



De waarde van ondergronds bouwen:

*In beeld brengen van **kosten**, **baten** en **argumenten**
van gerealiseerde ondergrondse projecten
(ex post evaluatie)*



Nederlands kenniscentrum
voor ondergronds bouwen en
ondergronds ruimtegebruik



Wie zijn wij?

- Ir. Lidwien Besselink
 - Projectleider COB-project De waarde van ondergronds bouwen



- Dr. ir. Geert Roovers
 - Lector Bodem en Ondergrond



Waarom dit onderzoek?

Versterken van positie van ondergrond in stedelijke ontwerp- en ontwikkelprocessen en besluitvorming daarover ...

... teneinde de potenties van de ondergrond beter te benutten.

A. Besluitvorming en argumenten

- Besluitvormingsproces: hoe is men tot het besluit gekomen?
- Op basis van welke argumenten?
- Welke rol heeft de ondergrond gespeeld in het besluitvormingsproces?

B. Effecten

- Welke effecten zijn opgetreden?
- In hoeverre komen deze overeen met ex-ante inschattingen?
- Welke baten worden nu ervaren?
- Welke effecten zijn vooraf niet meegenomen?

Ex-post evaluatie cases (10 à 15):

1. *Haagse tramtunnel (Souterrain)*
2. *Parkeergarages: Enschede*
3. *A4-schiedam*
4. Zuidas Amsterdam
5. Spoortunnel Delft
6. *Vergelijking met internationale projecten*

C. Gesprekskader voor bestuurders

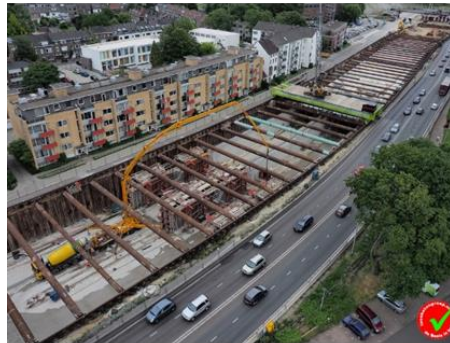
zodanig dat de ondergrondse opties worden betrokken in afwegings- en besluitvormingsproces

D. Batengericht ontwerpen:

input voor ontwerpen met waarden

Wat gaan we vandaag doen?

- Twee cases
- Eerste beelden
- Reflectie - discussie
- Onderzoeksproject en een uitnodiging



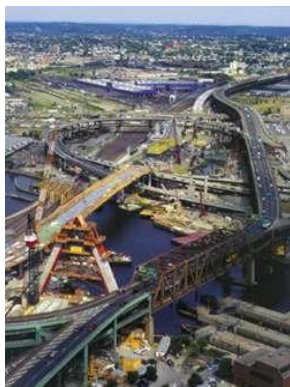


Two cases

slide 6

zondag 19 november 2017

Boston: Big Dig



Reference: Leijten, M. (2004)

Boston: Big Dig (1/3)

1951:

Start construction of 2x6-lane highway ('original artery'). Taking away of appr. 3.800 houses and many industrial areas. Highway separates old neighborhoods and downtown Boston.

Anti-highway revolt

Boston: Big Dig (2/3)

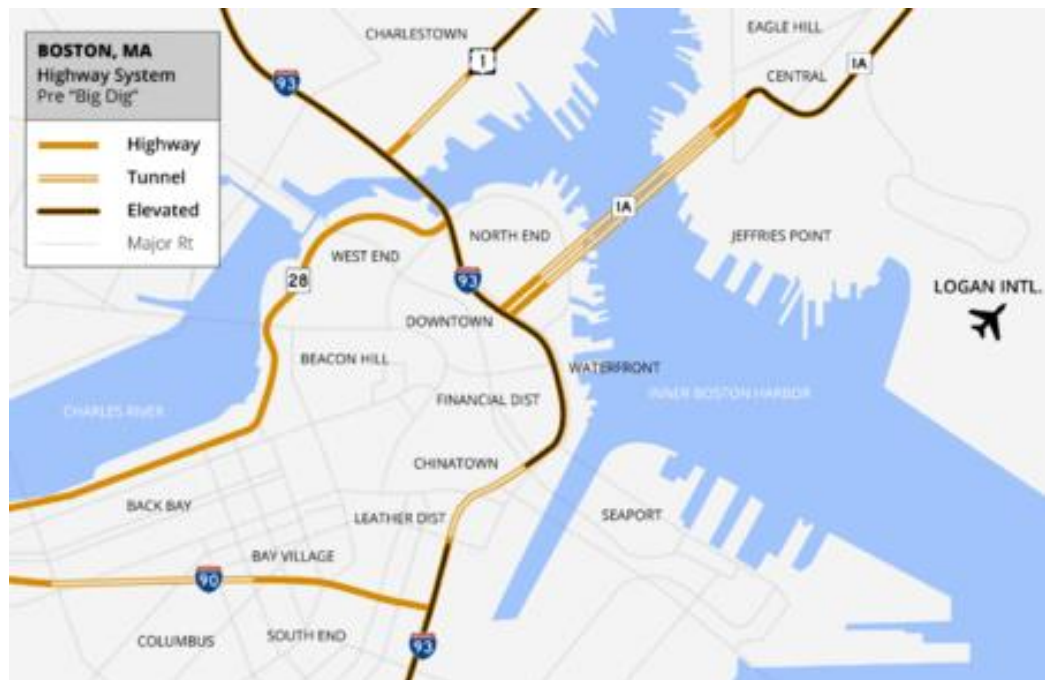
1972:

Central Artery and Third Harbour Tunnel plan.

- *Third Harbour Tunnel,*
- *Underground 2x6/2x8 Central Artery,*
- *New bridge across Charles River.*
- *Small housing and parks on top – mainly used as public space.*

1994-2007: Construction

Boston: Big Dig (3/3)



Main issues on subsurface solution (1/2)

Polarisation

Budget exceedance, due to risks, complex construction methods, mitigation measures and keeping the traffic running.

From \$2,6 bil. to \$14,6 bil.

Taking down (several) houses

Main issues on subsurface solution (2/2)



Accelerator of decision making – bridging gaps between stakeholders

Substantial improvement of environmental quality

Substantial reduction of congestion

Barrier removal:

Reduction of physical, social and psychological distance between old neighbourhoods and downtown Boston

New qualities at a bargain?



30-11-2016 10 years later, did the Big Dig deliver? - The Boston Globe

[Subscribe](#)
Starting at 60 cents

[Members](#)
[Sign In](#)

10 years later, did the Big Dig deliver?

The \$15 billion project is a road paved with failures, successes, and what-ifs.



JOHN TLUMACKI/GLOBE STAFF/FILE

Dan Gasbarre, a Perini Corp. engineer, surveys the construction of tunnels north of downtown from a roof in City Square in 1991.

By **Anthony Flint** | DECEMBER 29, 2015

It was our obsession spanning three decades, the kitchen renovation that would never end, fodder for late-night television jokes. The Big Dig was no mere act of public works, never talked about in the way New Yorkers refer to the Lincoln Tunnel or the George Washington Bridge — infrastructure that cleanly does its job. Ours was the mega project of faulty epoxy, light fixtures dropping like pine needles, Ginsu guardrails, and sea water leaks. The boondoggle, good money after bad, the white elephant.

