# Designing for vital soil in urban areas

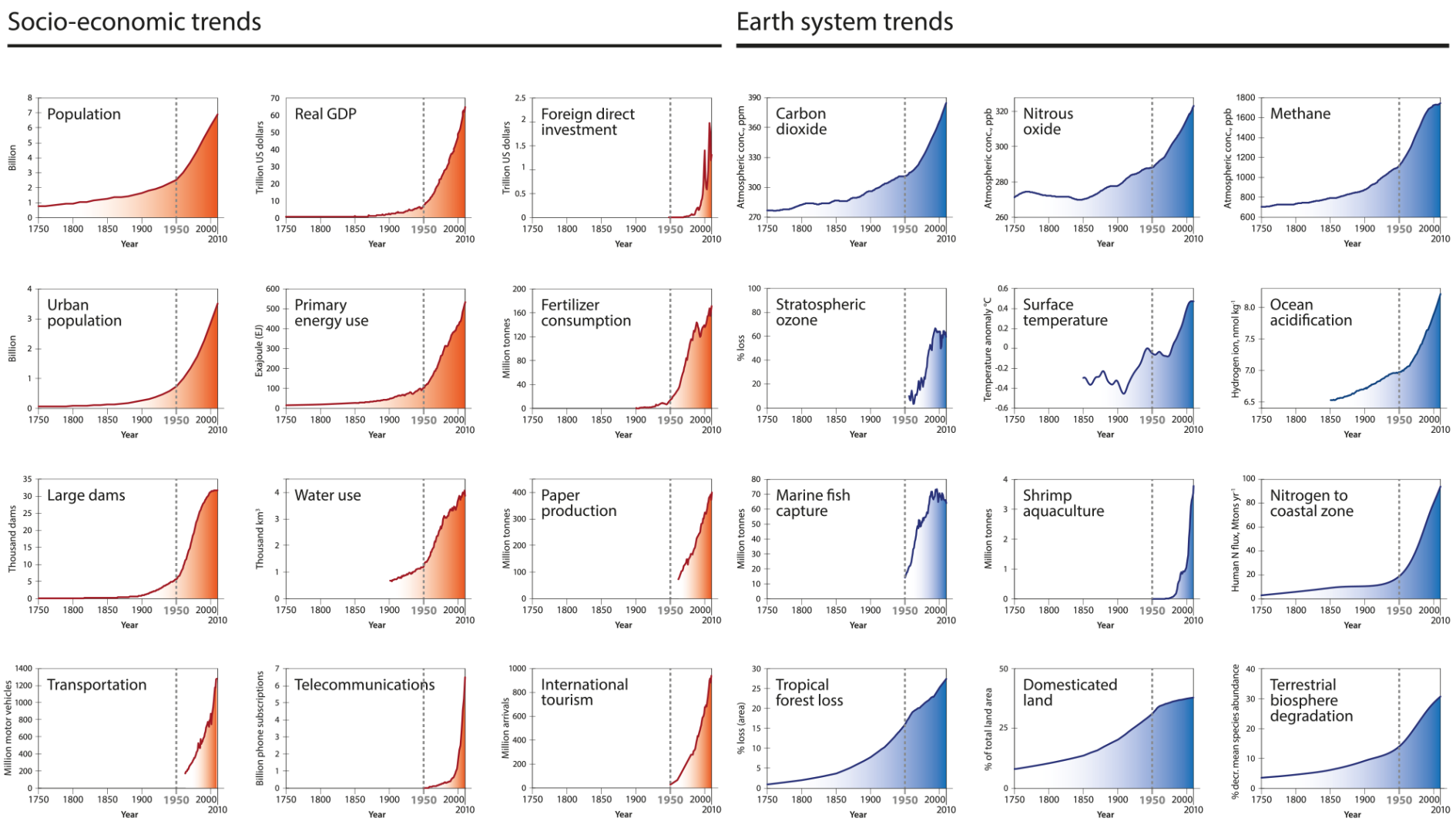
POSAD MAXWAN
strategy x design

stimuleringsfonds
creatieve industrie

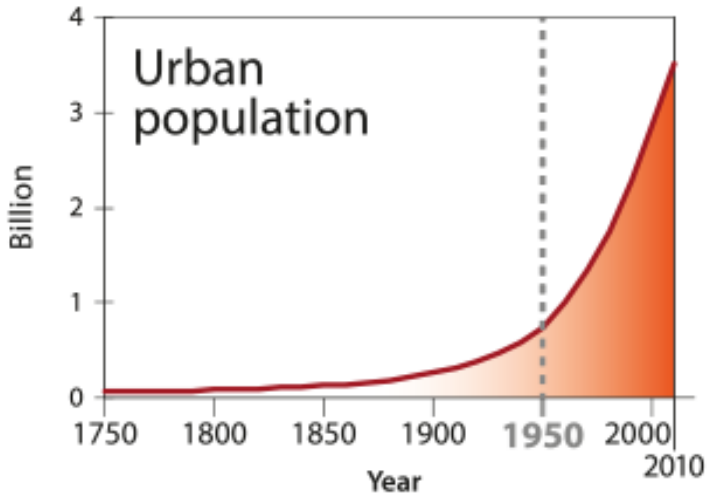
# Why to care about the vital soil?

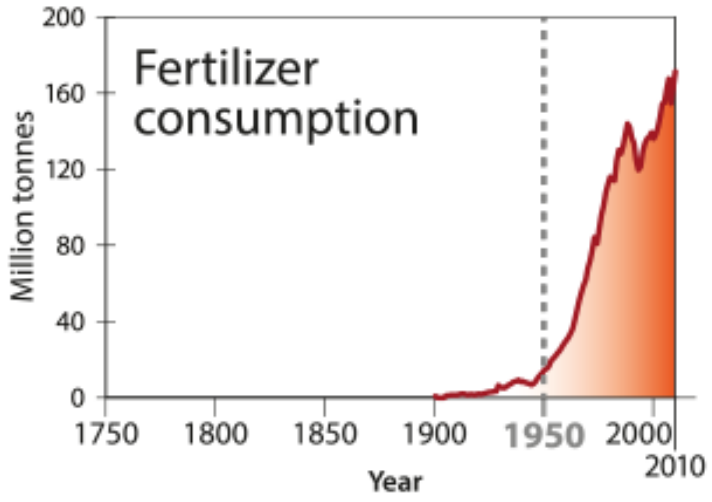
# Great Accelaration (International Geosphere-Biosphere Programme (IGBP), 2004)

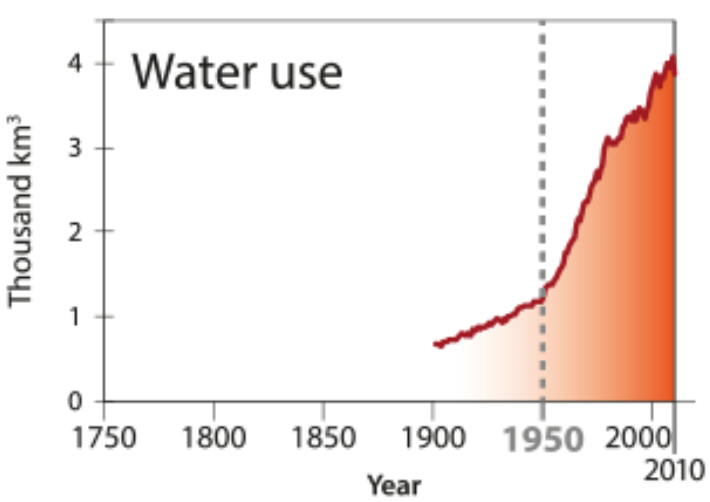
*Exponential increase in human activities and their impact starting in 1950*



# Socioeconomic trends lead to exploitation of soil

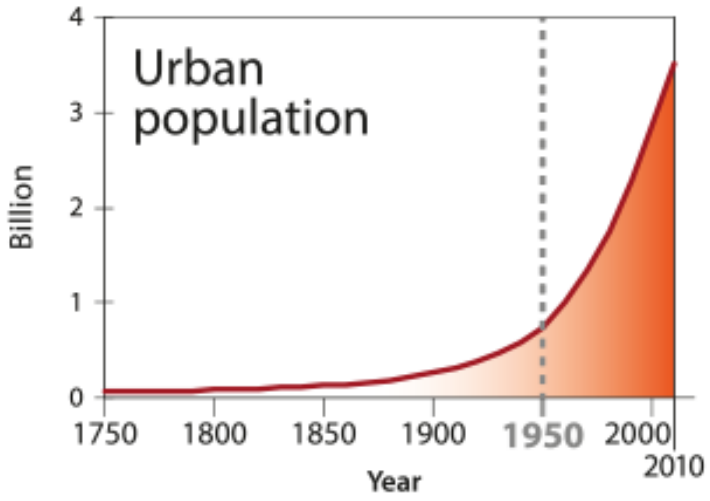


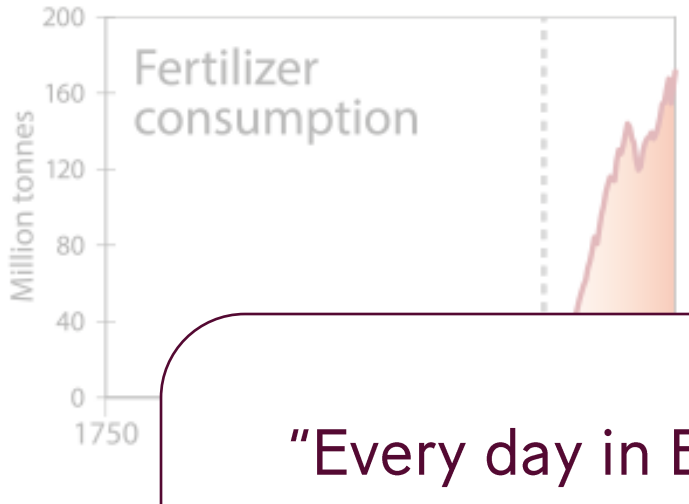



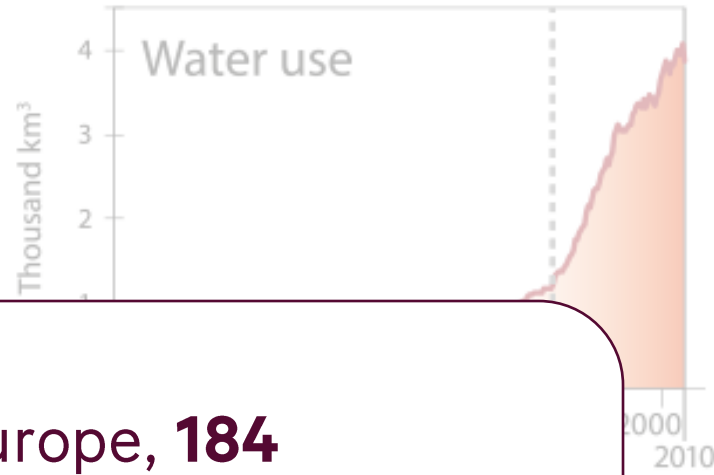




- **more intensive land use**; ecosystem degradation
- **soil degradation**

# Socioeconomic trends lead to exploitation of soil



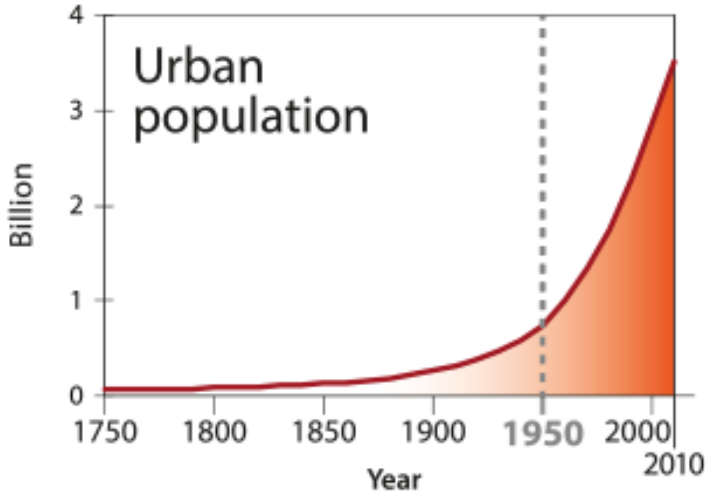



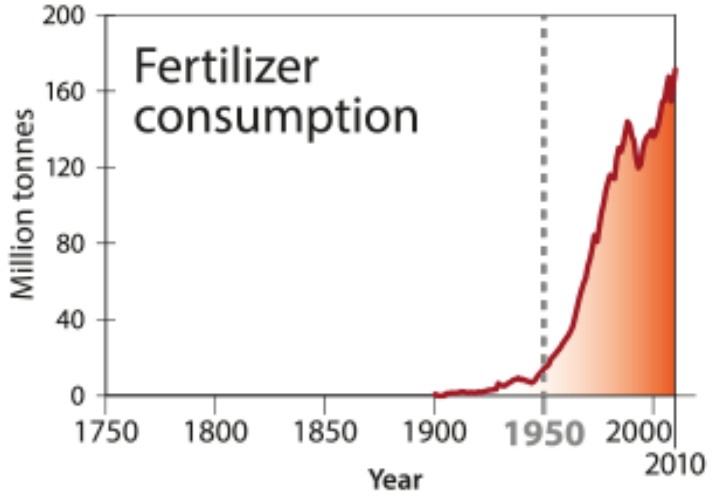

- **more intensive land use**; ecosystem degradation
- **soil degradation**

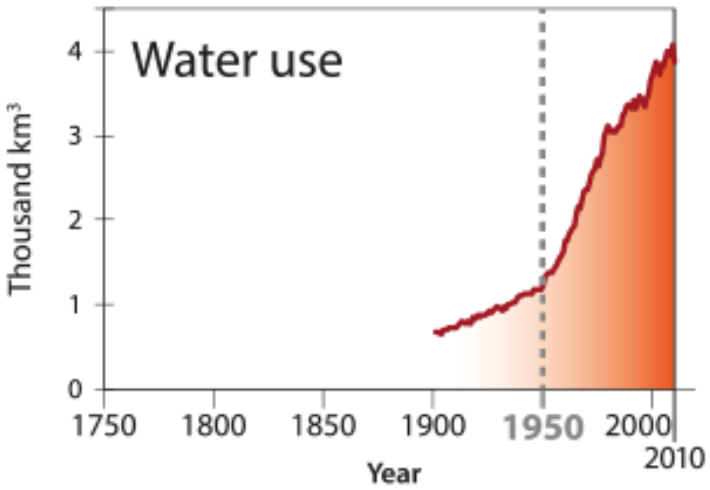
"Every day in Europe, **184 hectares of land** (250 soccer fields) are **urbanized**."

