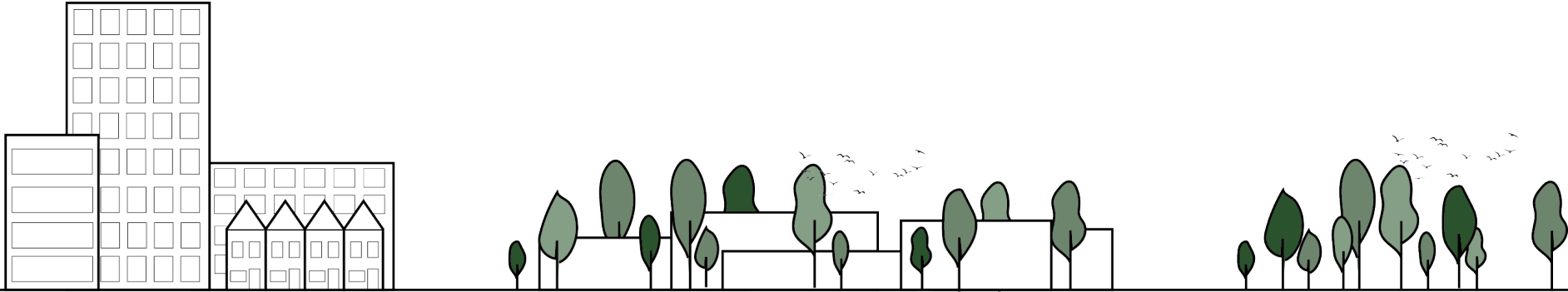


# MAKING GREY GREEN

**Redesigning business parks as an additional step  
to bringing back biodiversity in these areas**



Annelies ter Pelkwijk  
4358147  
13-01-2022



WHAT IF BUSINESS PARKS COULD LOOK LIKE THIS?



INSTEAD OF THE GREY AREAS THEY ARE NOW.

# Table of content

- INTRODUCTION
- THEORY
- INTRODUCING THE LOCATION
- DESIGNING FOR BUSINESS SITES
- DESIGN IMPLEMENTATION
- CONCLUSIONS

A photograph of several monarch butterflies with orange and black wings, perched on and flying around clusters of purple flowers with yellow centers. The background is a soft, out-of-focus green and yellow.

# INTRODUCTION

# BIODIVERSITY UNDER THREAT



POPULATION GROWTH



INVASIVE SPECIES



HABITAT DISTRUCTION



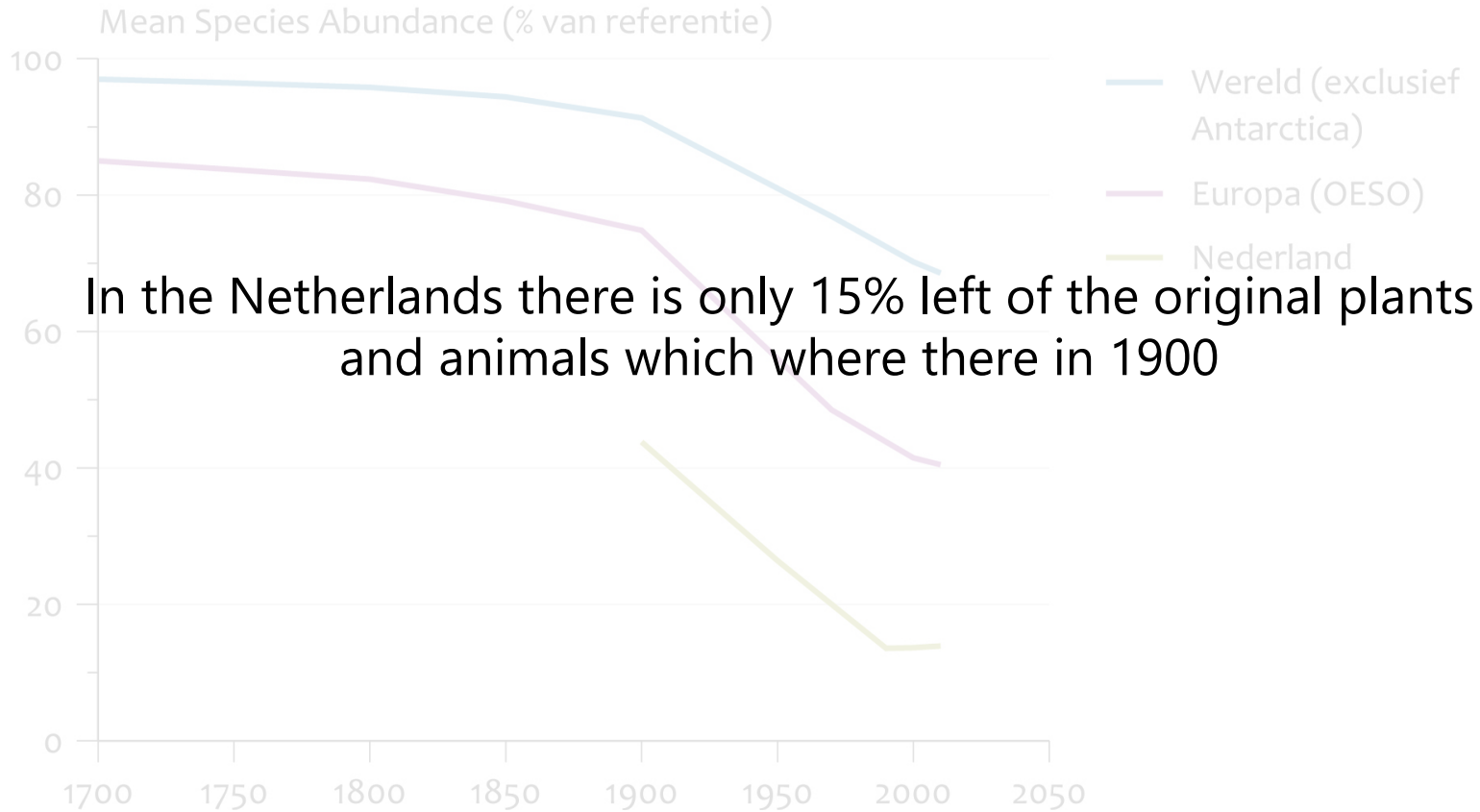
POLLUTION



CLIMATE CHANGE



OVER EXPLOITATION



(Biodiversiteit, 2013)

13% of surface in the Netherlands is built environment and from this 2,5% is business sites

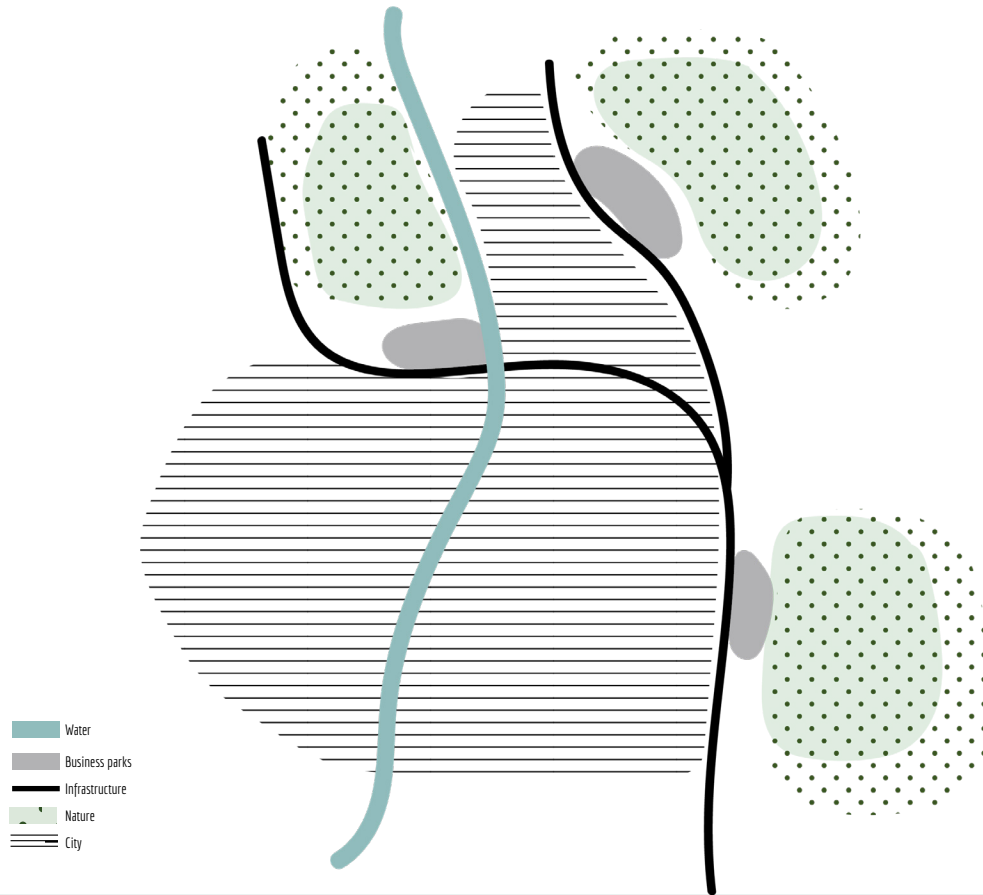


(CBS, 2016)



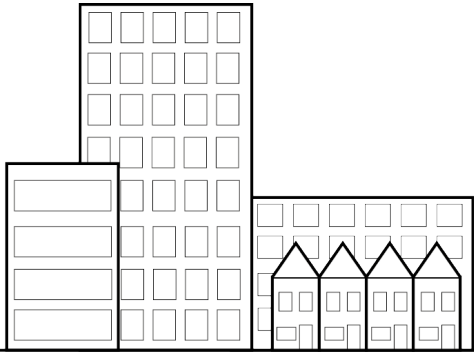
# BUSINESS SITE

- Large grey area's
- Add to urban heat island effect
- Situated close to infrastructure
- Border of the city

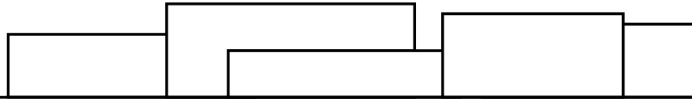


# BUSINESS SITE AS A BARRIER

CITY



BUSINESS PARK



GREEN AREA



## PROBLEM STATEMENT

Business parks are not designed with the purpose of being a green park, there is only limited green that does not add to biodiversity. These business parks are now grey barriers for the city and the green.

# AIM

The aim of this thesis is to improve biodiversity on a business site and change the business site into a corridor to connect to the ecological network. And with this also improve human well-being.

# RESEARCH QUESTIONS

“What are design tools an urban designer can use to improve biodiversity and human well-being on a business site and how can this be implemented? Using case study location Spaanse Polder.”

- SQ1 What is biodiversity and human well-being and how are they connected?
- SQ2 What are the opportunities to enhance biodiversity and human well-being in a business site?
- SQ3 What are design tools to enhance biodiversity and improve human well-being?
- SQ4 How can these design tools be implemented in the case study location Spaanse Polder?



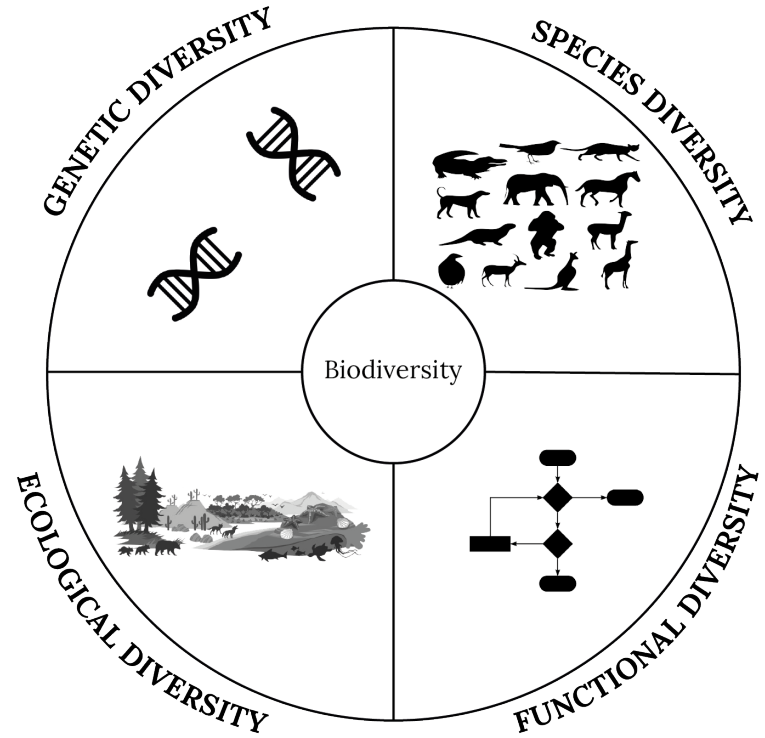
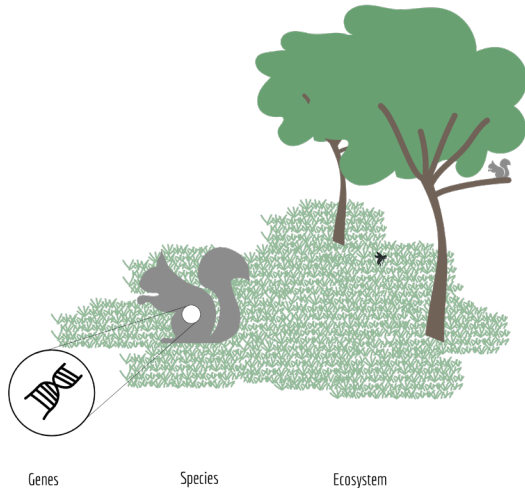
# THEORY

**SQ1** What is biodiversity and human well-being and how are they connected?

# BIODIVERSITY

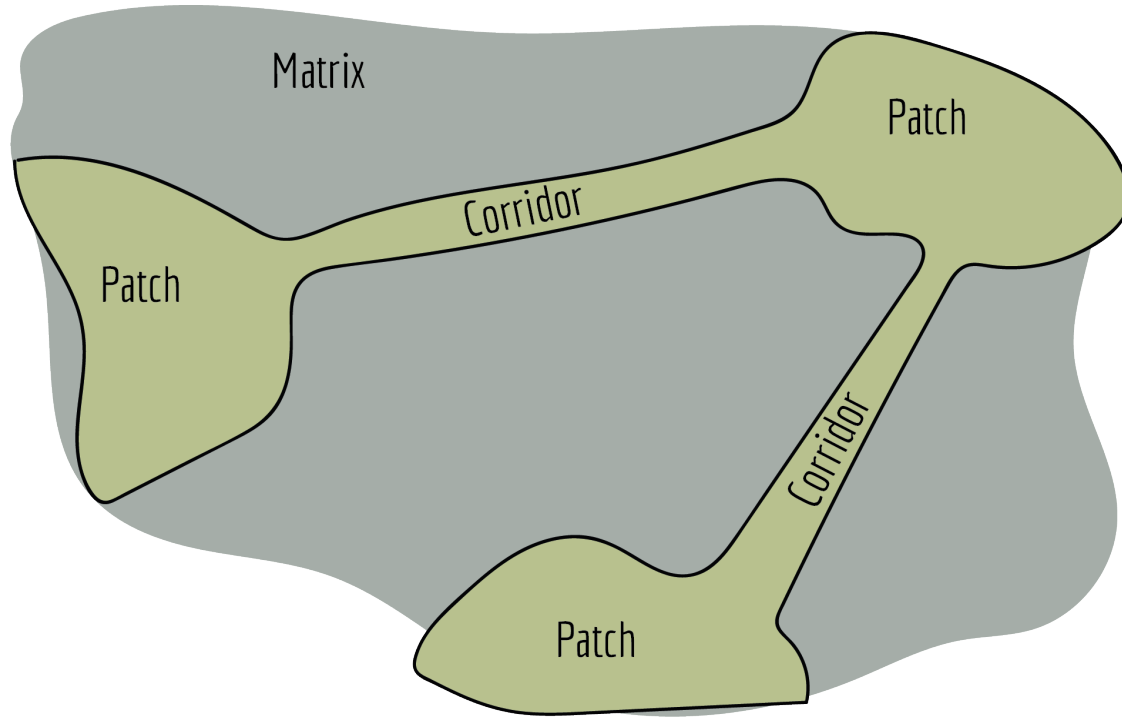
“The variety of life on Earth at all its levels, from genes to ecosystems, and the ecological and evolutionary processes that sustain it.”

(Lavery et al., 2008, pp. 2)



(Miller & Spoolman, 2017)

# ECOLOGICAL CONNECTIONS

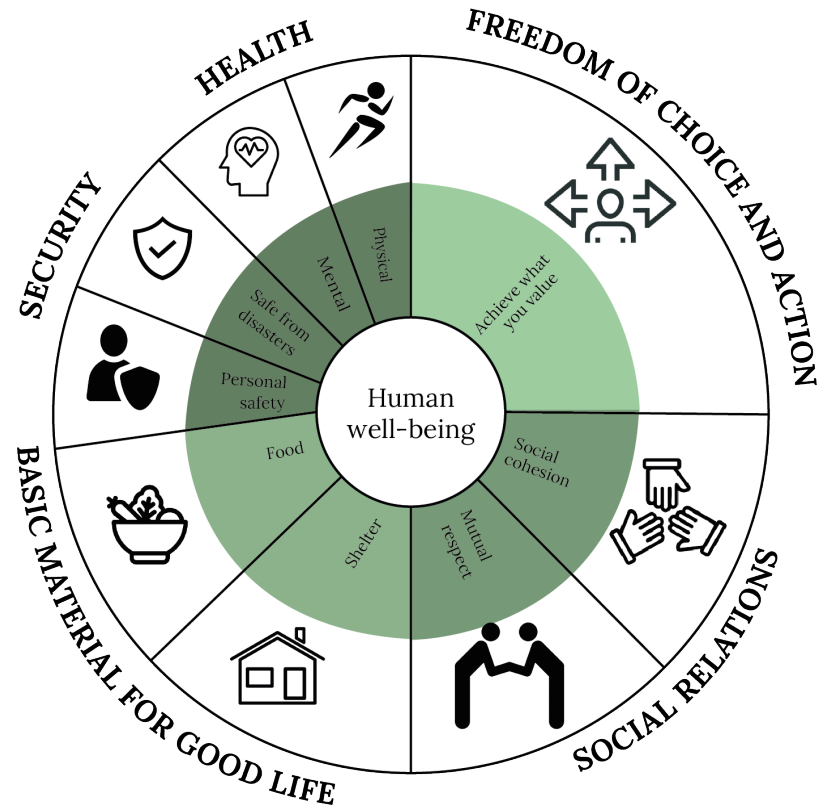


(Dramstad et al., 1996)



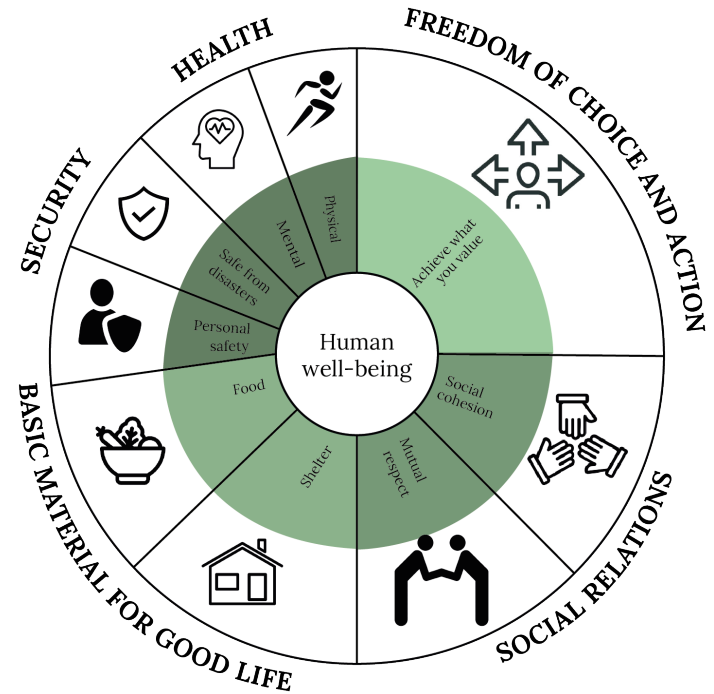
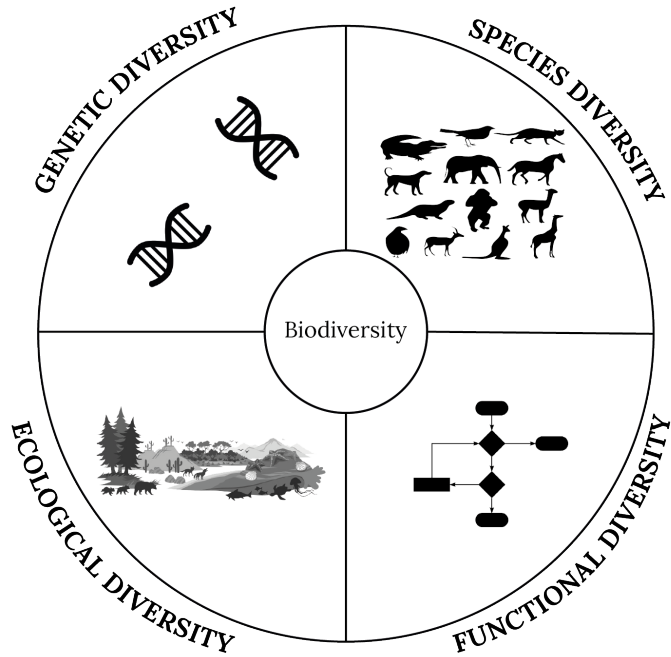
# HUMAN WELL-BEING

Human well-being is based on how people are feeling and how they are doing this is perceived differently by people around the world.  
(Millennium Ecosystem Assessment, 2003)  
(Ashton et al., 2013).