Het Souterrain



Tramtunnel

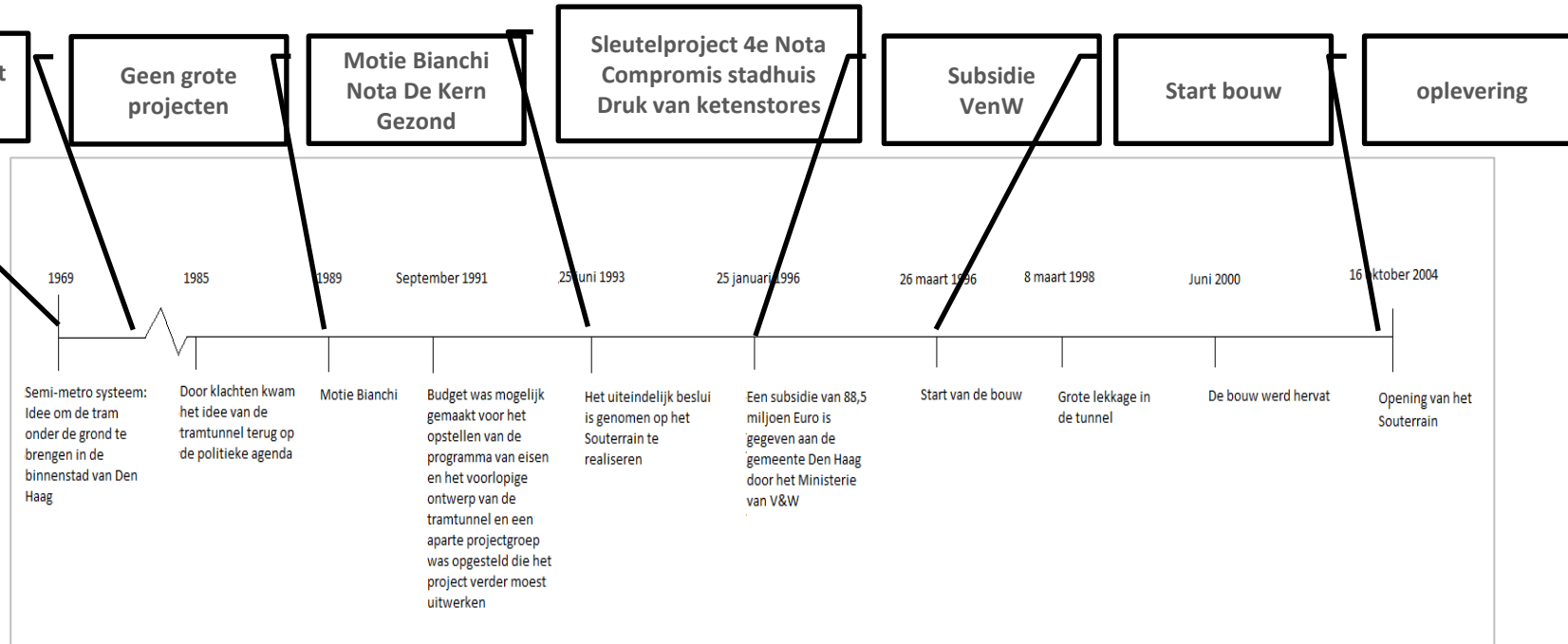


Ondergrondse parkeergarage

Locatie



Tijdslijn



Actors

- Gemeente Den Haag
- Ministerie van Verkeer en Waterstaat
- HTM
- De Kern Gewond
- Rover
- Inwoners
- Winkelketens
- Onroerendgoedontwikkelaars

Results

- Two arguments for Het Souterrain:
 - Traffic related argument: congestion on the crossing Grote Marktstraat/Spui
 - Spatial argument: The quality of the Centre of The Hague should be improved
- A solution (Het Souterrain) looked for problems and budget
- Decisive to go underground:
 - Political figures with administrative courage and a vision
 - Political package deals and momentum
- Knowledge about the traffic need, to go underground and construction risks are not used in the final decision

Arguments (Pro)

- Traffic related
- Public transport
- Economic development area
- Live ability/ spatial quality area

Unexpected benefit: Private investments in adjacent real estate as a result of the improvement of the spatial quality, in which Het Souterrain has played a major role

Arguments (against)

- Costs (234 million Euro while 139 million calculated)
- Innovative construction method-> construction risks (cost overruns + increased construction time)
- Small companies have left or went bankrupt due to the construction nuisance
- Tram travelers are not dropped anymore in front of the chain stores
- The tramline deflections have resulted in disadvantages for the tram travelers
- Parking places on the ground are insufficient disappeared



Eerste beelden

slide 21
zondag 19 november 2017

Eerste beelden (1/4)

- Gebruik van ondergronds bouwen is altijd ingebed in een grotere stedenbouwkundige ontwikkeling – problematiek. Ondergronds bouwen helpt vanuit verkeerskundig, sociaal, leefbaarheids én economisch perspectief, en herstelt onwenselijke consequenties van eerdere grootschalige stedelijke ingrepen.
- Ondergronds bouwen komt vaak pas in beeld te komen als andere opties niet meer lukken. Veelal is sprake van een ondergrondse oplossing als een *‘procesingreep om een patstelling te doorbreken’*. Alleen bij Haagse Tramtunnel was dit anders!
- Financiering vanuit meerdere partijen - zowel private partijen als verschillende overheden - lijkt cruciaal.



Eerste beelden (2/4)

Dit heeft implicaties – roept vragen op:

- Versterken positie ondergronds bouwen zou via de 'stedenbouwkundige – ruimtelijke band' moeten lopen. Hoe krijgen we ontwerpen en ontwikkelen met ondergrondse opties vanaf begin volwaardig op tafel in een stedenbouwkundig - ruimtelijk proces?
- Hoe gaan we in de business-case om met scope, schaal en verevening (tussen partijen en in de tijd) – als meervoudige financiering cruciaal is voor succes?
- Er lijkt een kantelpunt waarin de stedelijke druk zo groot wordt dat ondergronds bouwen aantrekkelijk wordt. Hoe ziet zo'n kantelpunt eruit, en wanneer kantelt het dan?



Waarden door ondergrond (3/4)

Travel time

Fuel savings (€)

Implementation urban mobility policies

Use of natural resources

Energetic efficiency

Land consumption (surface)

Noise

Vibrations

Visual impact mitigation

Soil pollution and disturbance

Groundwater pollution

Buffer space for floods/floods mitigation

Consumption underground resources (ground, water, geothermal)

Liveability

Improved use of surface:

- Continuous space use/accessibility
- Image of the city
- Real estate value
- Revenue from commerce, business and taxes
- Space for recreational activities

Waarden door ondergrond (4/4)

Air pollution and emissions

Isolation against extreme weather conditions (rain, heat, cold)

Resilience and protection to external threats (earthquakes, floods, fires, etc.)

Vulnerability to internal threats

Safety (car/pedestrians accidents)

Safety (micro-criminality)

Safety (manufacturing, laboratories, scientific facilities)

Safety (limited access)

Accessibility (to the structure)

Psychophysical comfort (living/working underground)

Air pollution

Water pollution

Soil pollution

Flora and fauna

Cultural and archaeology

Risks of buildings in proximity

Income loss business and commerce

Reuse of geomaterials

Underground space reallocation and restoring the initial situation



Reflectie en discussie

slide 26
zondag 19 november 2017

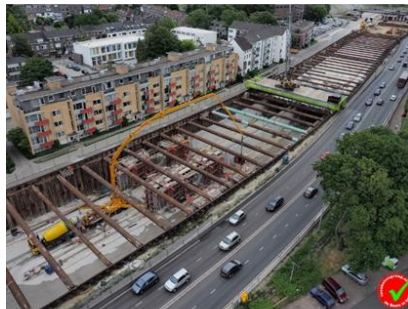


COB-onderzoeksproject

De – maatschappelijke en economische – waarde van ondergronds bouwen

slide 27
zondag 19 november 2017

Dank!



symposium bodem breed
expertise
bodem en ondergrond

De SUB-URBAN Toolbox:

*Ondergrondspecialisten en Urban Planners
samen aan de slag*

*Petra van der Lugt, Kees de Vette & Ignace
van Campenhout*



THE SUB-URBAN TOOLBOX

COST SUB-URBAN is a European network of cities, national geological surveys and research institutes from 31 countries to improve understanding and use of the ground beneath our cities.

