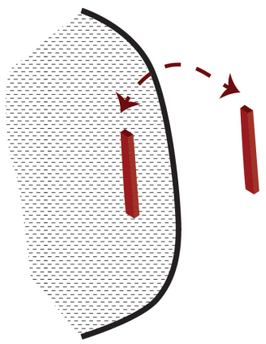
Function in floodplains refering to urban fabric



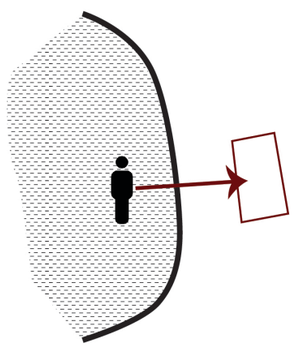
Enhance accessibility



Make dike the connection (buffer zone) with functions refering to both sides



Visual relation (vistas, landmarks)

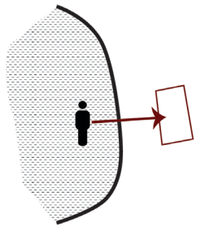


Relation through land ownership (maintenance, responsibility)

MAIN USER GROUPS AND FUNCTIONS

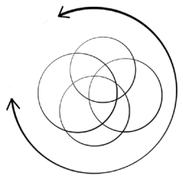
LOCALS

gardens

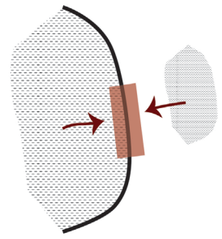


NEW RESIDENTS

new living mounds

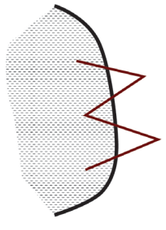


new centre



VISITORS

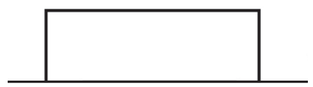
accessibility



What is the vision for the area?