- PBL Quickscan Ruimtebeslag in Nederland

# Socioeconomic trends lead to exploitation of soil



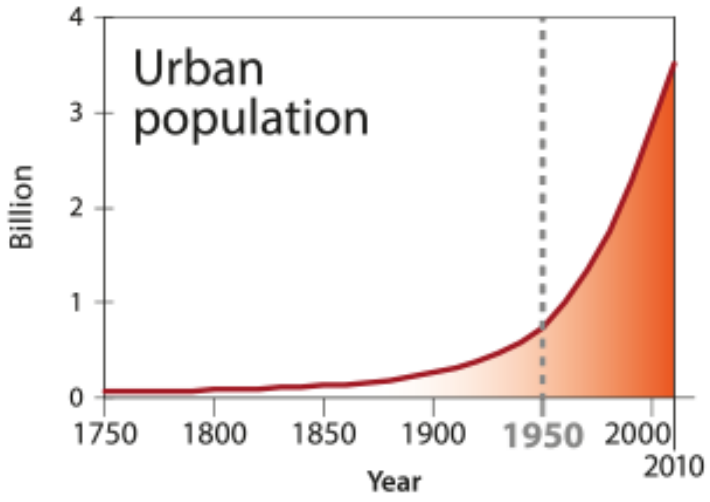



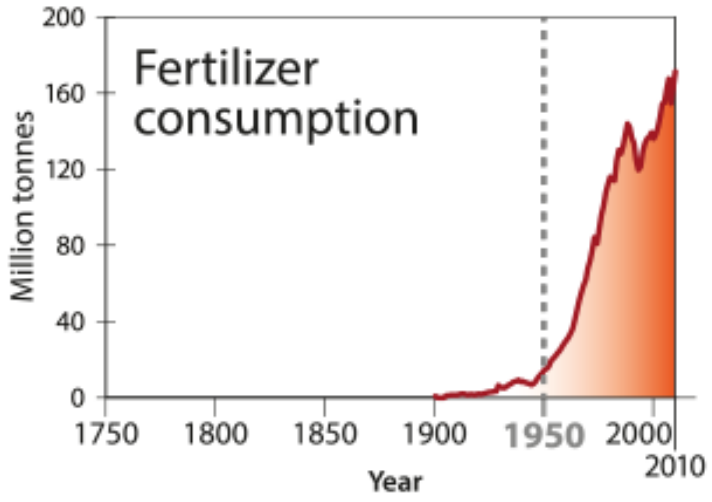



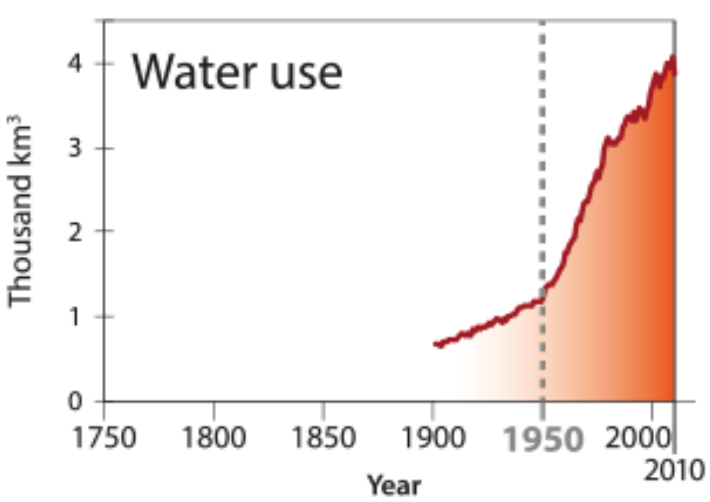

- **more intensive land use**; ecosystem degradation
- **soil degradation**

- soil **acidification**
- **reduction** of soil biodiversity
- **disruption** of natural nutrient cycles

# Socioeconomic trends lead to exploitation of soil



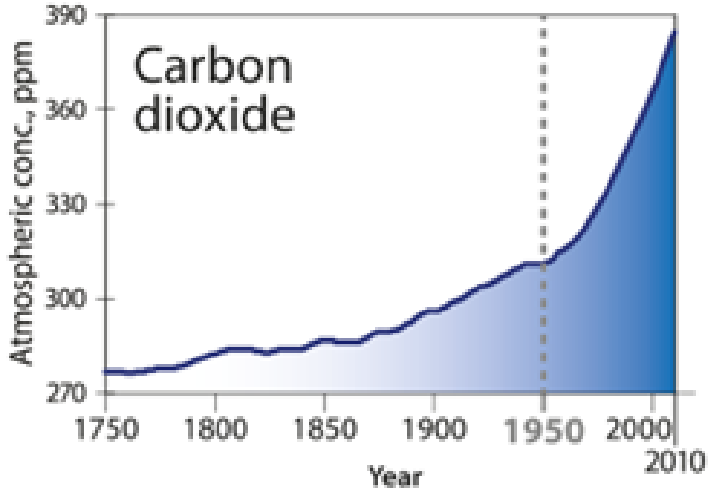



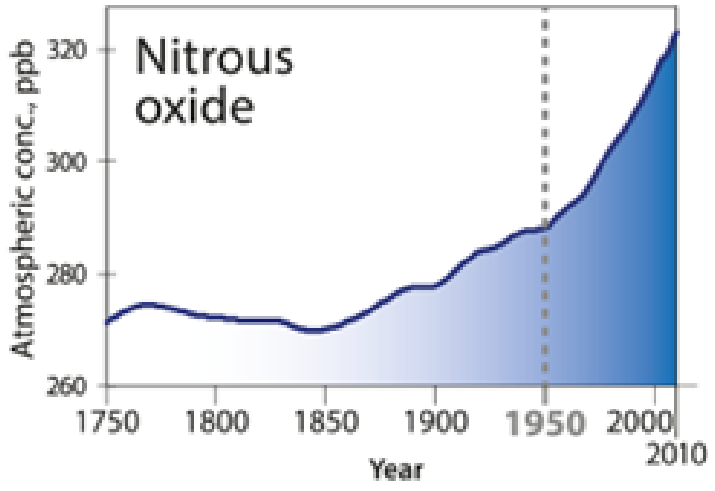

- **more intensive land use**; ecosystem degradation
- **soil degradation**

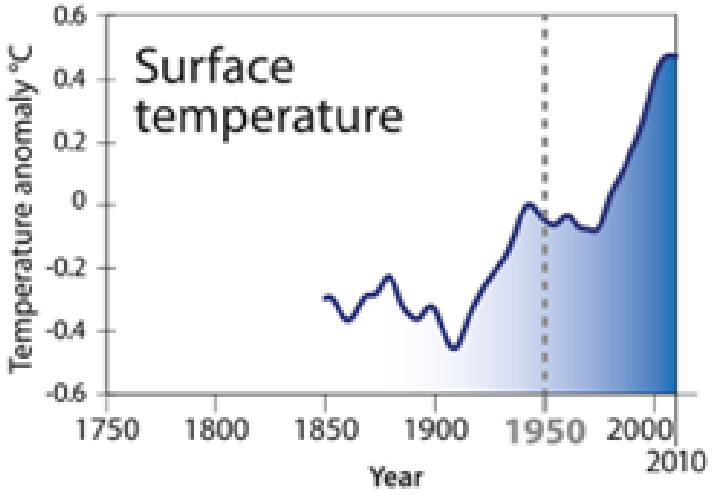
- soil **acidification**
- **reduction** of soil biodiversity
- **disruption** of natural nutrient cycles

- **salinization**
- **disturbance** of moisture balance
- **lowering of groundwater** levels; degradation of ecosystems

# Vital soils counteract negative “earth system trends”

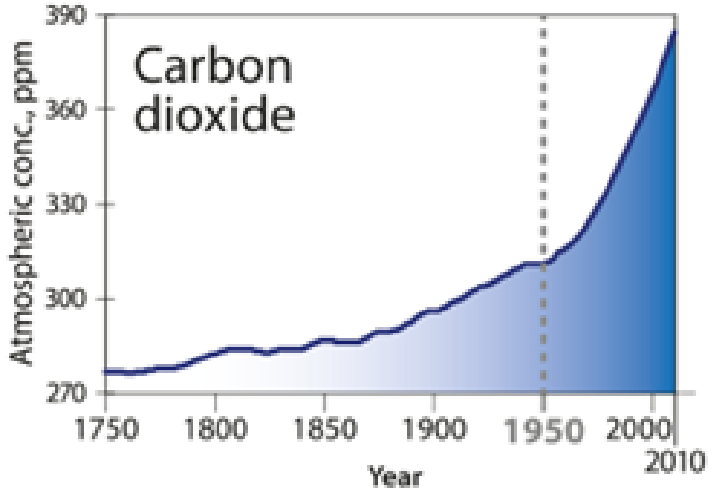


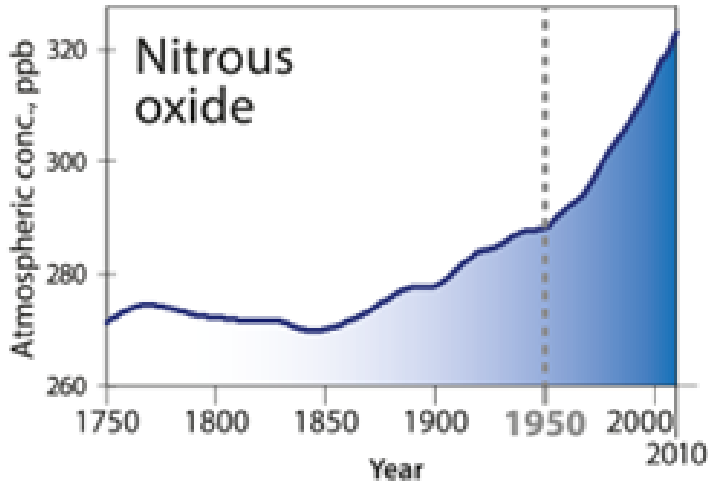



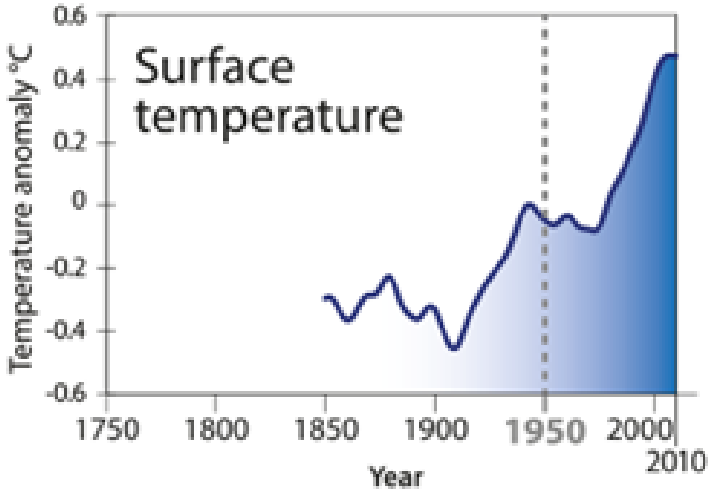




Vital soils with plenty of organic matter can more **effectively absorb and sequester CO2** from the atmosphere.

# Vital soils counteract negative “earth system trends”



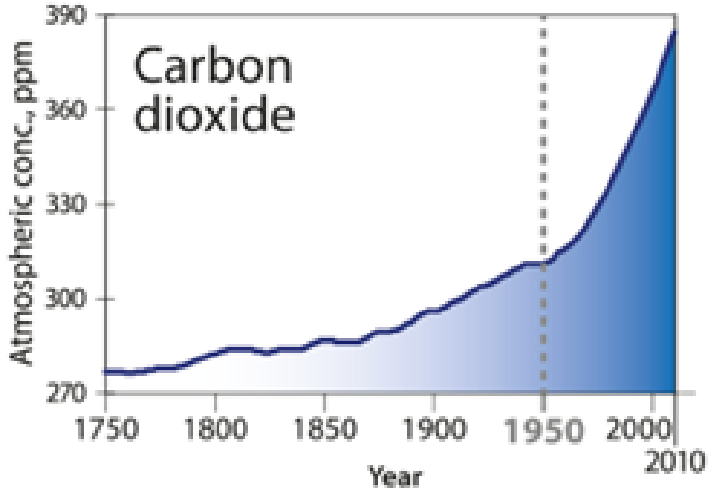



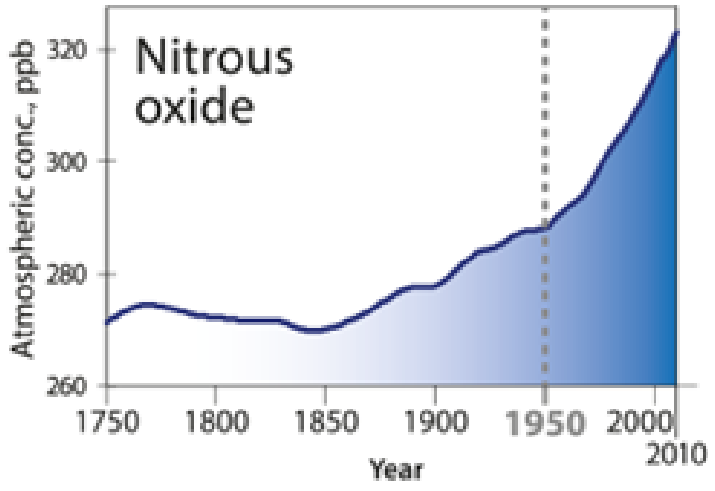



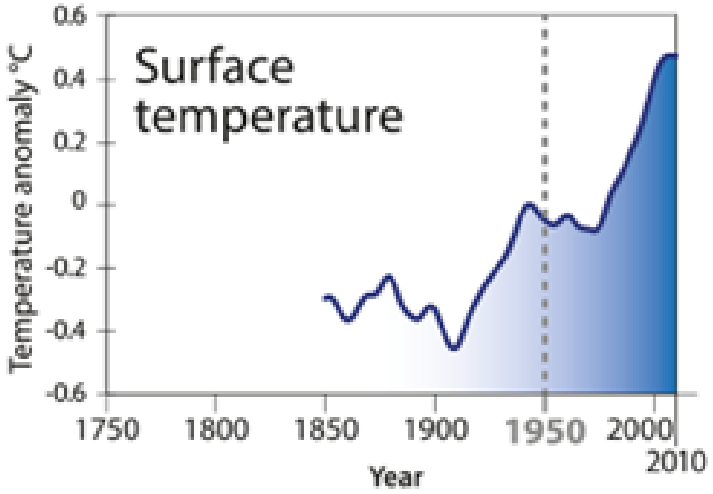

Vital soils with plenty of organic matter can more **effectively absorb and sequester CO2** from the atmosphere.

Vital soils with active microbial life can **convert nitrogen more efficiently** and make it available to plants.

# Vital soils counteract negative “earth system trends”



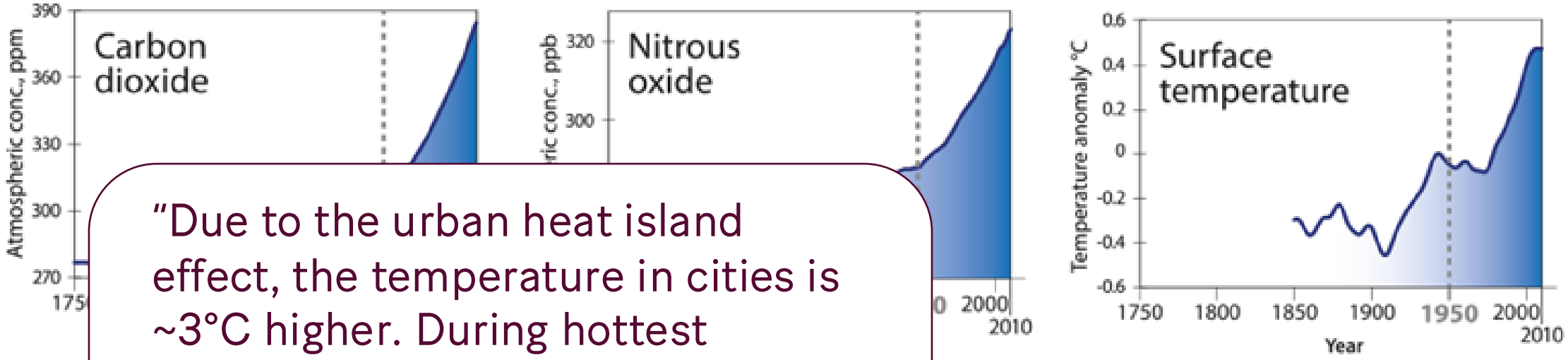




Vital soils with plenty of organic matter can more **effectively absorb and sequester CO2** from the atmosphere.

Vital soils with active microbial life can **convert nitrogen more efficiently** and make it available to plants.

Vital soils **support robust plant growth.** Plants play a direct role in cooling their environment through **evapotranspiration**.

# Vital soils counteract negative “earth system trends”




“Due to the urban heat island effect, the temperature in cities is ~3°C higher. During hottest summer days the difference between a city and countryside can reach 8°C.