COST SUB-URBAN'S AIMS ARE TO:

- Share geoscientific knowledge across the disciplines within the geoscientific community
 - Facilitate relationships between urban/geo specialists and urban decision makers especially during early stages of planning
 - Inform and empower policy and decision makers in relation to the urban subsoil
 - Highlight the importance of the subsoil in making our cities "future proof" and provide them with the tools and facts they need to make informed decisions
- For these reasons COST SUB-URBAN has prepared this Toolbox: a collection of recommended methodologies and workflows, case studies, reference documents, external web sites and other supporting information, and a decision support system. The toolbox goes beyond a list of what can be achieved in their own organisations and that helps users to address issues with a fraction of the costs.

WWW.SUB-URBAN.EU/TOOLBOX

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY



COST is supported by
the EU Framework Programme
Horizon 2020



Nederlands kenniscentrum
voor ondergronds bouwen en
ondergronds ruimtegebruik

COST SUB-URBAN

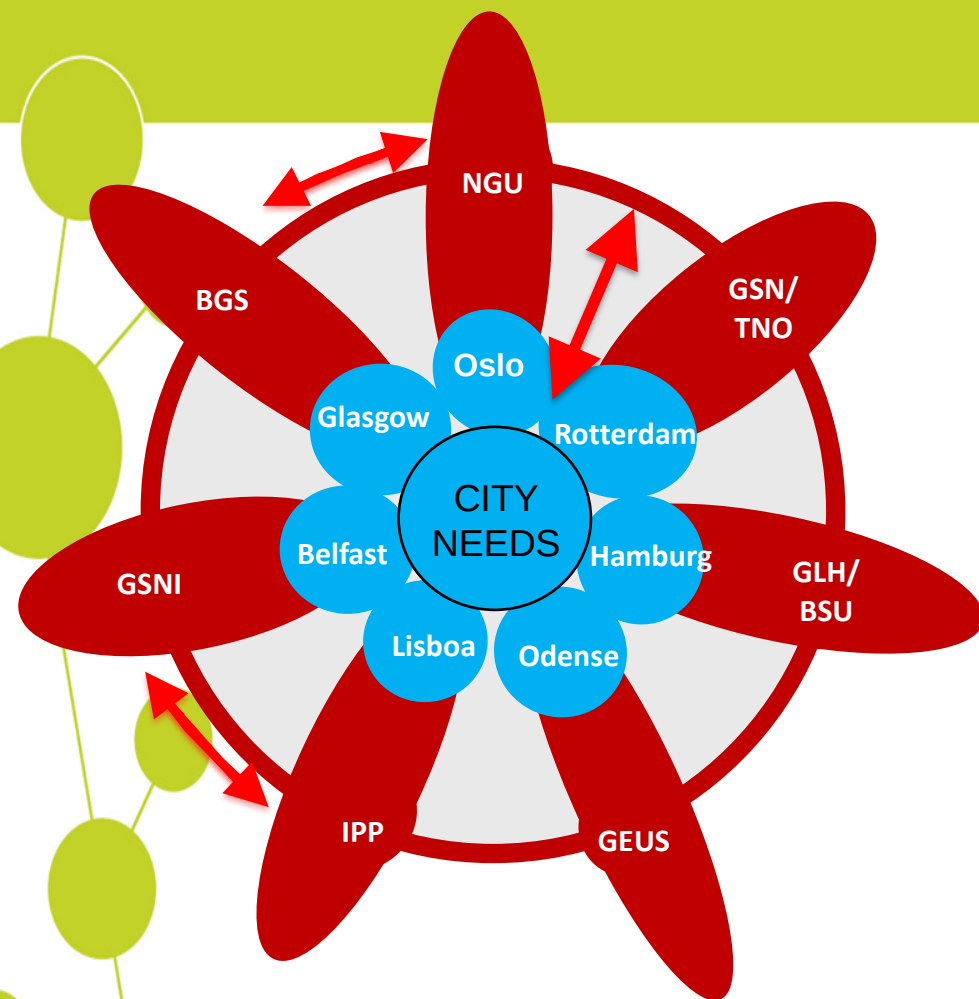
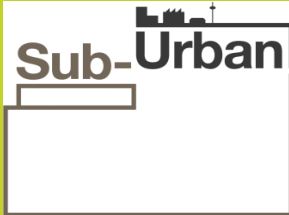
*Europees netwerk om het
begrip en het gebruik van de ondergrond
onder onze steden te bevorderen*



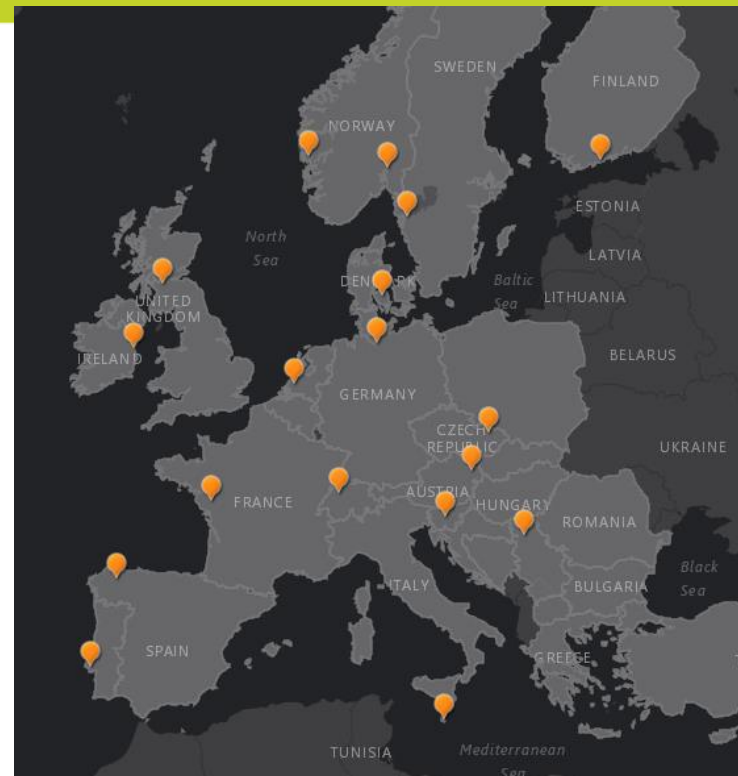
Kennis en middelen beschikbaar stellen aan
besluitvormers:

- **Optimaliseren van ondergrondse potentie**
- **Herkennen en managen van conflicterend gebruik van de ondergrond**
- **Beheersen van de ondergrondse ecosystemen**

Het Sub-Urban Network



*Netwerk van experts die kennis
over ondergrond ontwikkelen...
...en van hen die deze kennis zouden
kunnen gebruiken*



- Netwerk van >30 landen
- >150 researchers, ondergrondspecialisten en urban planners
- 23 deelnemende steden



Nederlands kenniscentrum
voor ondergronds bouwen en
ondergronds ruimtegebruik

Waarom?