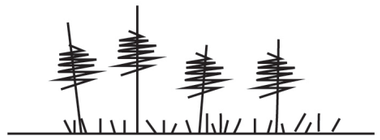
THE VISION FOR THE AREA

1



New housing units

2



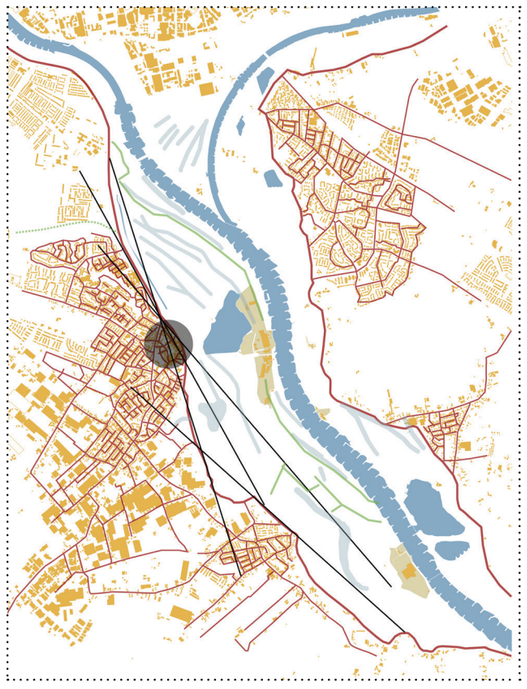
Huissen Gardens

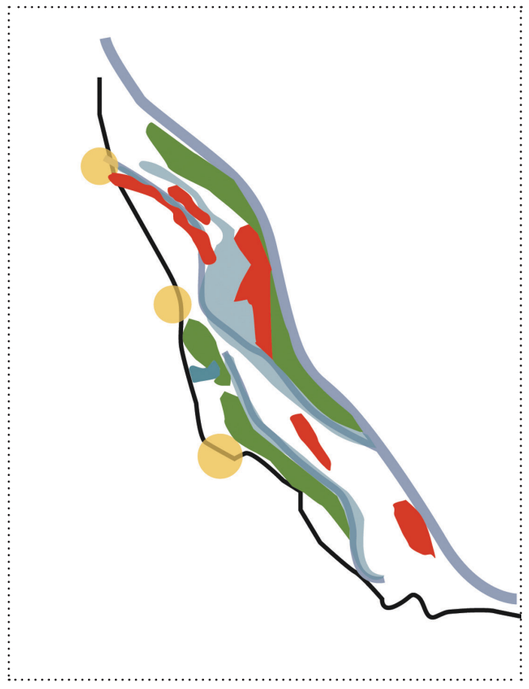
3

New reference point
on existing mound

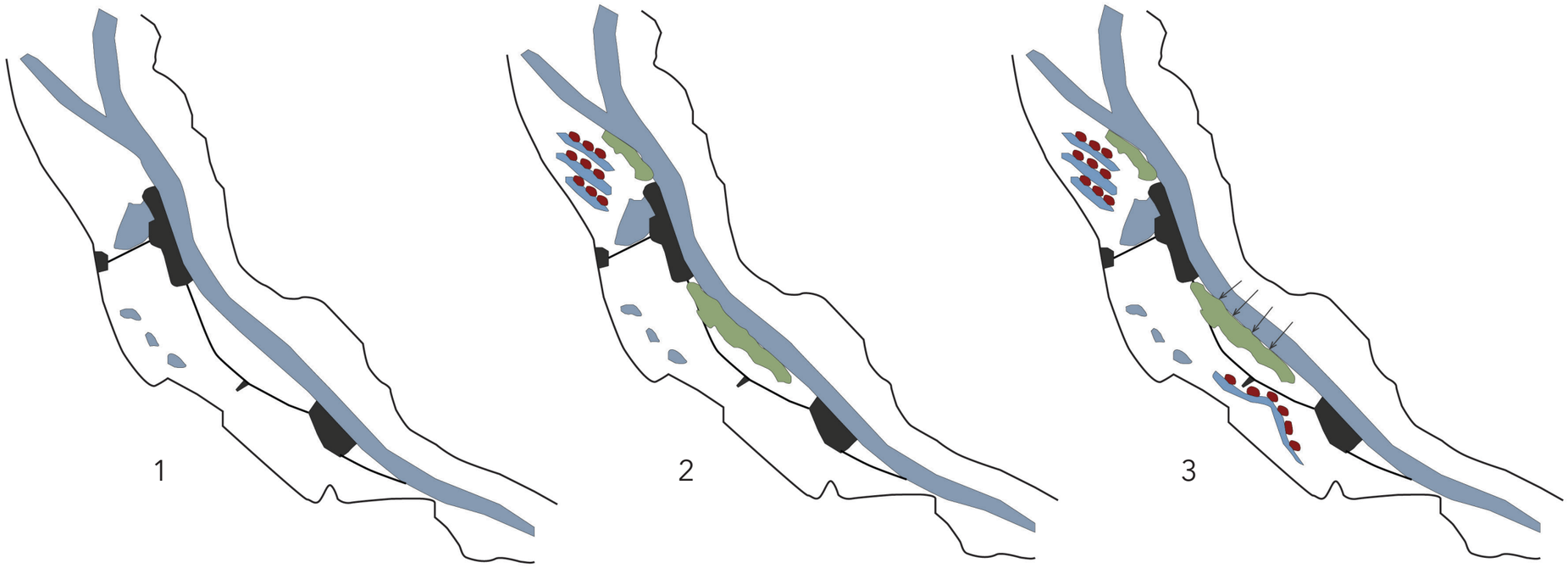
4

Enhance river dynamics





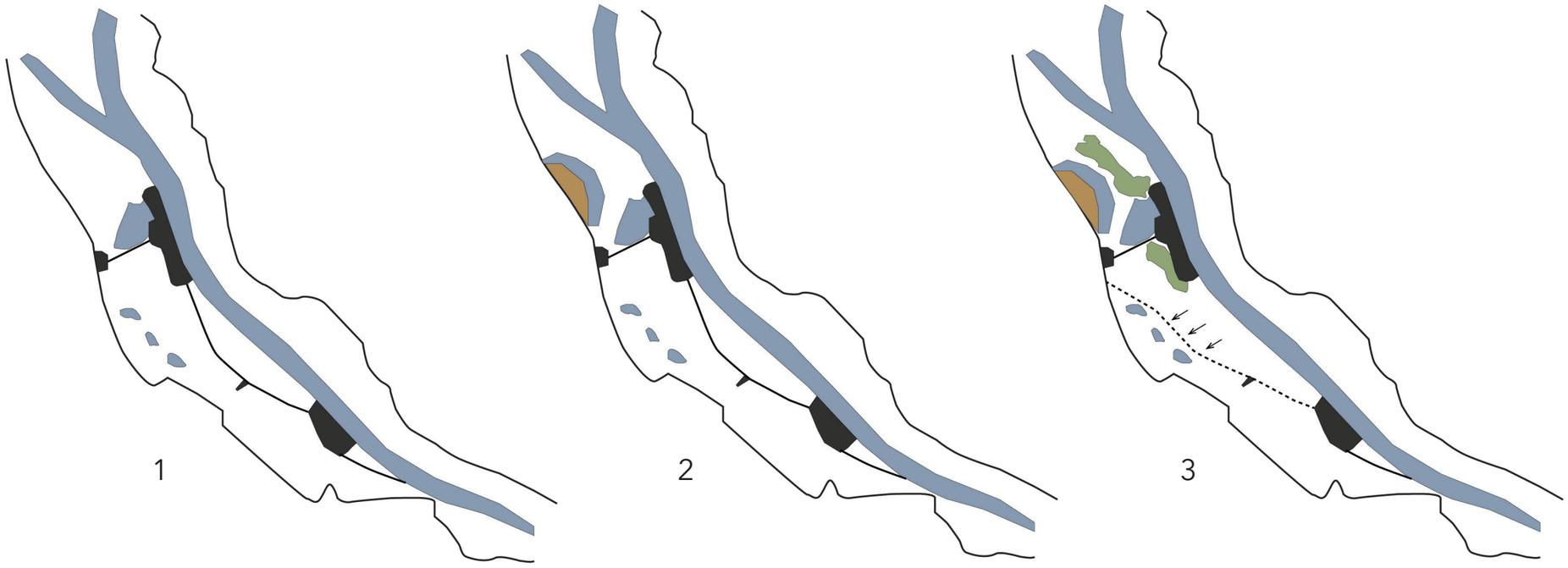
STORYLINE 1 Build new housing units

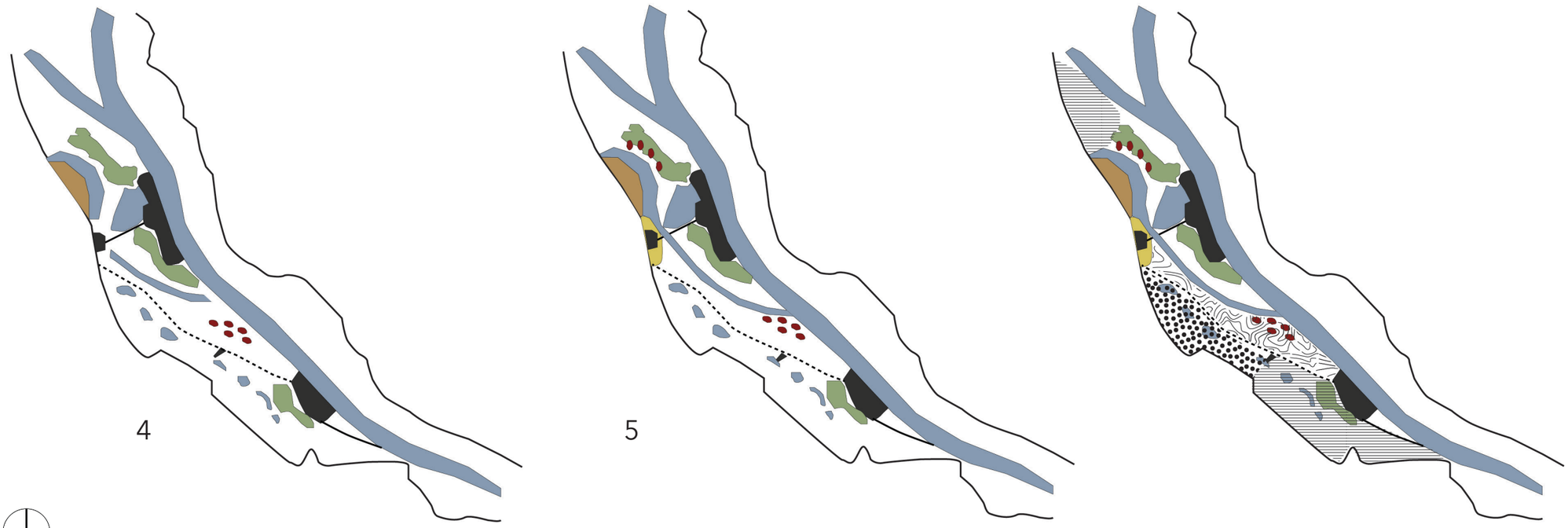


1

research
by
design

STORYLINE 2 Create new Huissen gardens

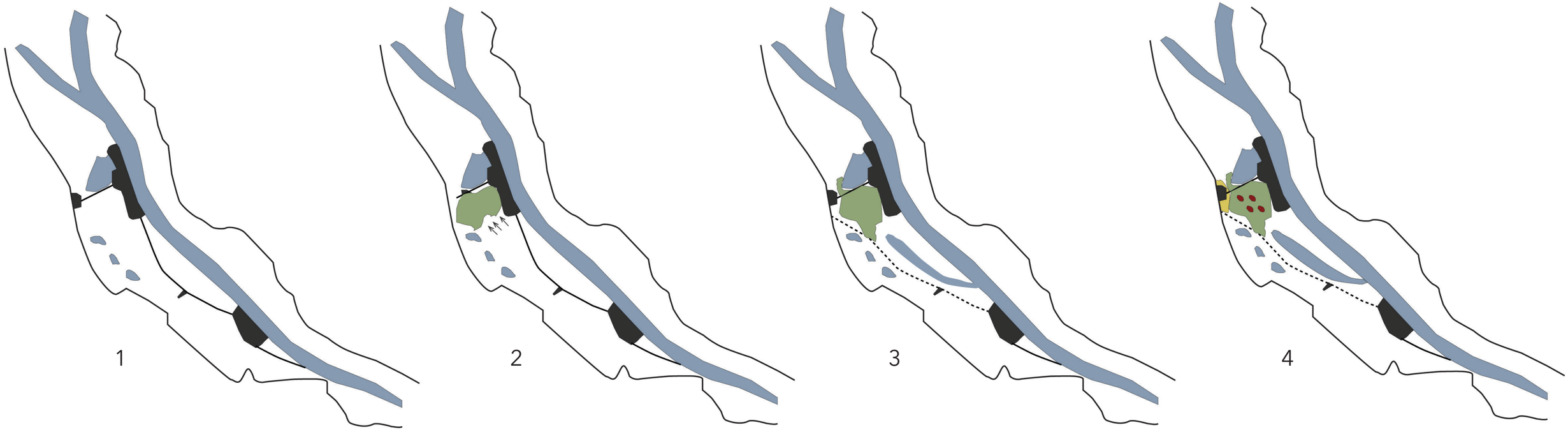


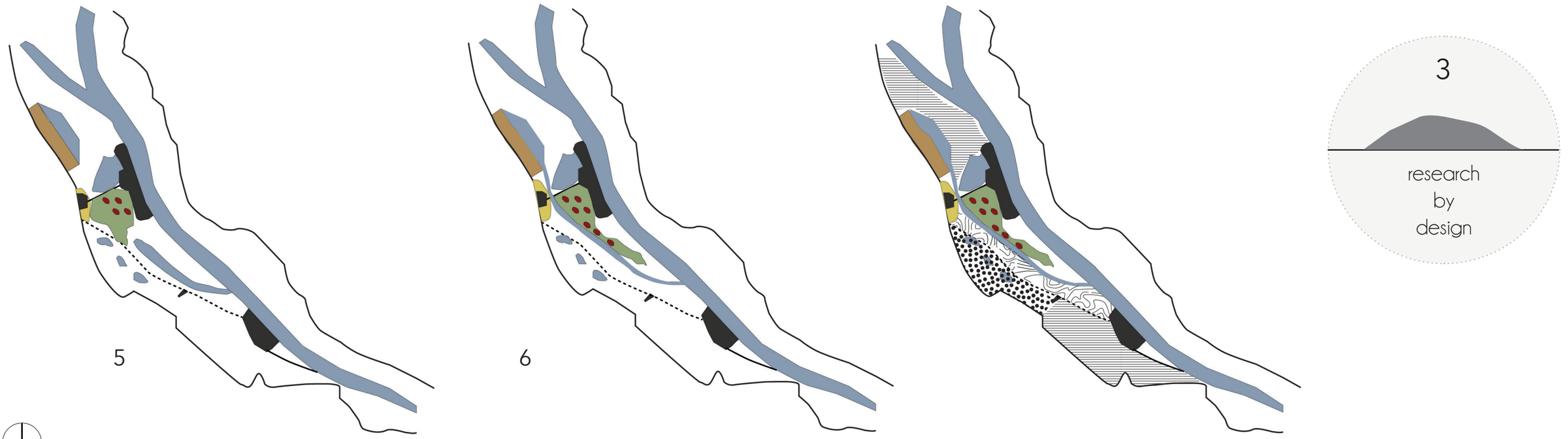


2

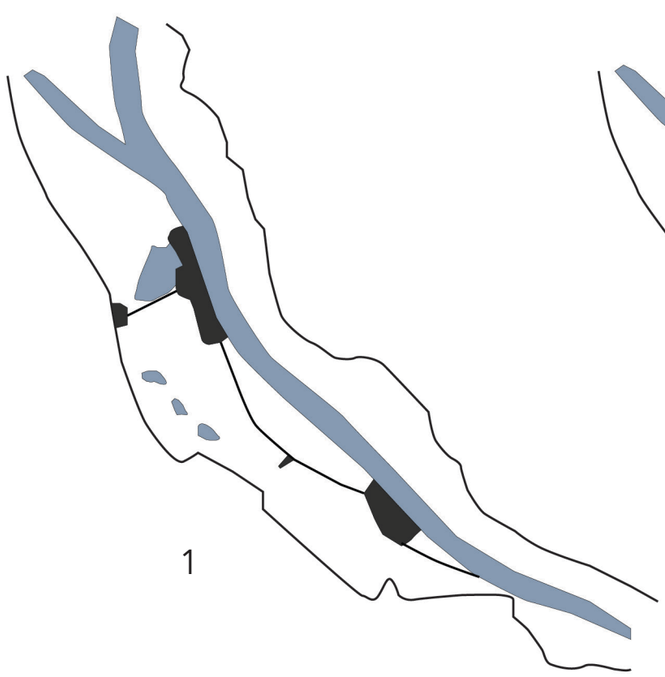
research
by
design

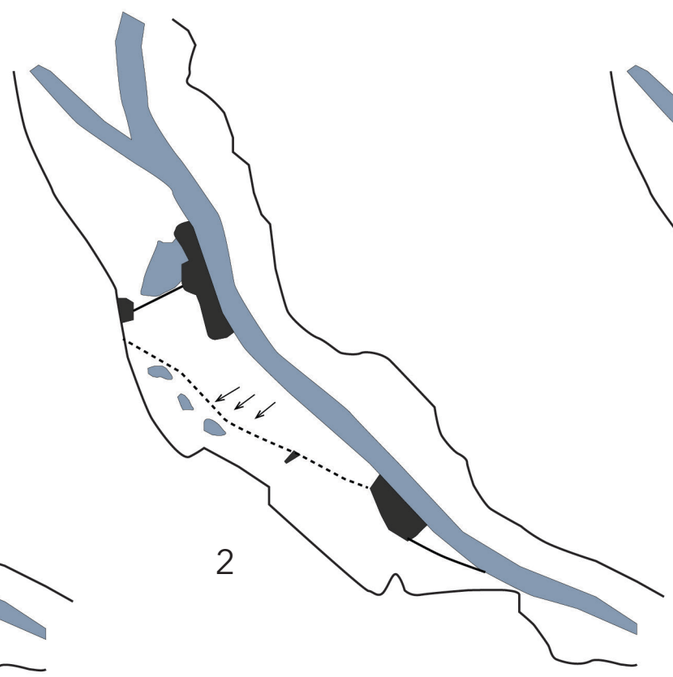
STORYLINE 3 Create new centre on existing mound