- Atlasleefomgeving.nl

Vi

org

**effectively absorb and sequester CO2** from the atmosphere.

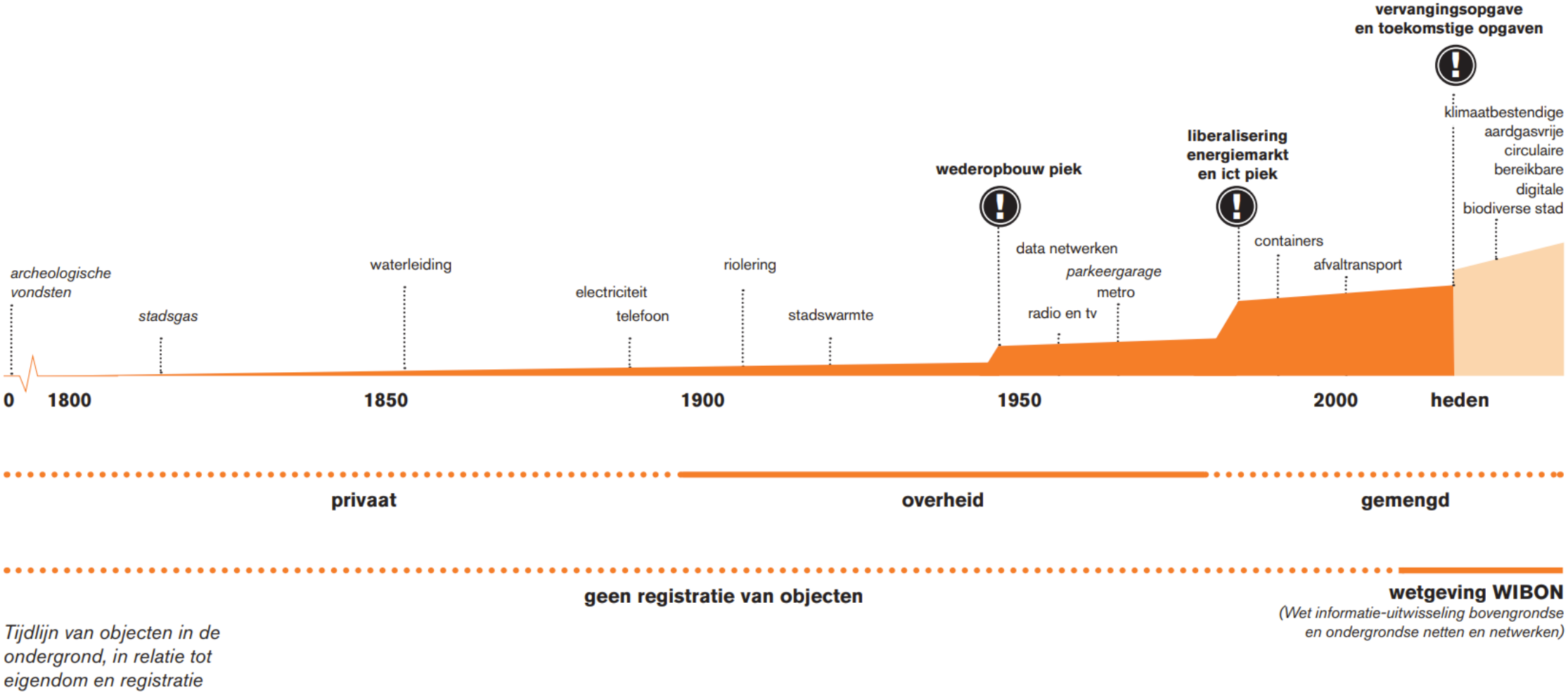
**t**

**nitrogen more efficiently** and make it available to plants.

Vital soils **support robust plant growth.** Plants play a direct role in cooling their environment through **evapotranspiration**.


30

# Scarcity of space and lack of insight into what lies hidden underground




*Tijdlijn van objecten in de ondergrond, in relatie tot eigendom en registratie*

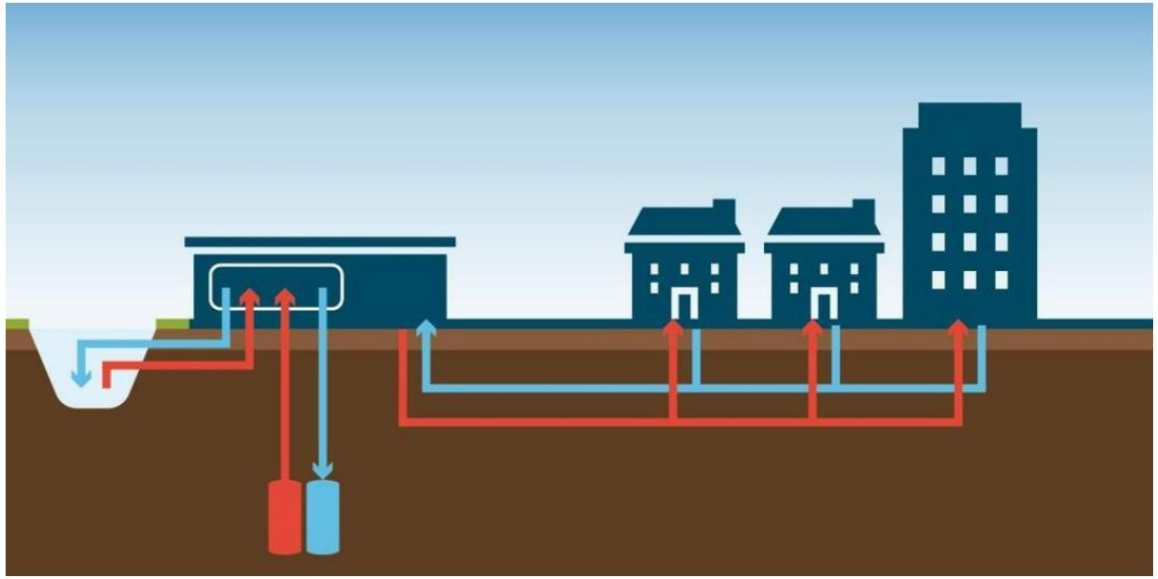
Bron: COB

# Disciplines in the underground work in silos

## Miljoenen kilometers aan kabels en leidingen onder de grond en de chaos wordt alleen maar groter

## Combinatie aquathermie en bodemenergie heeft potentie

29.08.2022 | Innovatie  Kenneth Nwosu



**De combinatie van aquathermie en bodemenergie is veelbelovend, zo schrijft de Branchevereniging Bodemenergie. Die conclusie volgt uit onderzoek, in opdracht van de provincie Utrecht, naar de haalbaarheid van grootschalige aquathermie als verduurzamende stap voor warmtenetten. Eventueel in combinatie met warmte-koudeopslag in de vorm van bodemenergie.**

# Uncertainty about the impact of urban plans on the underground and vice versa

**“Als er meer mensen in centrum komen wonen, moet er ook meer groen zijn”: CD&V ziet heel wat kansen om bossen te planten in de stad**

**Breda is kletsnat en de bodem is een volle spons, toch staat het waterpeil ‘op een prettig hoog niveau’**

**Natuurinclusief ontwerpen én bouwen: de transitieopgave van nu**

vrijdag 3 november 2023 · 6 min

ARTIKEL

BN DeStem

**Nergens in het land voelen pissebedden zich zo thuis als in Utrecht**

# How do you design with/for vital soil?

# ... not alone!

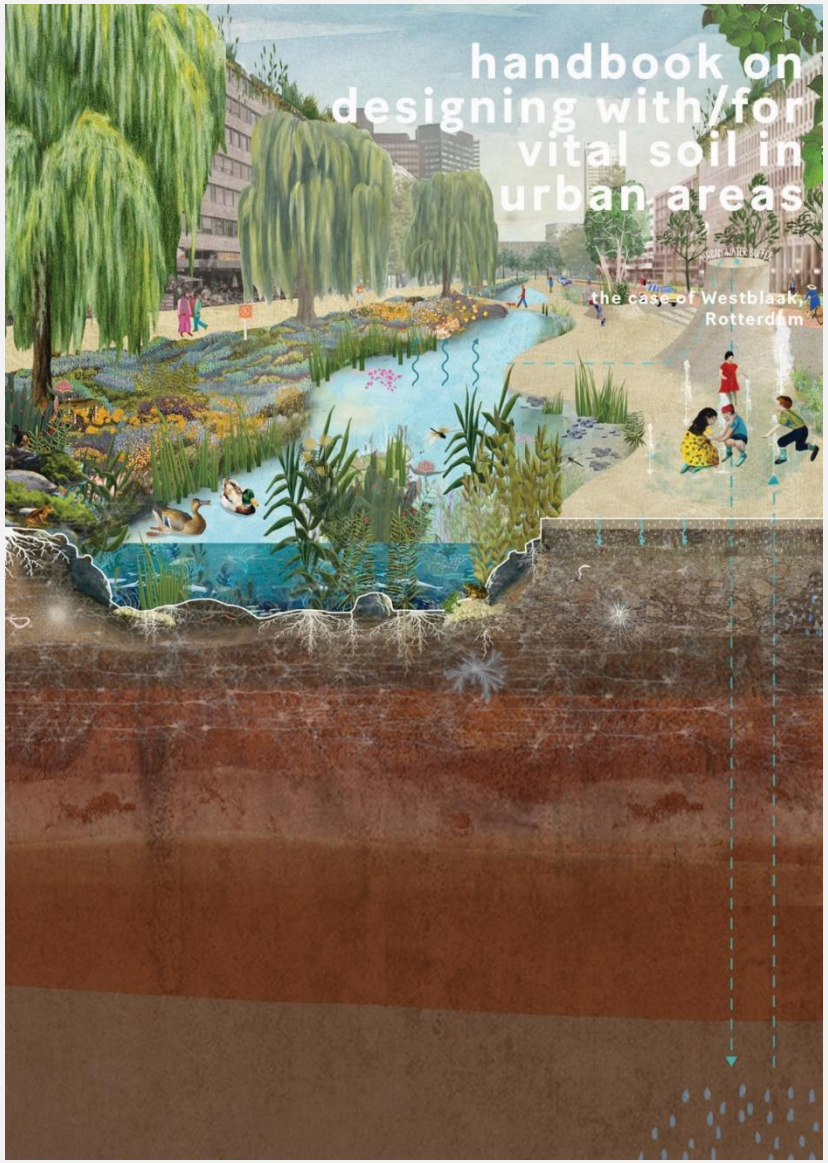
## colofon

**PosadMaxwan:**
Laura Thomas,
Gintare Norkunaite,
Ganesh Babu R P,
Martina Germanà,
Eva Verberne,
Anu Babu,
Preksha Rautela,
Kubra Turan,
Juliette Brouwer,
Michelle de Roo,
Eva Verberne.
*Quality control:*
Froukje van de Klundert,
Vincent Babeș.

**Gemeente Rotterdam:**
Pieter Boone,
John Jacobs,
Emiel Arends,
Jolande van 't Woudt,
Mathieu Lassus,
Kees Vette,
Patrick Heuvelman,
Ronald Loch,
Carolien van Eykelen,
Christian Gausepohl,
Tobias Windt,
Wessel Veenman,
Mariët Pors,
Jamila Aissati,
Albert Kemeling,
Bas de Wildt,
Martijn Lambregts,
Bert de Doelder,
Martin Looije,
Janneke Derksen,
Csaba Zsiros,
Sander Smits,
Quintus Drop,
Zeger Dalenberg,
Daniël Koster,
Kris Schaasberg,
Joke Klumper,
JJ van Elswijk,
Hanneke Wander
Koen Merkens
Lisette de Jong
Thamar Tax,
Thomas Haitsma,
Laura de Nijs,
Eva van der Zon-Smits,
Marcela Faria Gandara,
Petra Timmers.

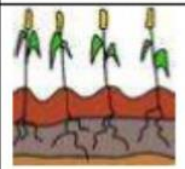
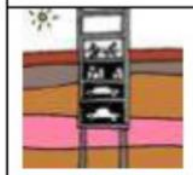
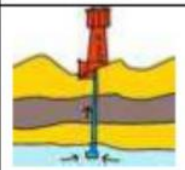
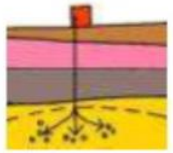
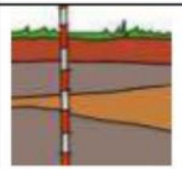
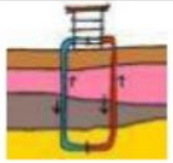
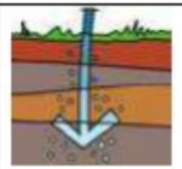
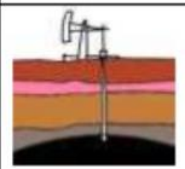
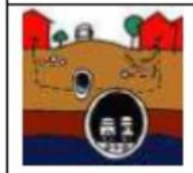
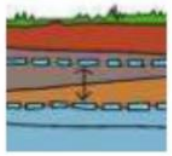
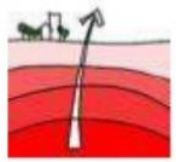
**Expert Pool:**
Evelijn Martinius (UvA),
Han de Wit (TAUW),
Peter Sloot (Aequator),
Vincent Merckx (Naturalis),
Marian Bertrums (GPKL),
Han Admiraal (Enprodes),
Giel Scheepers (HHSK),
Gerard Korthals (WUR),
Felipe Gonzalez (BUUR Part of Sweco),
Bert van Steeg (Bureau Leiding),
Eva Stache (TU Delft),
Tristan Cheaz (TU Delft),
Kevin Snijders (TU Delft),
Inge van den Berg (Gemeente Leiden),
Marc Spierings (BvB Landscaping),
Marc Schopman (Sweco),
Jart Ligterink (Sweco),
Louden Kremer (Sweco).

# **Result:** Handbook on designing with/for vital soil in urban areas



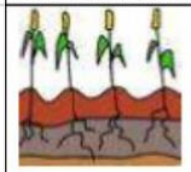
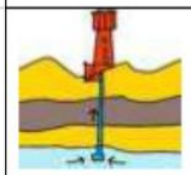
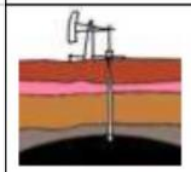
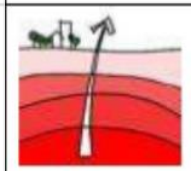

What *is* the
vital soil?
Workshop
Workshop
BLUE CITY
BLUE CITY
BLUE CITY
Toilets
Toilets

# **The soil offers a lot of services,** but not all at once.

| Draagkwaliteit | | Informatiekwaliteit | | Regulatiekwaliteit | | Productiekwaliteit | |
|---|---|---|---|---|---|---|---|
|  | Basis voor bouwactiviteiten |  | Cultuurhistorische betekenis |  | Gezonde en schone bodem |  | Gewasproductiecapaciteit |
|  | Ondergrondse activiteiten (incl. weg- en railinfrastructuur) |  | Diversiteit landschapsbeeld |  | Levende bodem |  | Voorraad drinkwater |
|  | Ruimte voor opslag stoffen |  | Geomorfologische diversiteit |  | Stabiele bodem |  | Voorraad delfstoffen |
|  | Warmte/koude opslag |  | Ecologische diversiteit |  | Waterfilterende bodem |  | Voorraad fossiele energie |
|  | Riolering, kabels en leidingen |  | Niet gesprongen explosieven |  | Waterbergende bodem |  | Geothermische energie |

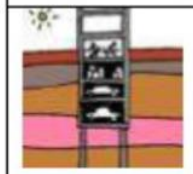
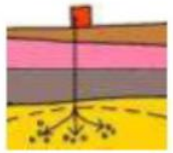
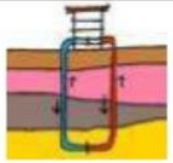
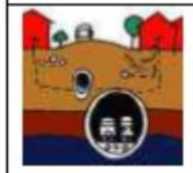
Source: ruimtexmilieu.nl

# Focus in a countryside: **productive services**

| Draagkwaliteit | | Informatiekwaliteit | | Regulatiekwaliteit | | **Productiekwaliteit** | |
|---|---|---|---|---|---|---|---|
|  | Basis voor bouwactiviteiten |  | Cultuurhistorische betekenis |  | Gezonde en schone bodem |  | Gewasproductiecapaciteit |
|  | Ondergrondse activiteiten (incl. weg- en railinfrastructuur) |  | Diversiteit landschapsbeeld |  | Levende bodem |  | Voorraad drinkwater |
|  | Ruimte voor opslag stoffen |  | Geomorfologische diversiteit |  | Stabiele bodem |  | Voorraad delfstoffen |
|  | Warmte/koude opslag |  | Ecologische diversiteit |  | Waterfilterende bodem |  | Voorraad fossiele energie |
|  | Riolering, kabels en leidingen |  | Niet gesprongen explosieven |  | Waterbergende bodem |  | Geothermische energie |

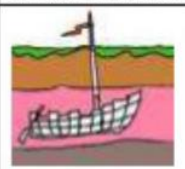
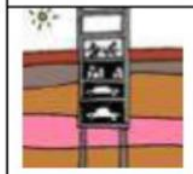
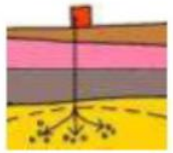
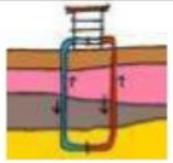
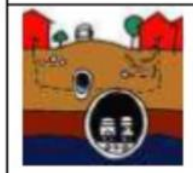
Source: ruimtexmilieu.nl