Onze kennis over de ondergrond is gefragmenteerd...

- Sectorale insteek: geohydrologen, archaeologen, geotechnici etc.
- Ieder een eigen model “geen geïntegreerd model”
- Ondergrond wordt gefragmenteerd gepresenteerd aan urban planners
- Subsurface specialisten niet pro-actief bezig met urban planning

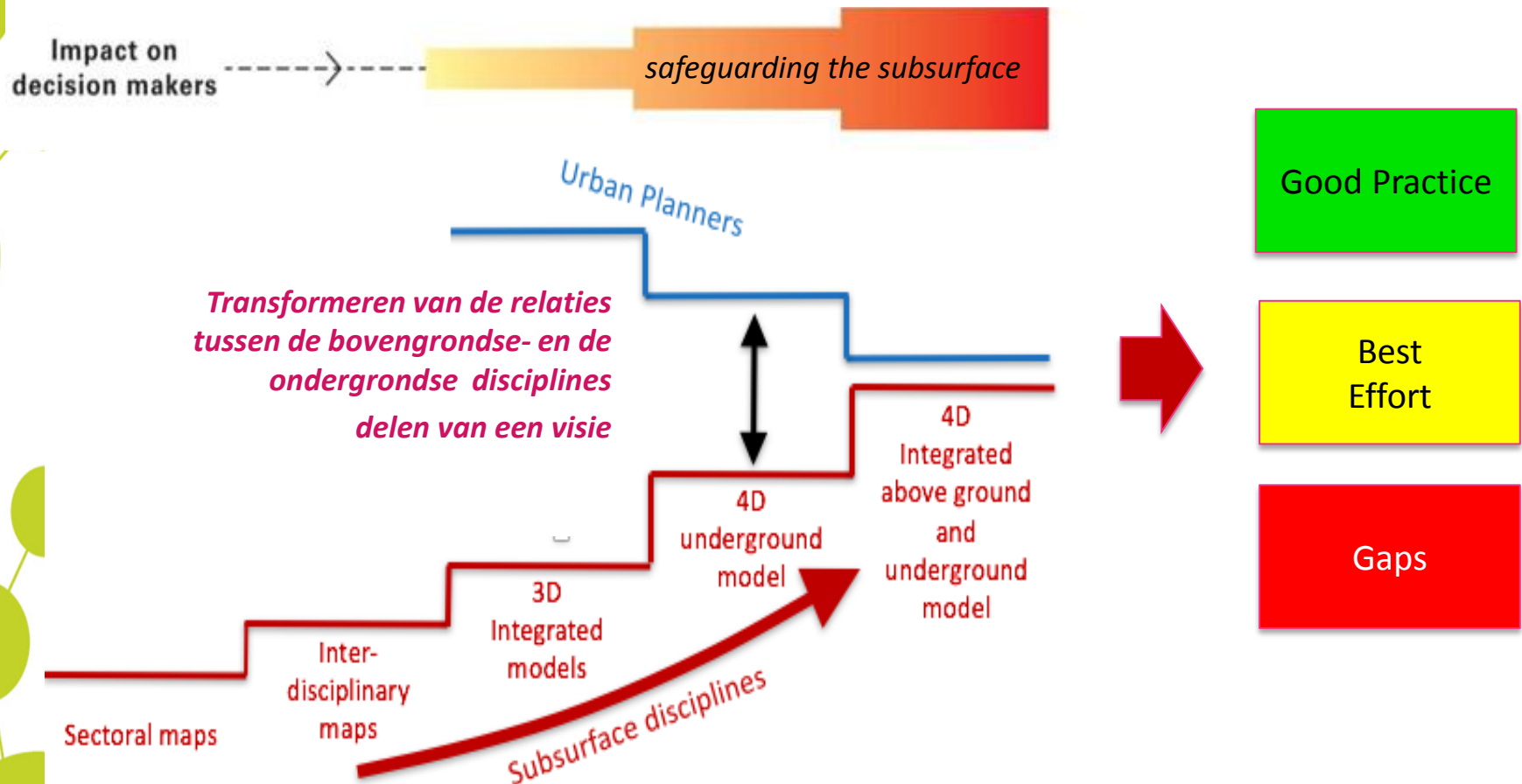
Ondergrond specialisten en urban planners praten niet dezelfde taal

- Verschillende departmenten
- Urban planners niet bewust van beperkingen en kansen van ondergrond
- Voor veel urban planners staat ondergrond gelijk met “kosten en vertragingen”
- Resultaat: “engineering volgt planning” in plaats van “engineering hand in hand met planning”

Besluitvormers & Politici

- Ondergrond is een “zwarte doos”, “uit het oog, uit het hart”
- Verantwoordelijkheden voor de ondergrond bij verschillende autoriteiten .

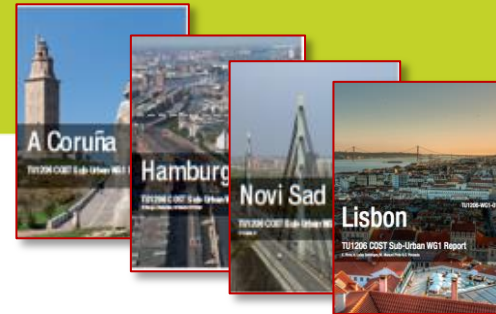
De insteek



COST Sub_Urban 2013- 2017: Producten

Stadsrapporten

city setting, planning issues met ondergrond, economische aspecten, beleid, status infrastructuur, de organisatie rondom urban planning, juridisch framework



WerkGroep rapporten

Ondergrondse urban planning, Data mngnt, 3D modellering, grondwater, geothermal, geotechnisch, milieu, archeologie

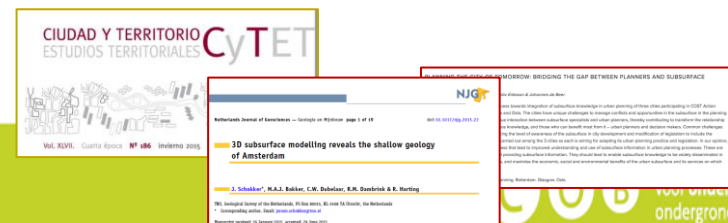


STSM rapporten

(Short term visits, uitwisseling van kennis en methodes)



Publicaties



COST Sub_Urban 2013- 2017: het Proces



Niet alleen kennis bij elkaar brengen maar ook de mensen met die kennis,
'community'

Workshops

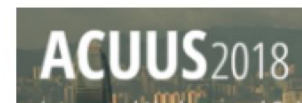


Bijdragen aan conferenties,



13-16 March 2017
Bucharest, Romania

Nauwe relaties met andere
professionele organisaties

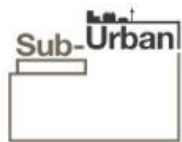


Cooperatie met city
networks



Website

“hoe de resultaten werd geproduceerd”



SUB-URBAN CITY OVERVIEWS CITY STUDIES
GOOD PRACTICE / BEST EFFORT KNOWLEDGE EXCHANGE TOOLBOX NEWS
EVENTS PUBLICATIONS

SUB-URBAN

Sub-Urban is a European network of Geological Surveys, Cities and Research Partners working together to improve how we manage the ground beneath our cities.

Background image: Oslo.