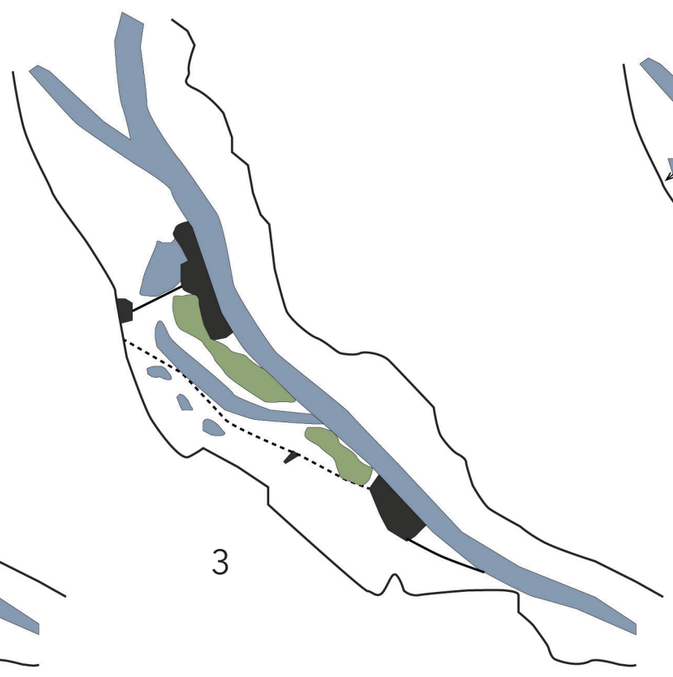


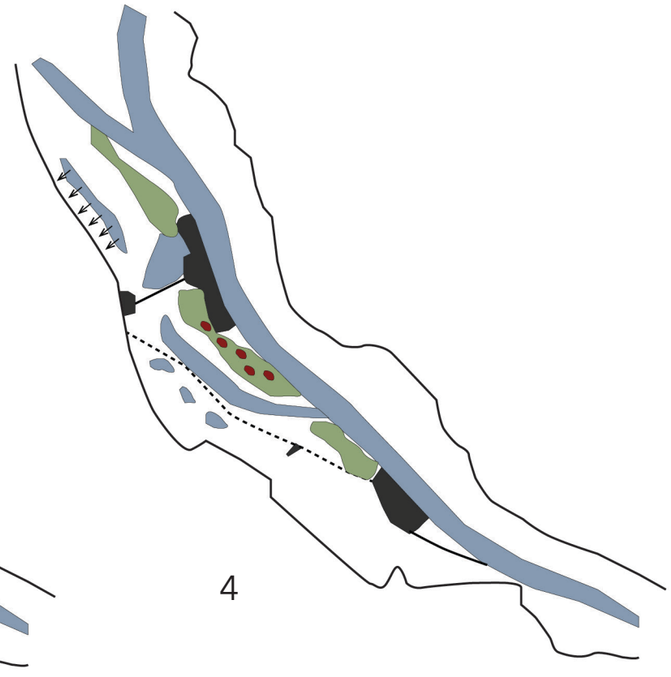


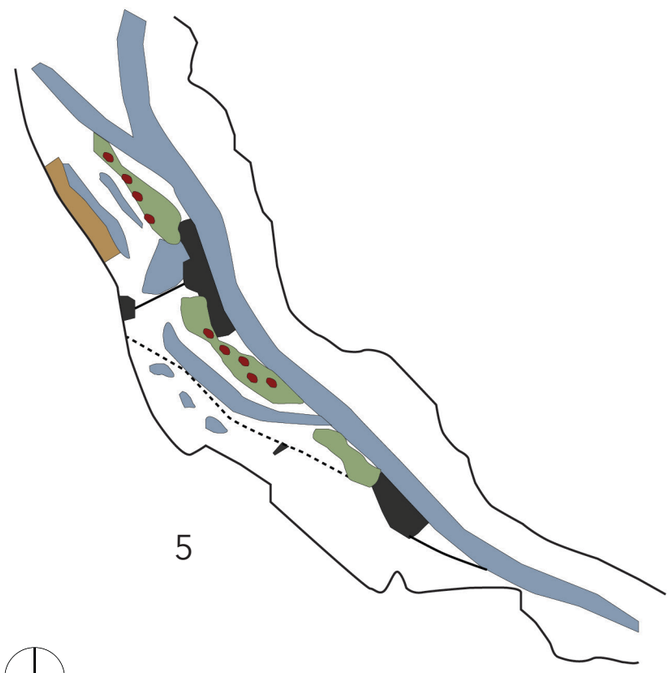
STORYLINE 4 Enhance river dynamics

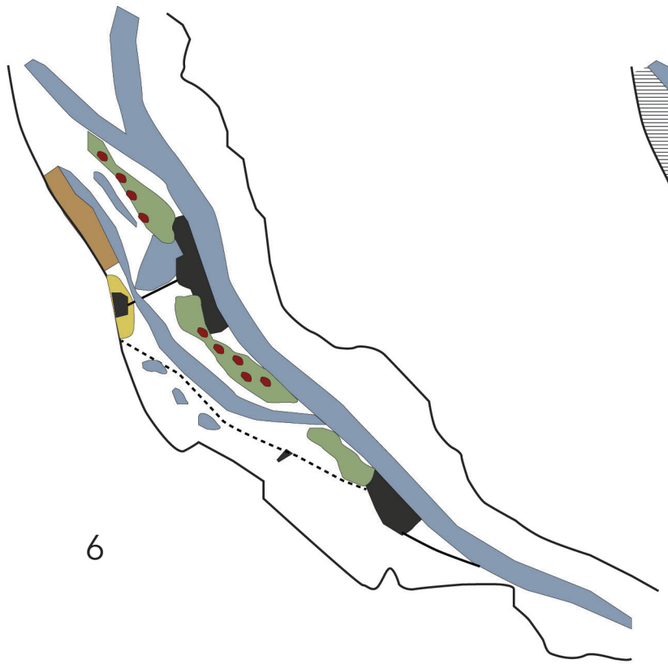


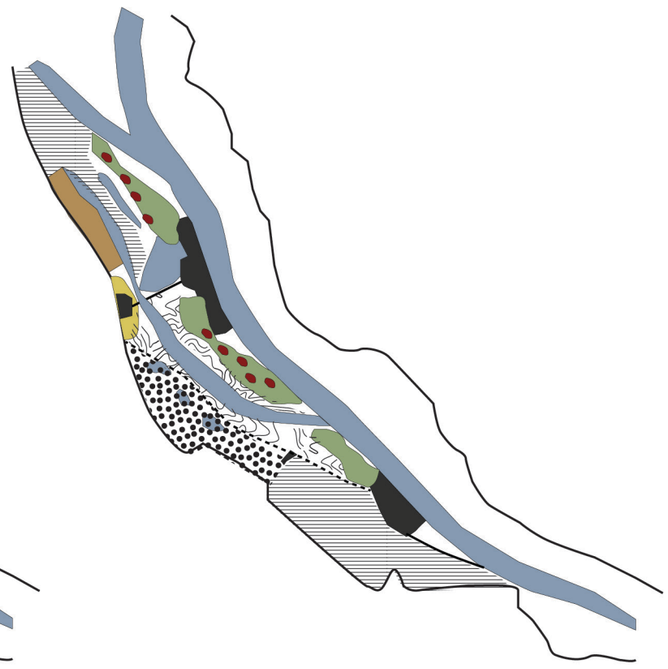




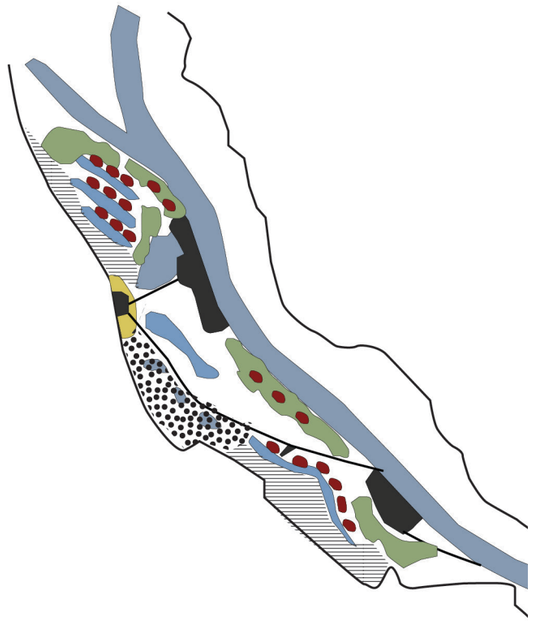




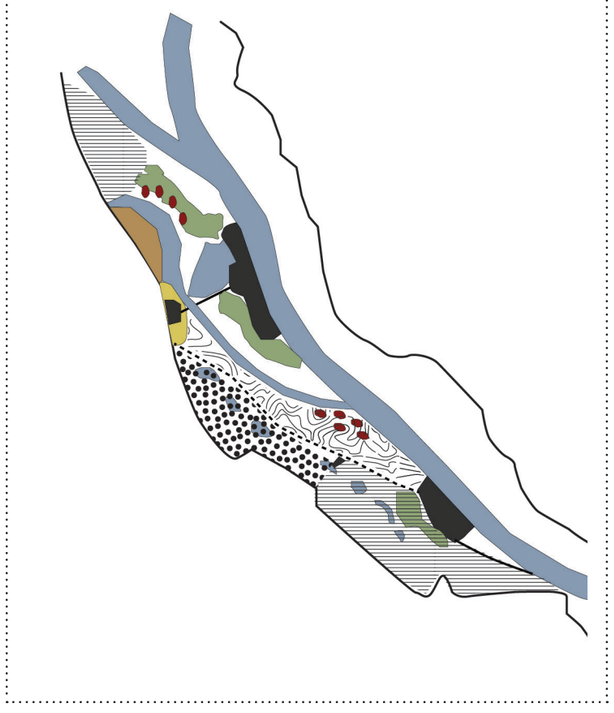




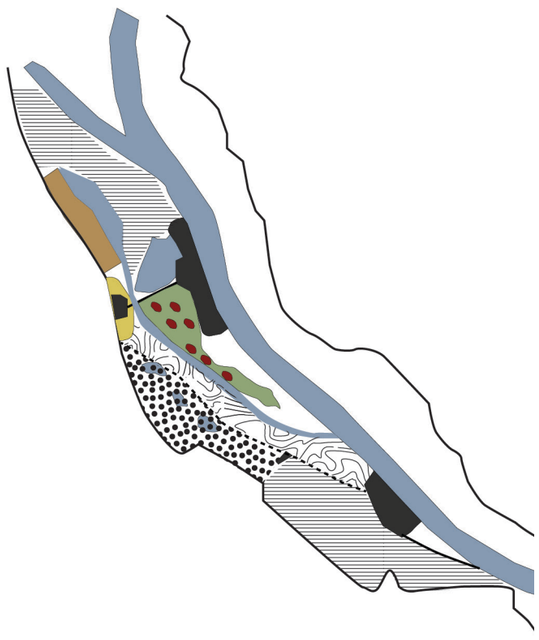
COMPARISON OF STORYLINES



1



2



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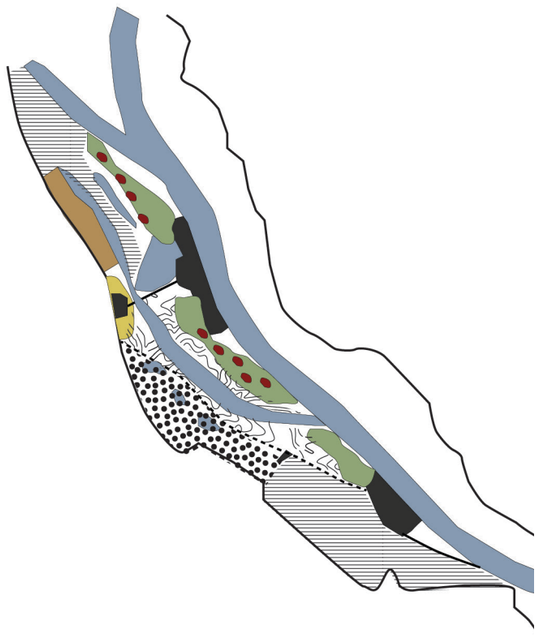
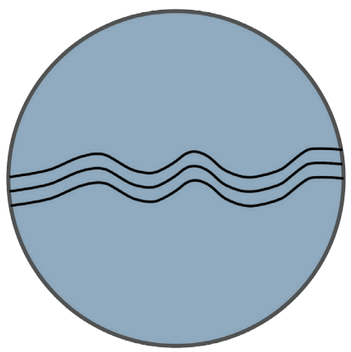


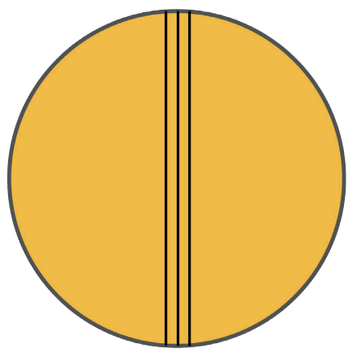
4

THE TENSION BETWEEN PROCESSES AND FORMS



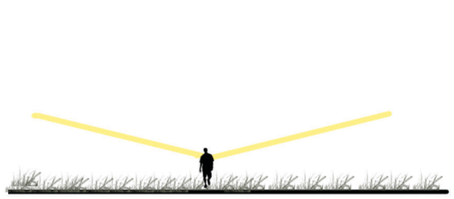
Process-oriented decisions

VS



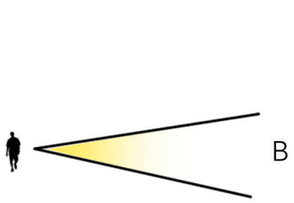
Social/architectonic oriented decisions

PRINCIPLES - experience of person in the landscape



openness

enclosure



viewpoints

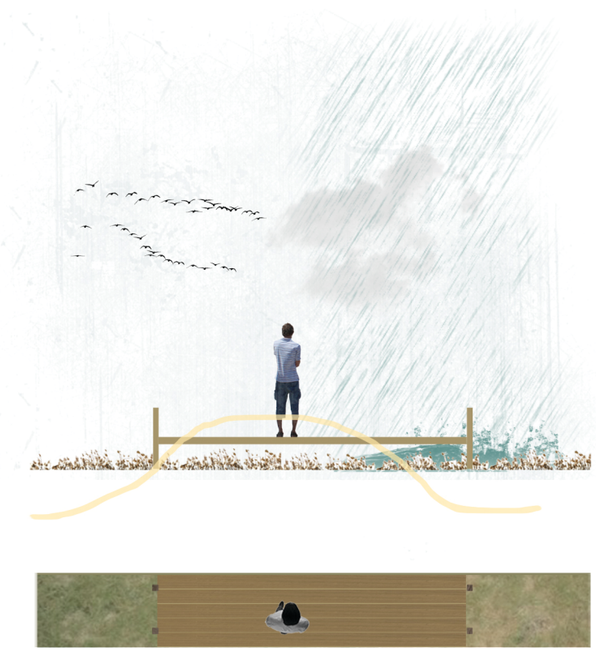
facilities

diverse levels

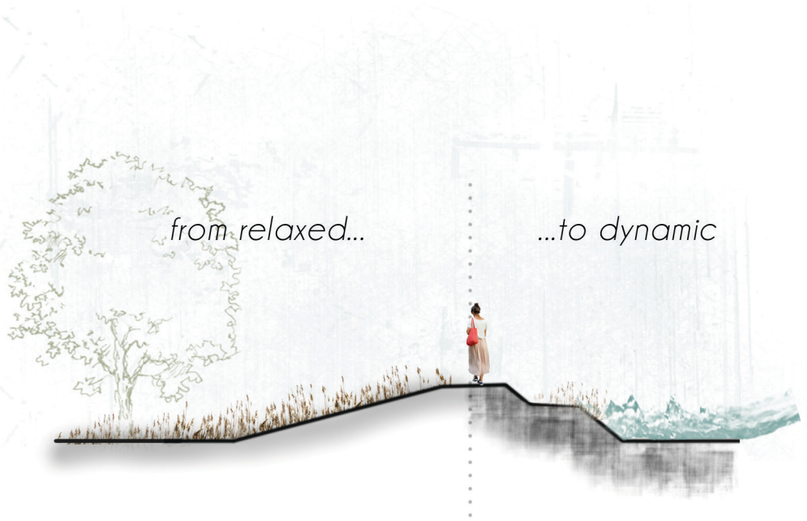
PRINCIPLES - main elements express the dynamic riverscape

unfixed paths express the dynamic landscape

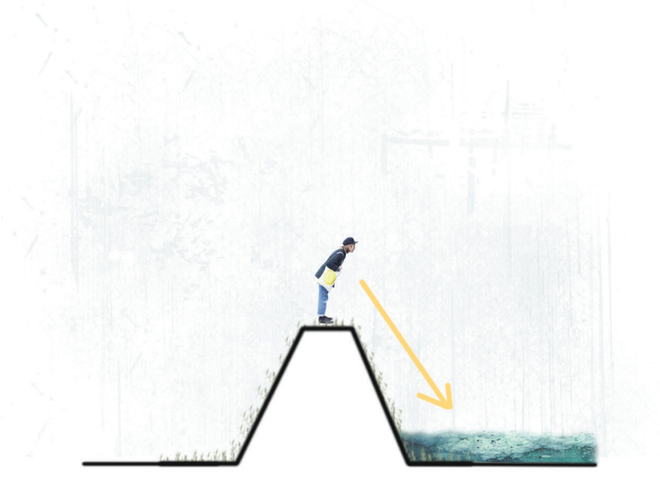
fixed paths relate to the less changing landscape