# Focus in a city: **carrying services**

| Draagkwaliteit | | Informatiekwaliteit | | Regulatiekwaliteit | | Productiekwaliteit | |
|---|---|---|---|---|---|---|---|
|  | Basis voor bouwactiviteiten |  | Cultuurhistorische betekenis |  | Gezonde en schone bodem |  | Gewasproductiecapaciteit |
|  | Ondergrondse activiteiten (incl. weg- en railinfrastructuur) |  | Diversiteit landschapsbeeld |  | Levende bodem |  | Voorraad drinkwater |
|  | Ruimte voor opslag stoffen |  | Geomorfologische diversiteit |  | Stabiele bodem |  | Voorraad delfstoffen |
|  | Warmte/koude opslag |  | Ecologische diversiteit |  | Waterfilterende bodem |  | Voorraad fossiele energie |
|  | Riolering, kabels en leidingen |  | Niet gesprongen explosieven |  | Waterbergende bodem |  | Geothermische energie |

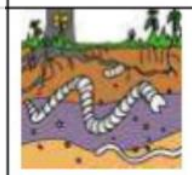
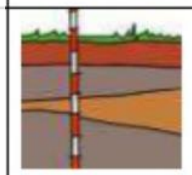
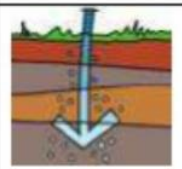
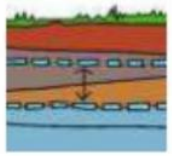
Source: ruimtexmilieu.nl

# Reducing risks

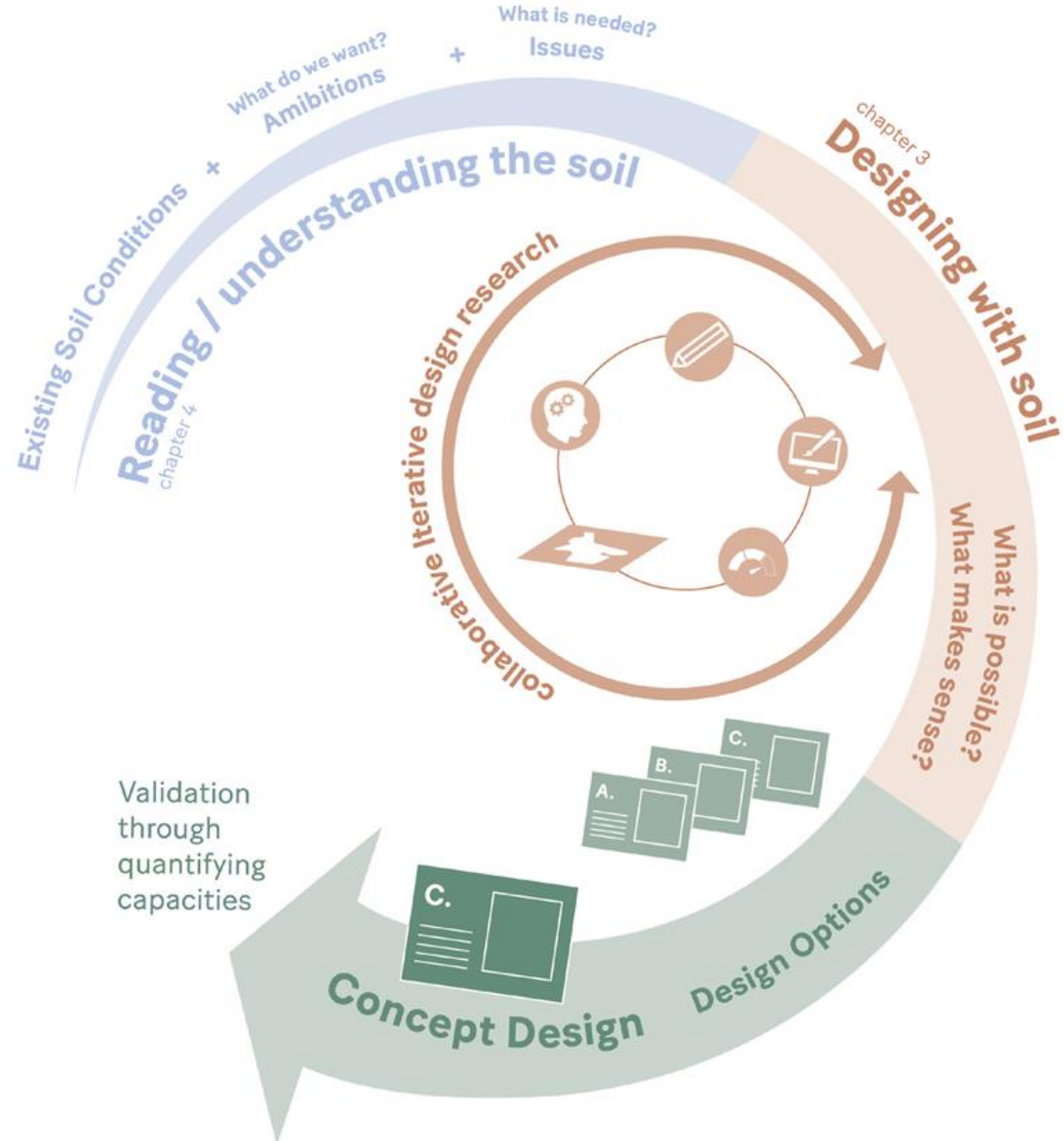
| Draagkwaliteit | | Informatiekwaliteit | | Regulatiekwaliteit | | Productiekwaliteit | |
|---|---|---|---|---|---|---|---|
|  | Basis voor bouwactiviteiten |  | Cultuurhistorische betekenis |  | Gezonde en schone bodem |  | Gewasproductiecapaciteit |
|  | Ondergrondse activiteiten (incl. weg- en railinfrastructuur) |  | Diversiteit landschapsbeeld |  | Levende bodem |  | Voorraad drinkwater |
|  | Ruimte voor opslag stoffen |  | Geomorfologische diversiteit |  | Stabiele bodem |  | Voorraad delfstoffen |
|  | Warmte/koude opslag |  | Ecologische diversiteit |  | Waterfilterende bodem |  | Voorraad fossiele energie |
|  | Riolering, kabels en leidingen |  | Niet gesprongen explosieven |  | Waterbergende bodem |  | Geothermische energie |

Source: ruimtexmilieu.nl

# Scope of the research: **living and climate regulating soil**

| Draagkwaliteit | | Informatiekwaliteit | | Regulatiekwaliteit | | Productiekwaliteit | |
|---|---|---|---|---|---|---|---|
|  | Basis voor bouwactiviteiten |  | Cultuurhistorische betekenis |  | Gezonde en schone bodem |  | Gewasproductiecapaciteit |
|  | Ondergrondse activiteiten (incl. weg- en railinfrastructuur) |  | Diversiteit landschapsbeeld |  | Levende bodem |  | Voorraad drinkwater |
|  | Ruimte voor opslag stoffen |  | Geomorfologische diversiteit |  | Stabiele bodem |  | Voorraad delfstoffen |
|  | Warmte/koude opslag |  | Ecologische diversiteit |  | Waterfilterende bodem |  | Voorraad fossiele energie |
|  | Riolering, kabels en leidingen |  | Niet gesprongen explosieven |  | Waterbergende bodem |  | Geothermische energie |

Source: ruimtexmilieu.nl


Existing Soil Conditions
+
What do we want?
Ambitions
+
What is needed?
Issues
Reading / understanding the soil
chapter 4
chapter 3
Designing with soil
collaborative iterative design research
What is possible?
What makes sense?
A.
B.
C.
Validation
through
quantifying
capacities
C.
Concept Design
Design Options

# How do you read the soil as a designer?


Erasmus MC
Museumpark 140
Wytemaweg 10
Westzeedijk 200
HDI
VJP-84-H
erasmuskoeriers.nl
010 412 22 41

# Current surface of Westblaak

Still without the skate park, which counts as green!

# Case: Westblaak, Rotterdam

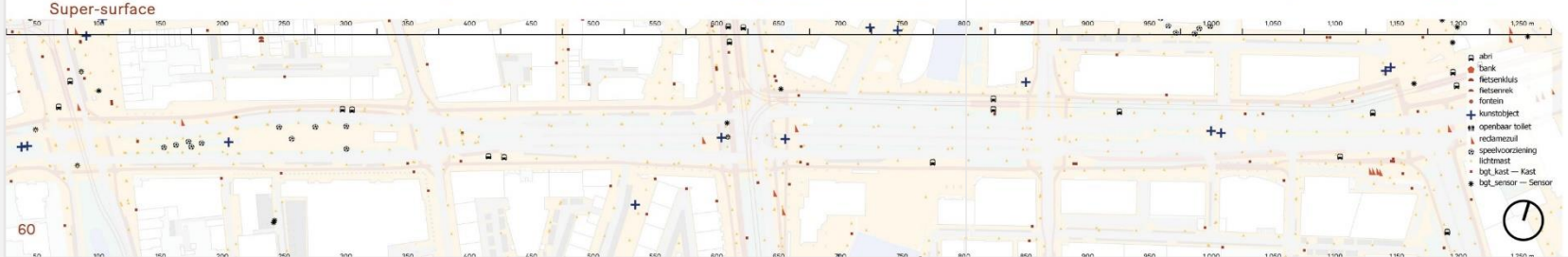
**One of the 8 Rotterdam city projects aimed at becoming more climate adaptive is in Westblaak. It is an important corridor in Rotterdam with multiple lanes of traffic, tunnels, and underground infrastructure including cables, pipes, and foundations.**

*The plans shows the site of study, Westblaak in Rotterdam as three seperate layers. The surface, subsurface and the above surface layers.*

Surface


Sub-surface


Super-surface




Rotterdam is developing 8 city projects that are part of the city's plan to become more climate adaptive and thus dealing with extreme heat and rains more effectively. All the projects focus heavily on nature based approaches and the transformation of Westblaak to Blaakpark is one if the city projects.

Westblaak is an important east-west corridor within the city of Rotterdam, technically running from Eendrachtsplein to Churchillplein, but part of the road that extends from Coolhaven to Oostplein, through Erasmus MC and Blaak.

At the surface level, Westblaak has **4 lanes of traffic** on average, with an additional **4 lane tunnel** below the Churchillplein. There are also **additional slip lanes** and **parking** adding to this asphalt. The **skatepark** situated in the middle of the road is an important destination within westblaak.

Under the surface, there are quite a few important cables and pipes, including but not limited to **drinking water, sewage pipes** (which also carry rainwater at the moment), **electricity cables, district heating pipes, gas pipes, telecom, and internet cables**. Beyond these, there are also the **road and metro tunnels, roots of trees and plants and other foundations**.

Above the surface, in the public space, we see a lot of signages, lights and other wayfinding devices. We also see access points for underground infrastructure as well. All these are usually arranged with the view of being able to access what is underground.

# Reading through time

Time is another fundamental line of enquiry to understand soil as an urban designer. The city is in constant transformation and the soil has been subjected to different forces over time. This is especially pronounced at Westblaak in Rotterdam.

From marshland and agricultural land to being part of the urban fabric, Westblaak has also seen open canals and war rubble along the way.

**1920s**
The open waterbodies of Binnenrotte, Blaakhaven and Coolsingel crossed the current stretch of Westblaak and Blaak to meet the Maas and were filled in later as the city and its population expanded.

**1960s**
During post-war reconstruction of Rotterdam, Blaak become a main motorway since the war rubble had already filled in Blaakhaven. The first north-south line of the Rotterdam metro passes under Blaak.

**1970s**
The current east-west axis of Westblaak and Blaak was established to make more space for the growing city and its cars.

**1980s**
A car tunnel that connects Westblaak and Blaak under churchillplein was constructed. The first stretch of the east-west line of Rotterdam Metro under Westblaak and Blaak was also built during this time and was extended further later.

**2000s**
By 2000s the main structure of Westblaak was already crystalised for a while. A skatepark in the middle verge between the traffic lanes was added after a long bottom-up process.

**2010s**
The municipality of Rotterdam has been slowly expanding the green cover within this stretch of Rotterdam. From completely paved surfaces to individual trees between them and now larger strips of green.

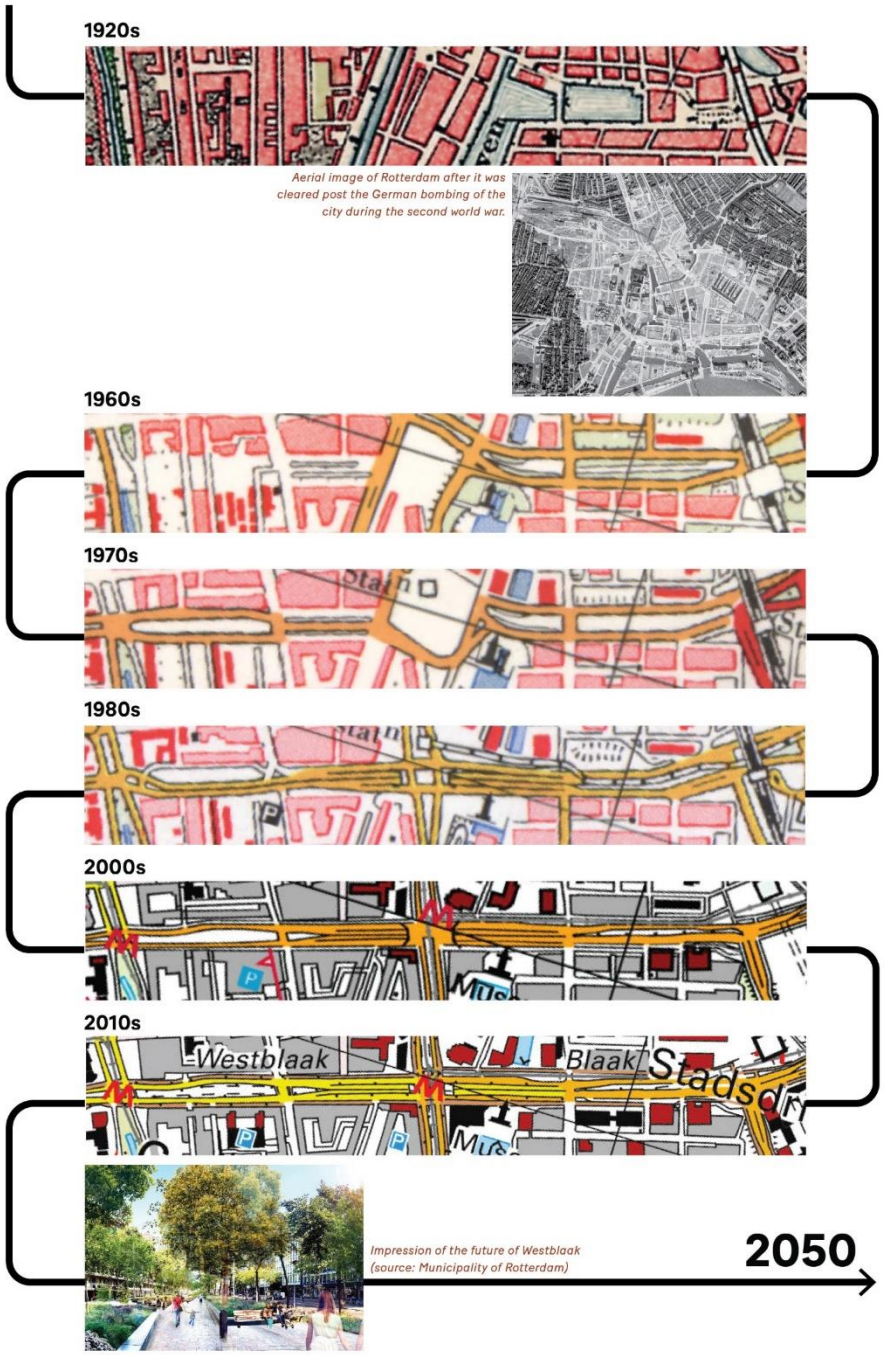
Recently, the speed of transformation has increased tremendously. Digging up streets to replace pipes and cables every other year, while we know it is not in the best interest of soil life to be distrubed so often.