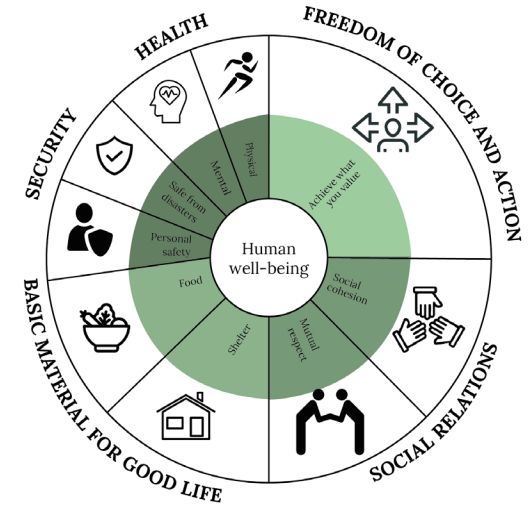
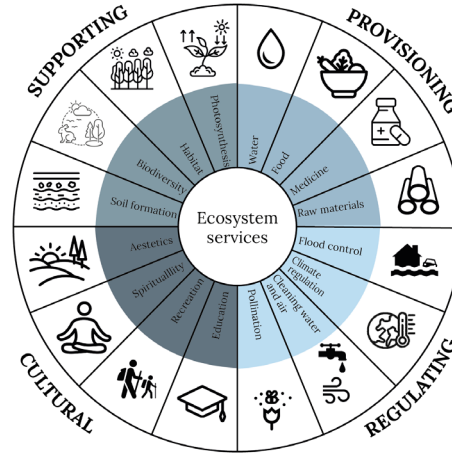
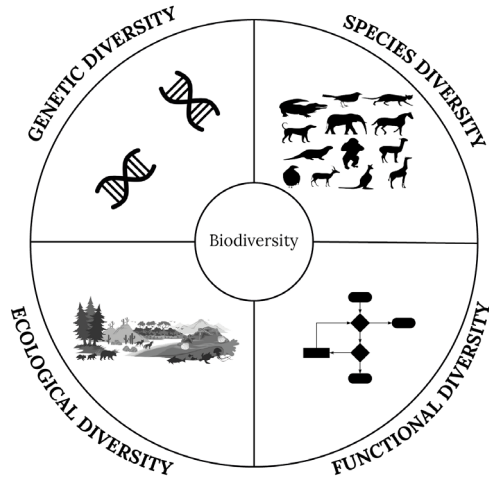
(Millennium Ecosystem Assessment, 2003)

# BIODIVERSITY — ? —> HUMAN WELL-BEING



(Miller & Spoolman, 2017)  
(Millennium Ecosystem Assessment, 2003)

# BIODIVERSITY → ECOSYSTEM SERVICES → HUMAN WELL-BEING

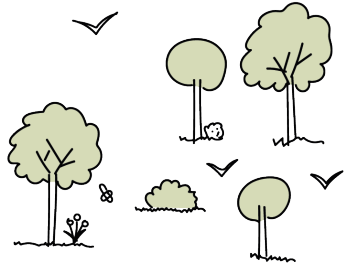


Our freshwater, the medicine at the pharmacy, and the wooden closet in the living room and other services are all benefits humans obtain from the ecosystem and are called the ecosystem services.

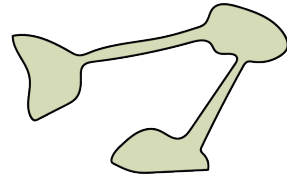
(Millennium Ecosystem Assessment, 2003)

# SELECTED PRINCIPLES

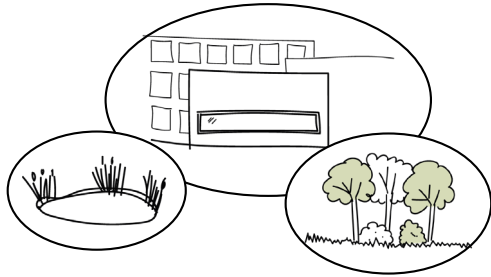
## BIODIVERSITY



Numbers and variety of species



Connecting habitats

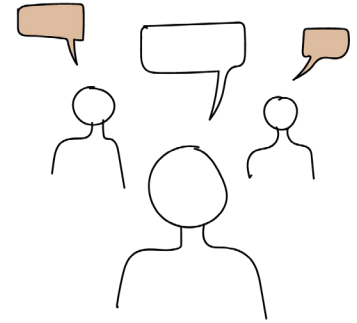


Habitat diversity

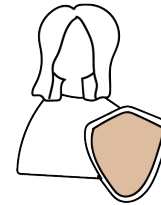
## HUMAN WELL-BEING



Health



Social relations



Security



# INTRODUCING THE LOCATION

**SQ2** What are the opportunities to enhance biodiversity and human well-being in a business site?

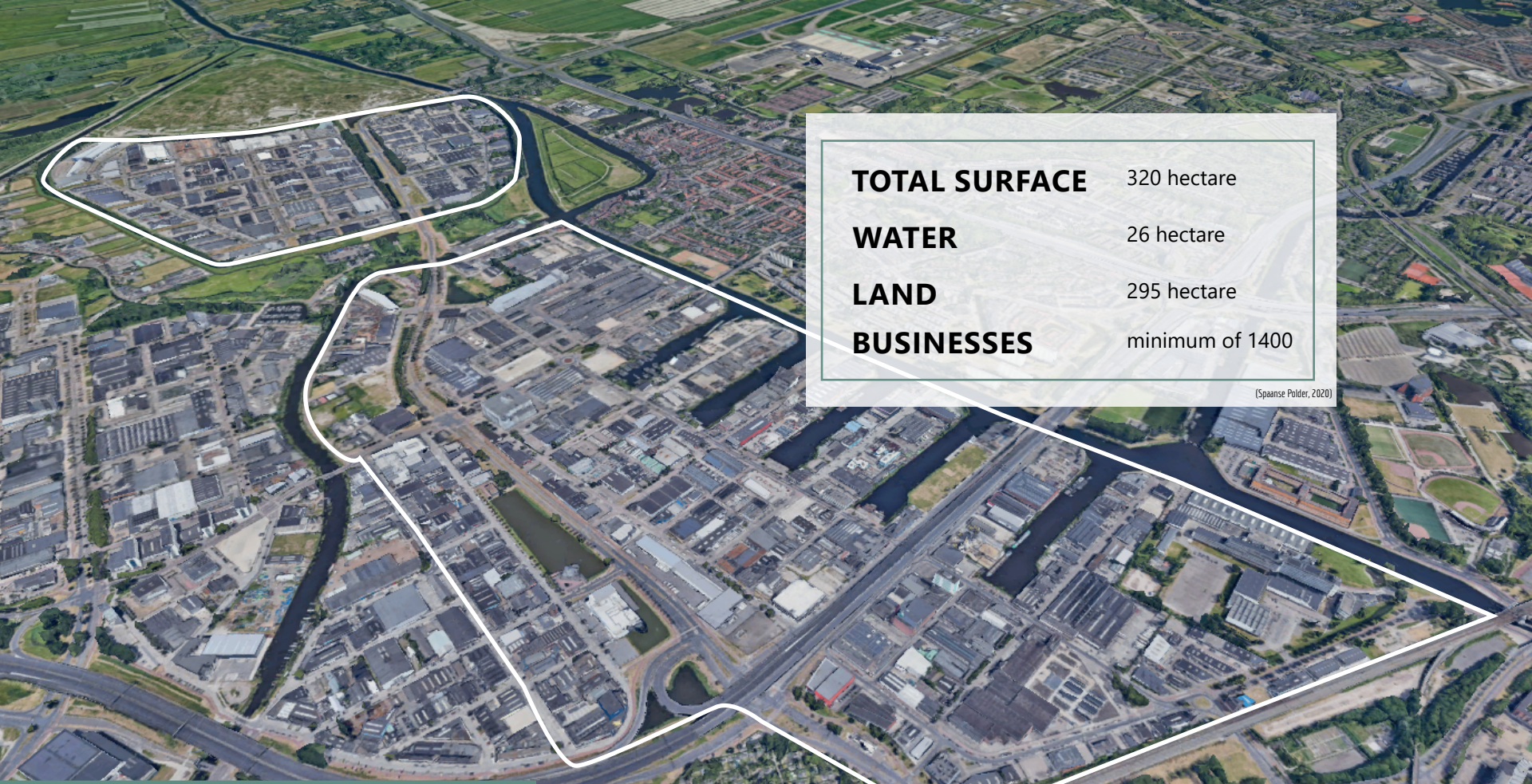
# SPAANSE POLDER

**LOCATED**

Rotterdam

**TYPE**

Mixed-use



<b>TOTAL SURFACE</b>	320 hectare
<b>WATER</b>	26 hectare
<b>LAND</b>	295 hectare
<b>BUSINESSES</b>	minimum of 1400

(Spaanse Polder, 2020)