elevated paths enrich the expe-rience from dry to wet times

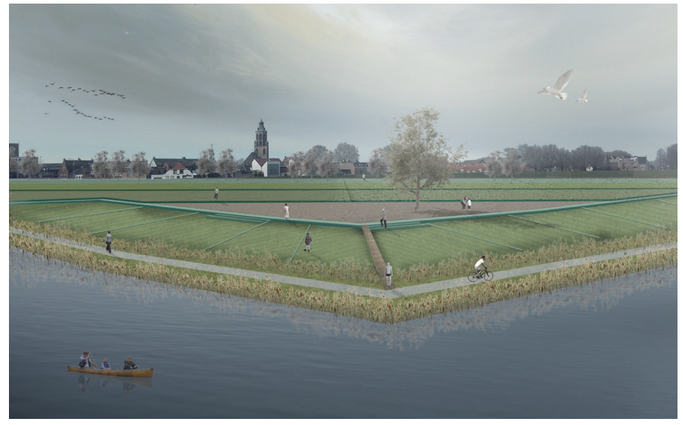


Different profile to express diversity between 2 sides



Steepness expressing inaccessibility or a dramatic imperssion

STEP 1 - the gardens



0

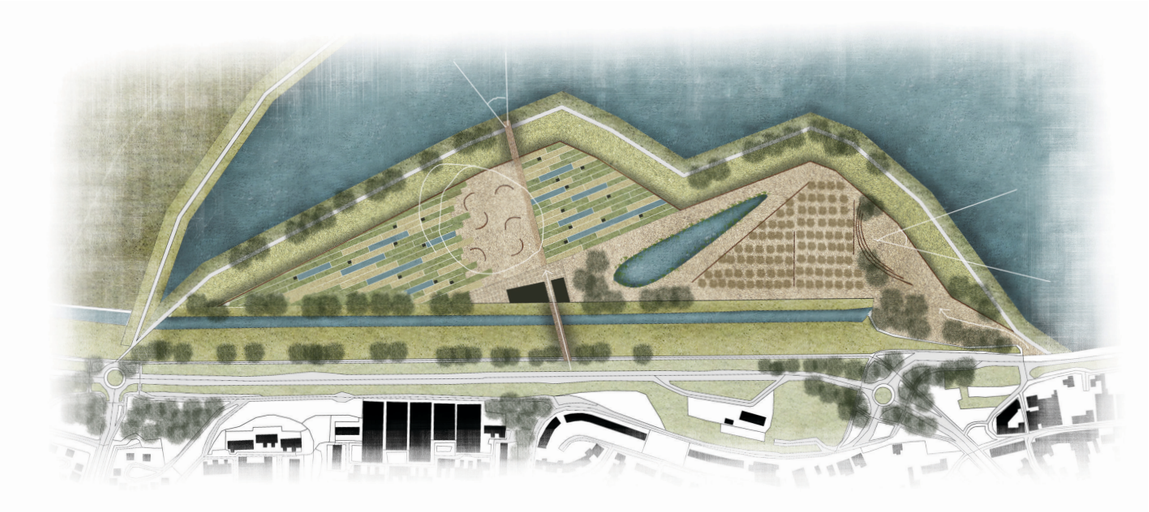
years

STEP 2 - the flood forest

forest as a curtain

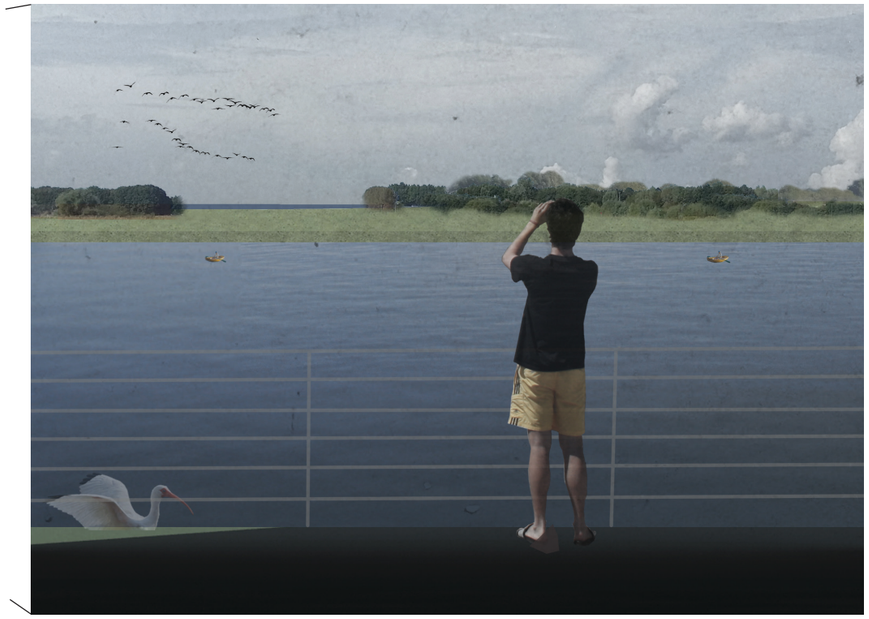
0 3 *years*

...the gardens



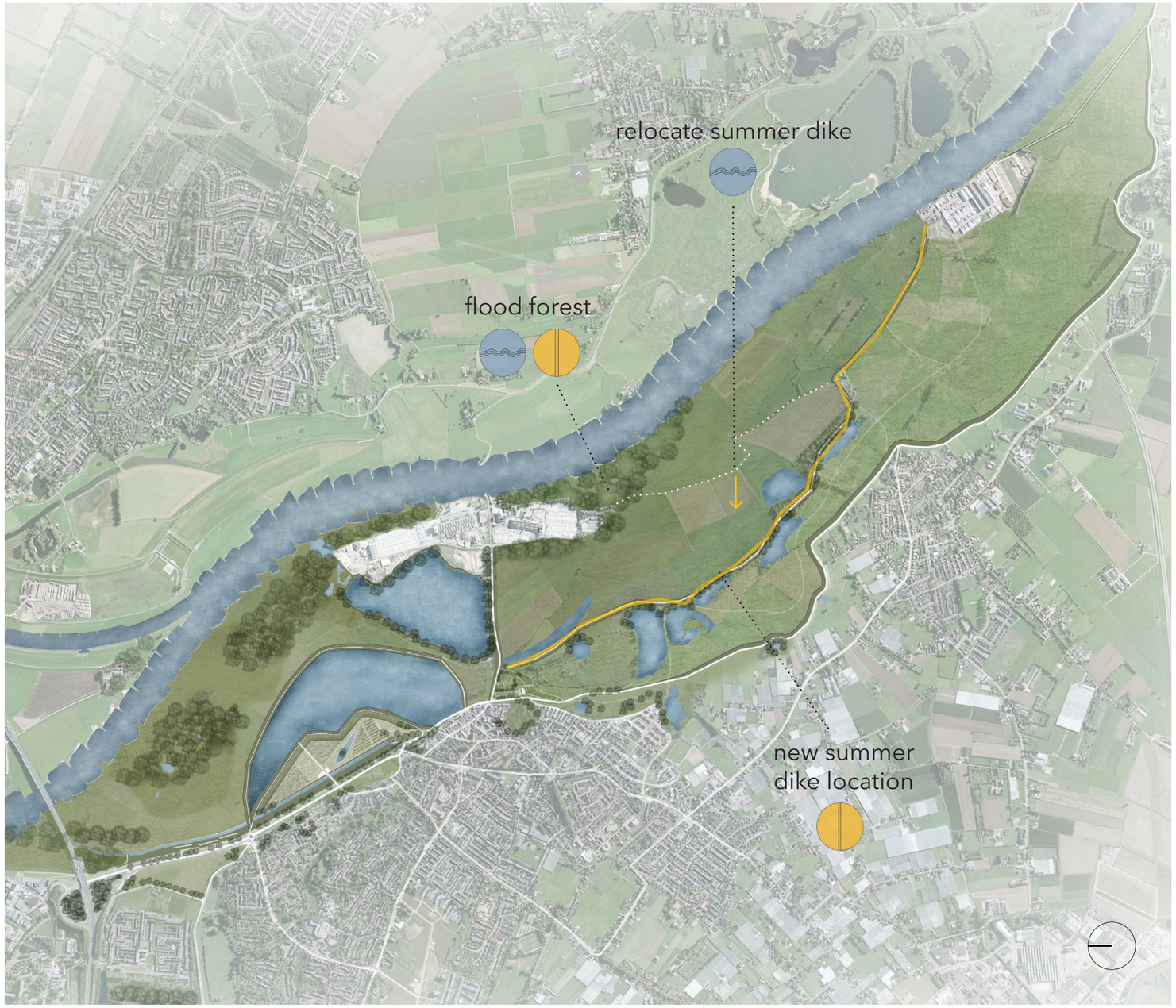
...vegetable gardens and sheds

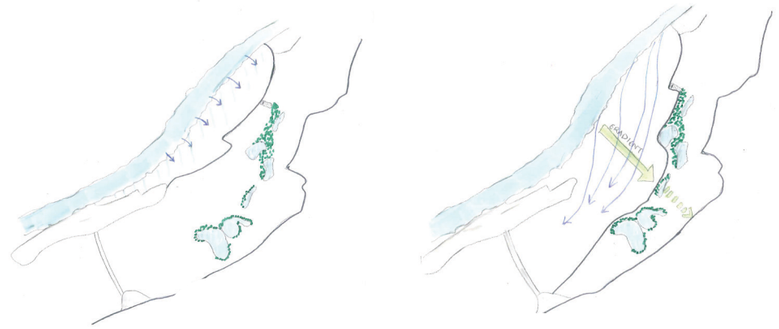
...'framed' entrance from bridge



...view to the landscape

STEP 3 - relocate summer dike



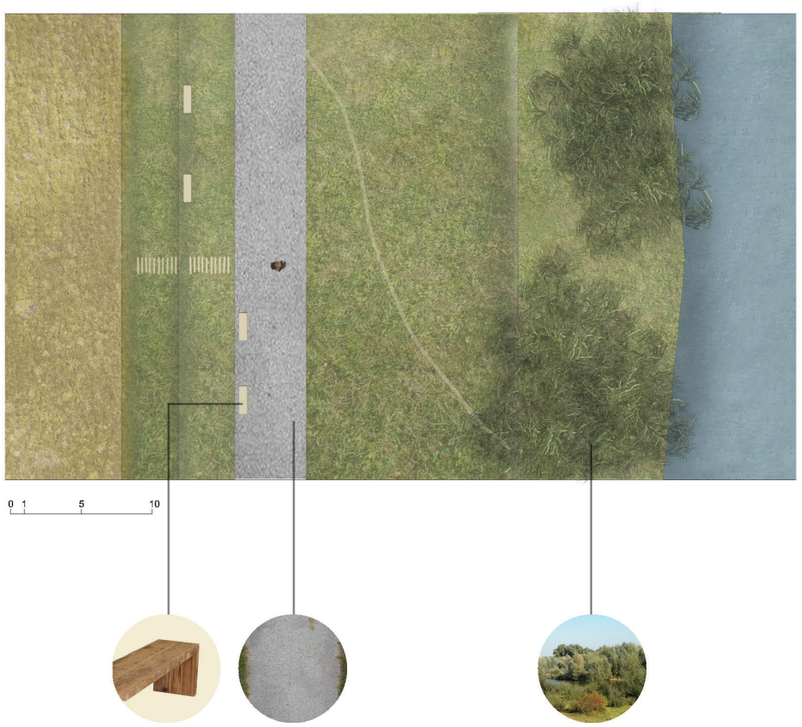