**Future**
As mentioned before, there are a large number of ambitions for Westblaak's future including that of transforming it into a park.

The structural transformation of Westblaak traced through the years leaves an incredible footprint on the soil as well. We'd see that clearly when we dive deeper into the soil.

**Westblaak in Rotterdam has undergone significant changes over the years, transitioning from marshland and agricultural land to being part of the urban fabric. It has seen the filling in of open waterbodies, the construction of motorways and tunnels, and the expansion of green cover in recent years. The future ambition for Westblaak is to transform it into a park. These transformations have left a noticeable impact on the soil, which will be further explored.**

*The timeline shows the spatial transformation of the stretch between Westblaak and Blaak over the past 100 years and the most important snippets along the years. (Maps source: TopoTijdreis)*




*Aerial image of Rotterdam after it was cleared post the German bombing of the city during the second world war.*

*Impression of the future of Westblaak (source: Municipality of Rotterdam)*

# Deep-er soil

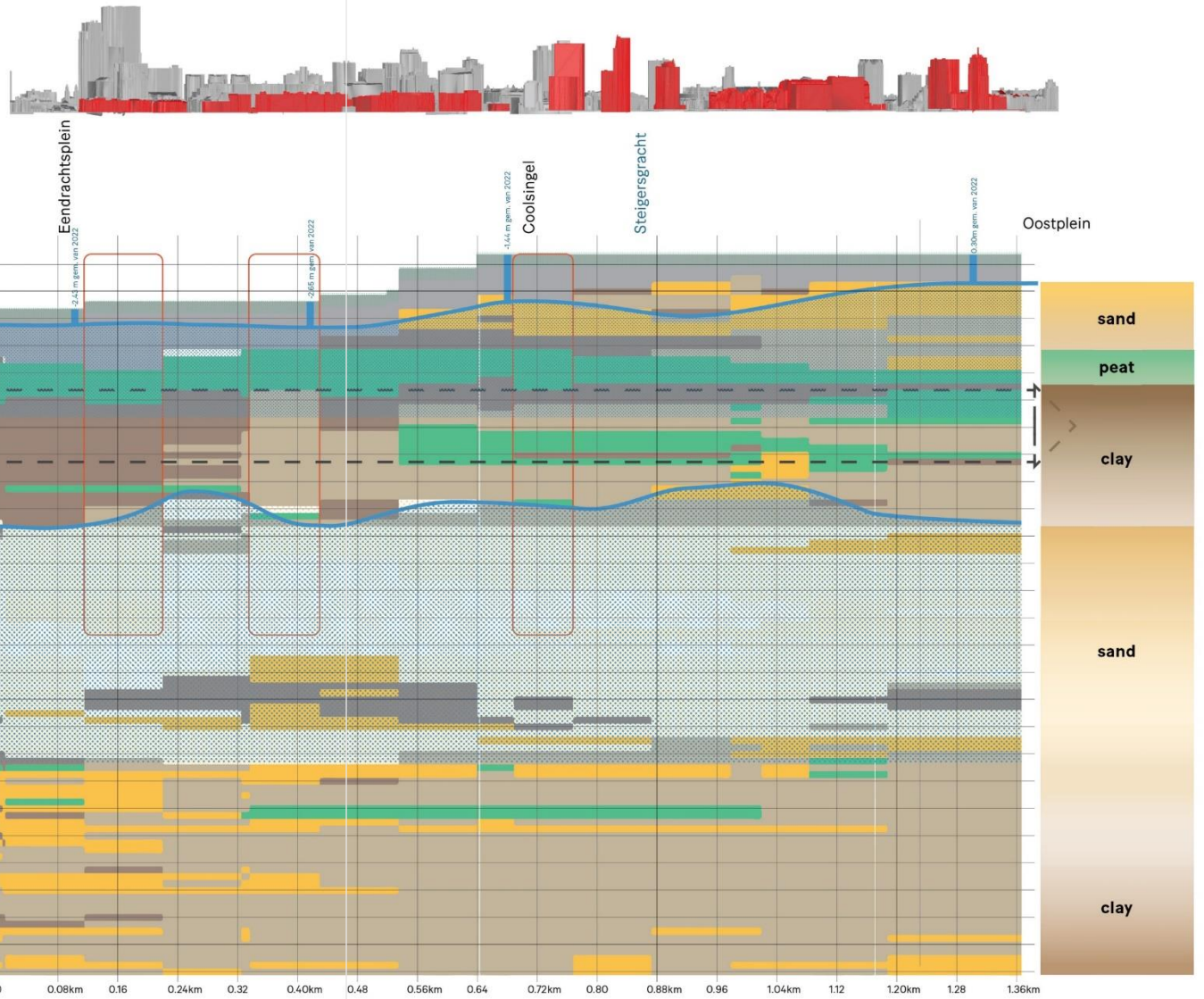
Diving deeper into the soil upto 50m below surface gives us a wealth of new systemic insights into how soil and water systems function in Westblaak.

The spatial transformations traced through time such as the filling of waterbodies and Blaakhaven can be seen on the subsurface as soil and rubble layers.

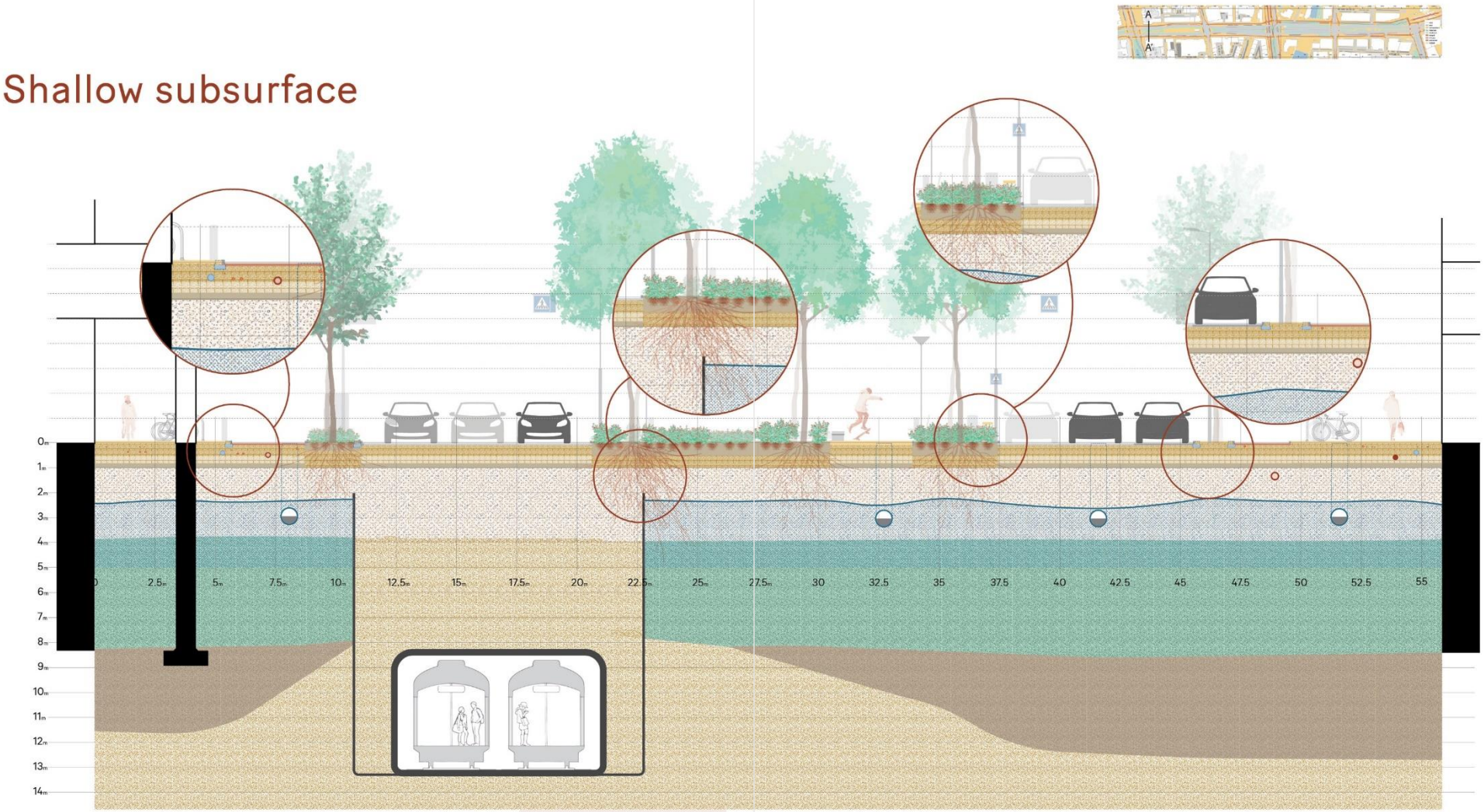
Below the anthropogenous layer of rubble and construction is the peat and clay layer acting as a barrier between the salty aquifer and the zone of saturation. The peat layers play an important role, storing large volumes of carbon underground. It is important to not disturb these layers of soil as they could potentially destabilise larger water and soil systems.

Positioning the deeper sections within the water system of the Maas also shows us that the soil under Westblaak is not well suited for underground waterbuffers that can be reused due to the strong underground water currents.

*This schematic section shows the subsoil upto 50m deep and the different soil types that can be found. The section is based on the data from the GeoTOP model of the BRO.*



# Shallow subsurface




Zooming into the top layers of soil, we see that there is a clustering of pipes and cables in the first metres of the sub-surface along the footpaths. They are clustered here as this is where it is most convenient for utility providers to access their cables and pipes if the need arises. While theoretically there is space available further deeper for cables/pipes. It isn't economically viable yet.

The heavily contested space of the top soil is also the one that is potentially teaming with the most life of all the sub-surface layers. They support a wide variety of bacteria, fungi, nematodes, earthworms and anthropods. Soil beyond 3 metres is unexplored in terms of their ability to host organisms. However, roots can still go deeper in search of nutrients and water in the soil, and along with them fungi.

*A transverse section through Westblaak reveals a wealth of information about what is happening underground. While data about the subsurface is quite limited in terms of accuracy, coverage and resolution, a composite section was made using data from the GeoTOP model, municipal soil studies and expert interviews.*

*While the section provides an image of order, the subsurface is anything but ordered. We can only know the exact state of cables and pipes through exploratory studies, digging through the soil.*

Beyond the first metre, the assumption is that the land has been raised with a mix of construction debris and sand from the reconstruction of Rotterdam post World War II. This anthropogenous layer also hosts the zone of saturation or the water table, which is quite close to the surface at around 2.5m and fluctuates slightly between winter and summer. There is little risk of seepage and subsidence in this specific location, but is more prominent in other parts of Western Netherlands.
Beyond the anthropogenous layers are the peat and clay layers for the next 8 metres acting as the confining layer beneath which lies a salty aquifer, which is experiencing autonomous salinisation due to variety of territorial factors.

We look beyond the busiest top few metres to take the metro into our field of view, as it is contextually relevant for our study as one of the largest subsurface space claims.

# How do you choose vital soil measures?

# Design Principles

Designing with/for soil is a complex endeavour. To deal with the complexity, we translate our understanding of the soil into design principles that can be applied on site. To further simplify the complexity of working with soil, we look at three distinct components that interface with soil:

1. Water (w)
2. Organic material (o)
3. Infrastructure. (i)

### Water

Soil is a medium that supports the movement of water above and below it. The properties of soil influence the water cycle on land to a large degree. The current operating principle is to move water out of the city as soon as possible. We are slowly moving from this colander approach to a sponge approach, where we delay the flow of water and store it within cities as long as possible as a response to climate extremities of increasing extreme rainfall events and extended droughts. With this in mind, the design principles to work with water and soil are:

- Creating soil conditions for water infiltration.
- Creating conditions for buffering water in the top soil.
- Create opportunities for long term water storage.
- Treating runoff water insitu as much as possible before combining streams.

### Organic material

We understand soil as an integral part of the ecosystem and it should have enough organic and mineral density to support life. Tabula rasa is a myth.

Life always finds a way and thus we start with what's already there in terms of existing ecosystems and build on it. While doing so, we make natural processes visible through design. Designing with/for soil to improve its ability to support life would mean that we focus on:

- Designing for biodiversity.
- Working with the time component of natural systems.
- Stimulate natural processes and build on them.
- Give literal and figurative space to nature and natural processes.

### Infrastructure

And finally, the subsurface as the engine room of the city houses a wide array of infrastructure from cables and pipes to full-on metro tunnels. To effectively deal with these infrastructural systems when designing for/with soil, we look at:

- Possibilities to reuse what's already available at site.
- Organising different spatial claims effectively.
- Designing infrastructural systems for multiple purposes and not just one.
- Minimising negative externalities of these technical systems.

**To simplify the complexity of designing with/ for soil, we look at three components that interface with soil: water, organic material, and infrastructure.**

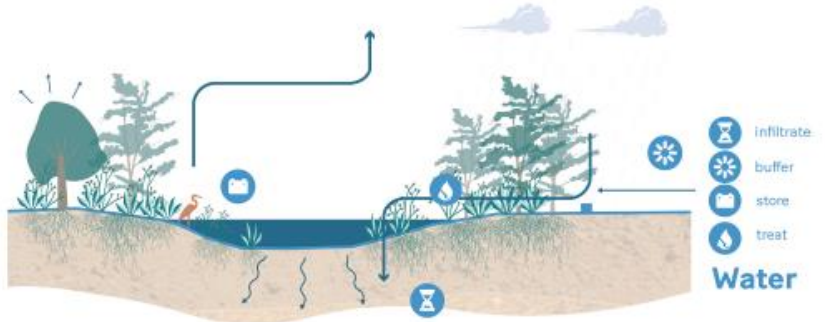
**Soil as a sponge, creating conditions for water infiltration, buffering, and long-term water storage.**

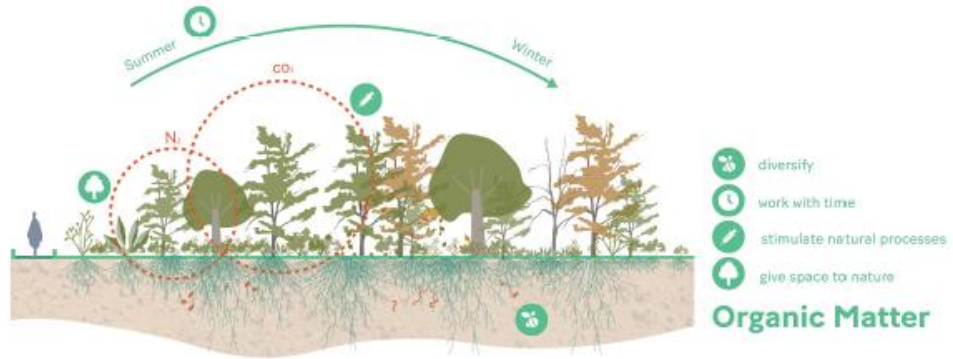
**A regenerative soil supporing biodiversity, working with natural processes, and providing space for nature.**

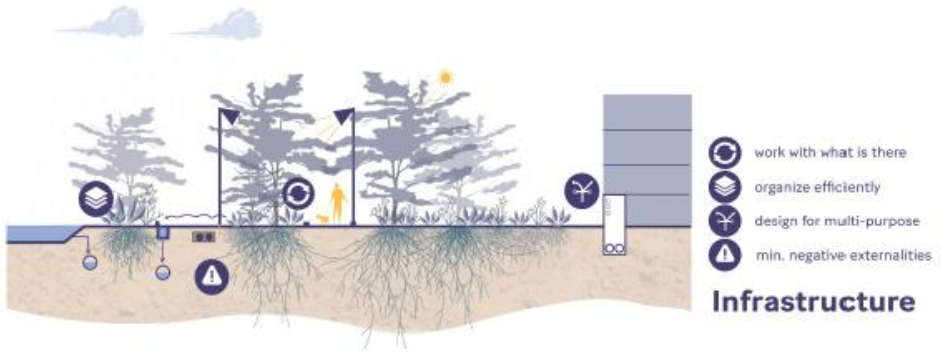
**Efficient subsurface with effectively organized infrastructure, designed for multiple purposes, and minimizing negative externalities.**