BLUE



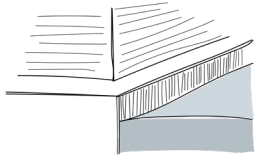
GREEN



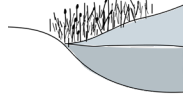
GREY



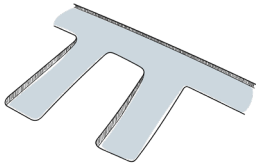
# BLUE STRUCTURES



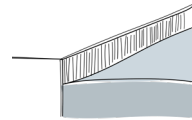
BACKSIDES TO WATER



NATURAL WATERFRONT



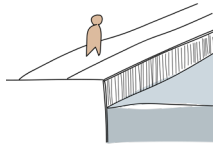
PORT ARMS



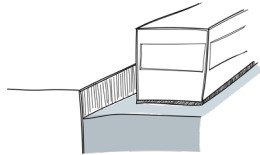
HARD WATERFRONT



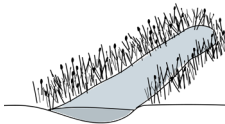
BOCHTAFSNIJDING



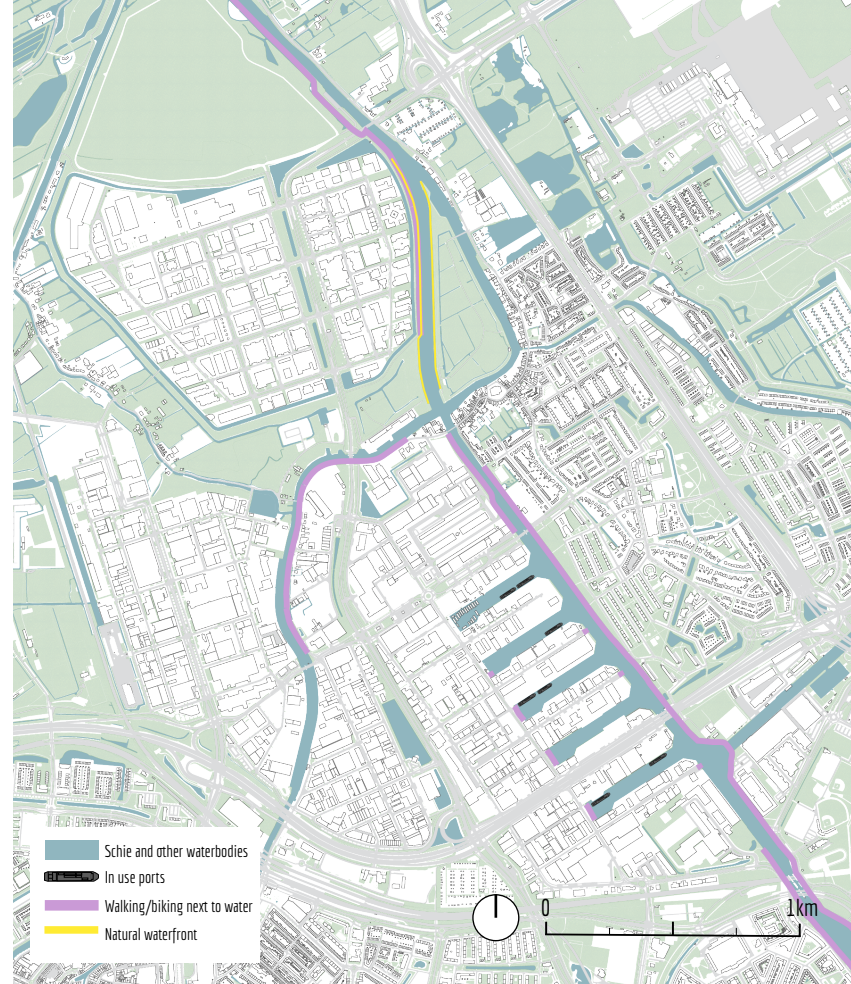
WALKING/BIKING NEXT TO SCHIE



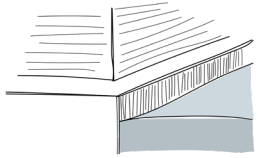
IN USE WATERFRONTS



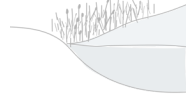
OTHER WATERBODIES



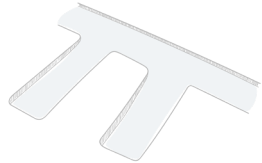
# BLUE STRUCTURES



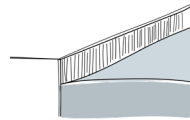
BACKSIDES TO WATER



NATURAL WATERFRONT



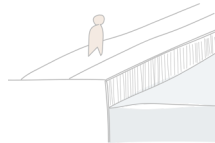
PORT ARMS



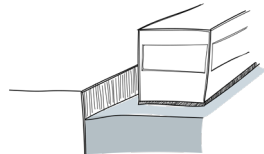
HARD WATERFRONT



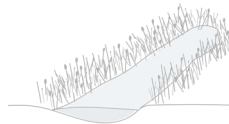
BOCHTAFSNIJDING



WALKING/BIKING NEXT TO SCHIE

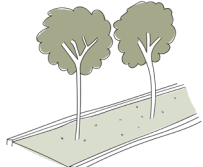


IN USE WATERFRONTS

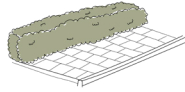


OTHER WATERBODIES

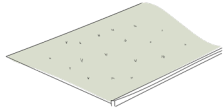
# GREEN STRUCTURES



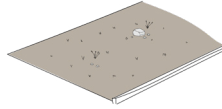
TREE ROWS



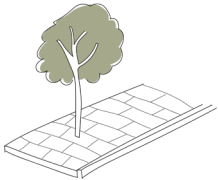
SHRUBS



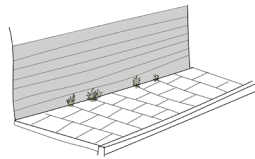
GRASSFIELDS



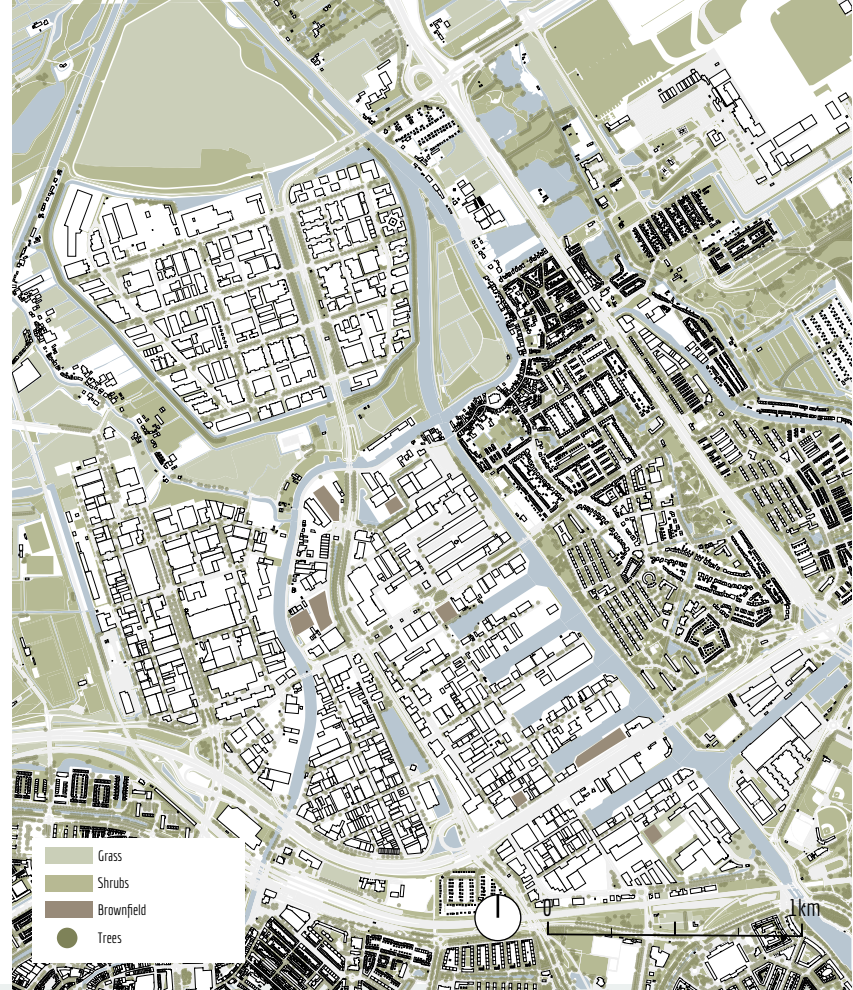
BROWNFIELDS



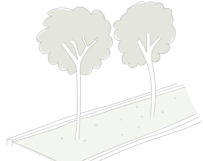
TREE IN PAVEMENT



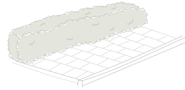
WEEDS



# GREEN STRUCTURES



TREE ROWS



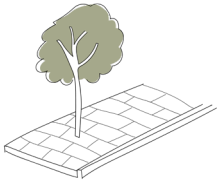
SHRUBS



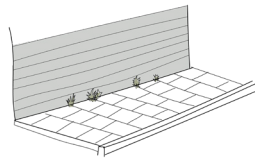
GRASSFIELDS



BROWNFIELDS



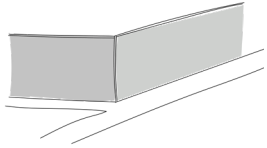
TREE IN PAVEMENT



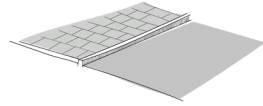
WEEDS



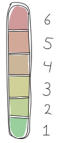
# GREY STRUCTURES



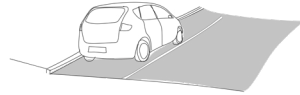
LARGE BUILDINGS



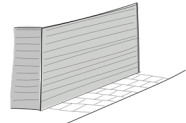
PAVED AREAS



ENVIRONMENTAL CATEGORY



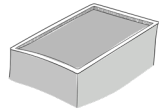
PARKING



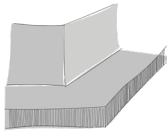
CLOSED FACADES



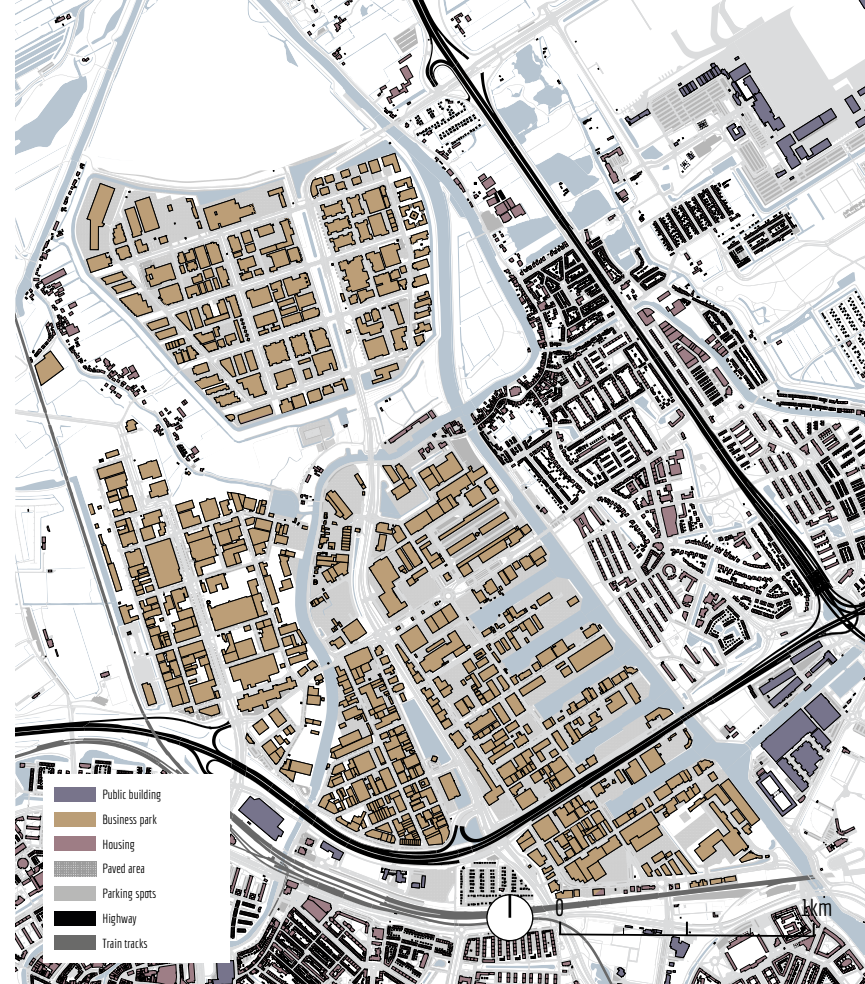
HIGHWAY



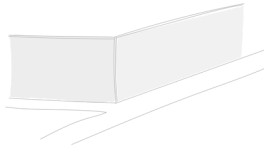
FLAT ROOFS



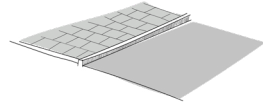
FENCES



# GREY STRUCTURES



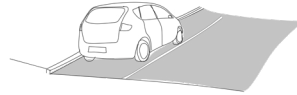
LARGE BUILDINGS



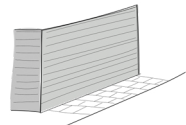
PAVED AREAS



ENVIRONMENTAL CATEGORY



PARKING



CLOSED FACADES



HIGHWAY



FLAT ROOFS



FENCES

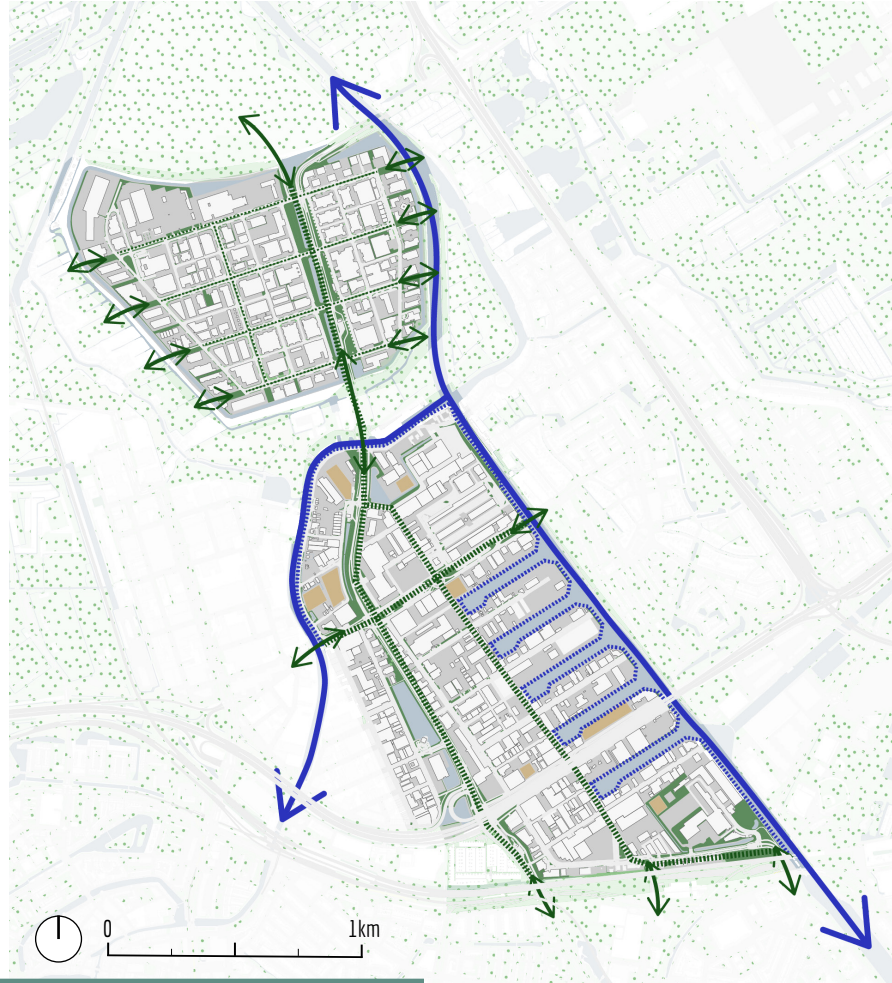


# ECOLOGICAL NETWORK



# OPPORTUNITIES

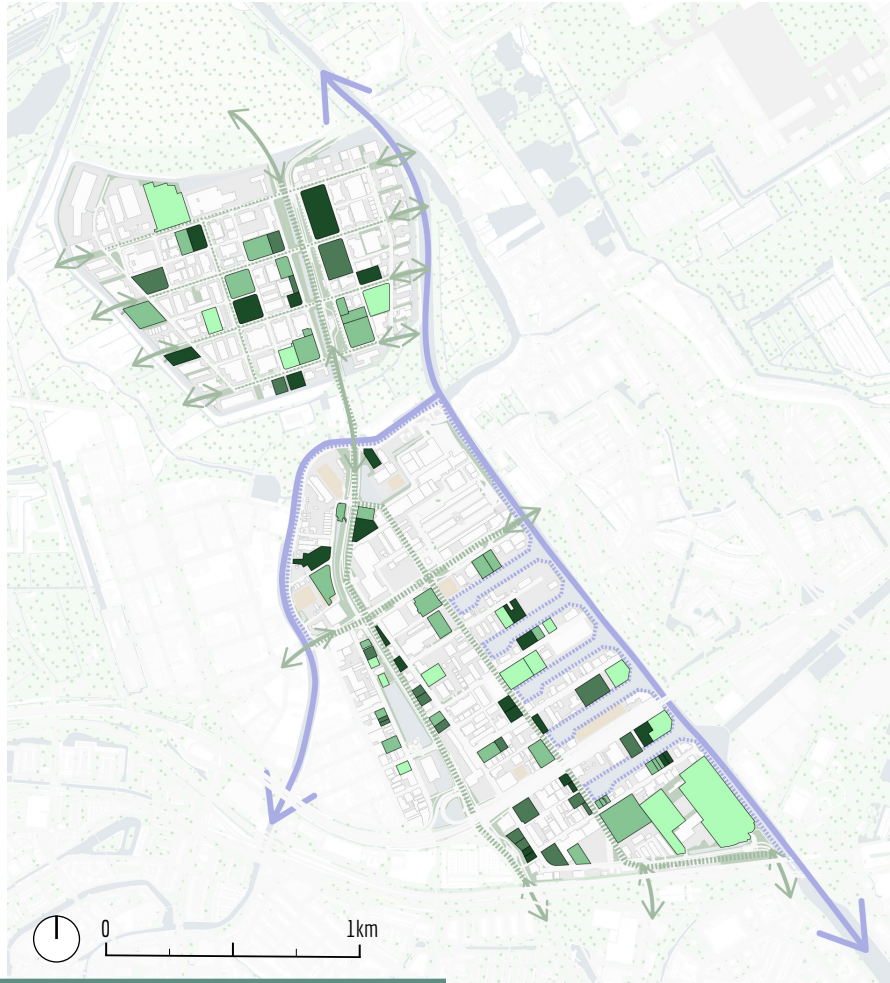
- Paved areas
- Brownfields
- Existing green on location
- ↔ Existing waternetwork
- Hard waterfront
- ↔ Ecological connection
- Corridors



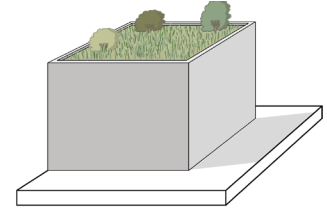


# OPPORTUNITIES

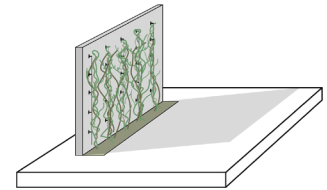
- Green roof
- Green facade
- Taking out pavement/permeable pavement
- Multiple options



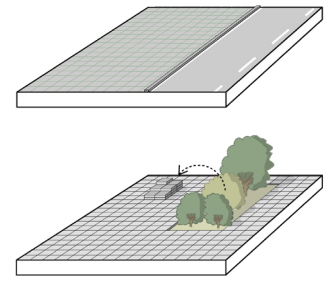
GREEN ROOF



GREEN FACADE



PERMEABLE PAVEMENT  
TAKING OUT PAVEMENT





# Designing for business sites

SQ3 What are design tools to enhance biodiversity and improve human well-being?

# USERS

I find it important that my employees are healthy and happy. I encourage them to go outside for a lunch walk.

**Employer**



Smantha

I want a good accessible road for my truck and a parking spot close to a place where I can have my break.

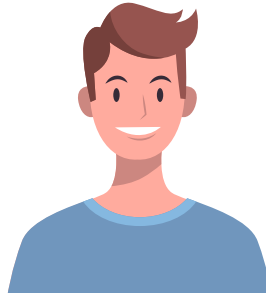
**Truck driver**



Joe

I cycle through the Spaanse Polder every week and I would like to take a break in the location somewhere next to the water.

**Passing through**



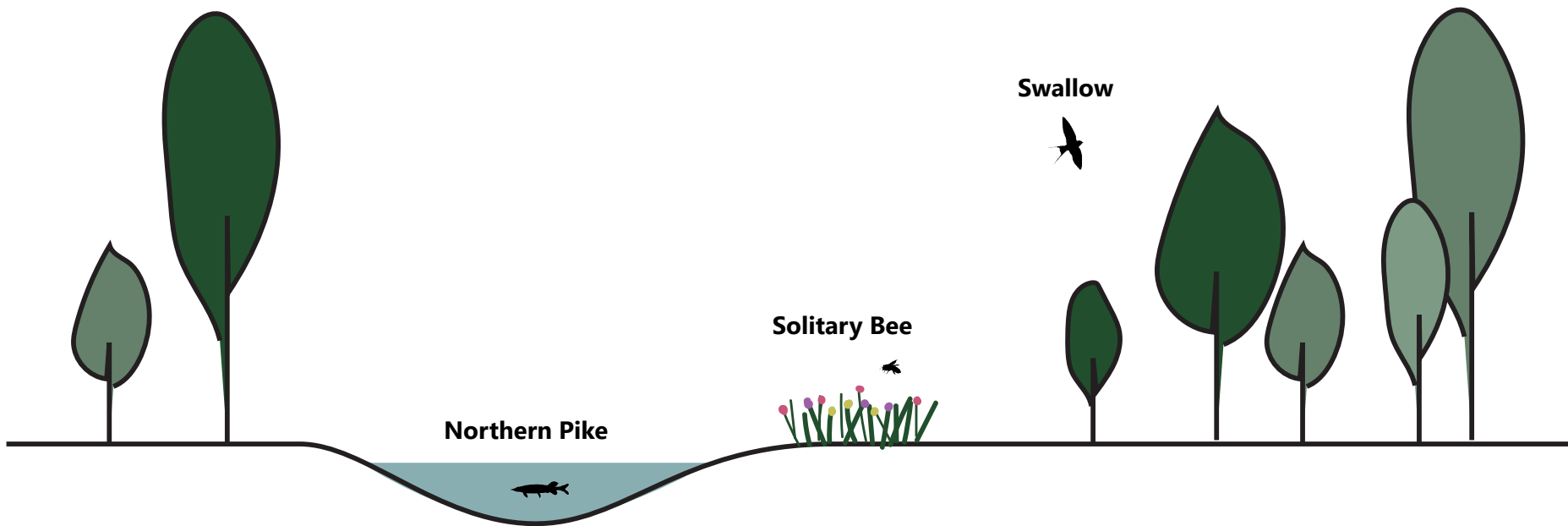
Nick

I want to make new social connections to other employees of the location, having a space where I can meet new people would be nice.

**Employee**



Vera



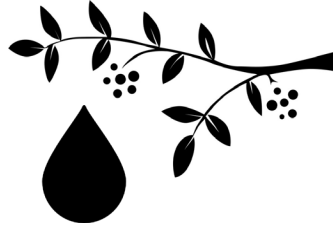


**Northern Pike**



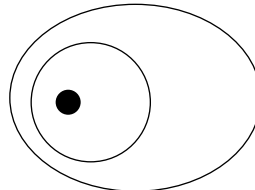
**SHELTER**

- Shallow water less than 50cm deep
- Planting to hide in



**FOOD AND WATER**

- Predator
- In the shallow waters between planting

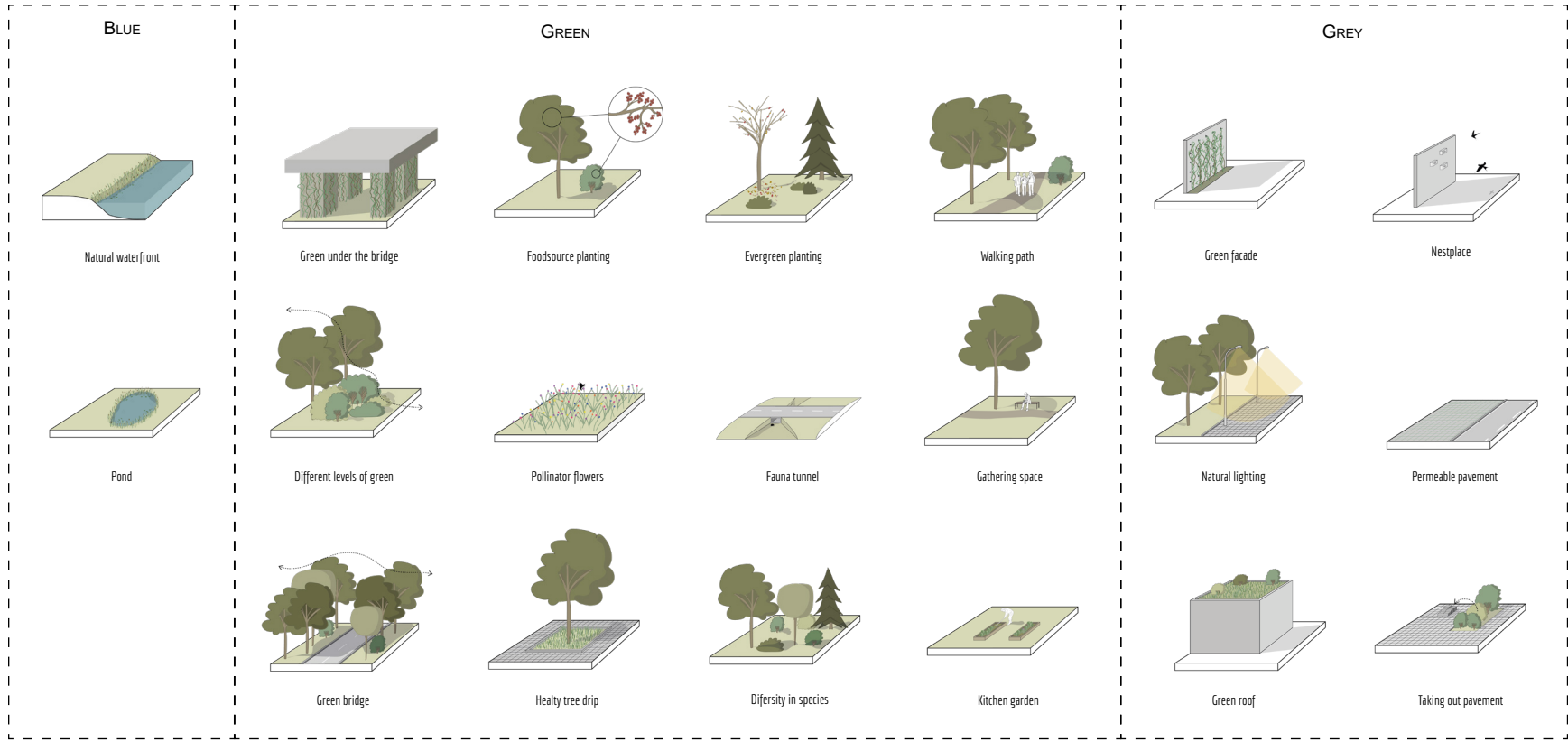


**SPACE**

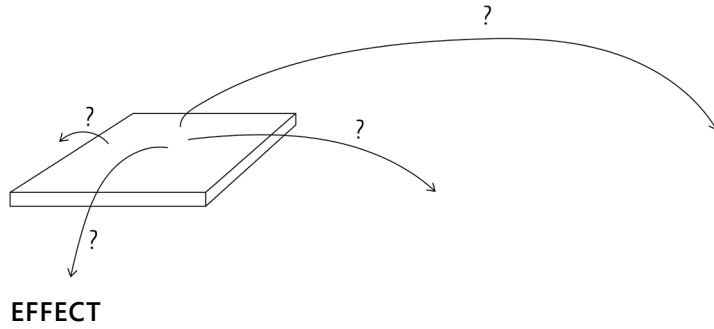
- True to one place
- Migration few kilometers to tens of kilometers

(Sportvisserij Nederland, 2006)

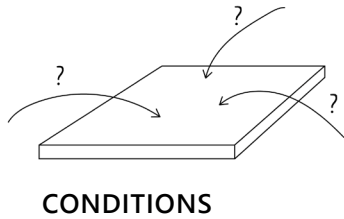
# DESIGN TOOLS



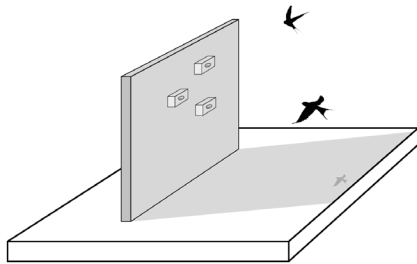
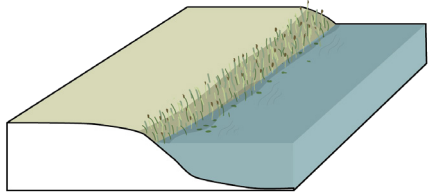
# FUNCTIONING OF THE TOOLS