dike between two natures

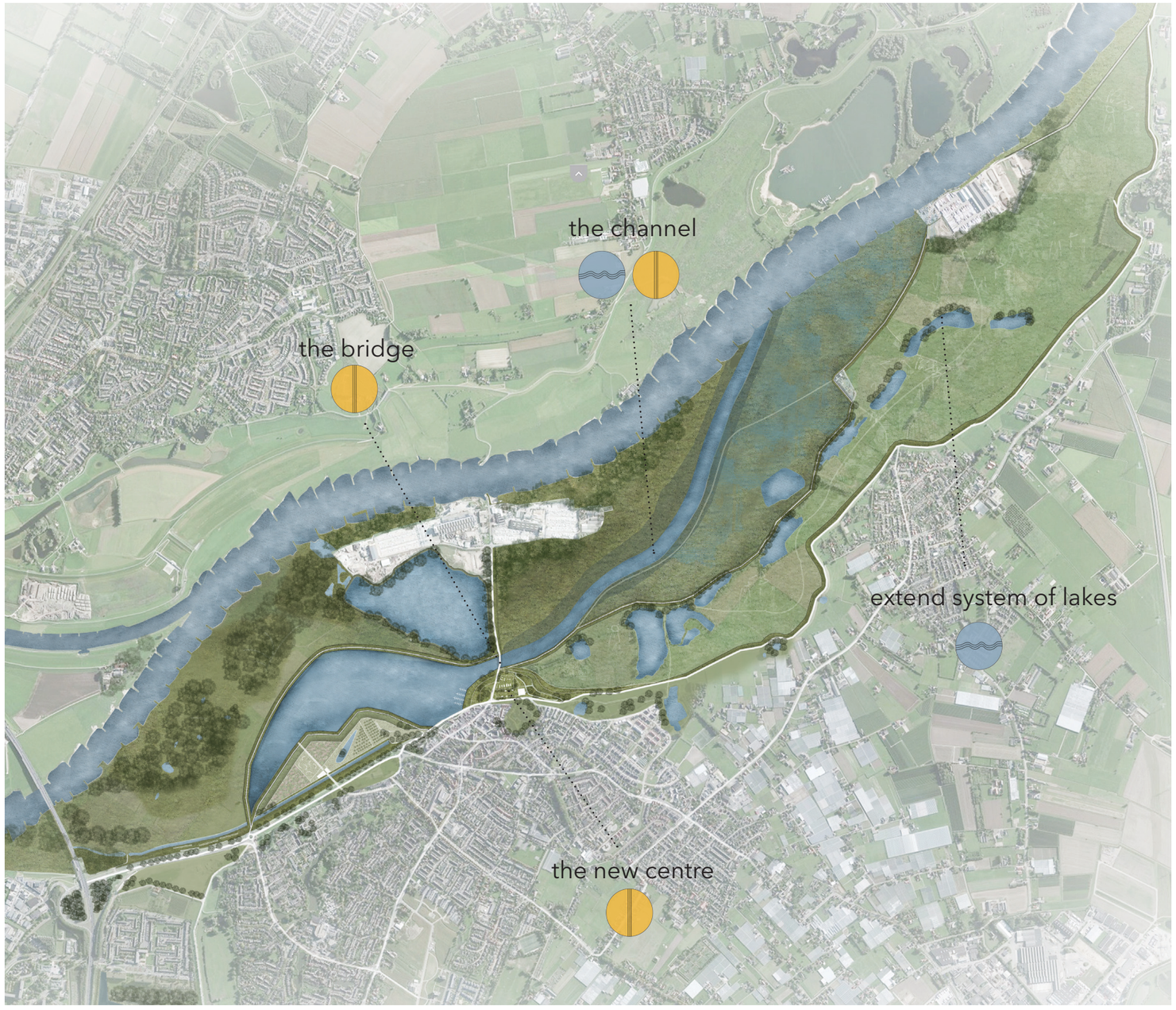
0

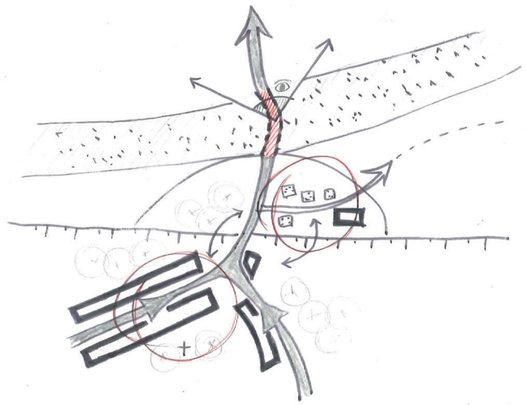
5

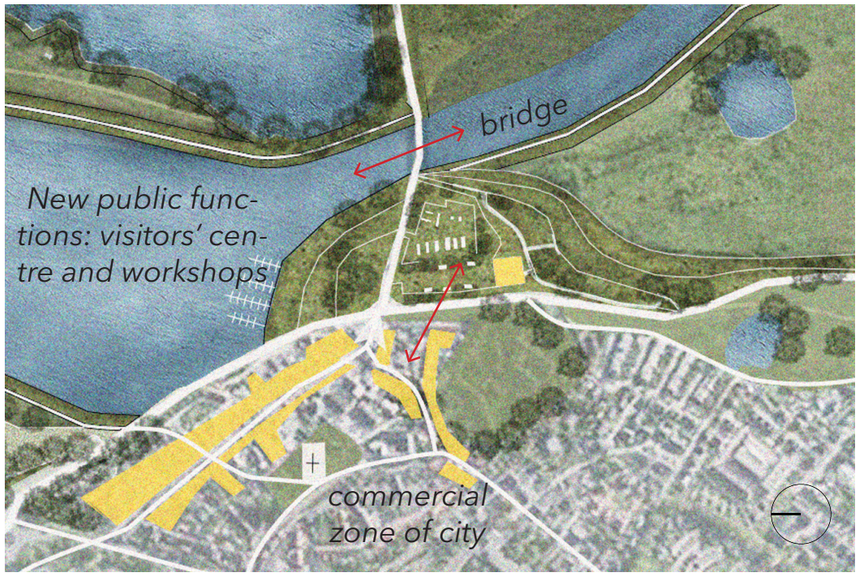
years


0 1 5 10

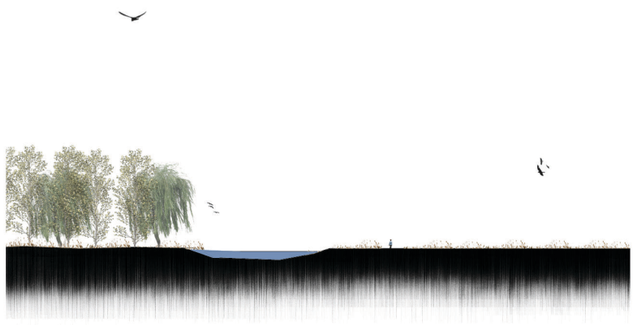
STEP 4 - the new centre

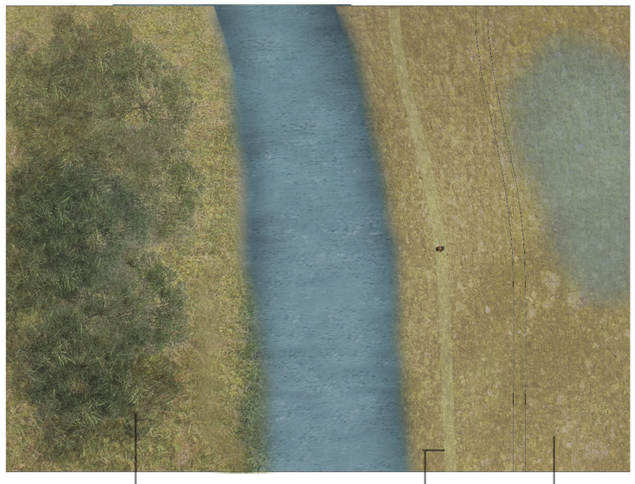


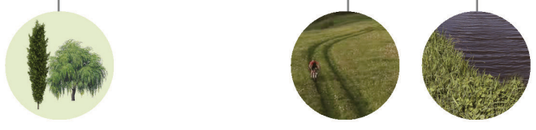




0 8 *years*

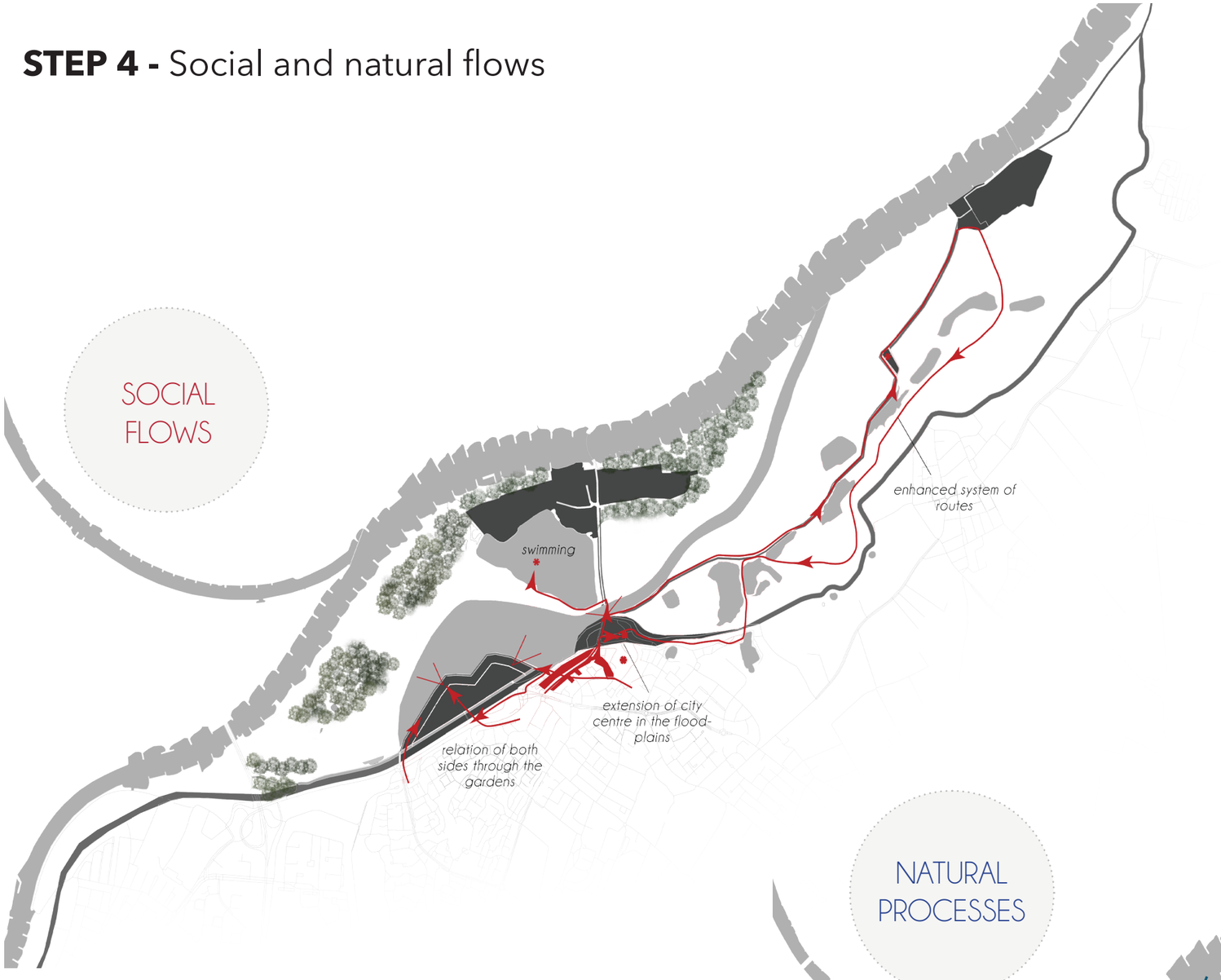



0 5 10 20



STEP 4 - Social and natural flows

SOCIAL FLOWS



human flows

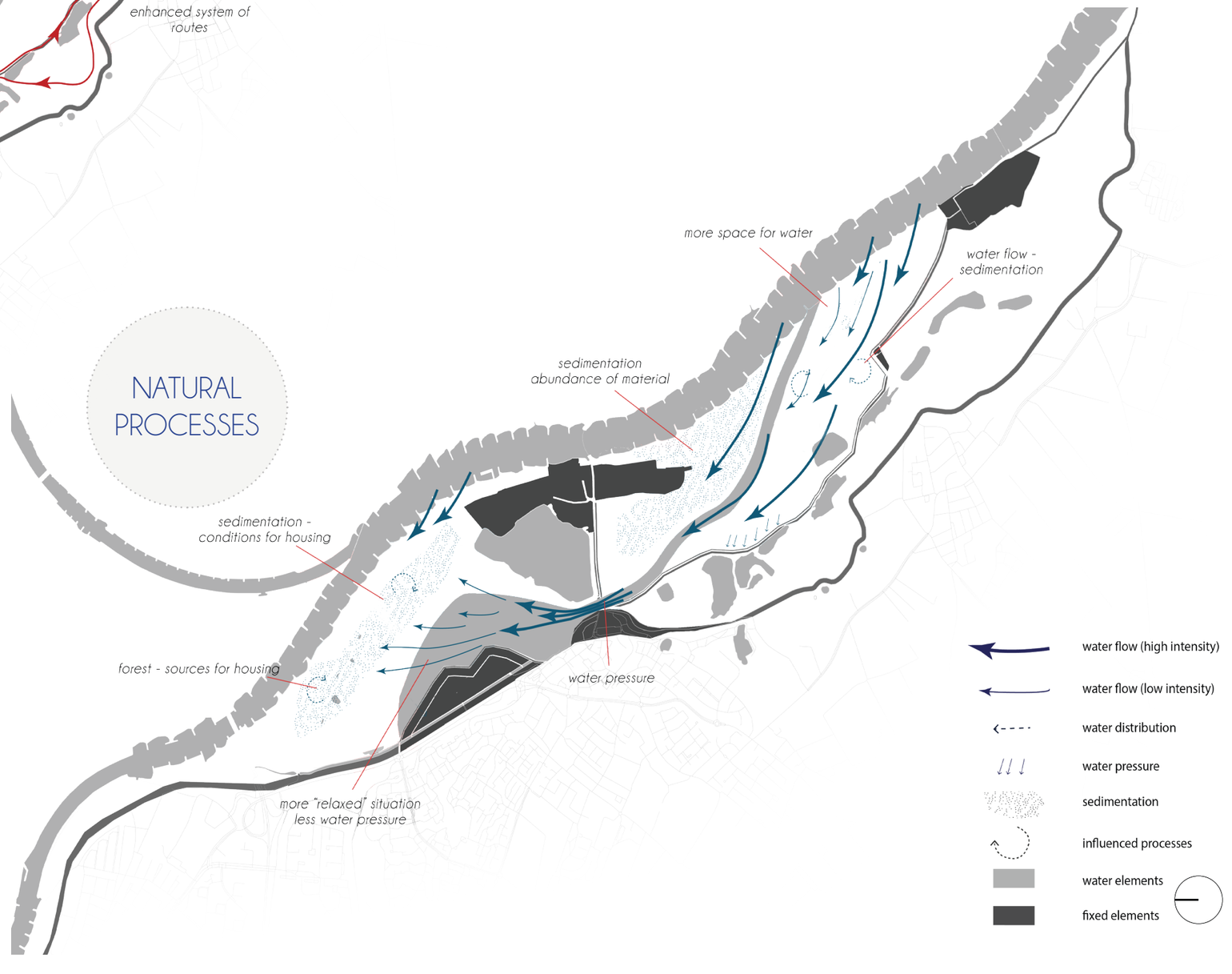
main elements

views

relation with bigger cities

possible connections

NATURAL PROCESSES



water flow (high intensity)

water flow (low intensity)