AAS-JAKOBSEN



Online Toolbox:

“hoe gebruikers er naar op zoek gaan”

Entree via Topics



COST SUB-URBAN

3D GEOLOGICAL SUBSURFACE MODELLING

Key Topics:
Subsurface modelling, modelling man-made ground, model integration, model maintenance
[return to Backwheel](#)

Seen in the urban context
Today, in more and more countries geological subsurface modelling is gradually replacing traditional mapping. Most often however, the information needed to create a reliable and useful urban subsurface model is not available within a GSO, let alone a single database. Different data types have to be combined to construct the model, data density is typically very variable and the data come in an array of different formats and are therefore not easily interoperable. Due to the dynamic nature of the urban subsurface, after model delivery regular maintenance is required to prevent the model from quickly being outdated. Typically, 3D geological subsurface modelling output is not used directly in the urban planning process, but forms the basis for applied

Geographisch



glasgow 4 of 32

SWEDEN FINLAND NORWAY DENMARK CZECH REPUBLIC AUSTRIA HUNGARY ROMANIA BULGARIA UKRAINE BELARUS LITHUANIA ESTONIA LATVIA IRELAND UNITED KINGDOM GERMANY FRANCE SPAIN ITALY TUNISIA GREECE TURKEY SYRIA

North Sea Baltic Sea Black Sea Mediterranean Sea

POWERED BY esri
Esri, HERE, Garmin, NGA, USGS

Search



Toolbox:

- Webbased, gebruiksvriendelijk:
 - Het laat zien “wat” “hoe” en “wanneer”
 - Videos,
 - Communicatie, netwerkplatform
 - Is een training tool
- “een set van voorbeelden van producten en processen” die kunnen dienen als inspiratie voor andere steden,

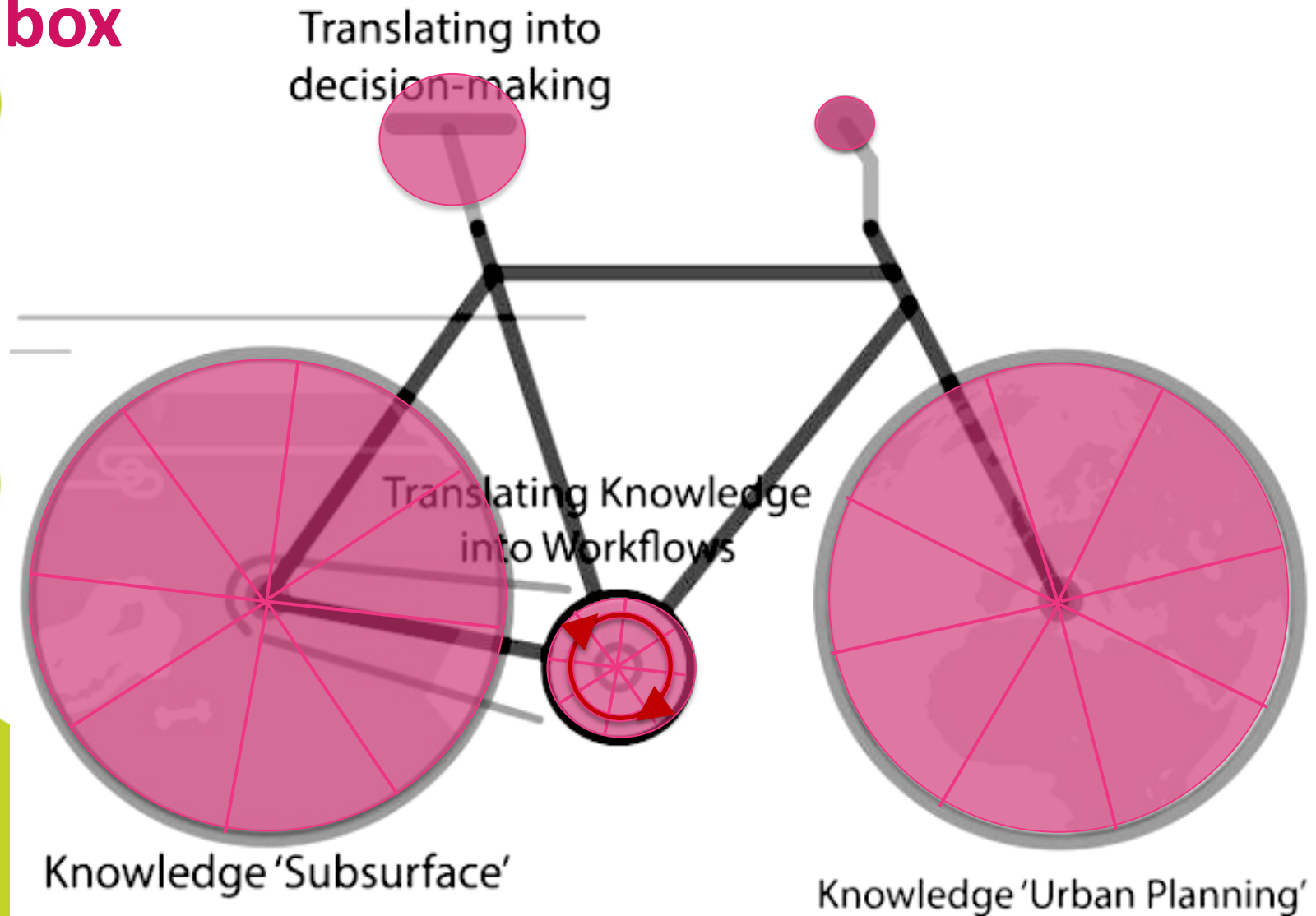
De gebruikers een gevoel geven voor wat mogelijk is in hun eigen organisatie

Hen helpen om dit voor elkaar te krijgen tegen een fractie van de kosten

.....from website..... to urban underground platform

Ondergrondspecialisten en urban planners met elkaar in verbinding brengen

Interactive online toolbox





SUB-URBAN
KNOWLEDGE EXCHANGE

CITY STUDIES
TOOLBOX

GOOD PRACTICE / BEST EFFORT
NEWS

EVENTS

PUBLICATIONS
CONFERENCE

TOOLBOX

The Toolbox comprise a fit-for-purpose suite of recommended methodologies, good practice, guidance, and case studies to enable the free flow of key subsurface data and knowledge.

The toolbox is now accessible [here](#).

Hyperlink to Toolbox



Nederlands kenniscentrum
voor ondergronds bouwen en
ondergronds ruimtegebruik



SUB-URBAN TOOLBOX

For more information [Rob van der Krogt](#), [Gillian Dick](#), [Fransje Hooimeijer](#), [Ingelov Eriksson](#)

This chapter takes the perspective of urban planning practice as a starting point, from the vision that societal challenges and improvements are mainly defined in the context of urban planning. An urban planner is trained to process and analyse various types of information concerning an urban area and present it to the public and decisionmakers.