- Animals
- People
- Ecological structure
- Another tool



- Location
- Climate
- Other tools



-  Diversity in species
-  Natural waterfront
-  Pollinator flowers

-  Healthy tree dirpline
-  Nesting boxes

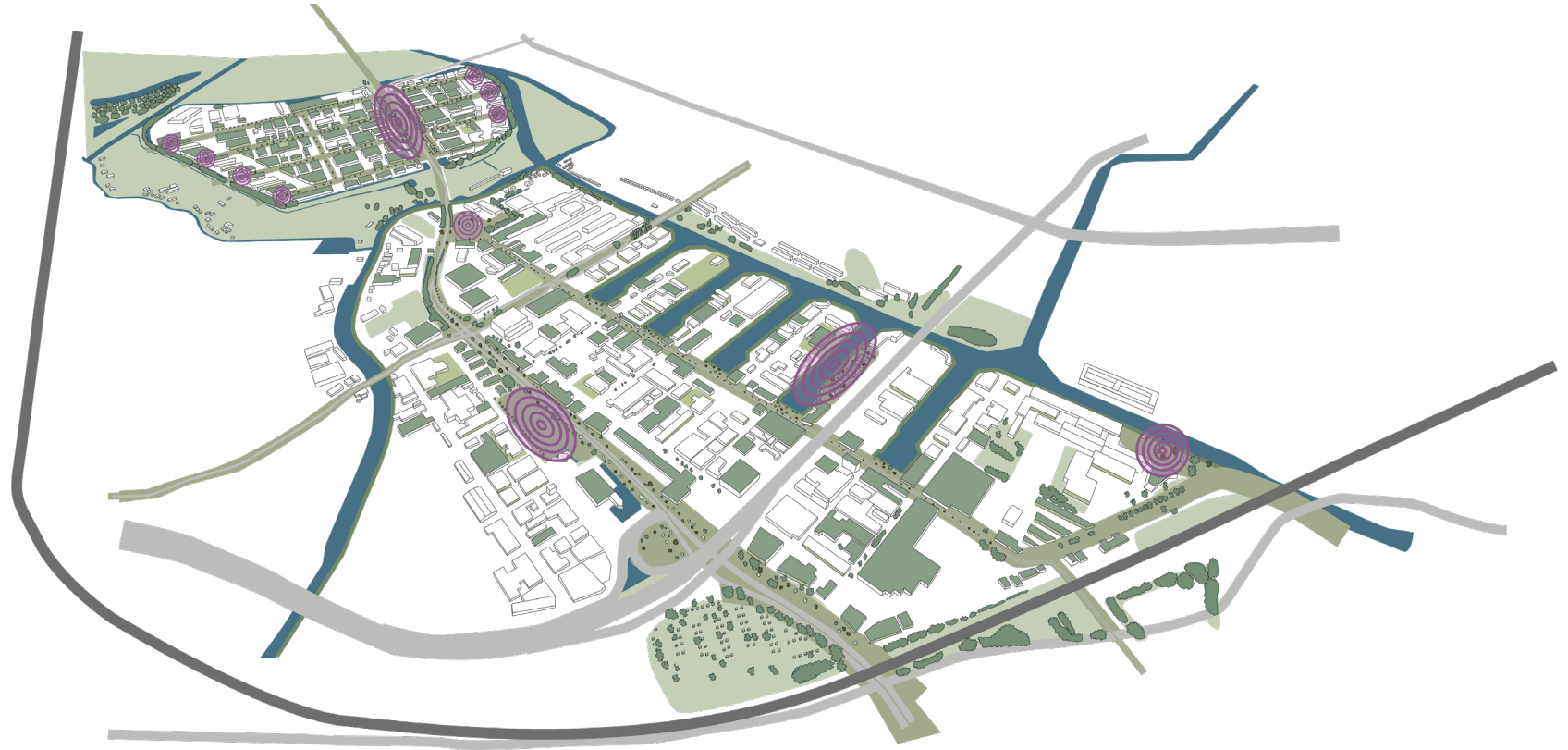




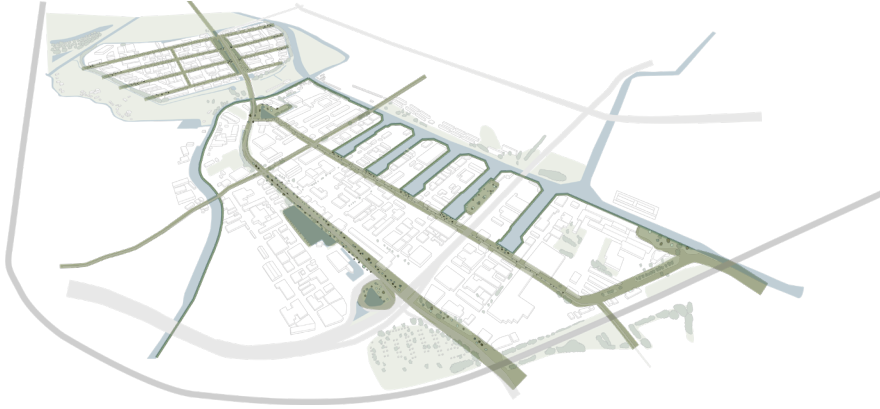
# DESIGN IMPLEMENTATION

**SQ4** How can these design tools be implemented in the case study location Spaanse Polder?

# VISION



## ECOLOGICAL LAYER



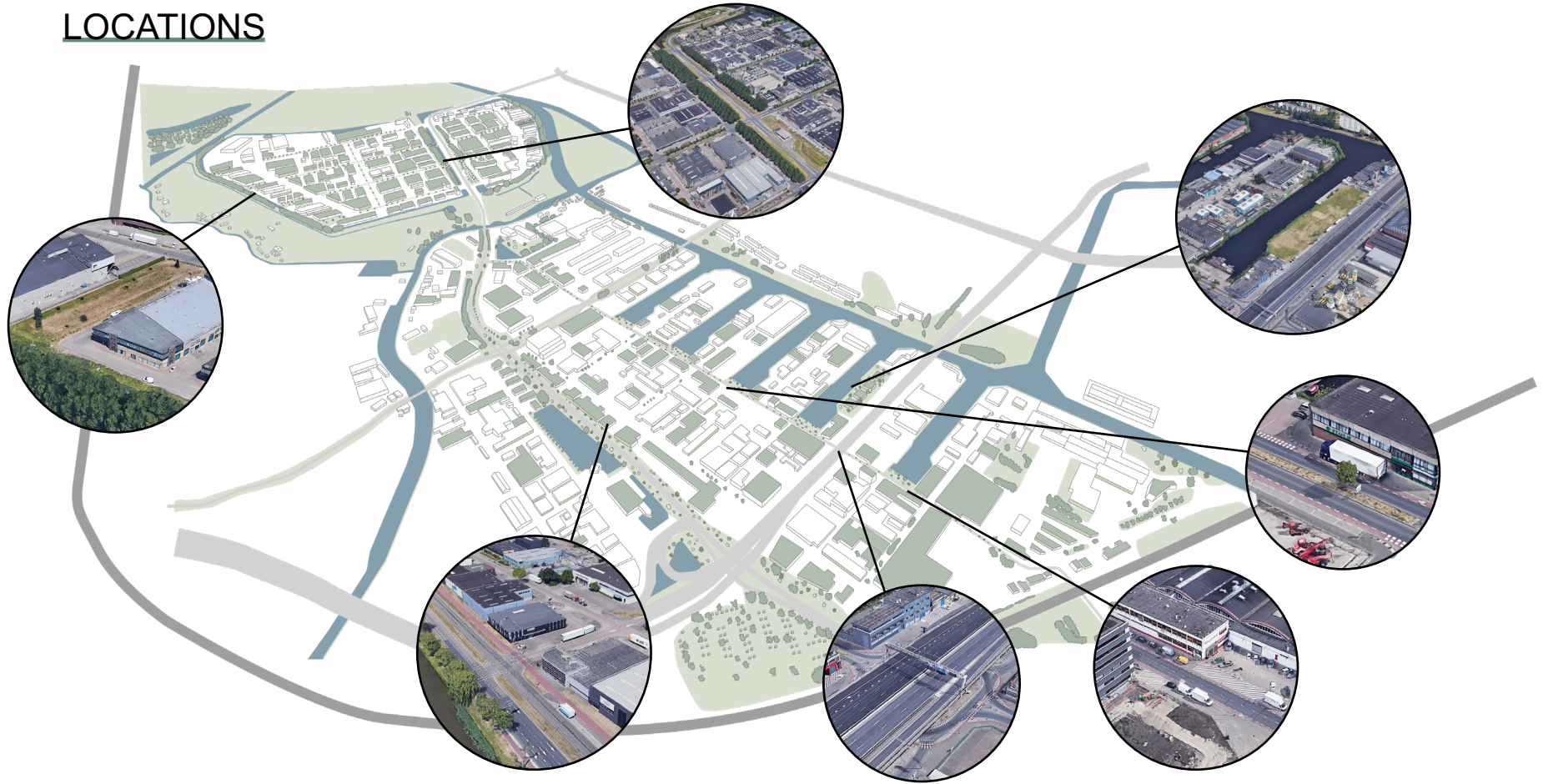
## RECREATIONAL LAYER



## PRIVATE PROPERTY LAYER



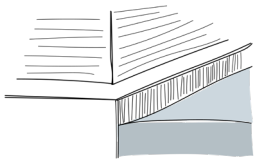
# LOCATIONS



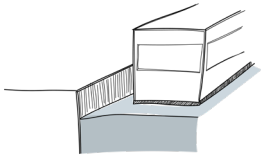
# PORT



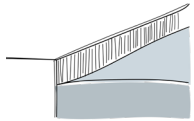
## SITUATION NOW



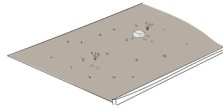
BACKSIDES TO WATER



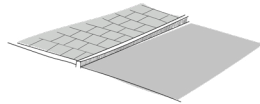
IN USE WATERFRONTS



HARD WATERFRONT



BROWNFIELDS



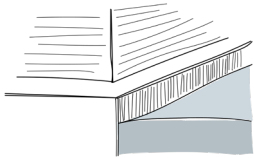
PAVED AREAS



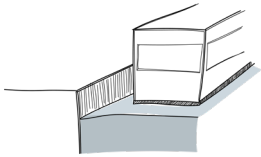
HIGHWAY



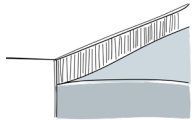
## SITUATION NOW



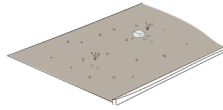
BACKSIDES TO WATER



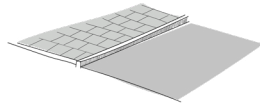
IN USE WATERFRONTS



HARD WATERFRONT



BROWNFIELDS










PAVED AREAS



HIGHWAY



## NEW SITUATION

-  Walking path
-  Natural waterfront
-  Jetty
-  New trees
-  New businesses
-  Dukdalf
-  New waterplants and pollinator flowers





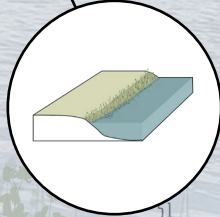
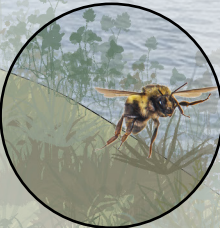
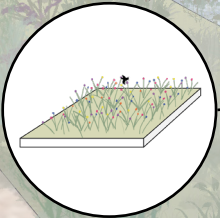
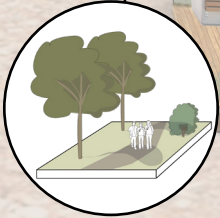
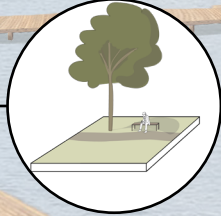
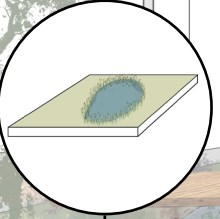
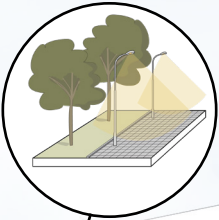
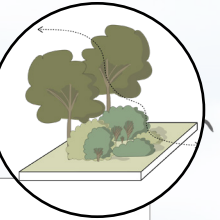
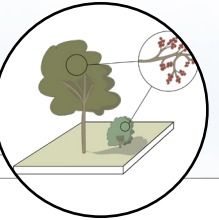
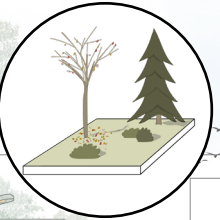
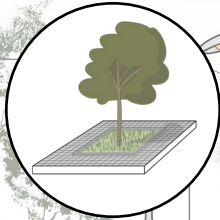
NEW SITUATION