water distribution

water pressure

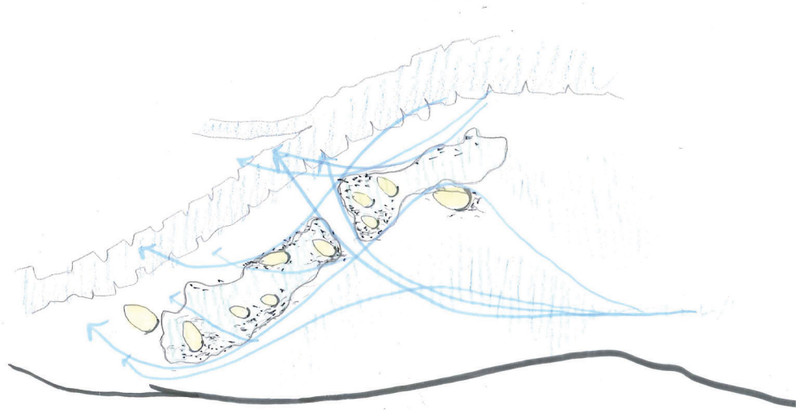
sedimentation

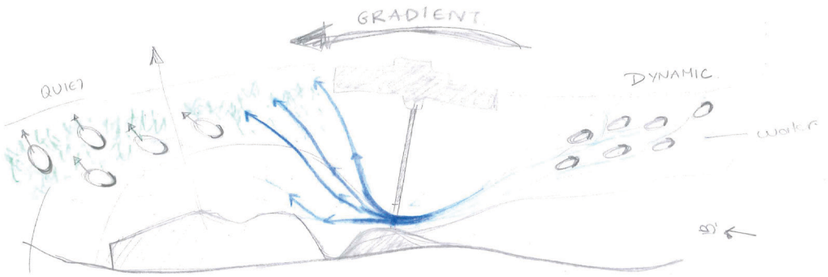
influenced processes

water elements

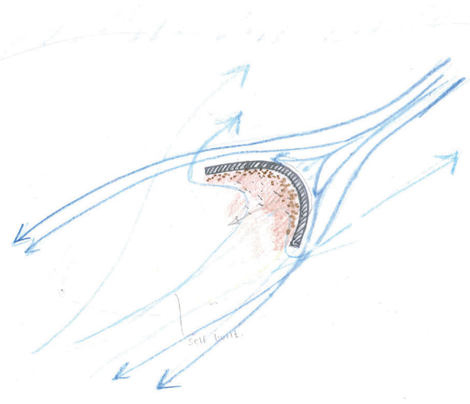
fixed elements

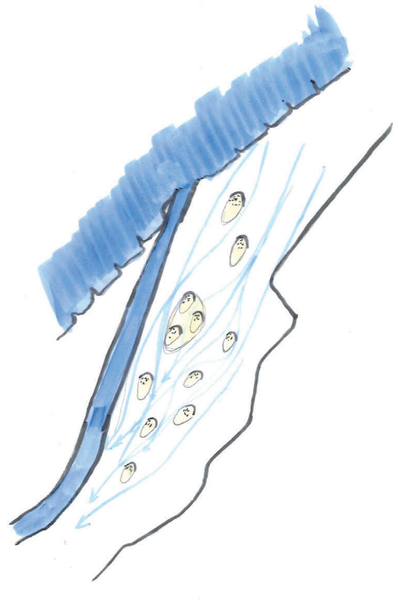
STEP 5 - The living mounds



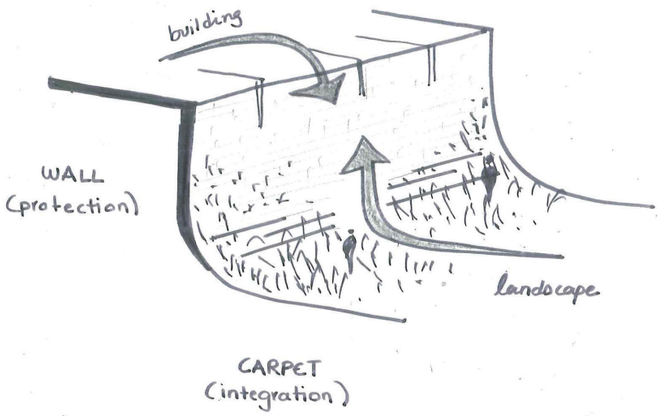


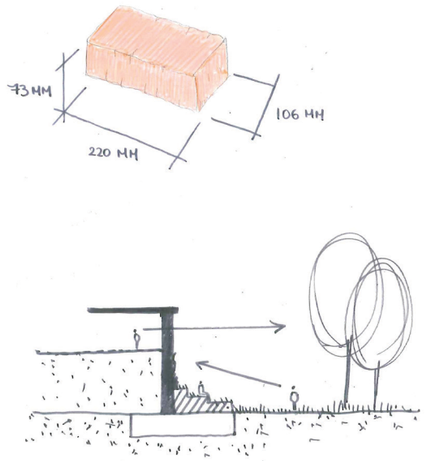
Research by design





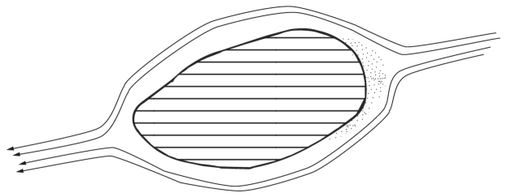
THE BARRIER WALL



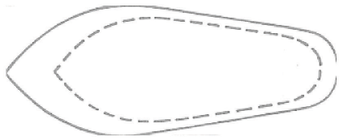


THE SHAPE

1. water flow



2. symbolism (boat)

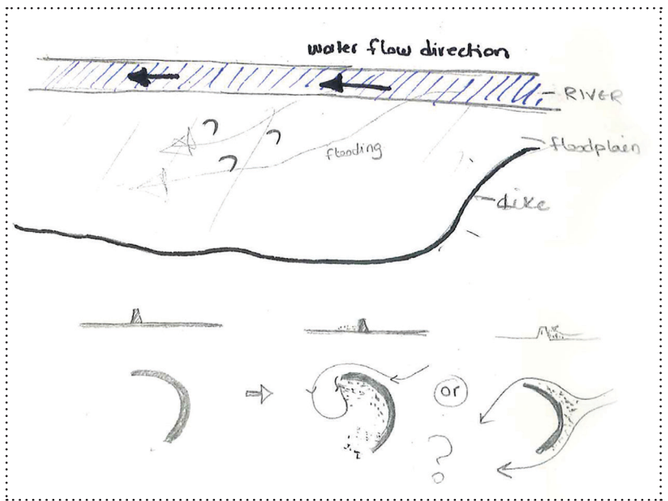


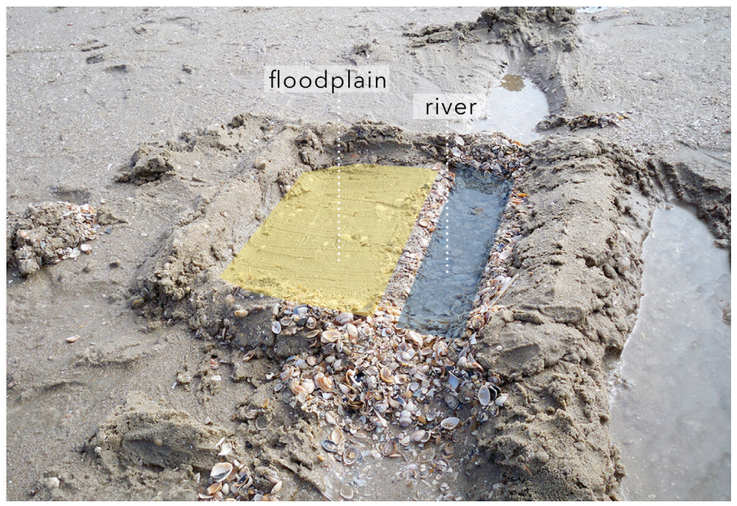
3. repetition

1

2

3





HOW MANY HOUSES?

Biomass

Average need per year for a small house (100 m2) = **8430 kWh**

For having wood pellets as a fuel, it is estimated that the provided energy is **4800 kWh / tonne**

A working forest, can annualy provide **2 tons per acre**

Which means that one family in a small house would need 8430 kWh /4800 kWh/t = **1,76 tons of wood**

3561,36 m2/house

Food production

An average family of 4 needs about **200 m2** of garden to sustain itself

Succession planting is also a good solution to save place. A combination of different edible seeds can be planted, according to their compatibility.

If there are also **animals**, there should be place for chicken, goats etc.

To be **self sustained**, the animals also need to be fed.

200 m2 / family of 4

Water

Each person is estimated to spend about **80-100 gallons** of water per day.

This number includes water for taking a shower, flushing toilet, washing hands, having a dish-washer etc.

For a **family of 4**, it is estimated that this number is about **200-400 gallons per day** (or 0,757 m3)

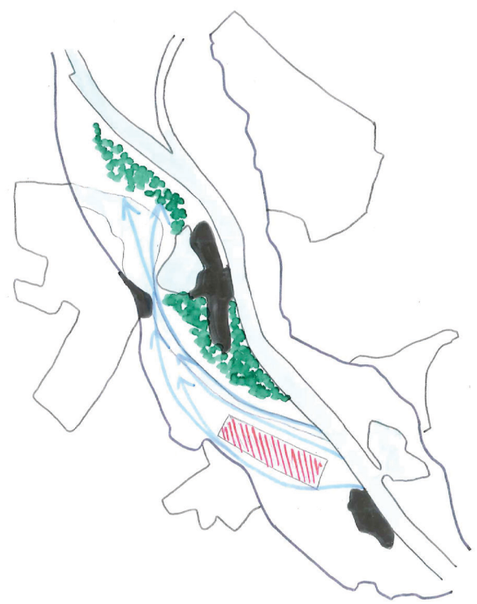
200-400 gallons per day
/family of 4

extreme situation

650

current plan

200



MASTERPLAN year 25+

Water level 12 +NAP

Max water level situation 14.73 +NAP

STEP 5- Social and natural flows

SOCIAL FLOWS

more engagement in the floodplains through sustainable living mounds

existing cultural elements get functions and value

centrality in Huissen -attract people from surrounding cities

better connection with Arnhem South

NATURAL PROCESSES

increased dynamics

gullies created by water flow through mounds

material collection through forest and mounds

forest - sources for housing

water pressure

more "relaxed" situation less water pressure

human flows

main elements

views

relation with bigger cities

possible connections

water flow (high intensity)

water flow (low intensity)