The overall structure of this chapter is based on the following subjects:
The perspective of urban planning practice can be described along the following lines ('spokes' in the bicycle front wheel):

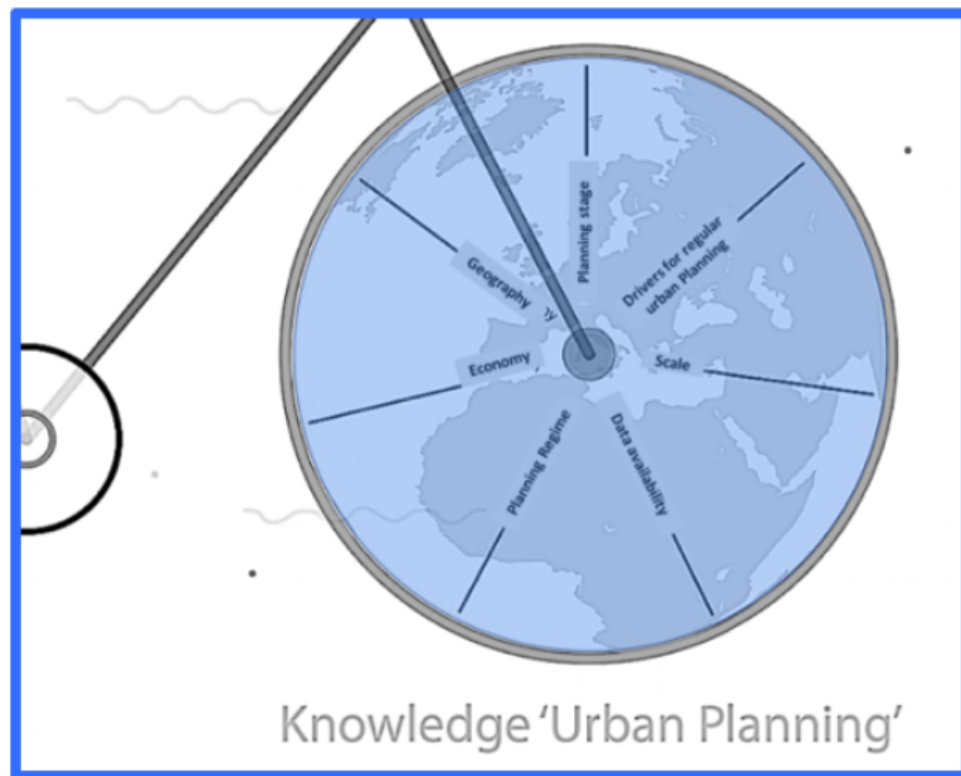
- [City characteristics/ External factors](#)
- [Evaluation framework for urban planning practices](#)
- [Examples of inclusive planning.](#)

For an overview of all Urban Planning topics addressed: [Click here](#)



Back

[back to the Index](#)



SUB-URBAN TOOLBOX

THE BACKWHEEL- KNOWLEDGE DOMAIN OF THE SUBSURFACE

[back to the Index](#)

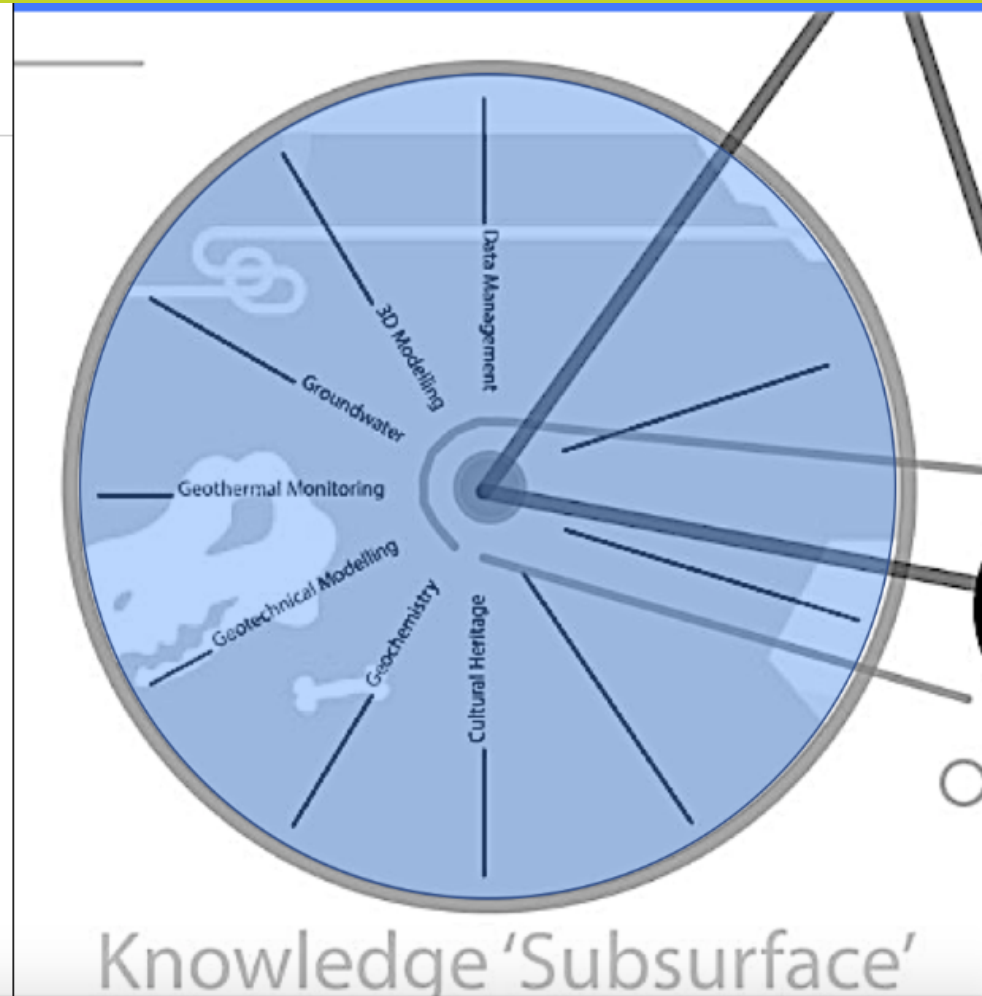
The topics of the Subsurface are:

- [Geology and use of the urban subsurface](#)
- [Data acquisition and management](#)
- [3D geological subsurface modelling](#)
- [Groundwater monitoring and modelling](#)
- [Geothermal monitoring and modelling](#)
- [Geotechnical modelling and hazards](#)
- [Geochemistry of the subsurface](#)
- [Cultural heritage](#)

For an overview of the good practices of each topic: [Click here](#)

For an overview of the Subsurface topics addressed in COST SUB-URBAN:

[Click here](#)





SUB-URBAN TOOLBOX

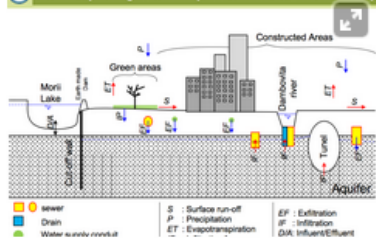
improve conceptual understanding - Glasgow

The case study is an example of how a robust conceptual groundwater model can be developed to help improve general understanding of urban groundwater resource in the absence of significant aquifer properties data (e.g. urban-scale groundwater flow patterns, general depth to groundwater and characteristics).