Natural waterfront  
With walking path



NATURAL WATERFRONT  
WITH WALKING PATH





NEW SITUATION

Natural waterfront  
With walking path

Park with innovative  
businesses



PARK WITH INNOVATIVE BUSINESSES

TASSI

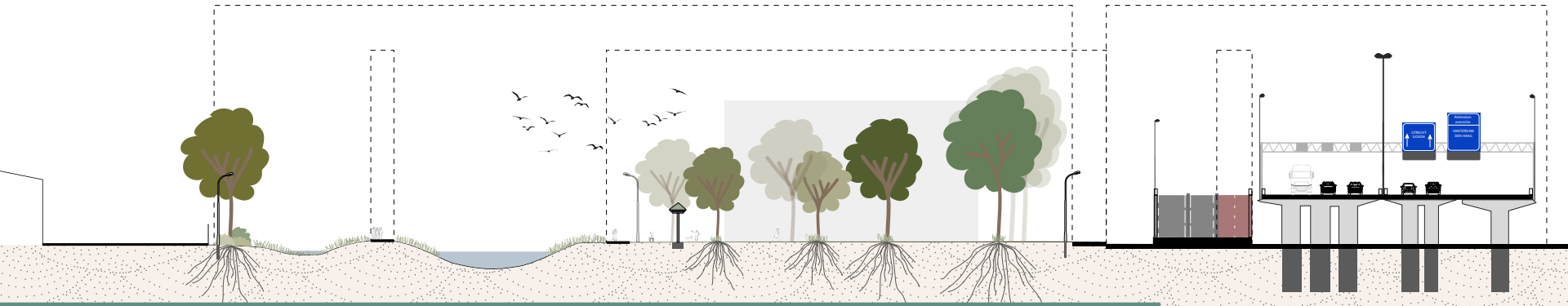




# SECTION



# SECTION







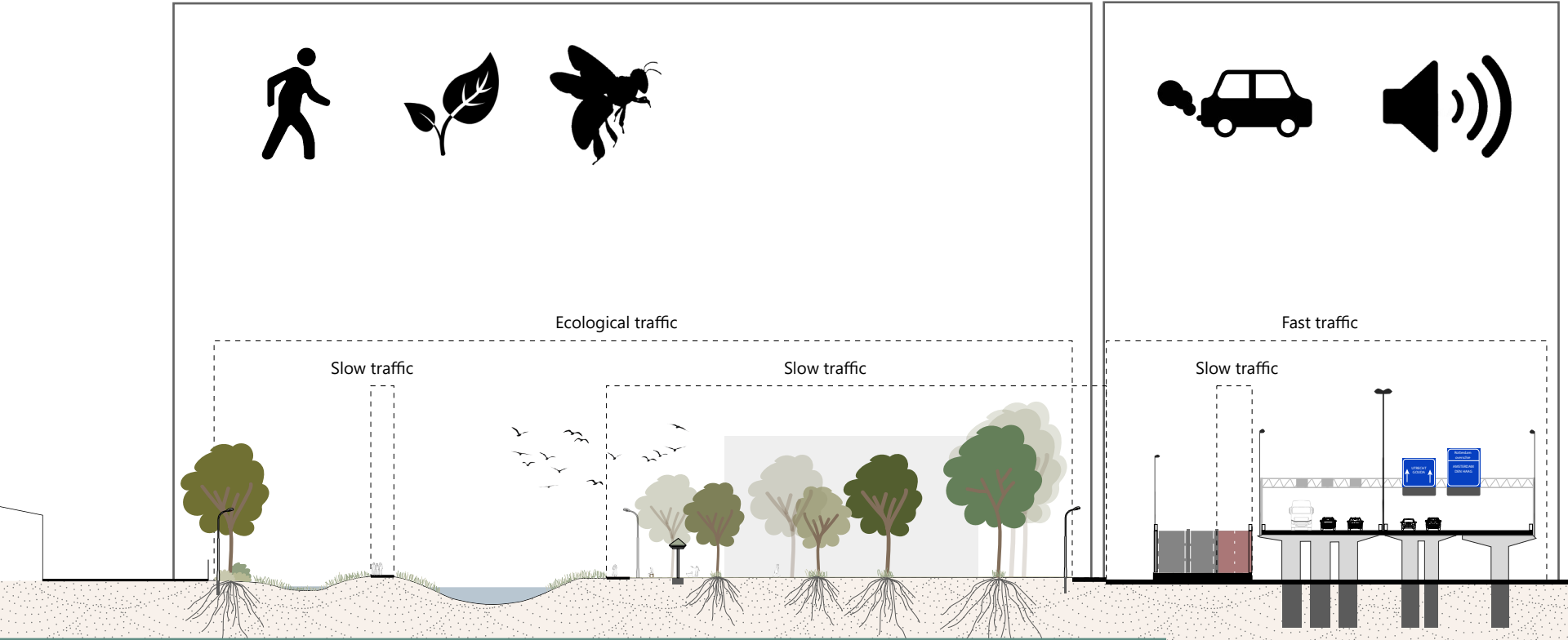
Ecological traffic

Fast traffic

Slow traffic

Slow traffic

Slow traffic





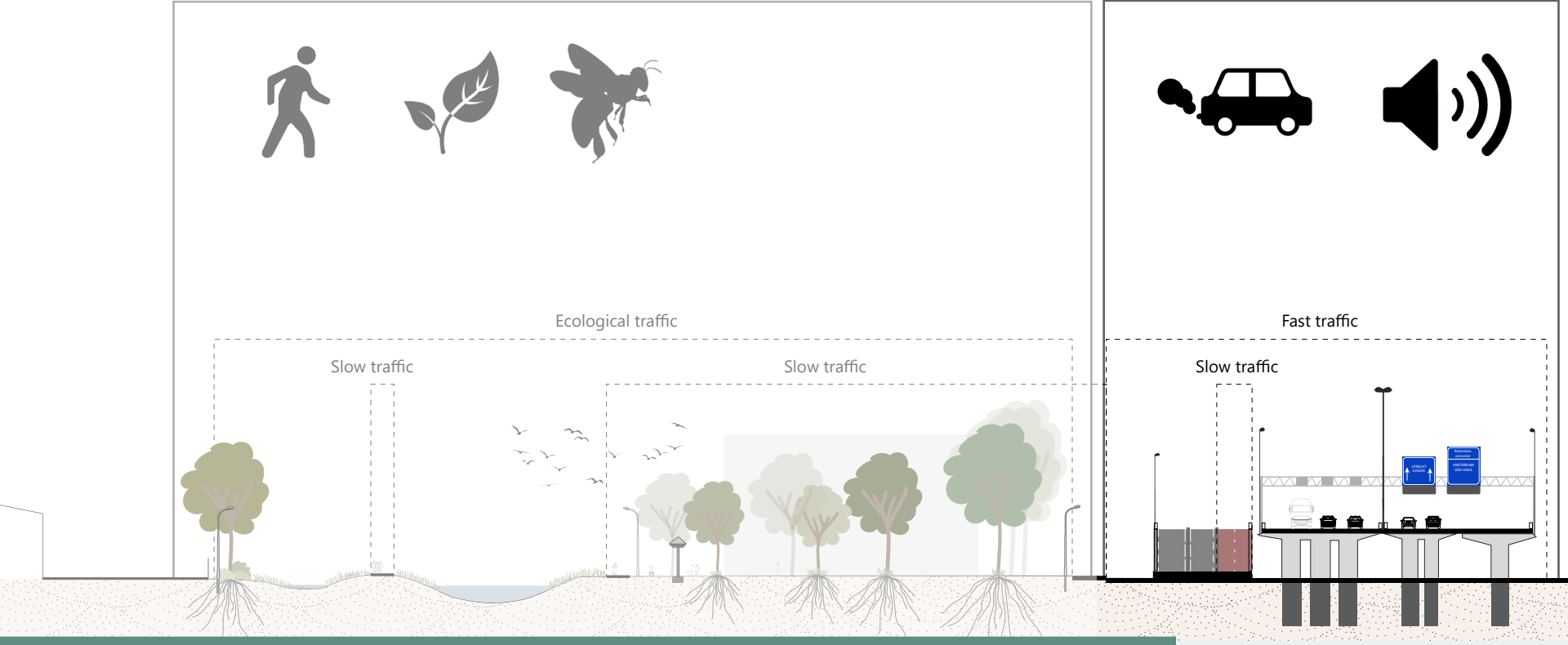
Ecological traffic

Fast traffic

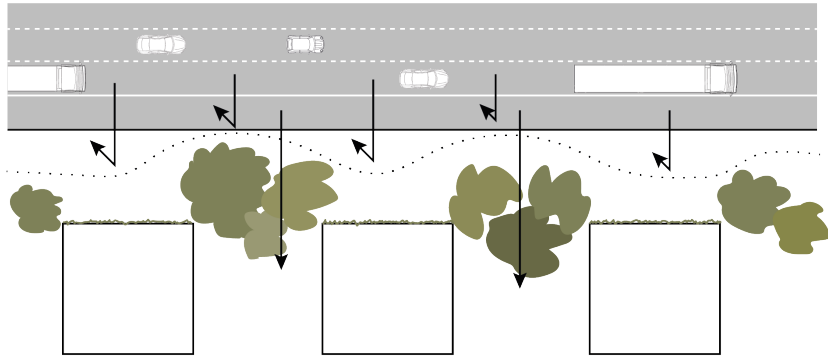
Slow traffic

Slow traffic

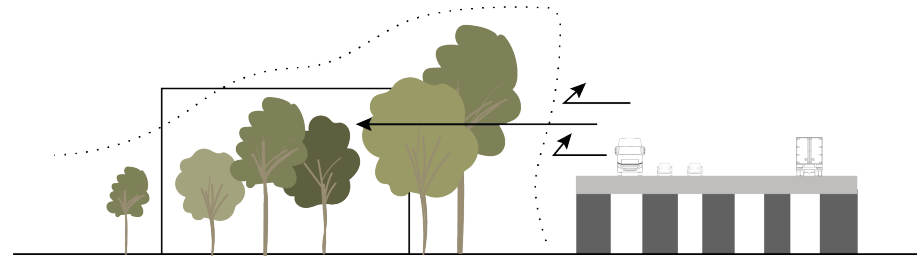
Slow traffic



## FAST TRAFFIC



TOP VIEW



SIDE VIEW



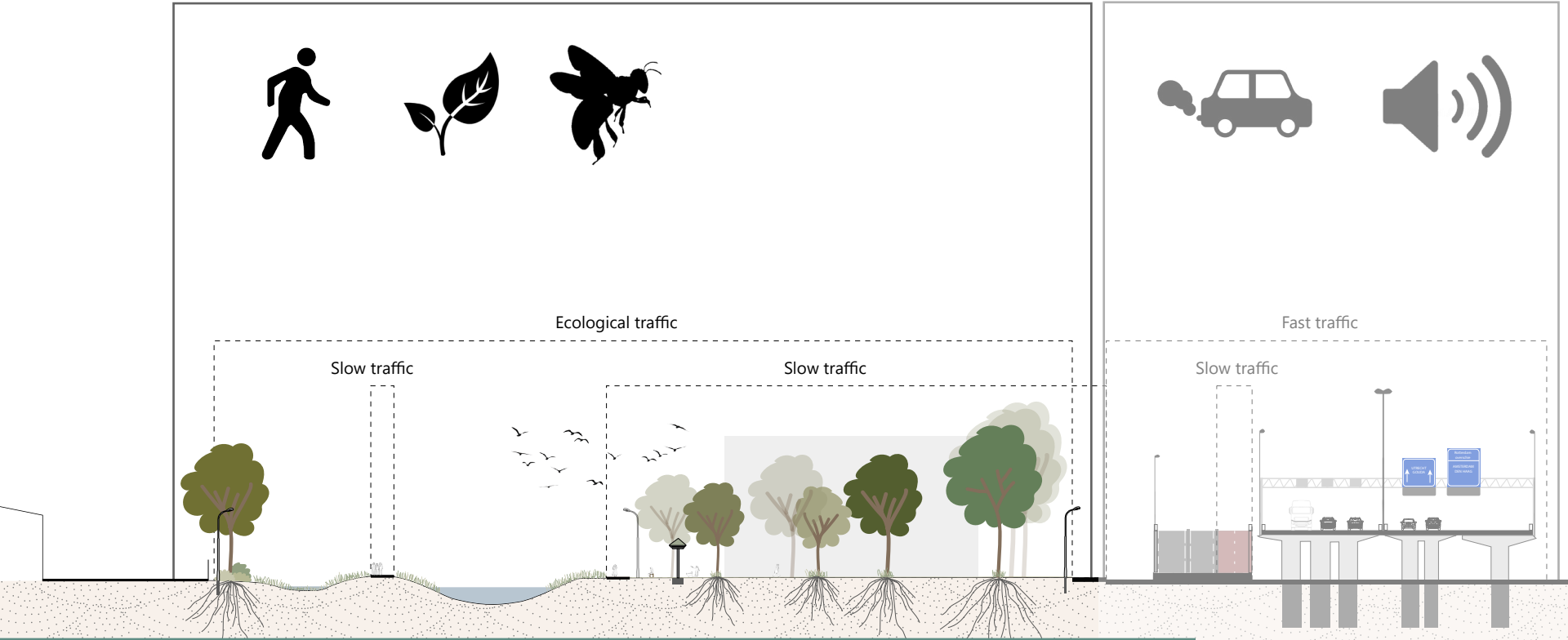
Ecological traffic

Fast traffic

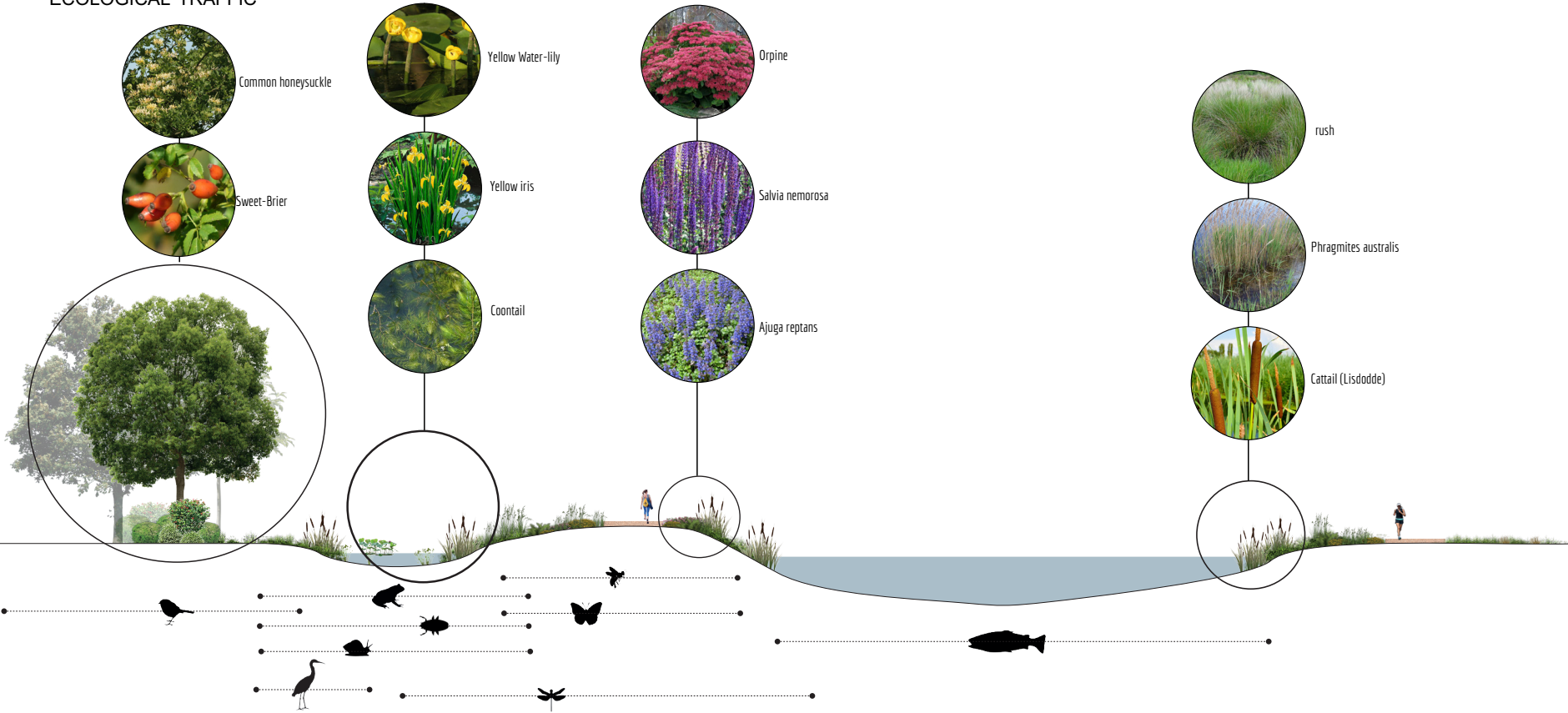
Slow traffic

Slow traffic

Slow traffic



# ECOLOGICAL TRAFFIC



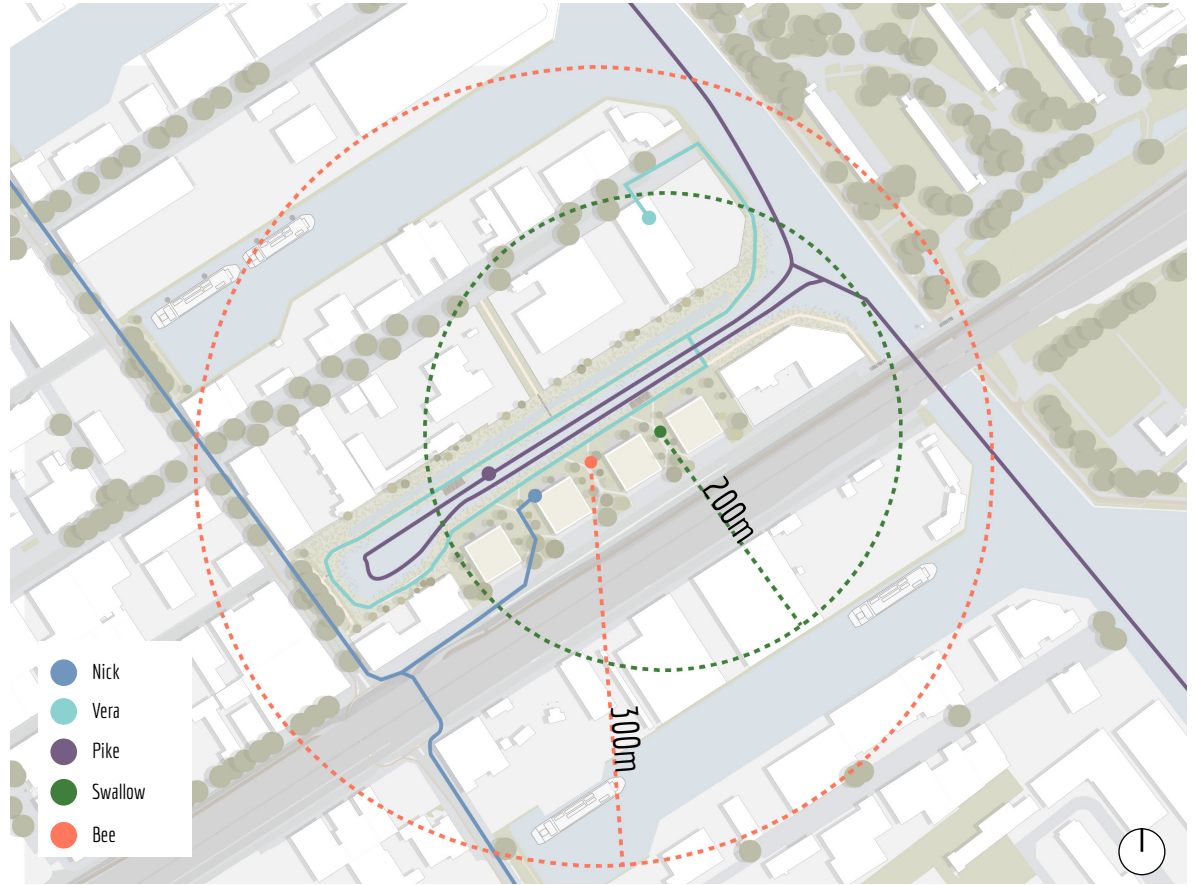
# USERS

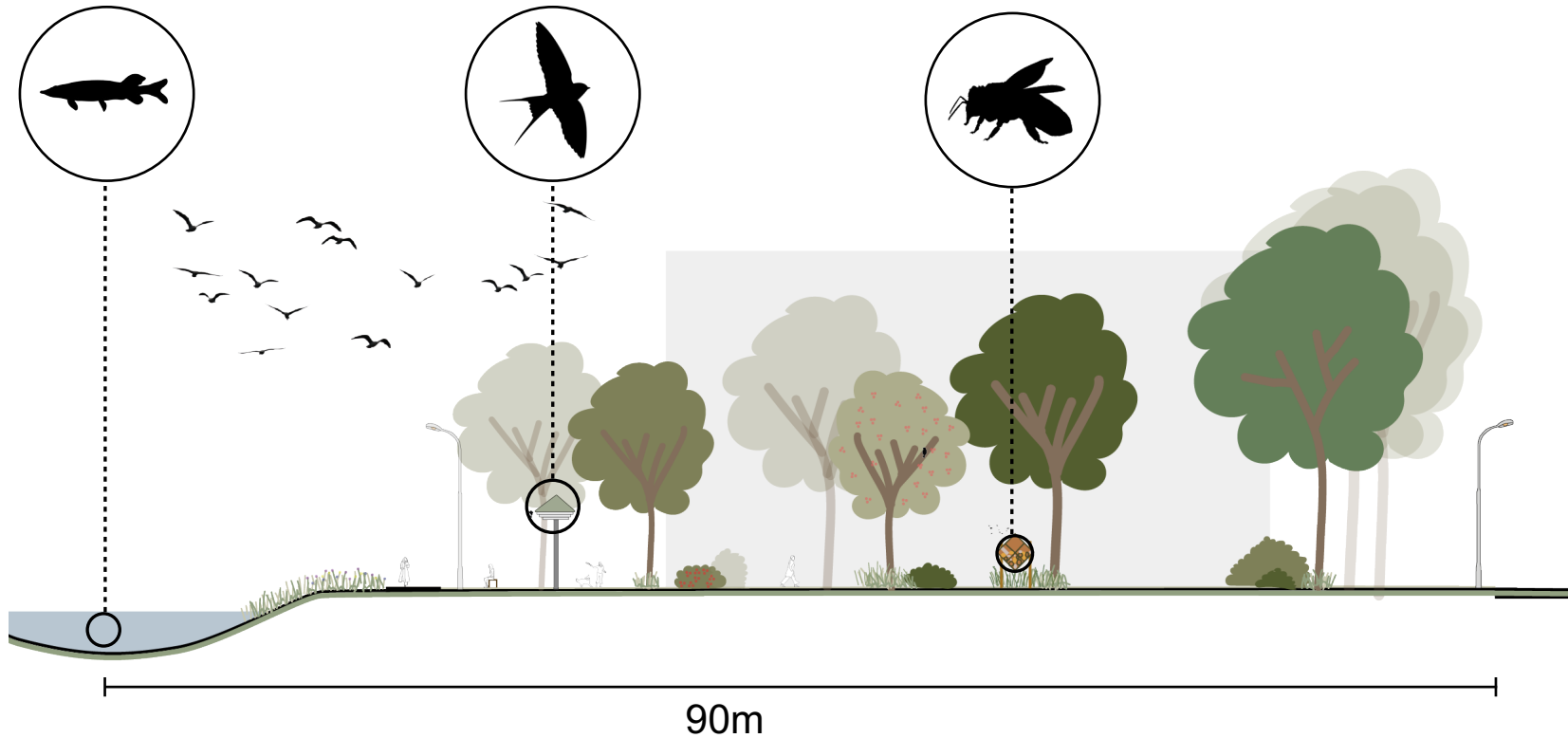


VERA



NICK



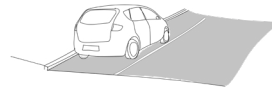
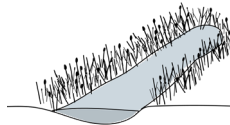
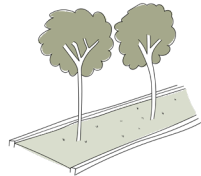
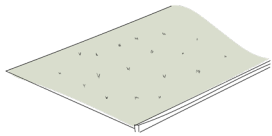


# MATLINGEPARK





# SITUATION NOW



- Plots
- Biking path
- Parking
- Roads
- Bus stop
- Trees
- Grass fields

## NEW SITUATION



- Walking path
- New biking path
- Jetty
- New trees
- New waterplants and pollinator flowers

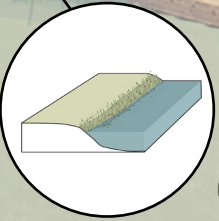
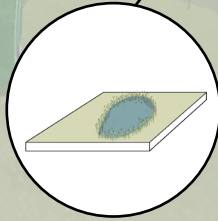
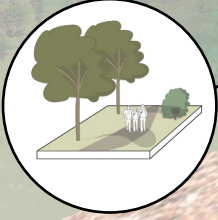
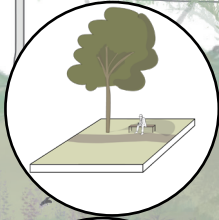
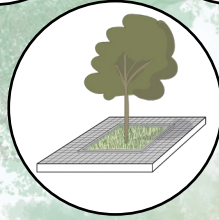
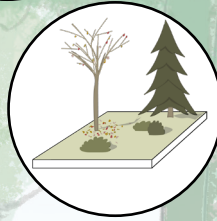
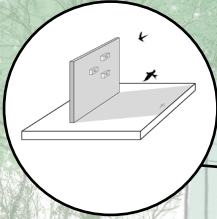
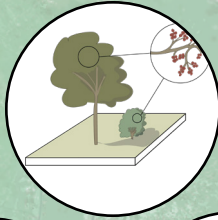
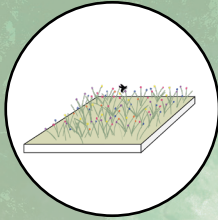
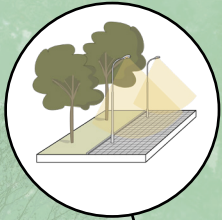
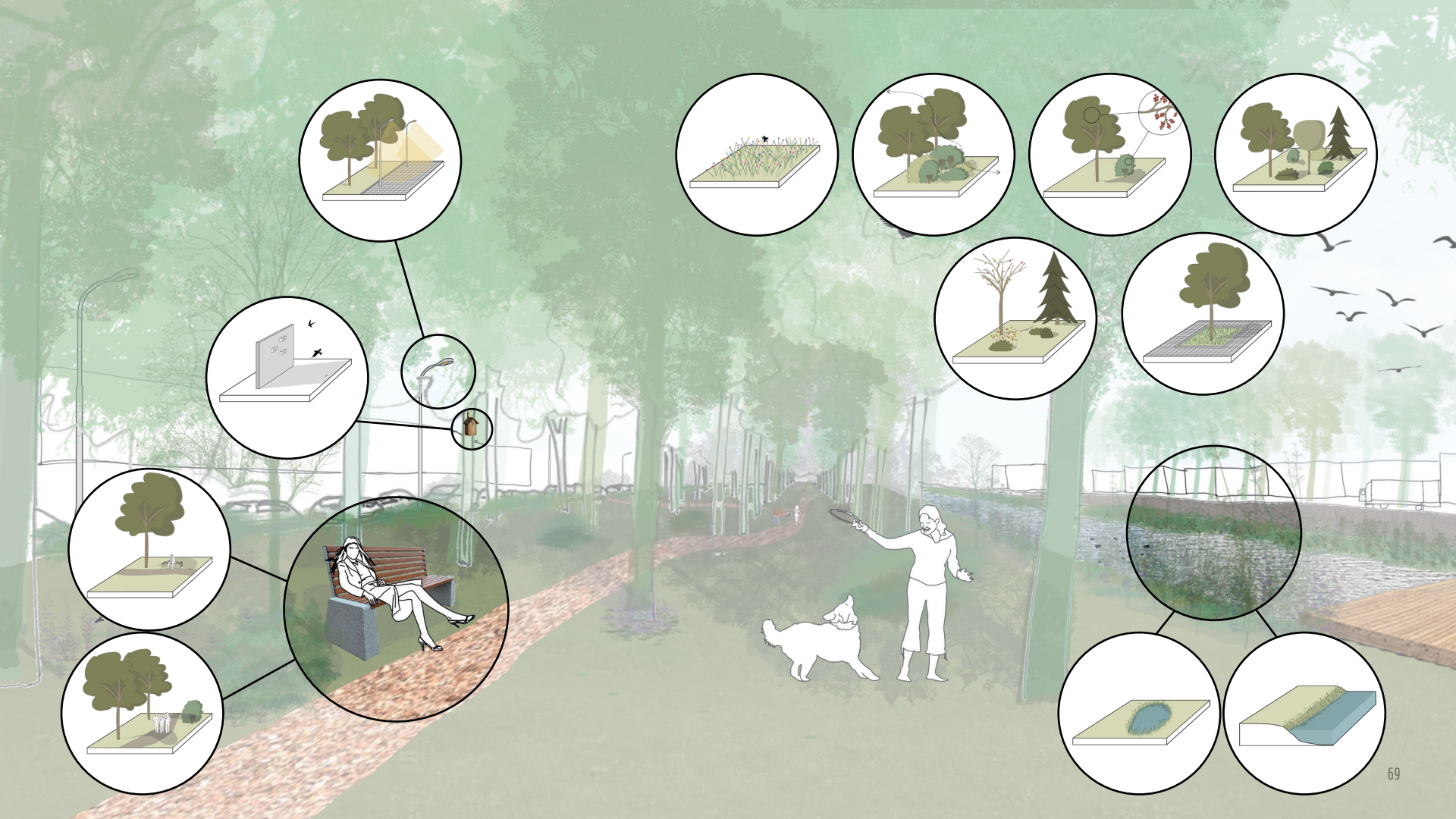
## NEW SITUATION