water distribution

water pressure

sedimentation

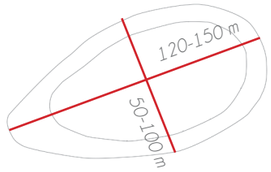
influenced processes

water elements

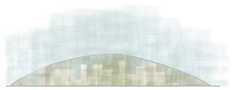
fixed elements

THE LIVING MOUNDS

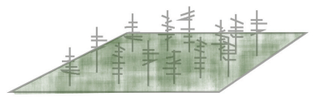
Basic rules and principles



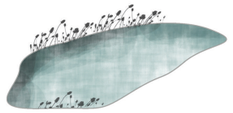
community of houses



5m height of mound

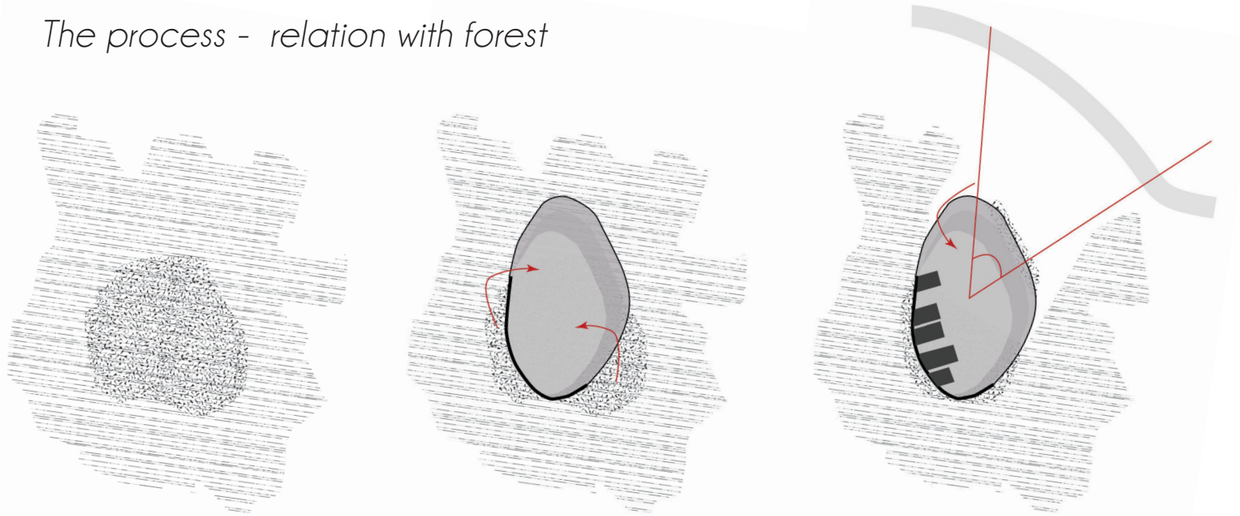


200 m2 garden per house

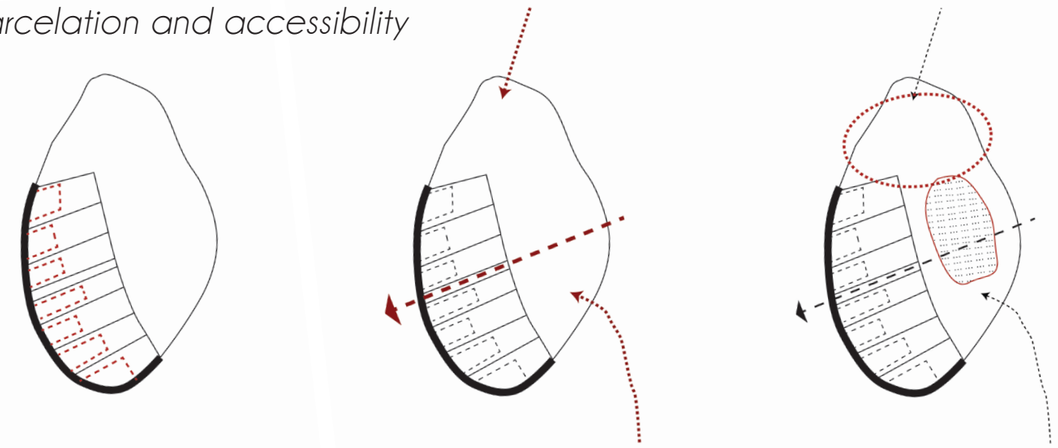


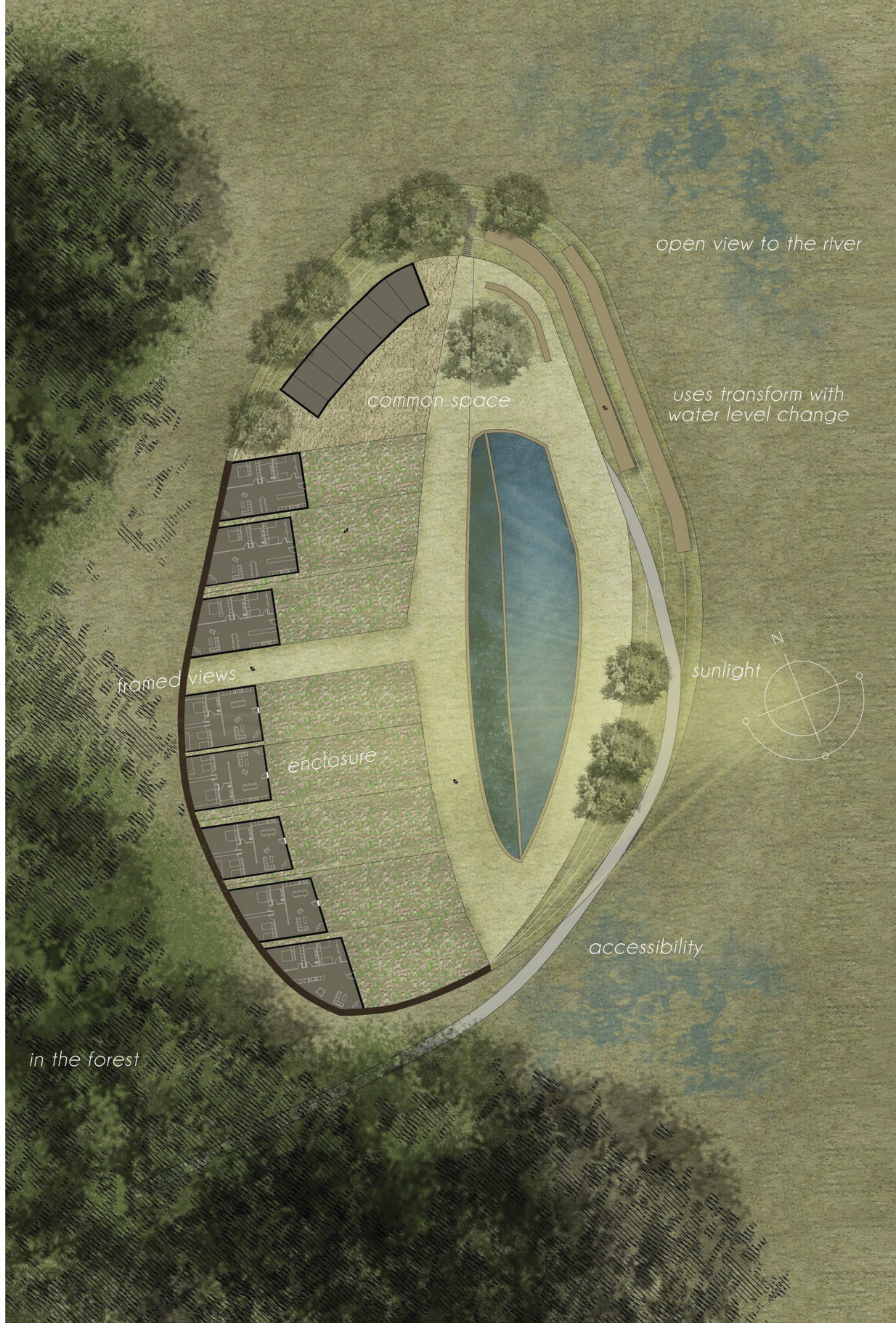
common water purification element

The process - relation with forest

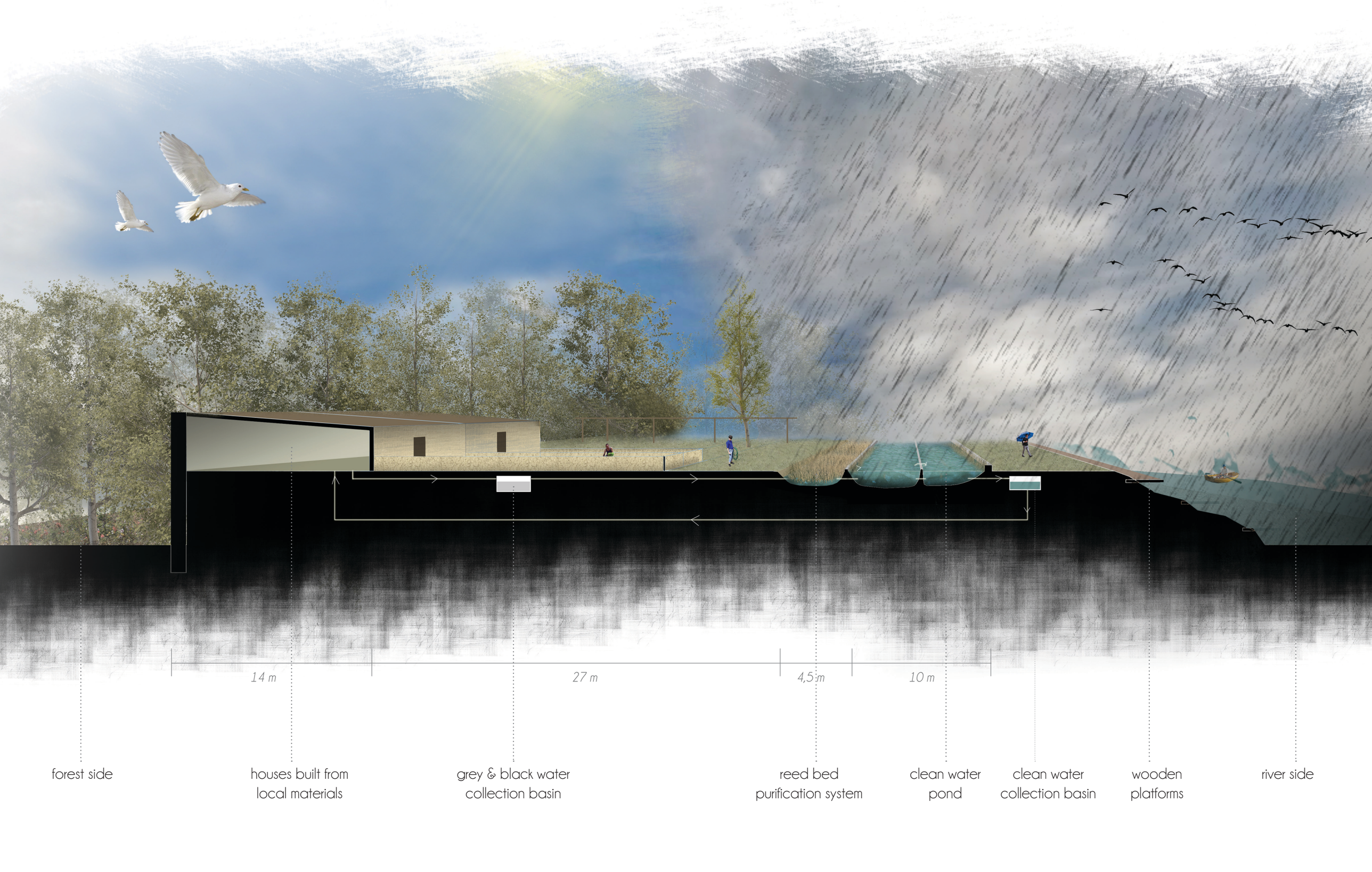


Parcelation and accessibility

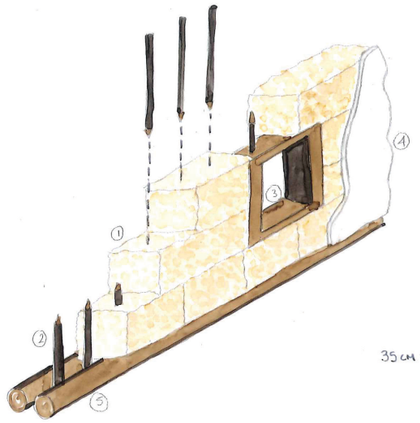


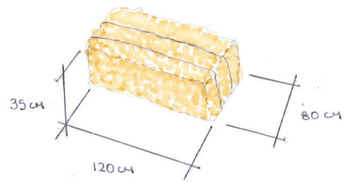


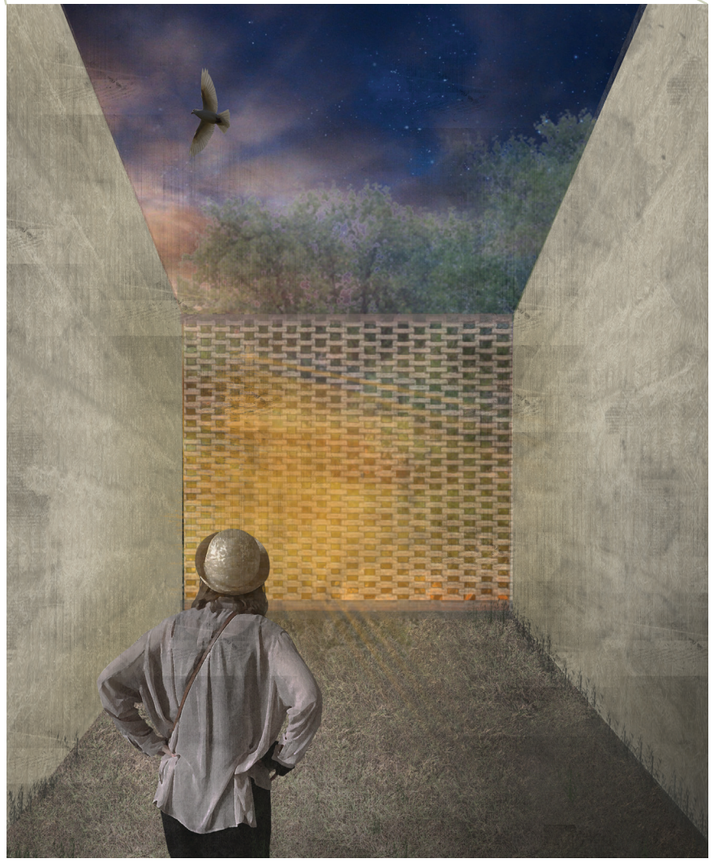
SUSTAINABILITY

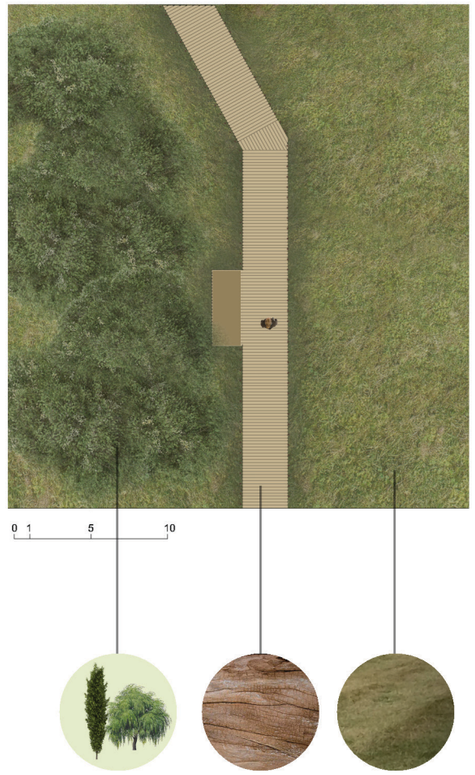


ATMOSPHERE

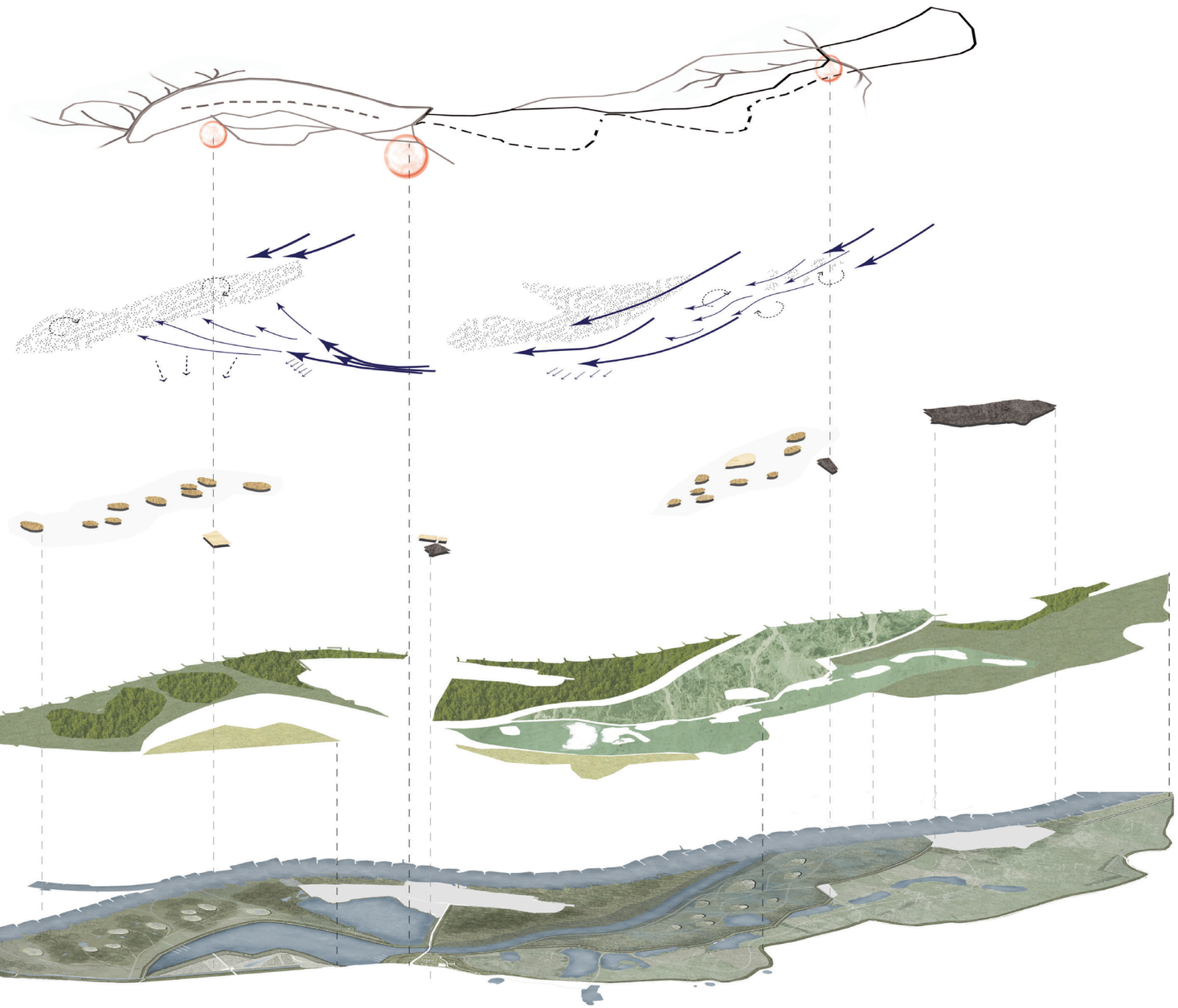







0 1 5 10

ADDED VALUE TO THE AREA



5