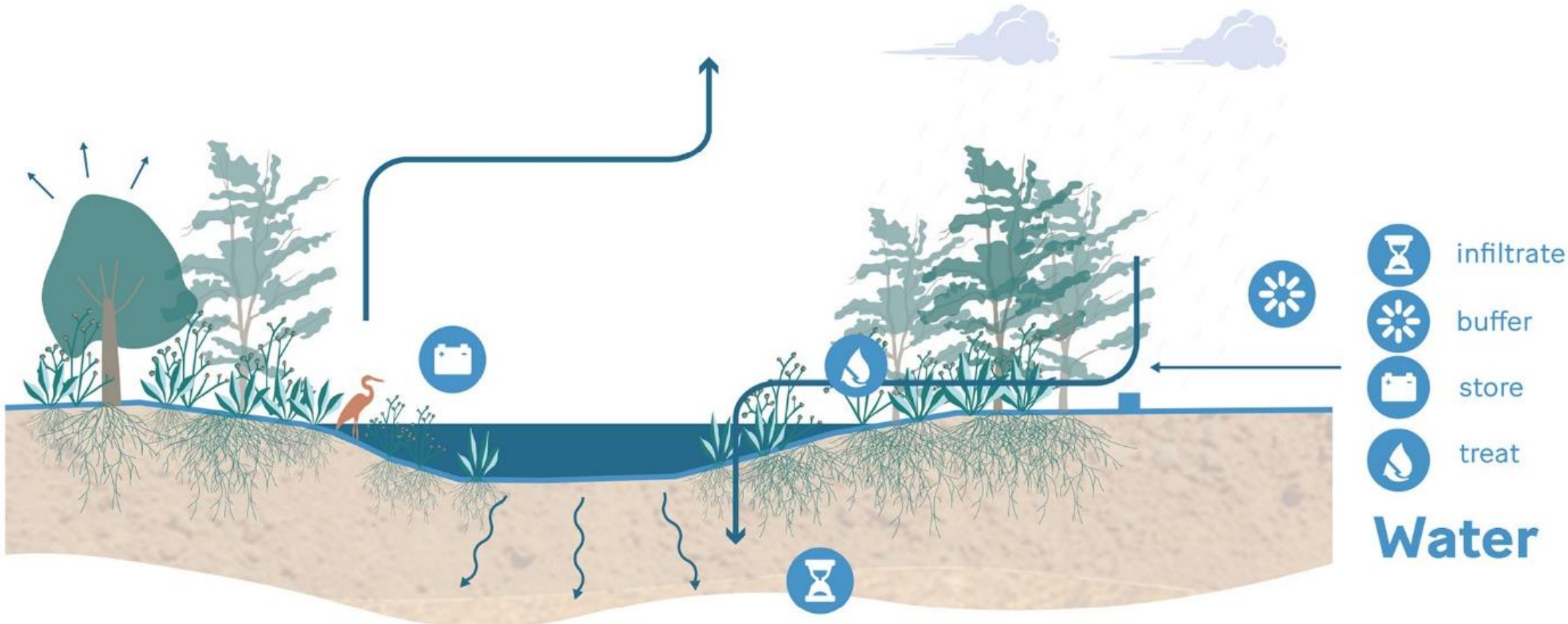
**Design principle:**
They are used as a basis for making design decisions in the context of working with soil. These principles are derived from an understanding of the complexity of soil and are intended to simplify the process of designing with soil by providing practical guidelines that can be applied on site.

*The design principles for designing with/ for a vital soil are structured around three fundamental components of vital soil in urban areas: water, organic material and infrastructure. The diagram to the right shows the interplay of the principles schematically.*




infiltrate
buffer
store
treat
Water

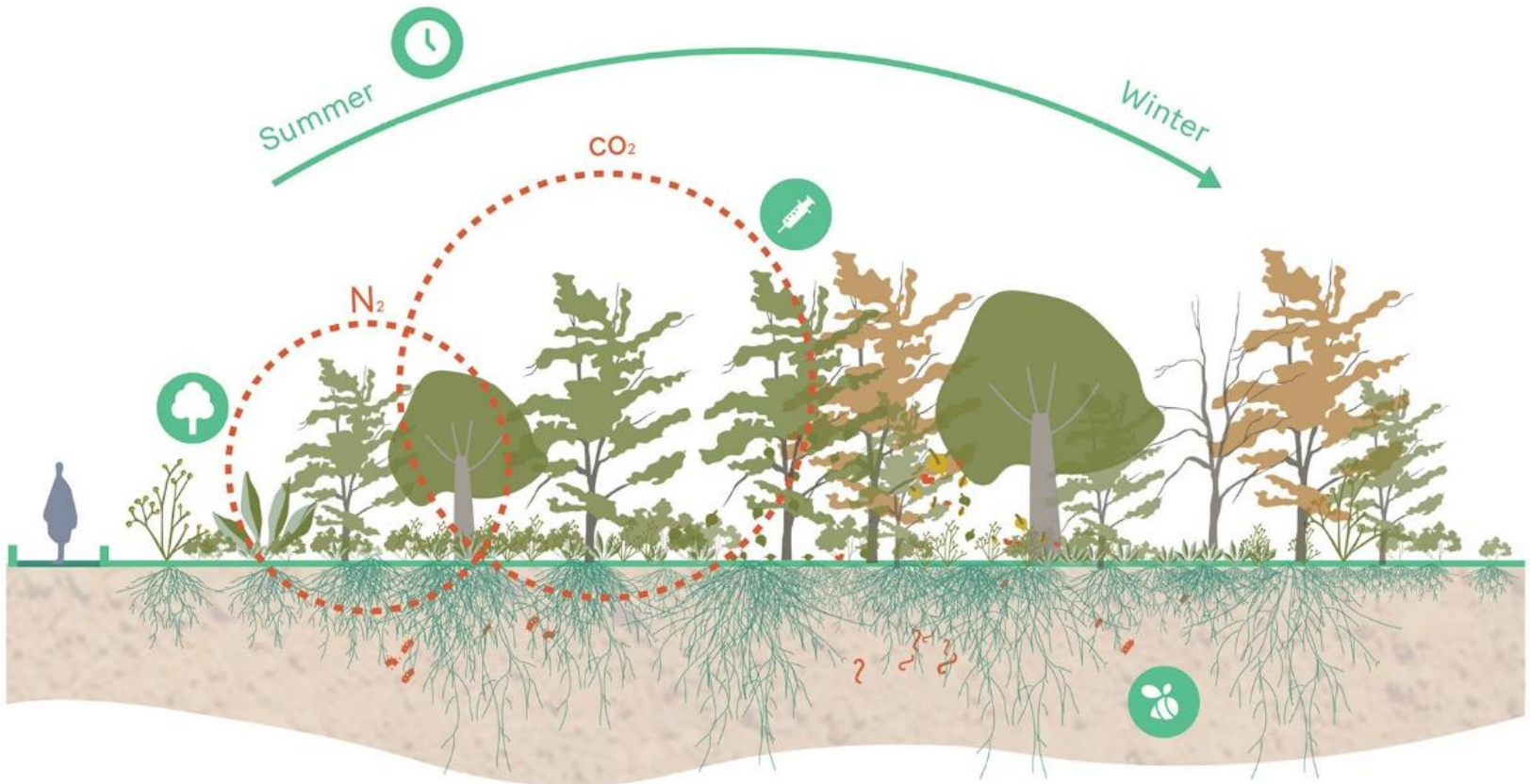
Rain garden, Zuidelijke Wandelweg, Amsterdam