New park

NEW PARK





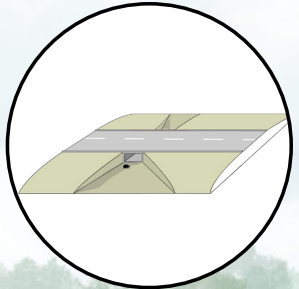
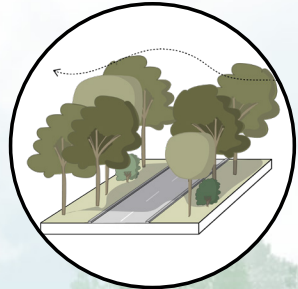
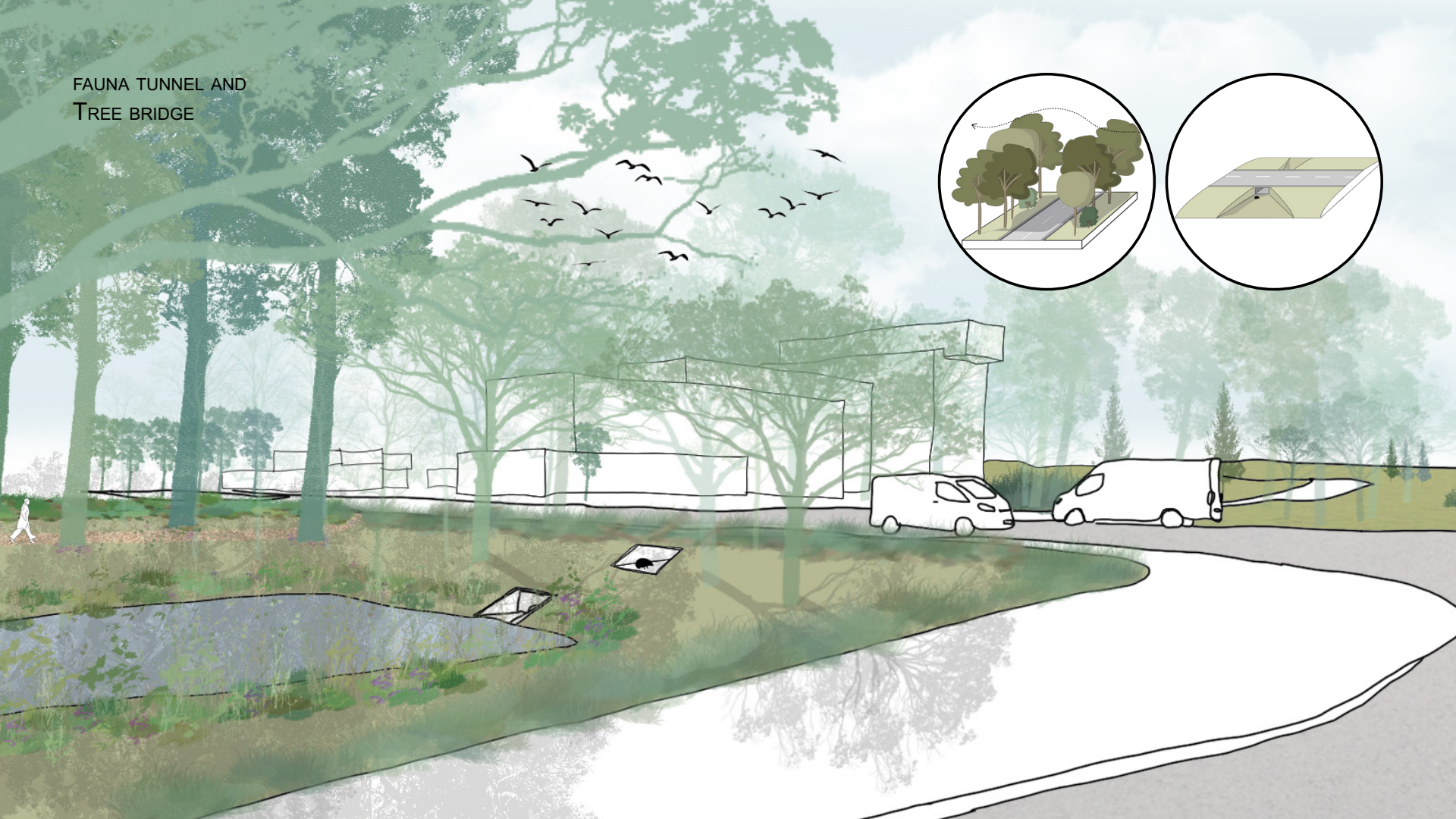
## NEW SITUATION



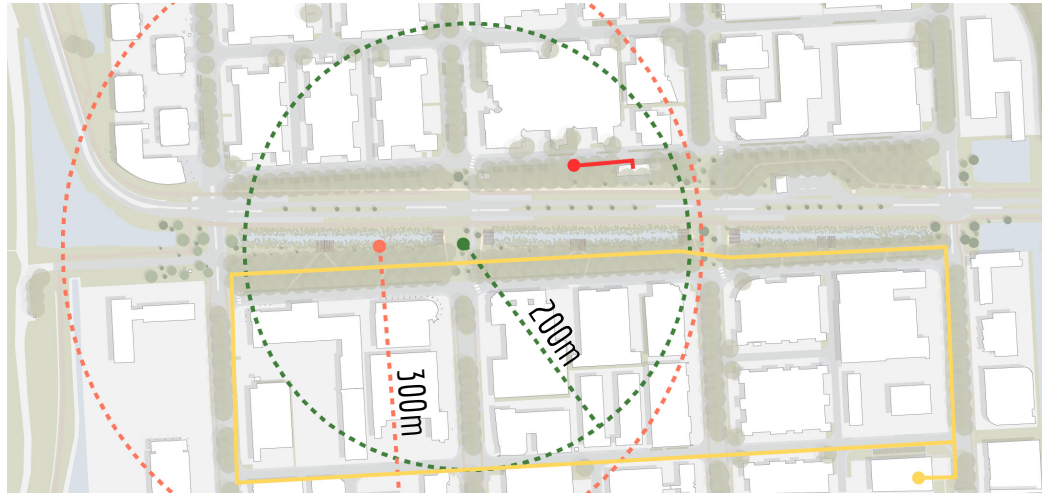
Fauna tunnel and  
Tree bridge

New park

FAUNA TUNNEL AND  
TREE BRIDGE



## USERS



● Samantha

● Swallow

● Joe

● Bee



SAMANTHA



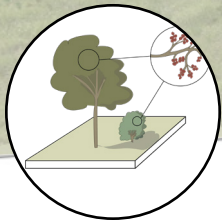
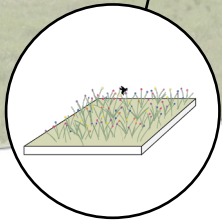
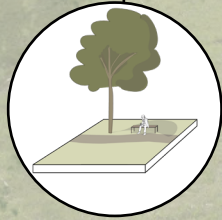
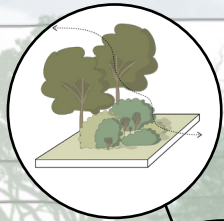
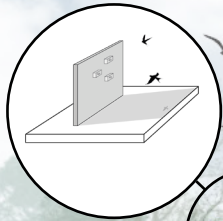
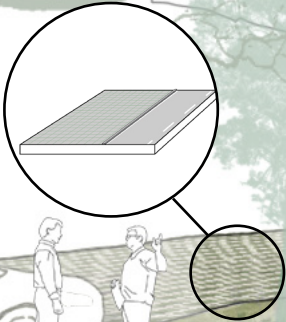
JOE



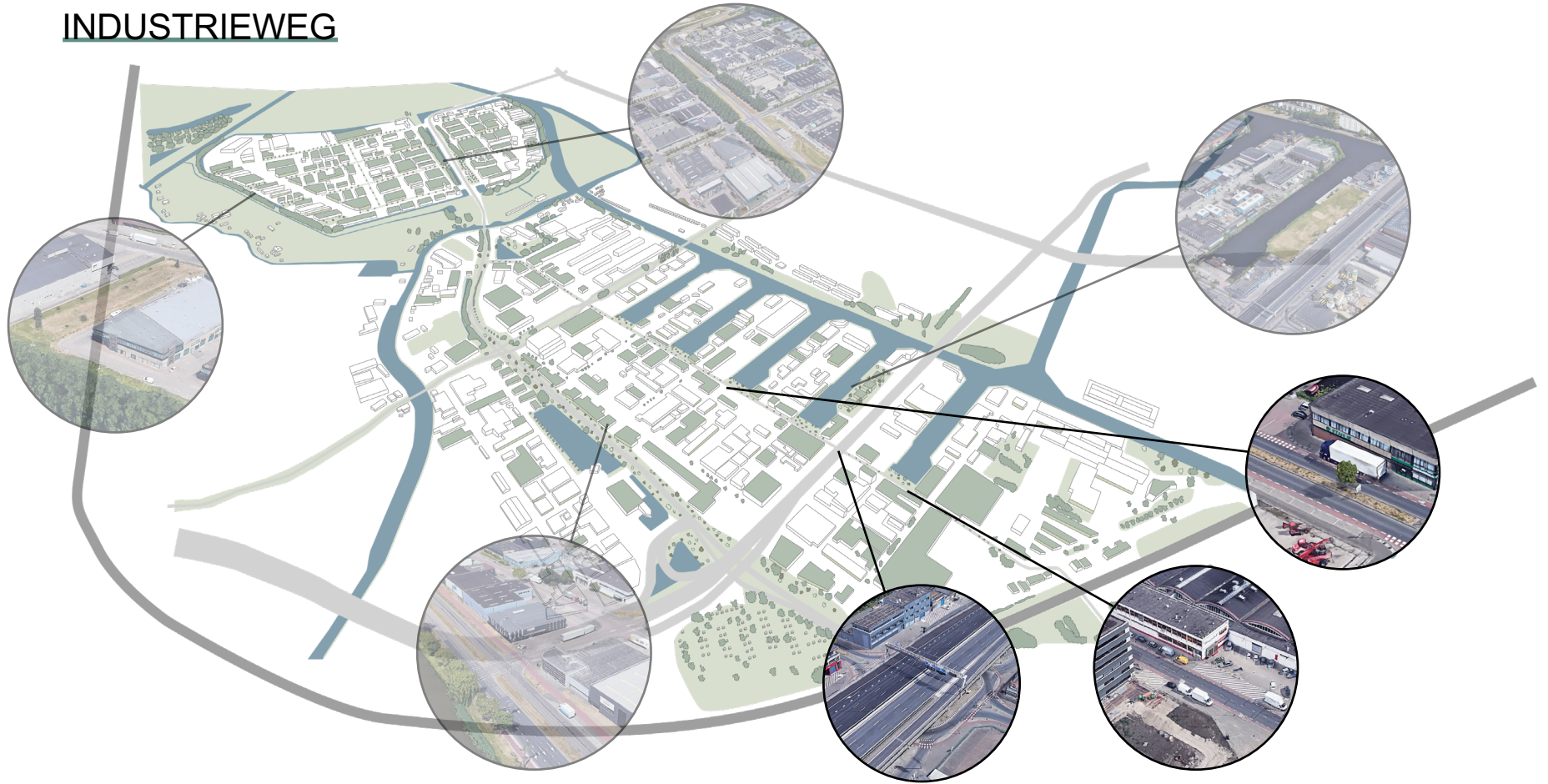
# POCKET PARK

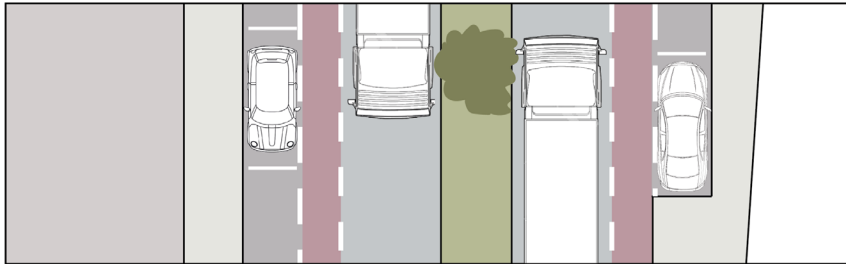
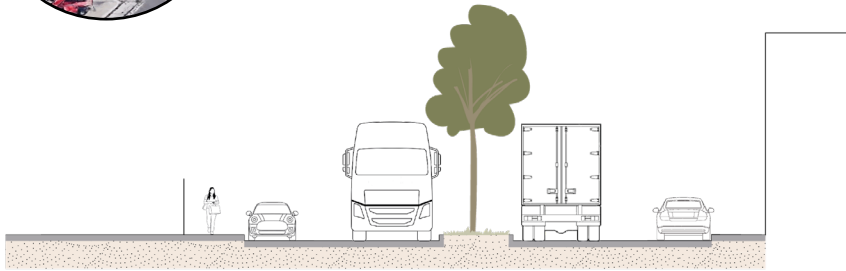




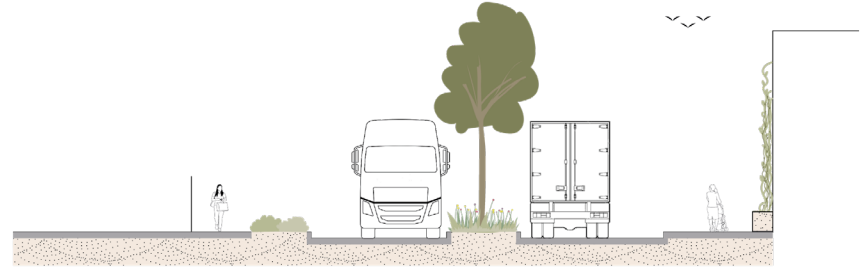


# INDUSTRIEWEG

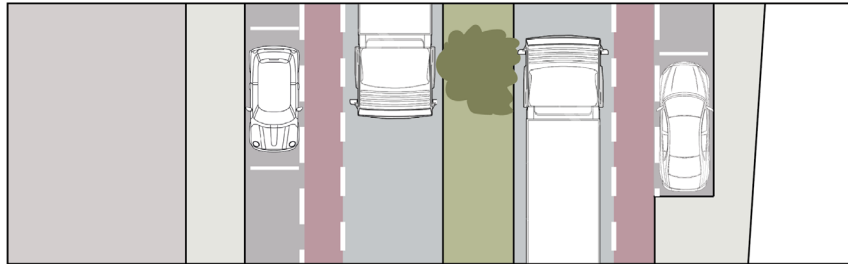
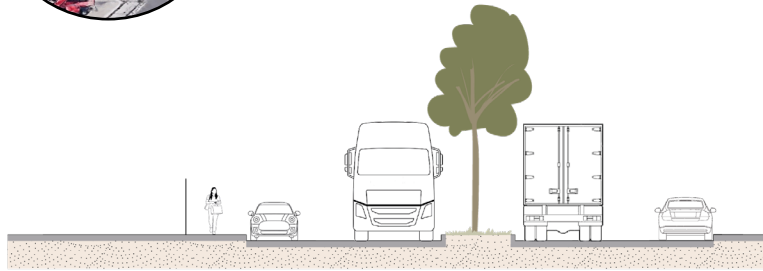




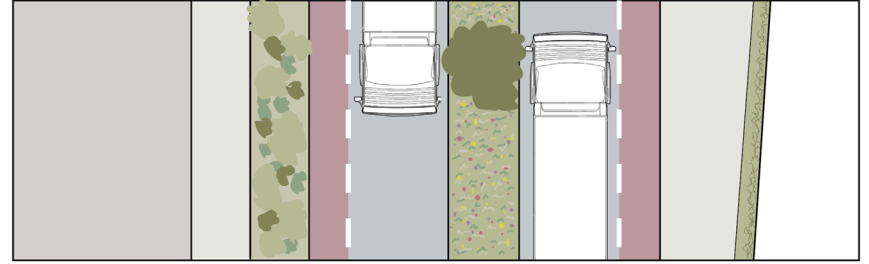
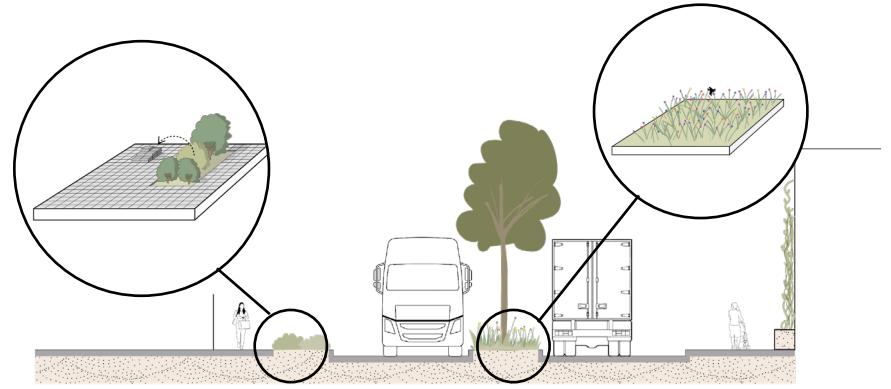
OLD SITUATION