5 accessibility/flows

4

4 natural processes

3

3 elements/functions

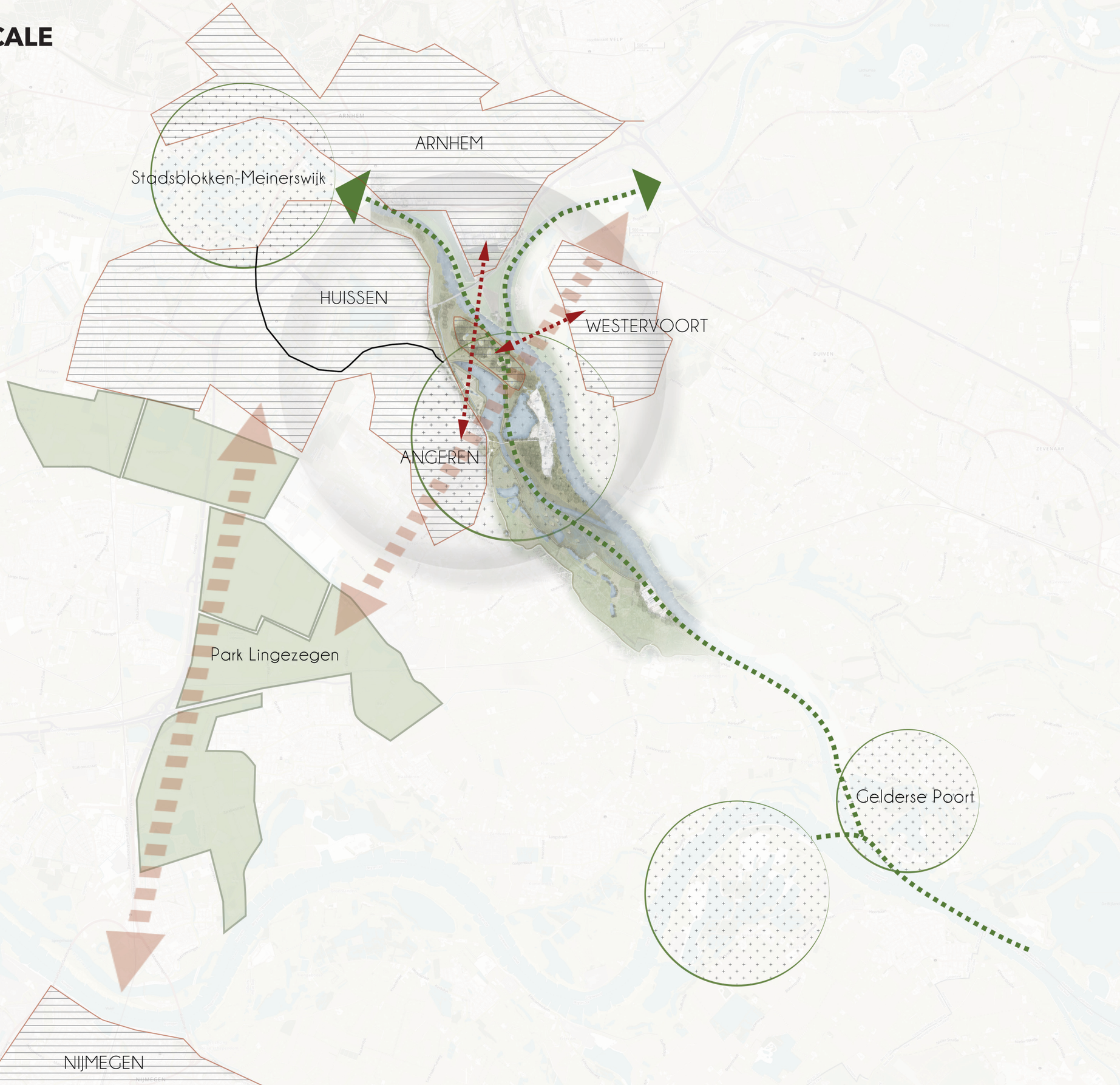
2

2 diverse natures

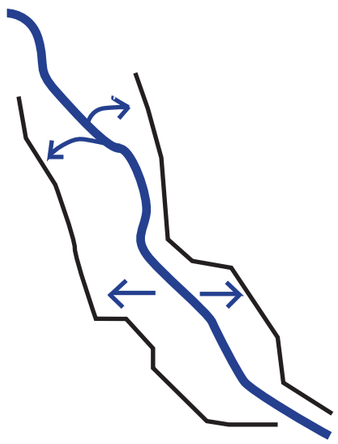
1

1 masterplan

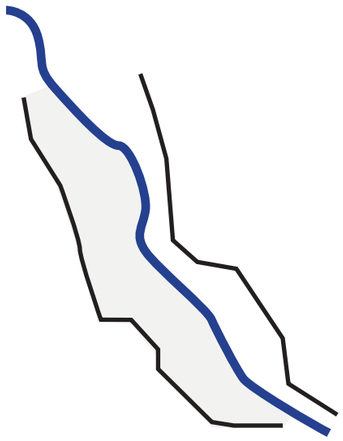
REGIONAL SCALE



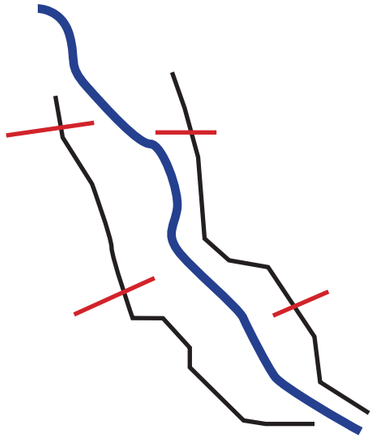
REFLECTION



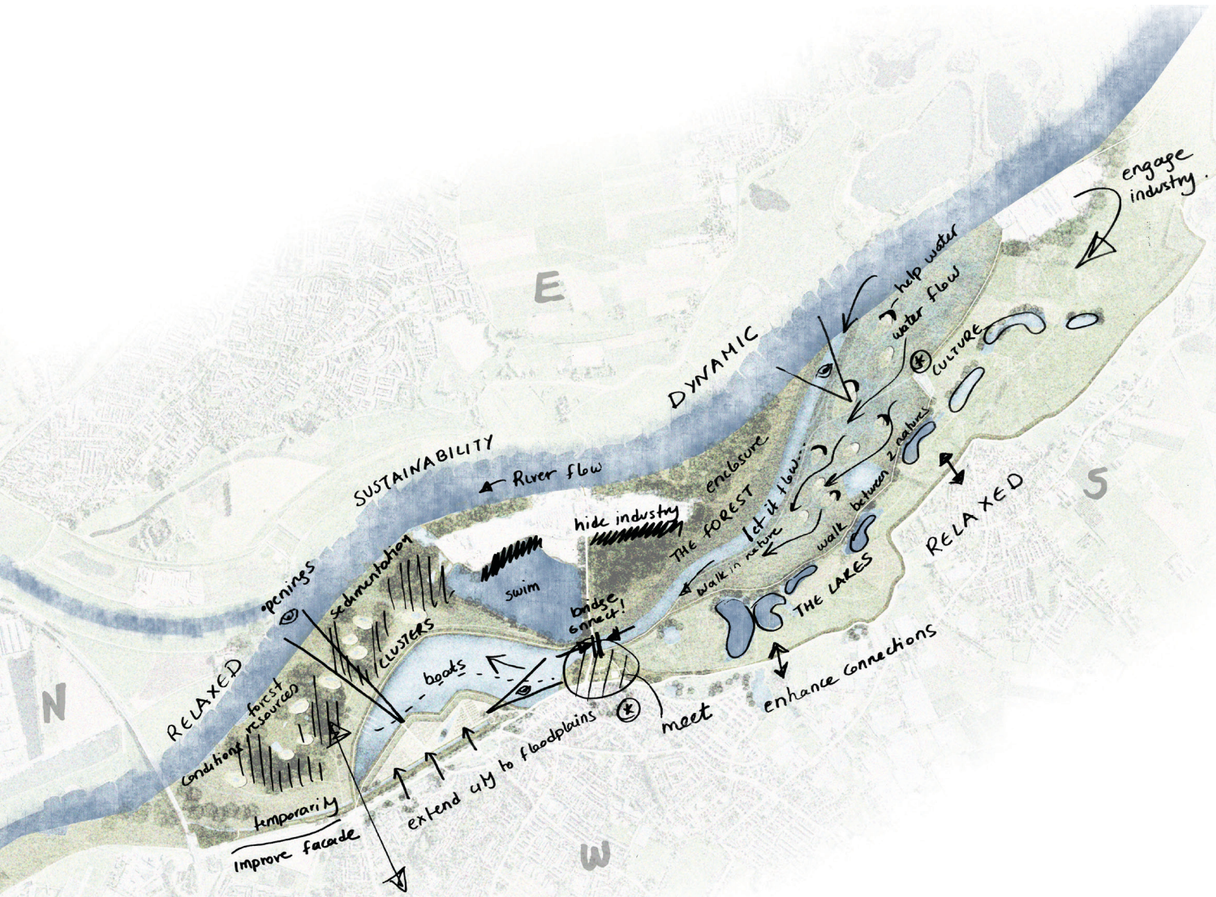
1. embrace processes- more space for water



2. multifunctionality - a new living environment



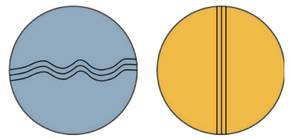
3. connect floodplains with urban fabric



Objective: to use the potentials of the natural river processes (inundation, sedimentation) as a condition for the creation of a multifunctional and sustainable landscape, focusing on a new living environment in the floodplains and allowing for more interaction between the two sides of the dike.

methodology

research by design



"Eventually, all things merge into one, and a river runs through it."

Norman Maclean

THANK YOU!