infiltrate

buffer

Biofilter, Klapwijk, FieldFactors

treat




diversify

work with time

stimulate natural processes

give space to nature

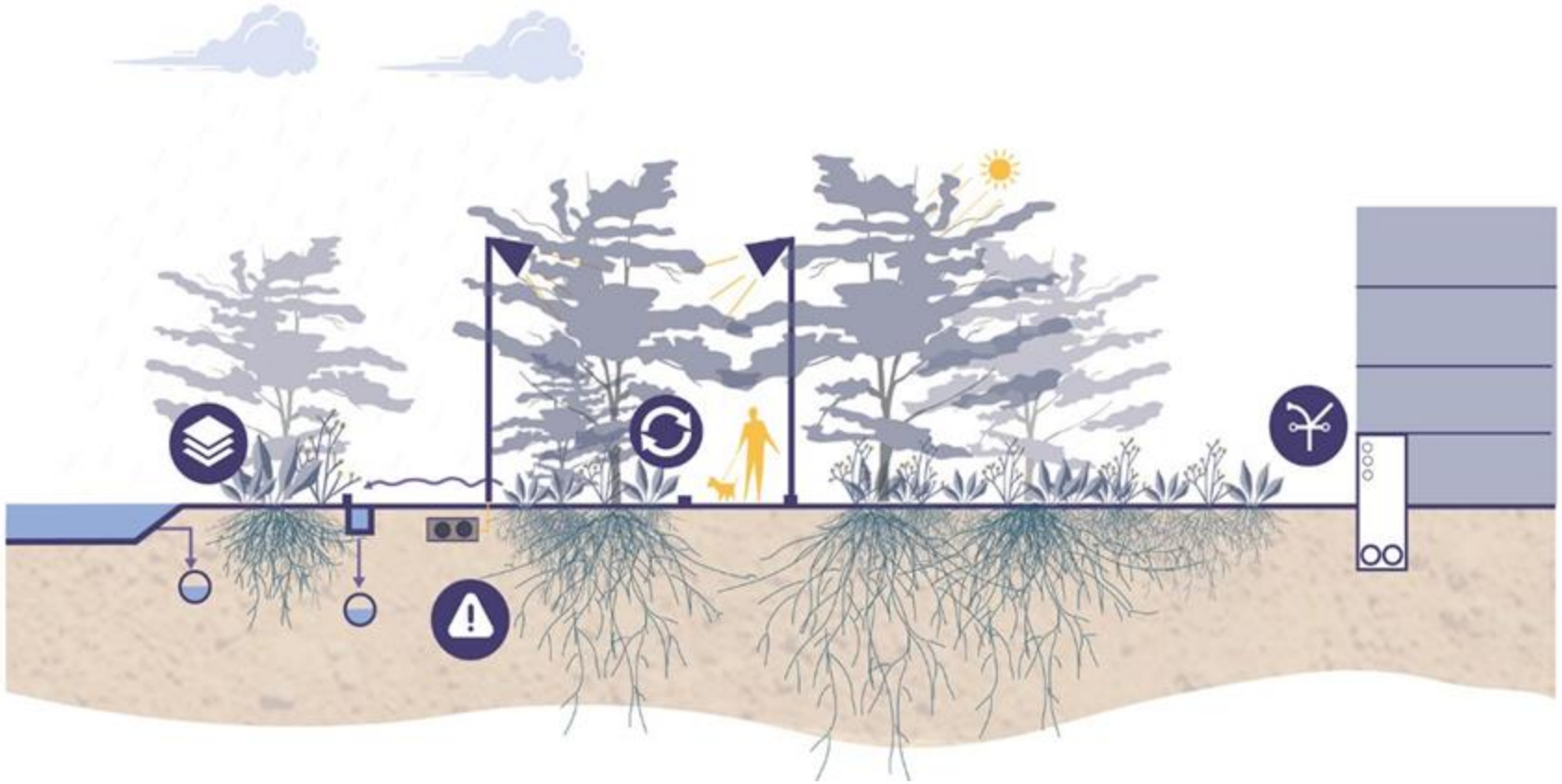
# Organic Matter

give space to nature

← So not like this

Jaktgatan and Lövängsgatan, Stockholm, AJ Landskap

diversify



work with what is there

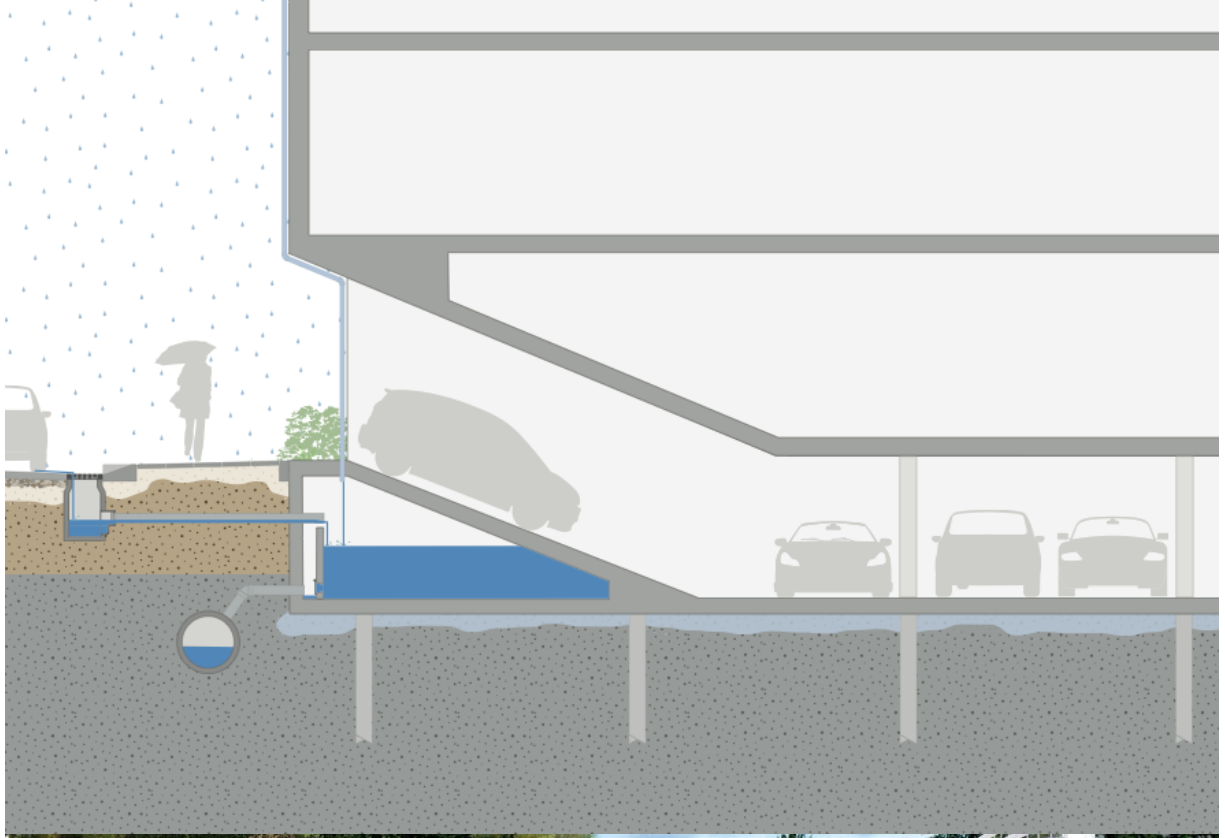
organize efficiently

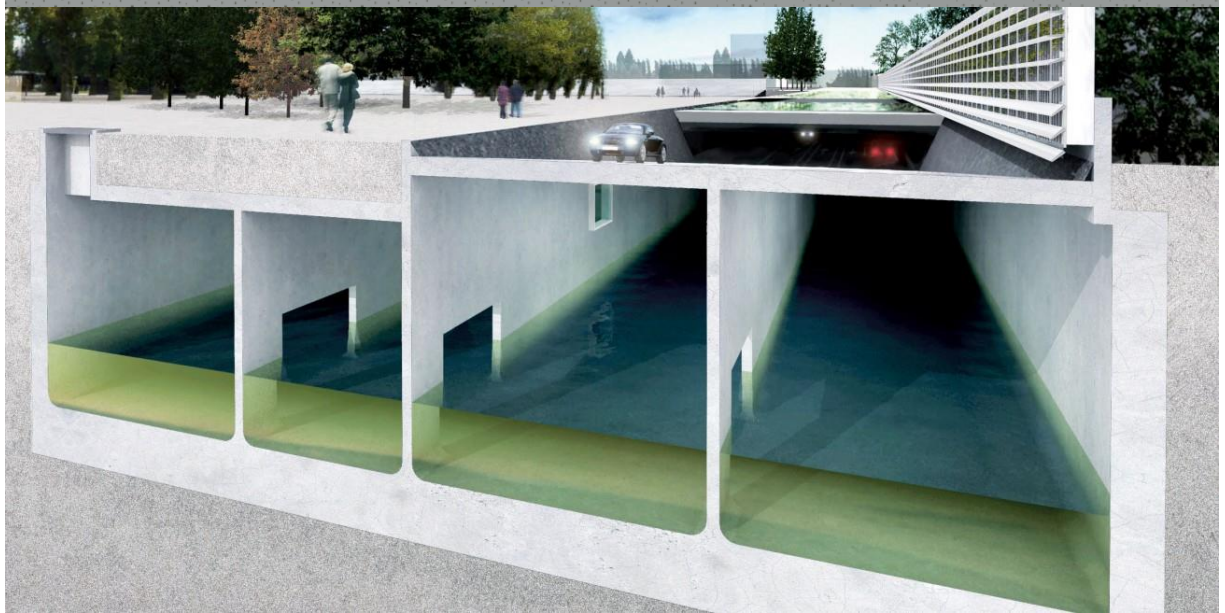
design for multi-purpose

min. negative externalities

# Infrastructure

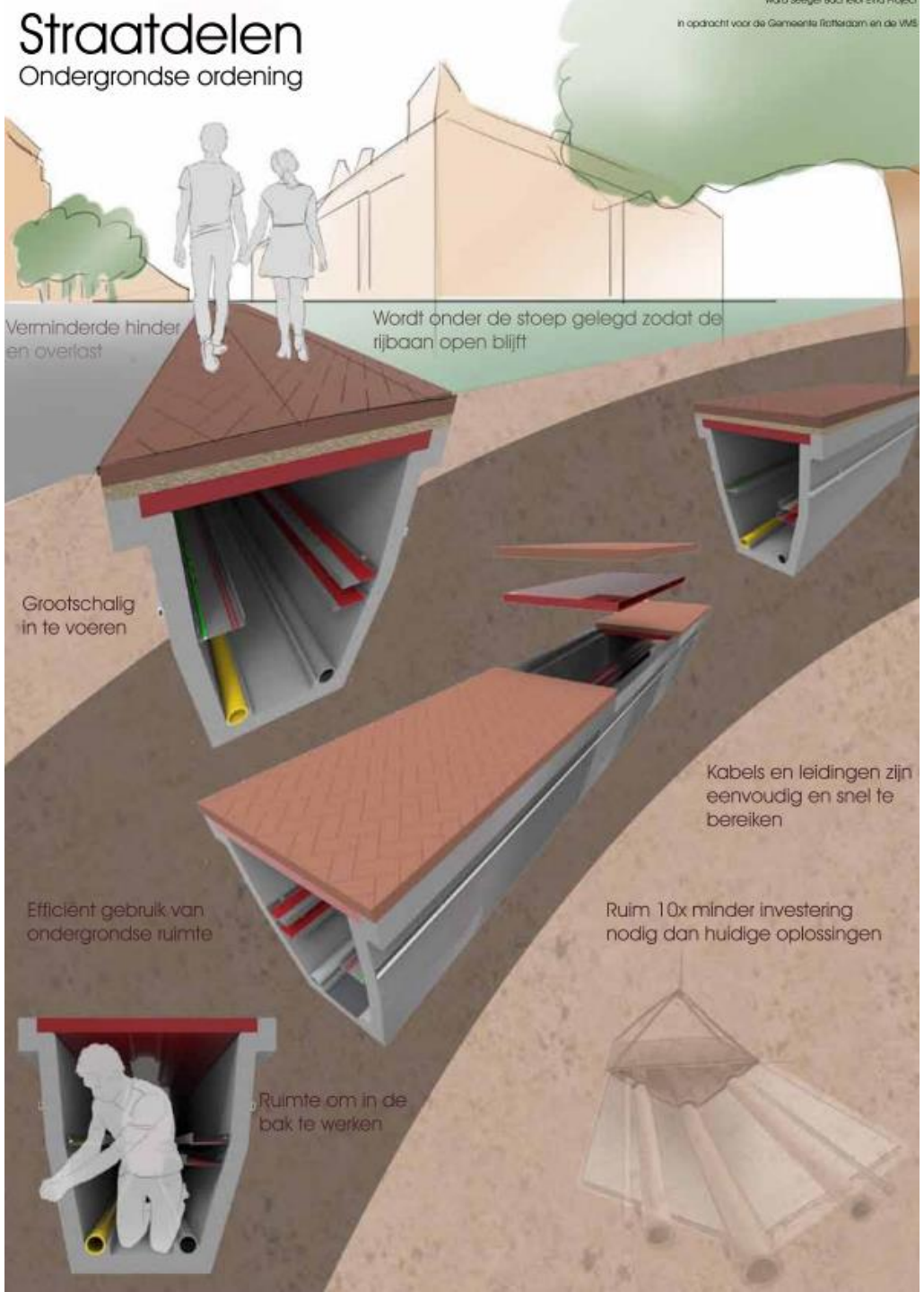
design for multi-purpose





Museumparkgarage, Rotterdam

organize efficiently




Source: Verrassende bestratingsproducten vinden hun weg in Rotterdam – WUR (2017)

**Legend**

Score per indicator: 0 1 2 3

Total score per transition:

Measure type: Leading / Following

## Climate adaptation

Cooling | Infiltrating | Storing

| Indication of scoring requirements | MEASURE TYPE | Shade | Evapotranspiration | Ventilation | Porosity | Vegetation | Water availability | TOTAL SCORE CLIMATE |
|---|---|---|---|---|---|---|---|---|
| Score = 1 (okay, low) | | small trees | grass, wet surface | does not hinder ventilation | plant soil | grasses and herbs | water is temporarily available | |
| Score = 2 (medium) | | medium size trees | perennials, green roofs | supports ventilation | sand, uncompacted soil | perennials | water is often available: small - medium storage | |
| Score = 3 (good, high) | | large, dense trees | tree, fountain | supports cool ventilation | gravel, wood chips, pump to first aquifer | trees and undergrowth | water is always available: large storage | |

## Biodiversity

| Species diversity | Unpaved surface | Nutrients | Tree canopy coverage | Connections to surrounding green | Space for roots | TOTAL SCORE BIODIVERSITY |
|---|---|---|---|---|---|---|
| few (1-2) new species | 20-50% | cover plants, worms, specific nutrients | 5-15% | green stepping stones | reduces underground infrastructures | |
| more (2-5) new species | 50-80% | compost, bokashi | 15-30% | connected green above ground | provides enough soil, reduces compaction | |
| supports natural communities | 80 - 100% | natural decomposition | >30% | connected green on all sides | secures connected underground ecosystems | |

## Circularity

| MKI | CO2 sequestration (soil) | CO2 sequestration (plants) | % Renewable/ reused/ recycled | Reuse potential at end of life | TOTAL SCORE CIRCULARITY |
|---|---|---|---|---|---|
| 50% materials with MKI class 1-2 or MKI <5,5 euro/m-m2-m3 | green mass, plant roots | grass, green roofs, mulch | 25% | 50% can be reused with limitations; plants are burned or dumped | |
| 75% | dried grass, leaves, tree roots | trees, mini forest | 25-50% | 50-75% reused; plants can become nutrients elsewhere | |
| ~100% | wood chips, turf | bamboos, fast growing trees | 50-100% | 75-100% reused; plants can become nutrients on site | |

**Measure description**

**w1.** Use rainwater to humidify soil by sloping sidewalks towards the green.

**w2.** Add tree granules.

**w3.** Design rain gardens.

**w4.** In areas designed for water infiltration, choose plants that tolerate wet soil.

**w5.** Add diverse water elements with nature-friendly water banks.

**w6.** Keep water systems separate when nutrients in one might negatively affect the other.

**w7.** Create water buffering on the surface.

**w8.** Minimize the amount of trees standing in direct range of a small isolated water body.

**w9.** Use rock wool, sheep wool or helophyte filters to filter polluted water.

**w10.** Use existing height differences to design water runoff.

**w11.** Reuse (rain) water daily.

**w12.** Reduce the amount of pavement to less than 50%.

**w13.** Use the water infiltration and storage capacity of the top sand layer.

**o1.** Add a layer of soil on top of the current maaiveld.

**o2.** Apply (and reuse) fast growing plants.

**o3.** Add organic matter.

**o4.** Choose plants that can absorb fine dust.

**o5.** Plant trees with larger canopies and bigger leaves.

**o6.** Add worms to the soil.

**o7.** Include do-not walk areas.

**o8.** Design with a mix of diverse types of surfaces and soils.

**o9.** Plant plants in phases to guarantee development of biodiversity over time.

**o10.** Create larger green patches around trees for leaves to fall and decompose.

**o11.** Include moments of no digging.

**o12.** Cluster different species of trees, shrubs and grasses in a minimum 3,5 x 3,5 meters size cluster.

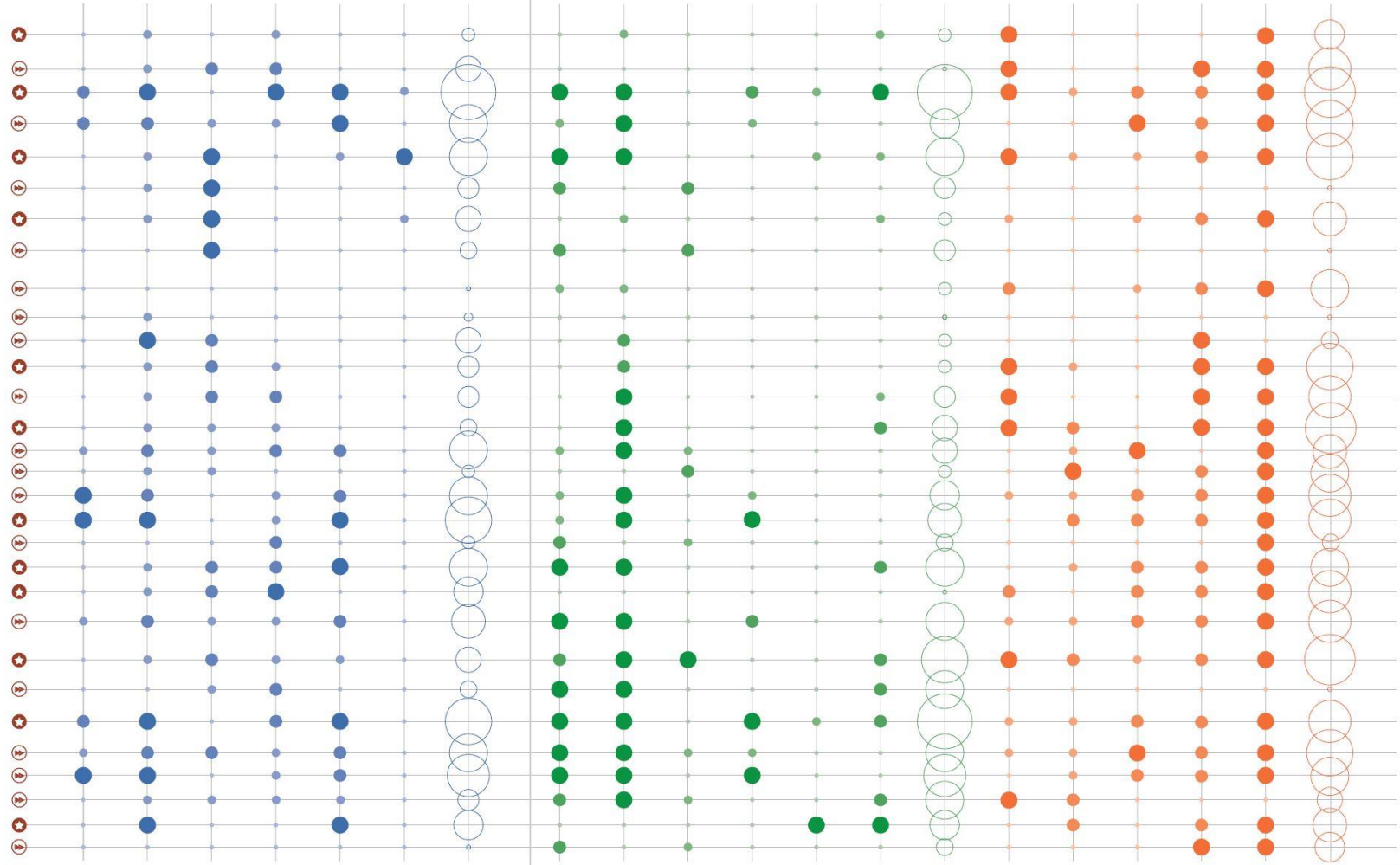
**o13.** First plant pioneer species to naturally prepare the soil.

**o14.** Choose plants that attract a lot of different species.

**o15.** Design for different mowing regimes. Leave cut grass on site.

**o16.** Allow tree roots to connect underground.

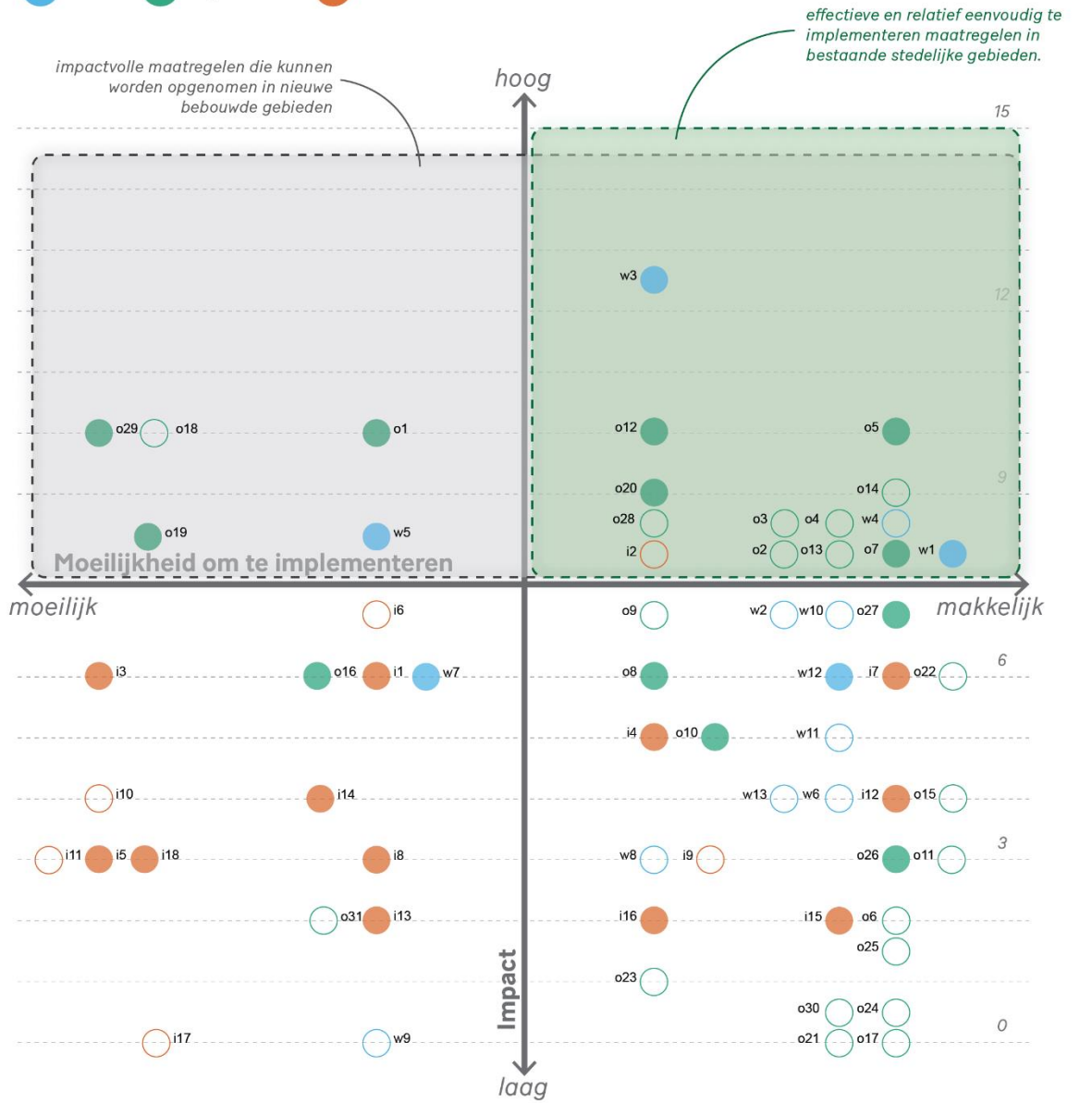
**o17.** Add shelters for insects and animals.