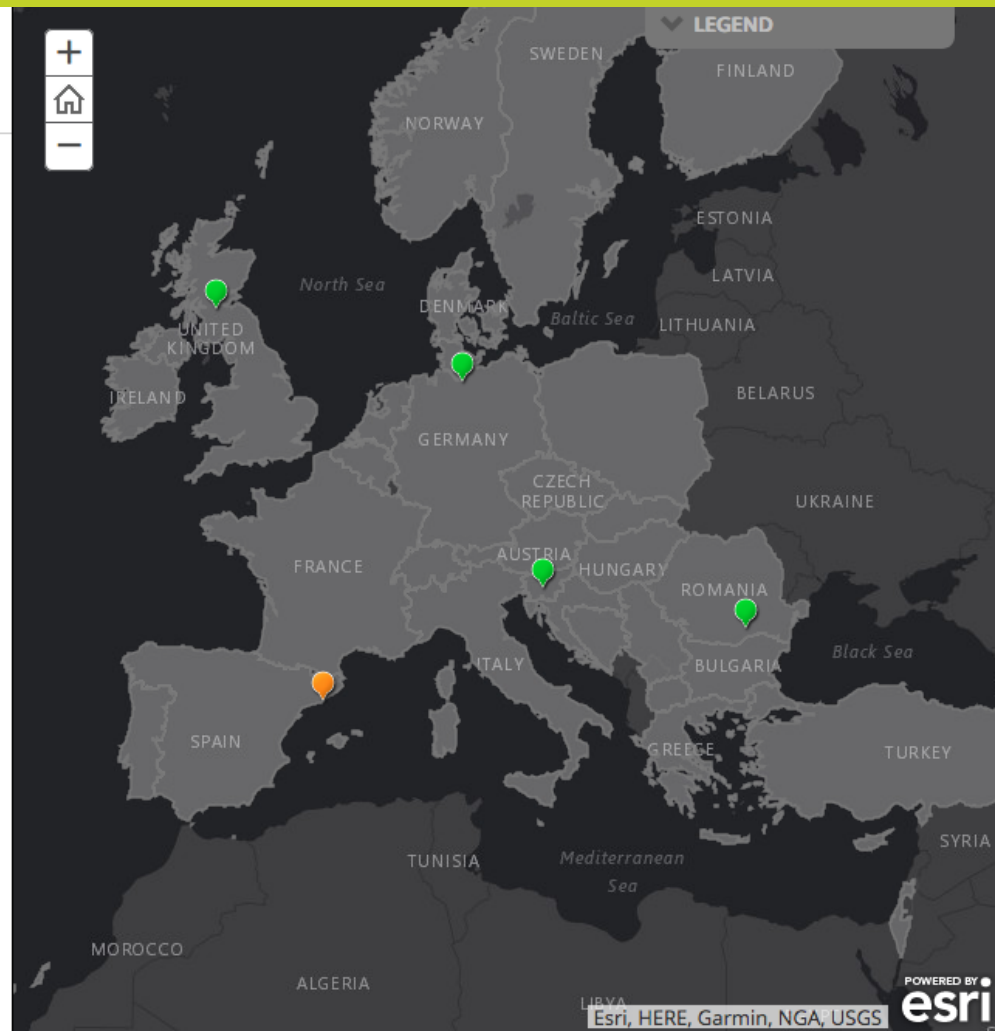
• Interaction of infrastructure to groundwater resources – Bucharest

Bucharest is one of the few cities to have developed a city-scale groundwater recharge and flow model which has integrated subsurface urban infrastructure, to better understand the impacts and interaction of the infrastructure to the urban groundwater resource.

Urban hydrological conceptual model of Bucharest city



In Bucharest the urban sewer infrastructure is known to impact the groundwater resource through leakage and new infrastructure has altered the groundwater flow regime in the city. To help understand these impacts better, and to mitigate impacts of future subsurface infrastructure a groundwater





SUB-URBAN TOOLBOX

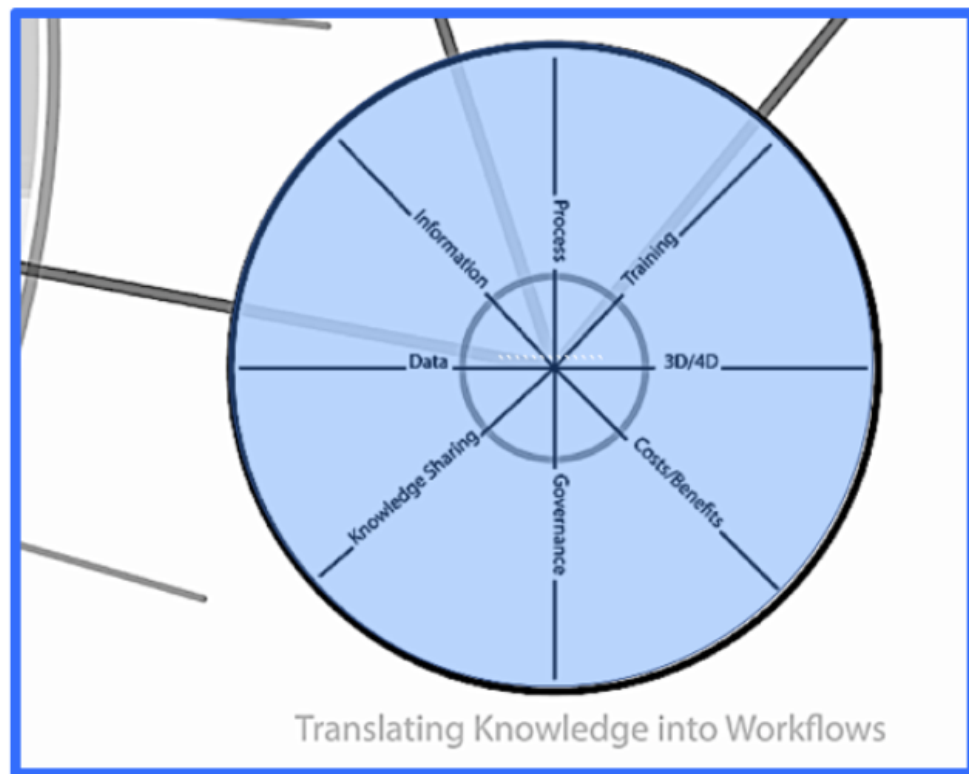
THE CRANK - TRANSLATING KNOWLEDGE INTO WORKFLOWS

[back to the Index](#)

The following topics play a key role in the process of bringing urban planners and subsurface specialists together:

- [Organising interdisciplinary teams](#)
- [From technical subsurface data to useful information for urban planners](#)
- [Multidisciplinary workshops](#)
- [The need for integrated 3D models](#)
- [Economical aspects of working with the subsurface](#)
- [Collaborative communities](#)

Regarding the subsurface as an integral part of the public space and subsequently including the subsurface automatically during the urban planning process is not yet standard practice. The subsurface is unknown territory for most city planners and developers. And unknown makes unloved. Bringing





SUB-URBAN TOOLBOX



D2 S2 2 Luisa Goncalves

II.IV - WORKSHOPS

W1. *Techniques of data acquisition and monitoring of the underground*
Ana Falcão, IST / Luisa Gonçalves, IPL, NovalMS, InescC (Cost Action TU1208 Member)

W2. *How to apply subsurface technology in urban planning and design*
Fransje Hooimeijer, TU Delft (Cost Action TU1208 Member); Hugo Rodrigues, IPL/
Alexandre Pinto, IST / António Miranda, CMLisbon

W3. *About the importance of groundwater in the cities, case studies in Lisbon*
Luís Ribeiro, IST / Cláudia Pinto, CMLisbon