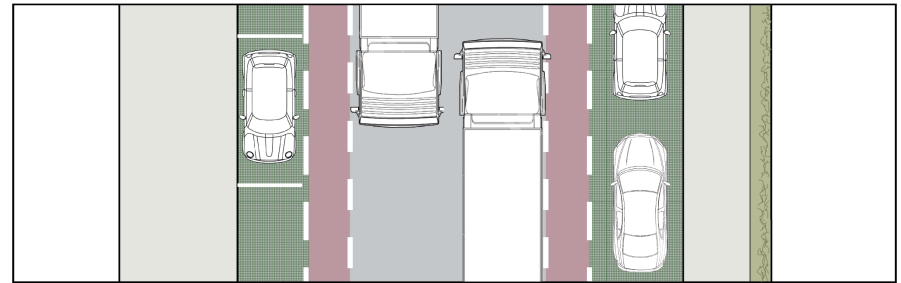
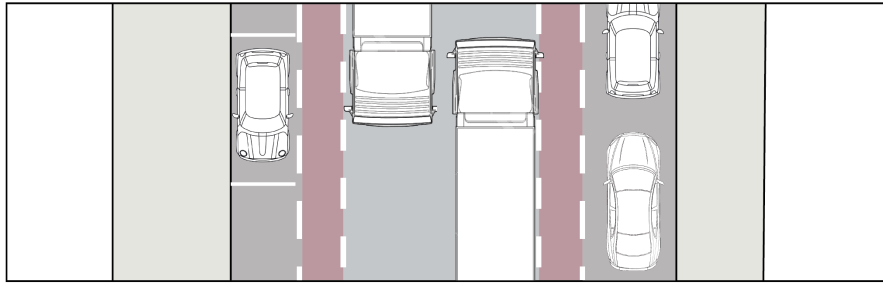
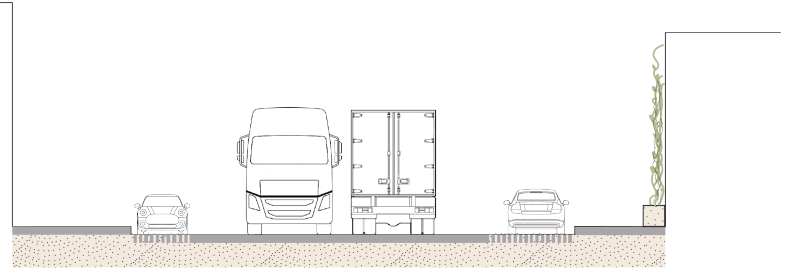
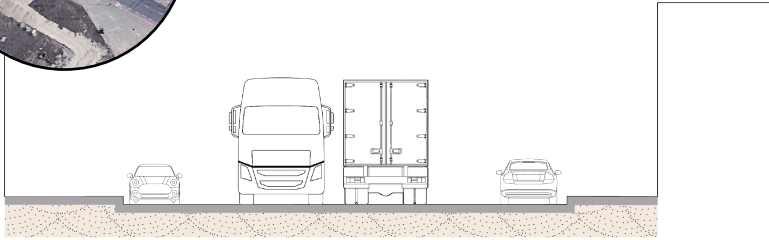
NEW SITUATION



OLD SITUATION

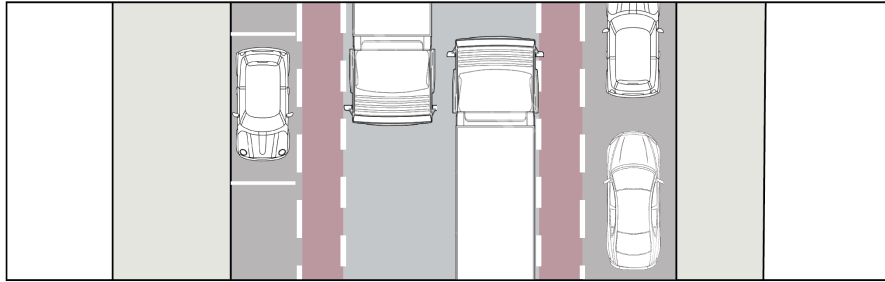
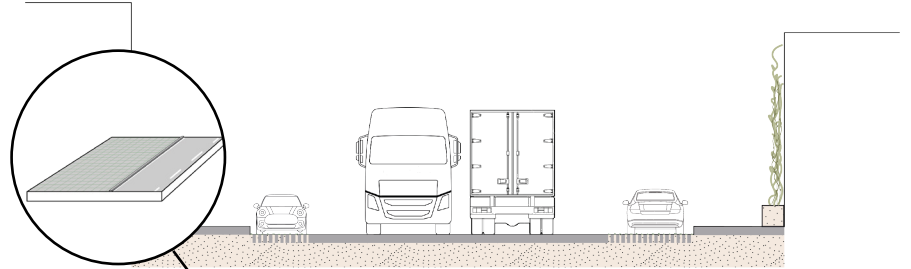
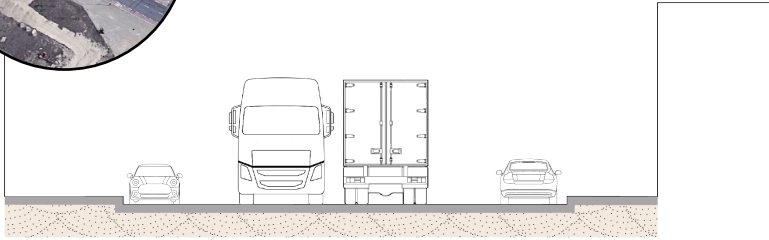


NEW SITUATION

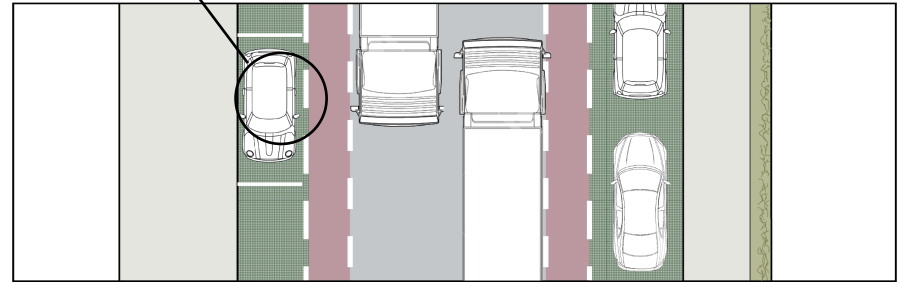


OLD SITUATION

NEW SITUATION

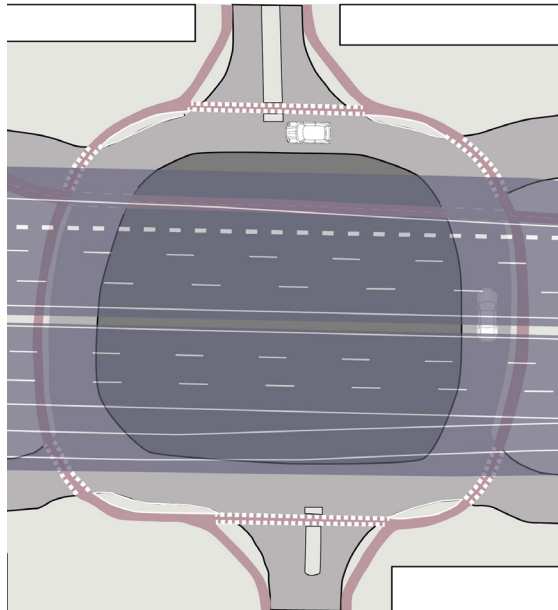
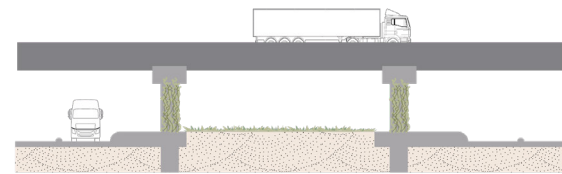
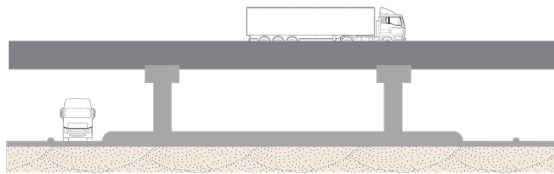
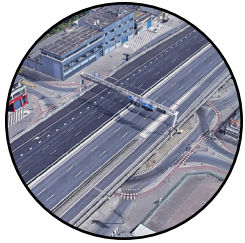


OLD SITUATION

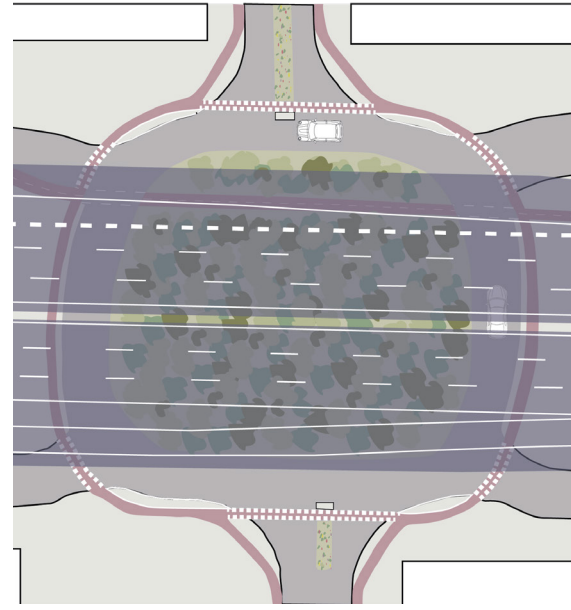


NEW SITUATION

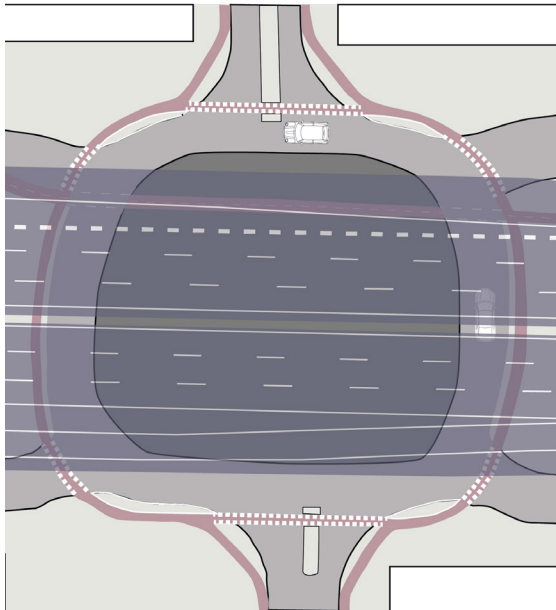
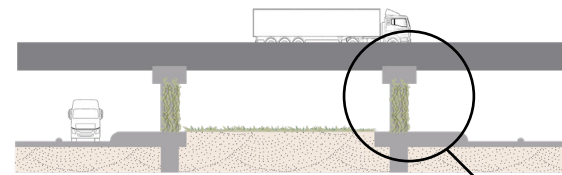
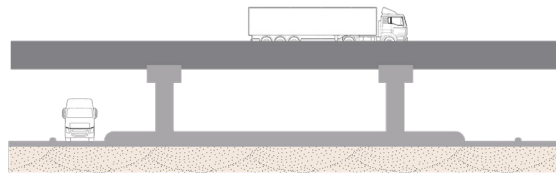