# Maximaliseren van klimaatadaptatie

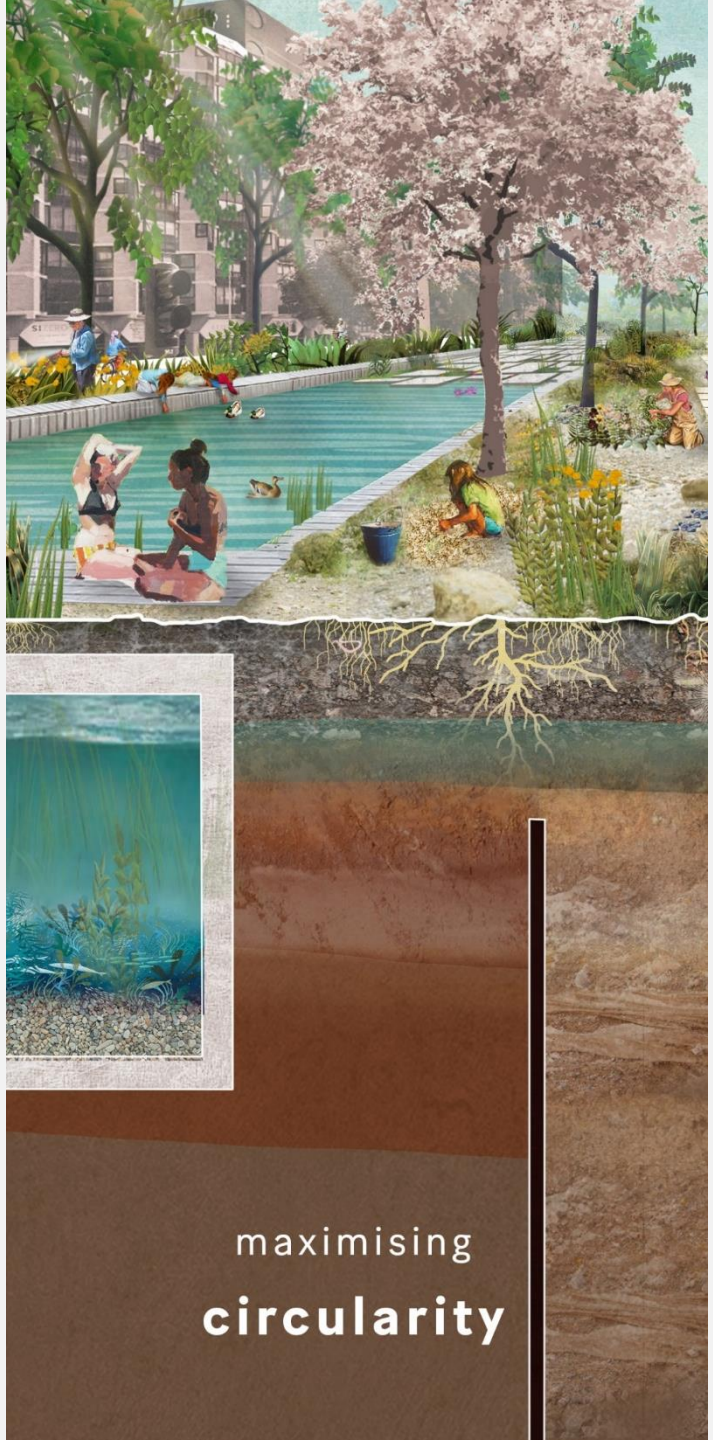
*leidende maatregelen* ●
*volgende maatregelen* ○

*water* *organisch* *infrastructuur*

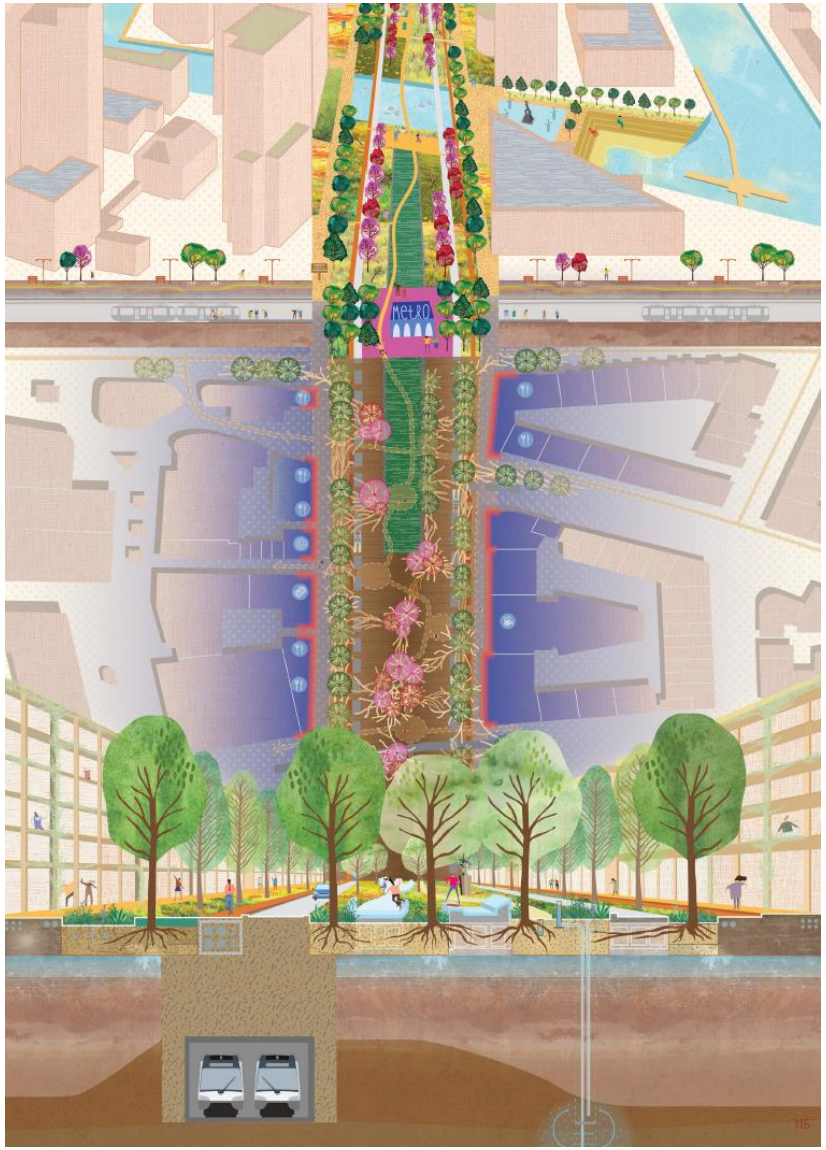



maximising
biodiversity

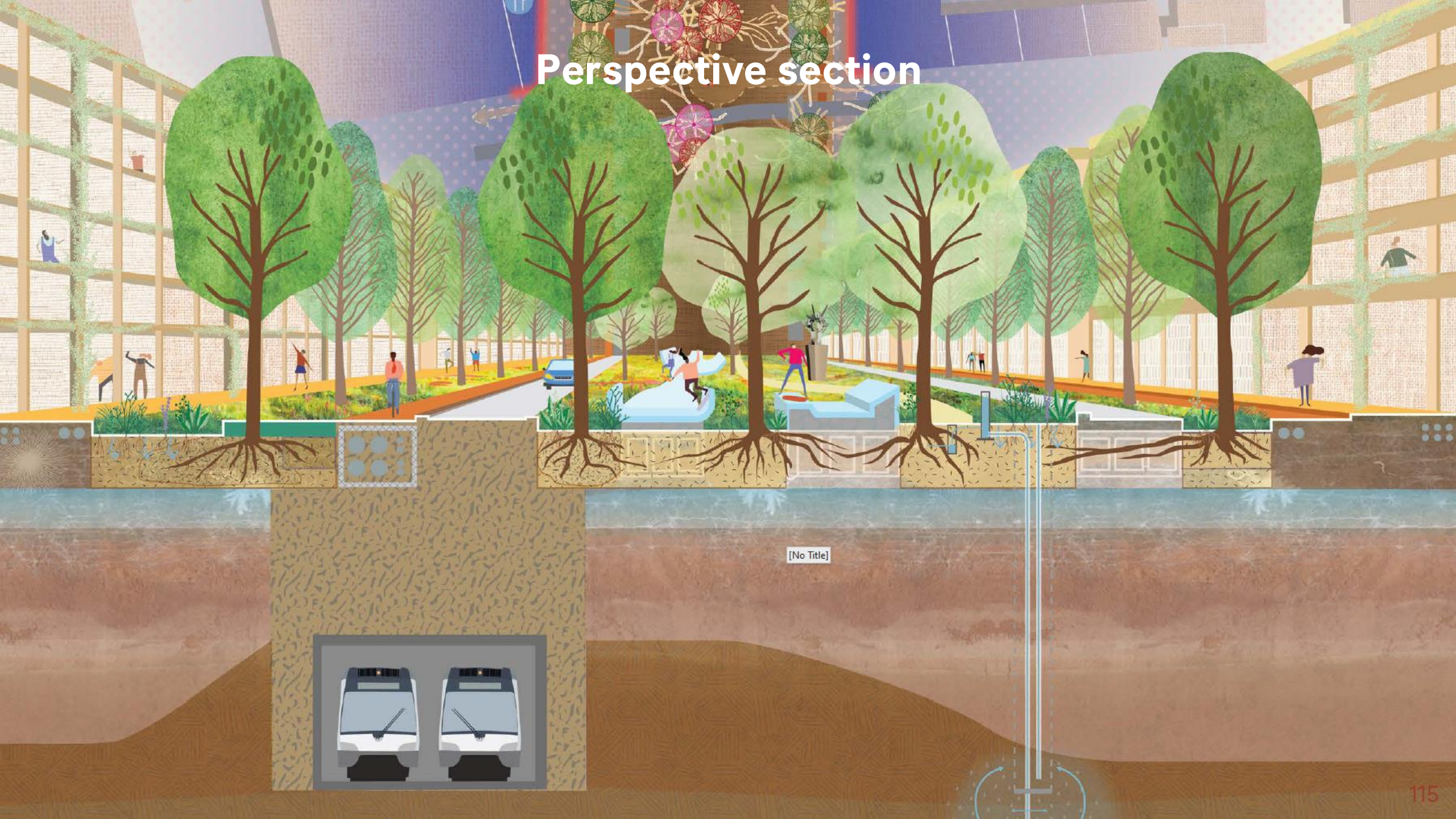

maximising
climate adaptation


maximising
circularity

# New way of visualizing soil



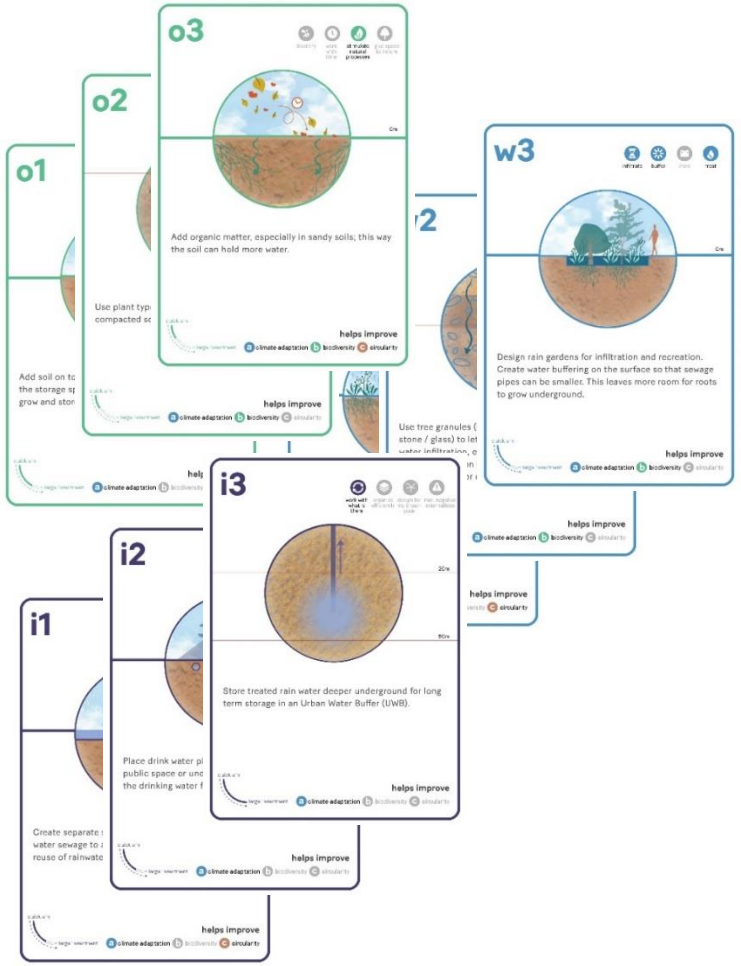
# Perspective section



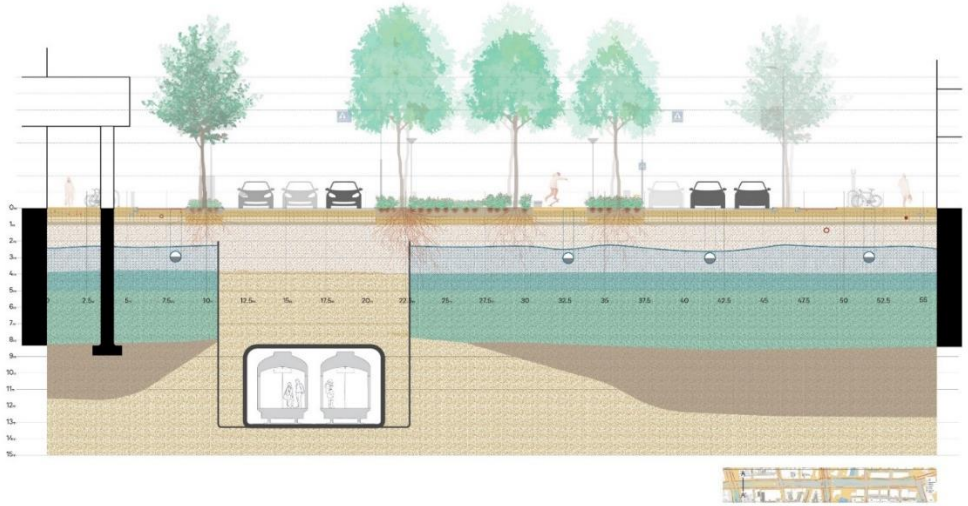
# Plan of the underground

# Workshop material

## Measure cards per system

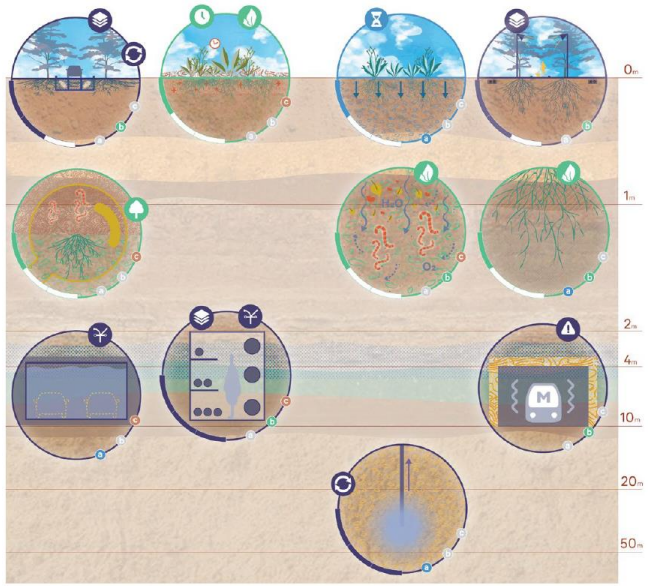



## + Section of existing situation



## + Impact matrix per topic

# Workshop. Designing for the vital soil




## Highlights

- Experience what does it mean to design for the vital soil in urban areas.
- Get acquainted with different disciplines in relation to soil planning.

120-180 min

6-8 participants per group

Basic price of a workshop €5.000
+ for an extra workshop group €500

## Contact

T: +31 (0)70 322 28 69
E: gintare.norkunaite@posadmaxwan.nl
A: Binckhorstlaan 36, C3.04,
2516 BE Den Haag (NL)
W: posadmaxwan.nl

bekijk het onderzoek

POSAD MAXWAN
strategy x design

**Download the research:**

POSAD MAXWAN

strategy x design

Gintare.norkunaite@posadmaxwan.nl