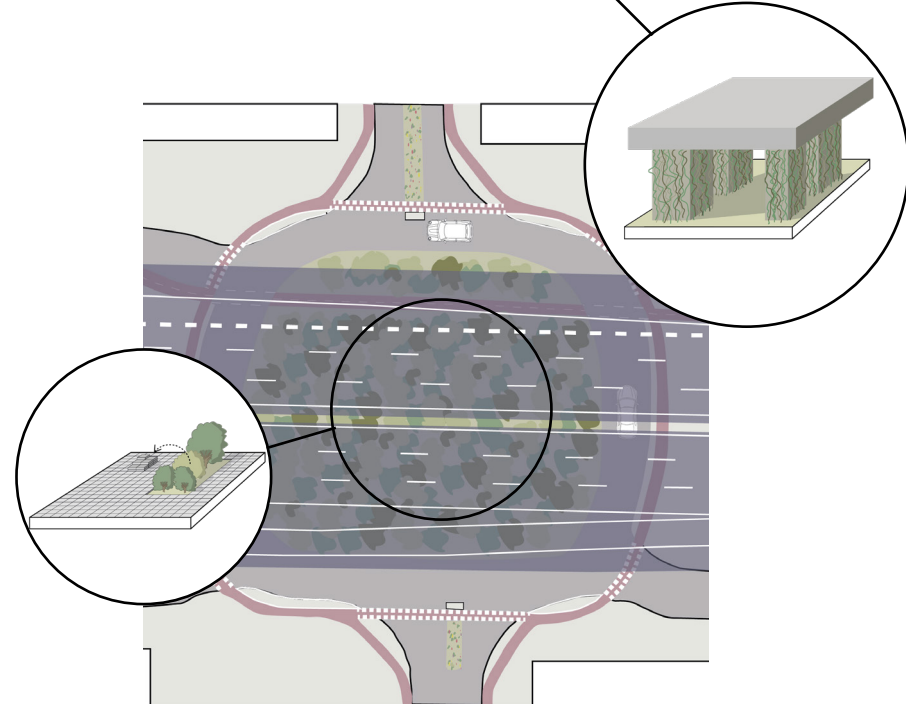
OLD SITUATION



NEW SITUATION

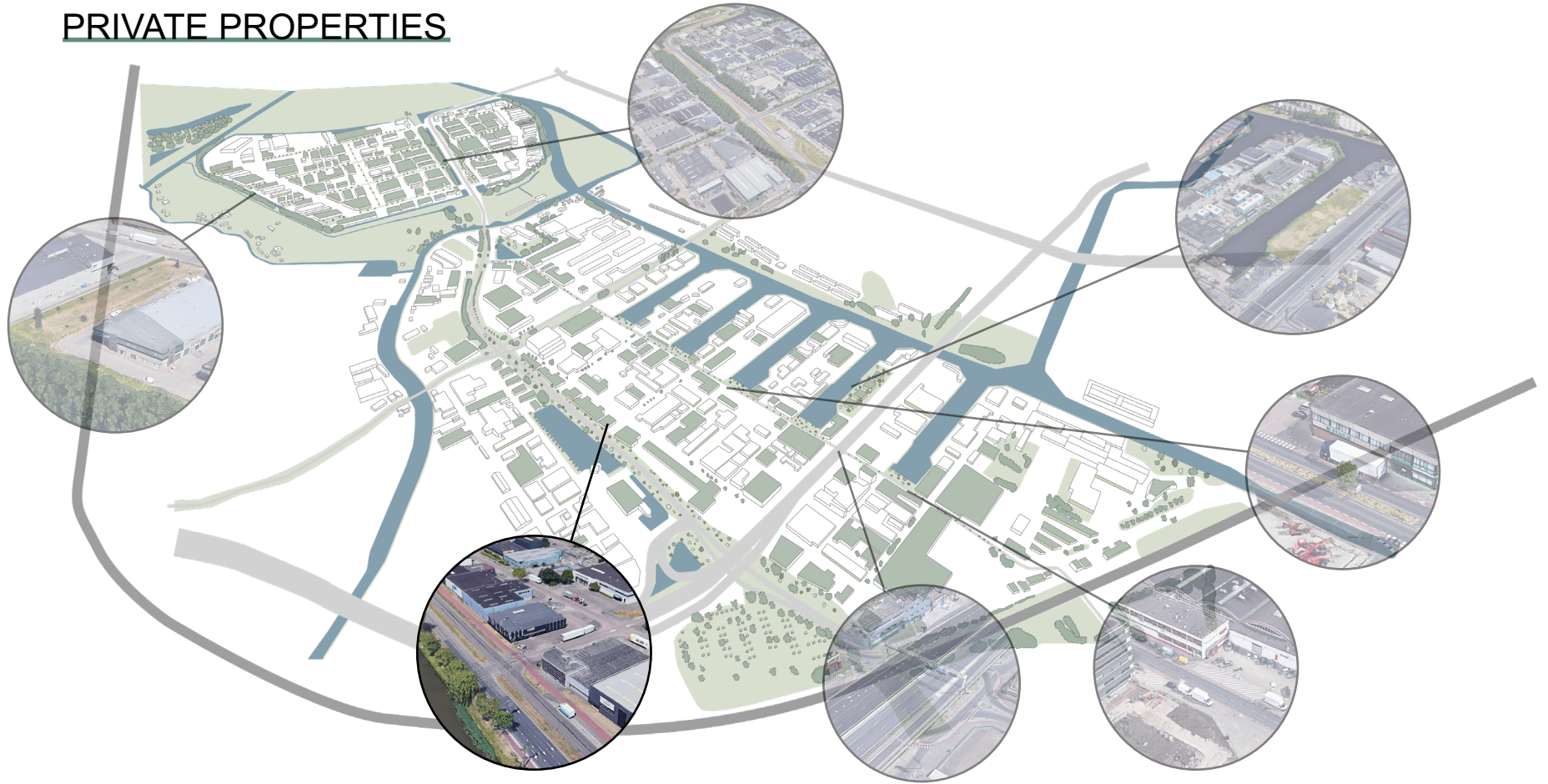


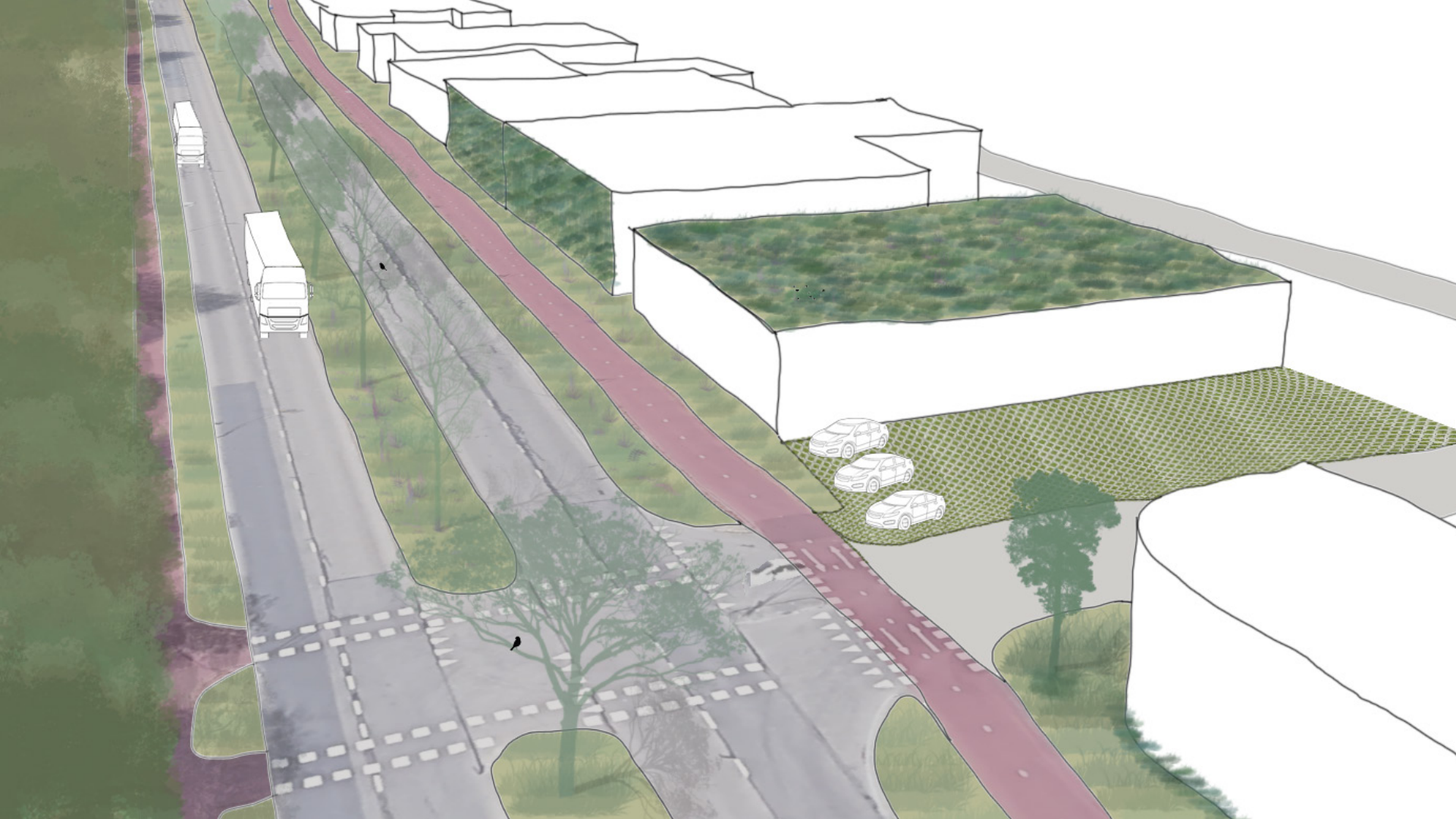
OLD SITUATION

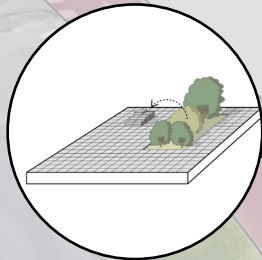
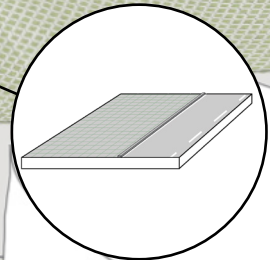
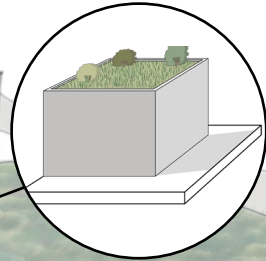
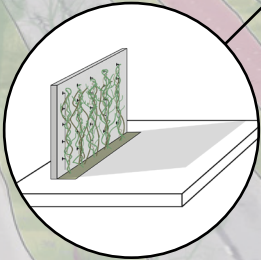
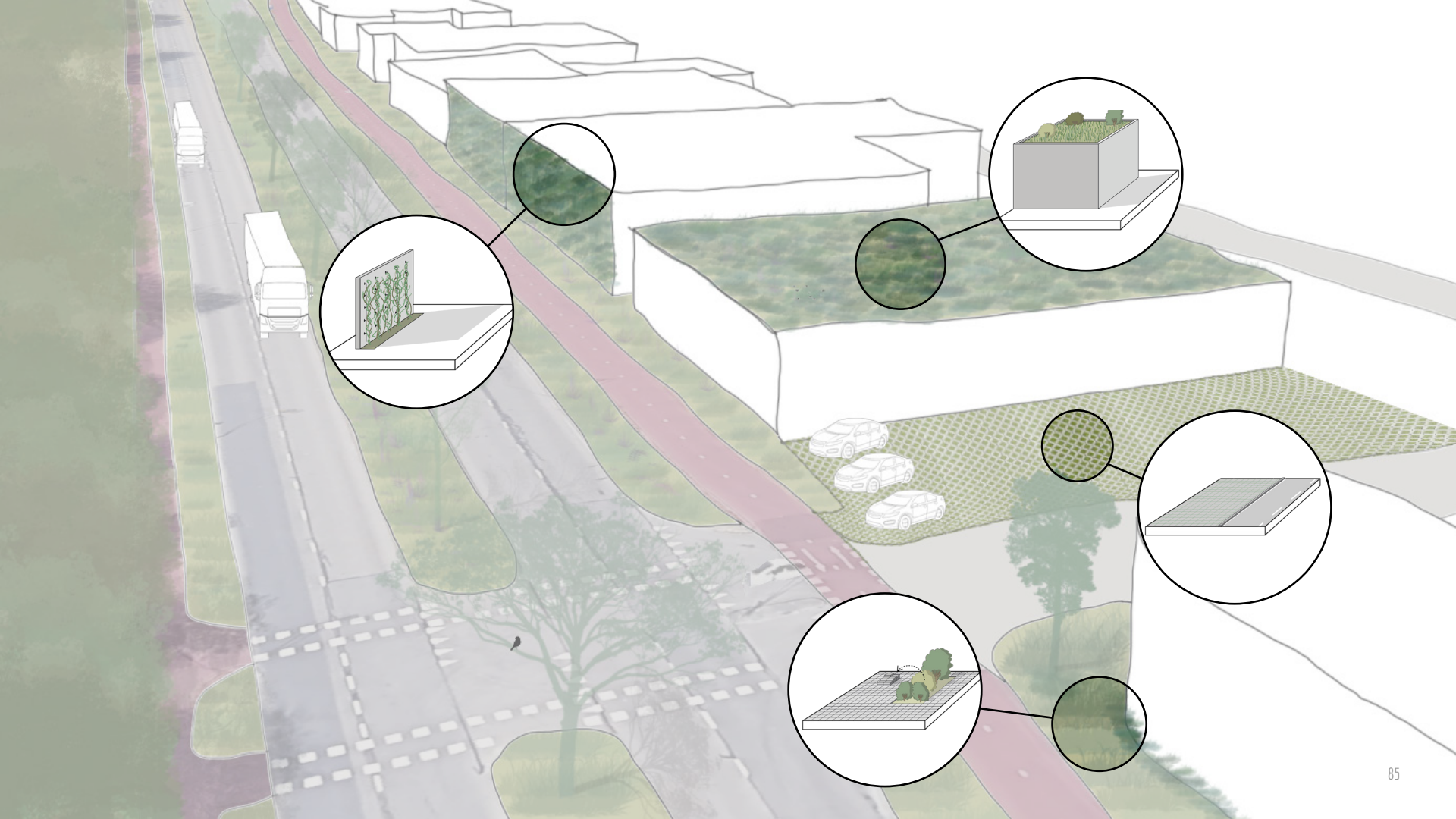


NEW SITUATION

# PRIVATE PROPERTIES







# Conclusion

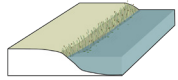
A close-up photograph of a hedgehog's face and upper body, surrounded by a dense layer of autumn leaves in various shades of brown, orange, and yellow. The hedgehog's spines are visible, and its small black nose and eyes are prominent.

# Main question

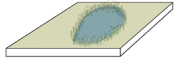
“What are design tools an urban designer can use to improve biodiversity and human well-being on a business site and how can this be implemented? Using case study location Spaanse Polder.”

# DESIGN TOOLS

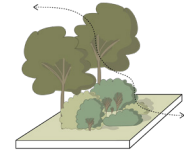
## BLUE



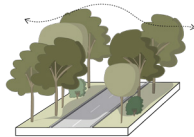
Natural waterfront



Pond

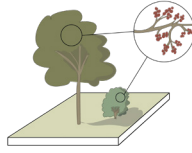


Different levels of green

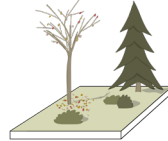


Green bridge

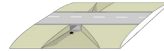
## GREEN



Food



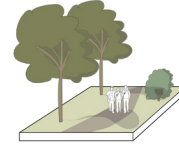
Evergreen planting



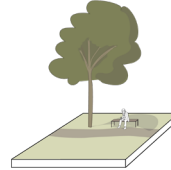
Fauna tunnel



Diversity in species



Walking path

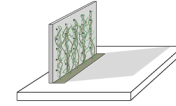


Sitting

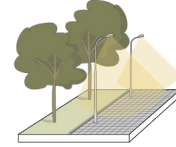


Kitchen garden

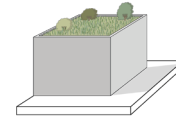
## GREY



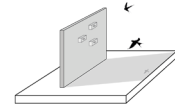
Green facade



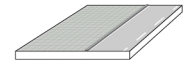
Natural lighting



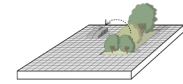
Green roof



Nestplace



Permeable pavement



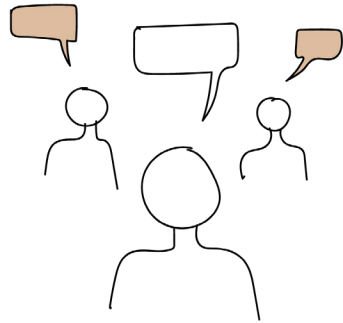
Taking out pavement



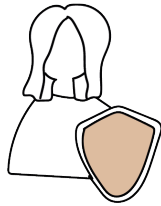
## HUMAN WELL-BEING



Health

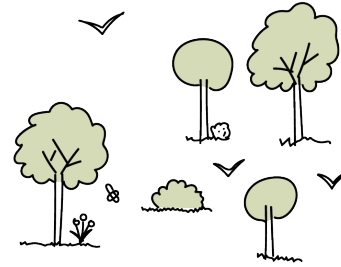


Social relations

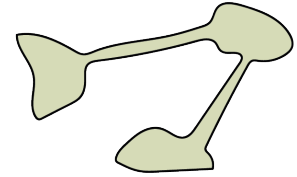


Security

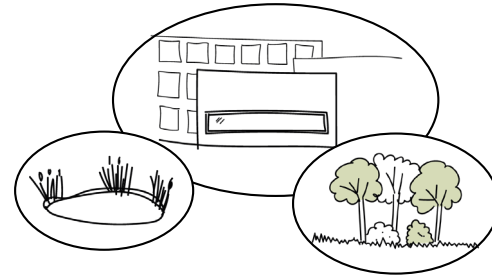
## BIODIVERSITY



Numbers and variety of species



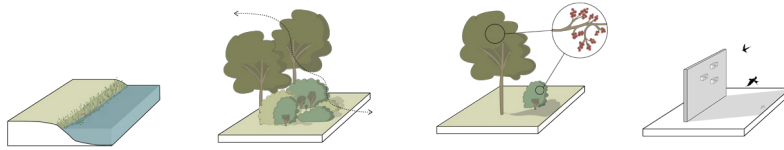
Connecting habitats



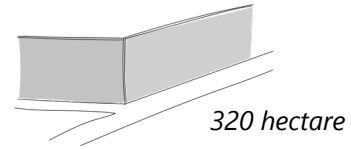
Habitat diversity

## IMPLEMENTATION

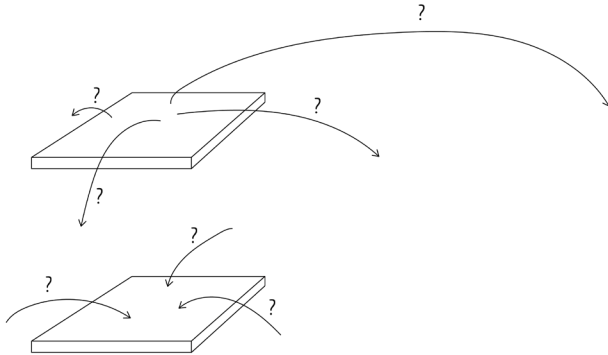
- Combining tools



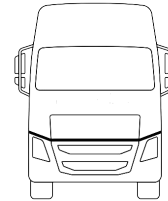
- The size of the location



- Effect and conditons on different scale levels

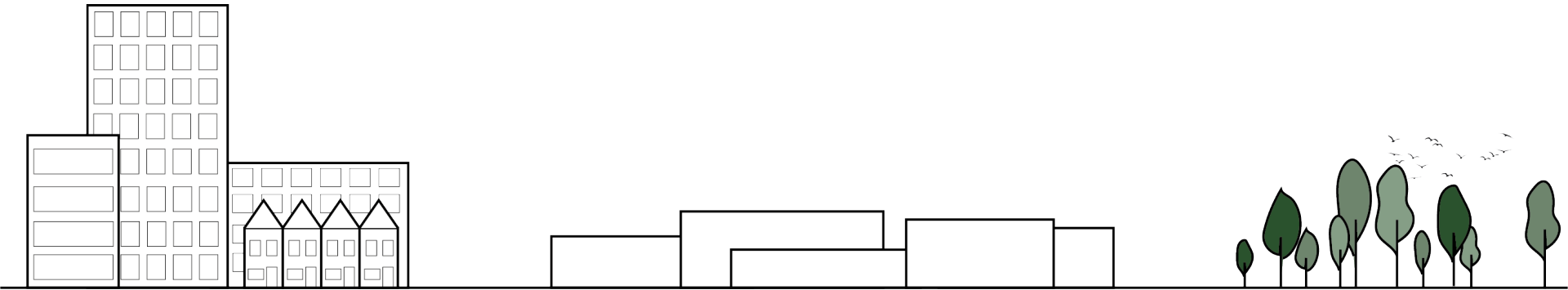


- It is still a business park with private properties

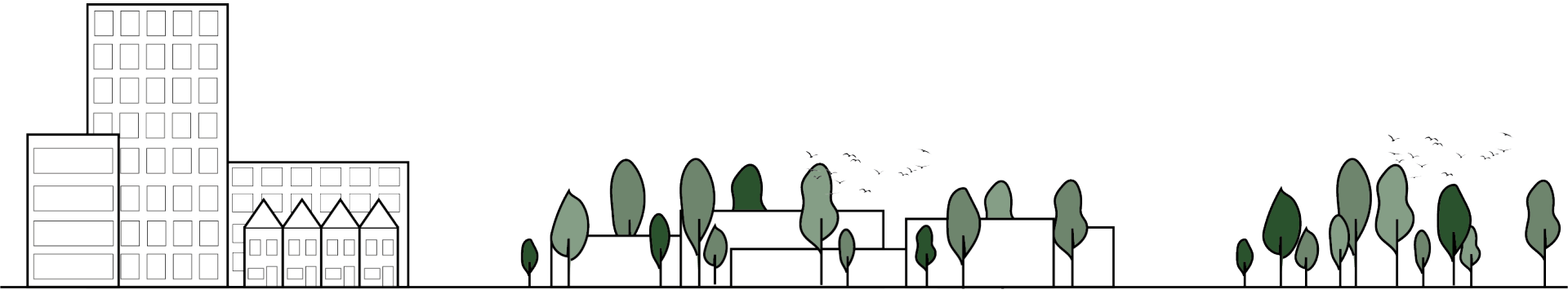


(Spaanse Polder, 2020)

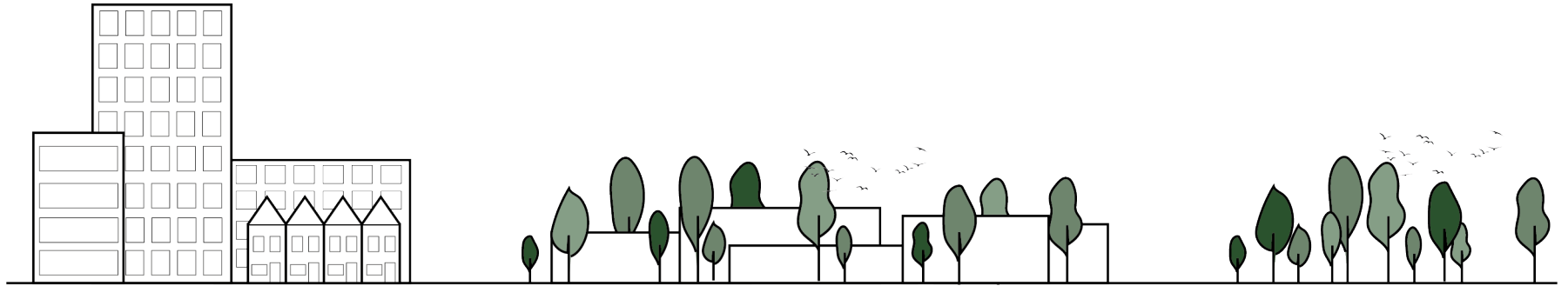
## FROM A BARRIER



## TO A CORRIDOR



# QUESTIONS?



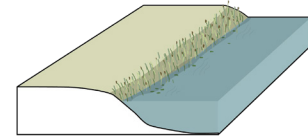
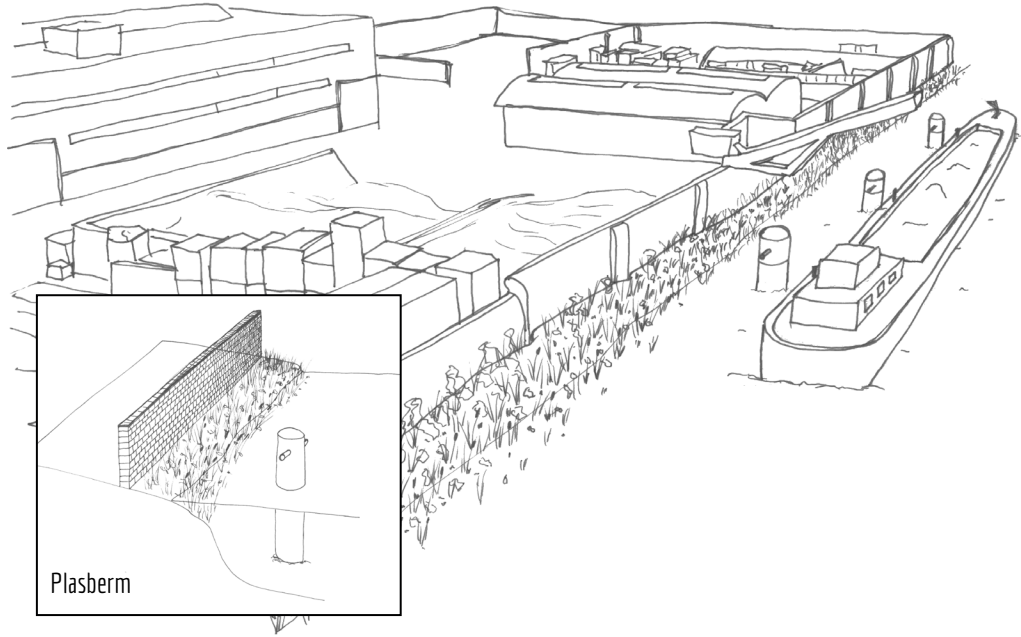
## Referenties

- ANP. (2016). *Bnr*. Retrieved March 29, 2021, from <https://www.bnr.nl/nieuws/binnenland/10311506/nederland-niet-goed-verzekerd-tegen-overstromingen>
- Ashton, K., Jones, C., & Global Education Project (Vic.). (2013). *Geographies of Human Well Being*. Geography Teachers' Association of Victoria (Global Education Project).
- Biodiversiteit. (2013). Compendium voor Leefomgeving. Retrieved Oktober 10, from <https://www.clo.nl/indicatoren/nl144002-ontwikkeling-biodiversiteit-msa>
- Conserve energy future*. (n.d.). Loss of biodiversity. Retrieved May 20, 2021, from <https://www.conserve-energy-future.com/causes-effects-solutions-depletion-natural-resources.php>
- DebraLee Wiseberg. (n.d.). *30 Unique Plants That Attract Butterflies*. Retrieved October 15, from <https://www.treehugger.com/plants-that-attract-butterflies-5105169>
- Dramstad, W., Olson, J. D., & Forman, R. T. T. (1996). *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning*. Island Press.
- Dutch cowboys. (n.d.). New York. Retrieved June 8, from <https://www.dutchcowboys.nl/entertainment/sex-and-the-city-komt-terug-met-een-nieuw-seizoen>
- Edie. (2020). *SBTi kickstarts process on global standard for science-based corporate net-zero targets*. Retrieved May 20, 2021, from <https://www.edie.net/news/6/SBTi-kickstarts-process-on-science-based-global-standard-for-corporate-net-zero-standards/>
- Laverty, M., Sterling, E., Chiles, A., & Cullman, G. (2008). *Biodiversity 101 (Science 101)* (First Edition). Greenwood.
- Meadowia. (n.d.). *What do caterpillars eat*. Retrieved November 22, from <https://meadowia.com/what-do-caterpillars-eat/>
- Michael Fiala. (n.d.). *NBC news*. Retrieved November 22, from <https://www.nbcnews.com/better/health/why-falling-love-gives-you-butterflies-ncna847951>
- Miller, T. G., & Spoolman, S. (2017). *Living in the Environment* (19th ed.). Cengage Learning.
- Millennium Ecosystem Assessment. (2003). *Ecosystems and Human Well-being: Current state and trends*, Chapter 1 MA Conceptual Framework, 25-36. Island Press, Washington, DC.
- Nature (n.d.). *GE news*. Retrieved November 22, from <https://www.ge.com/news/taxonomy/term/4152>
- NOS. (2016). Oprukkende rivierkreeft is plaag en delicatessie tegelijk. Retrieved June 8, from <https://nos.nl/artikel/2109070-oprukkende-rivierkreeft-is-plaag-en-delicatessie-tegelijk>
- Rijkswaterstaat. (n.d.). *A73, Limburg, the Netherlands*. Retrieved March 29, 2021, from <https://handbookwildlifetraffic.info/ch-6-integration-of-infrastructure-into-landscape/6-2-alignment/>
- Spaanse Polder*. (2020). AlleCijfers. Retrieved May 26, 2021, from <https://allecijfers.nl/wijk/spaanse-polder-rotterdam/>
- Walter. (2021). *Which birds fly in v formation*. Retrieved November 22, from <https://www.gardenbirdfeeder.co.uk/which-birds-fly-in-v-formation/>
- Wallpaperflare. (n.d.). *Hedgehog in leaves*. Retrieved November 25, from <https://www.wallpaperflare.com/hedgehog-in-leaves-eyes-muzzle-thorns-wallpaper-tpywo>

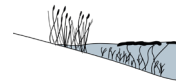
POSSIBLE FUTURE



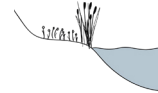
# IN USE WATERFRONT DESIGN



FLAUWHELLEND TALUD



DRASBERM



PLASBERM