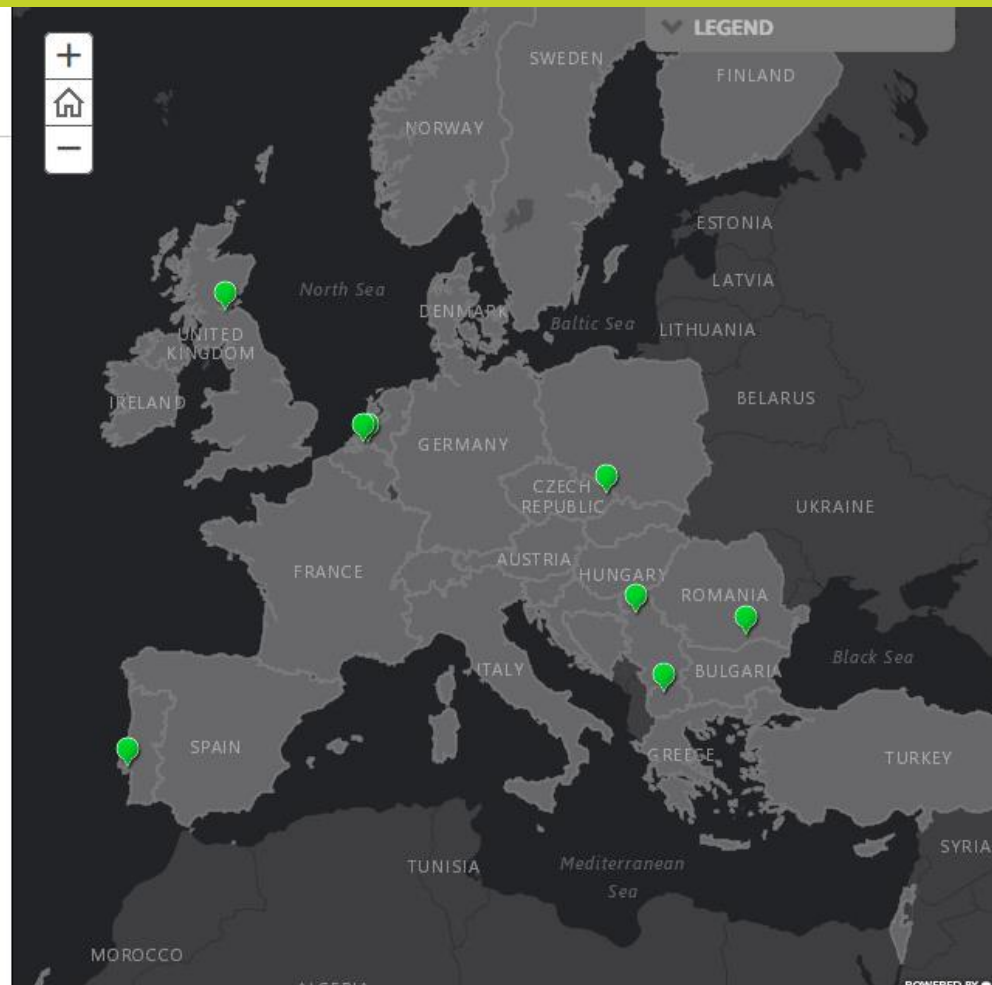


COST is supported by
the EU Framework Programme
Horizon 2020

TU1206 COST Sub-Urban Conference
14-16th March 2017 Bucharest
www.sub-urban.eu

• Charettes - Glasgow

A Charrette involves as series of workshops where stakeholders (people who

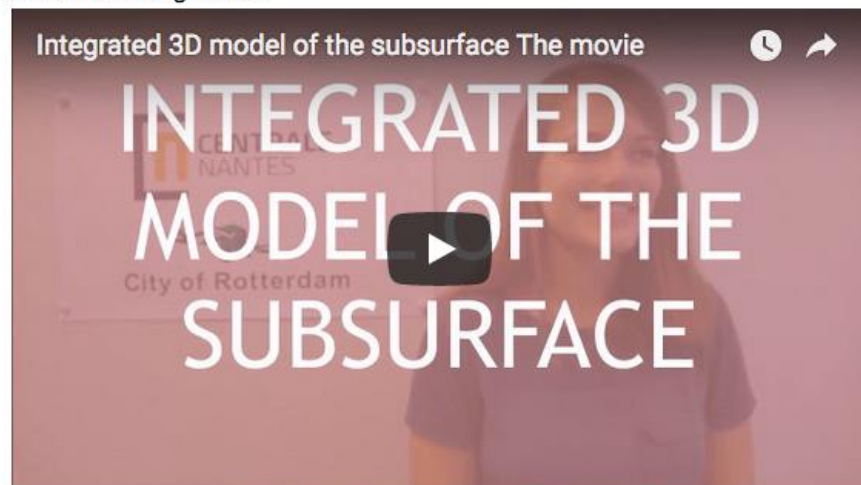




SUB-URBAN TOOLBOX

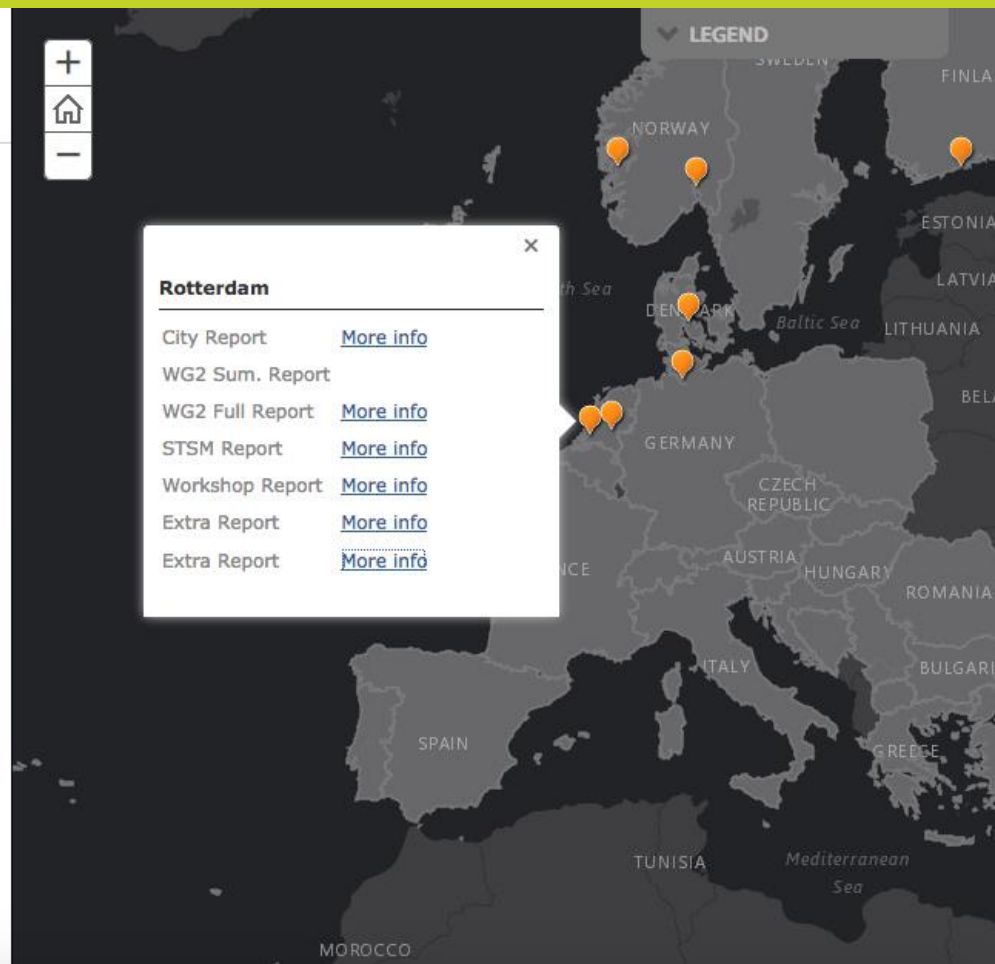
from her; " finally a person who understands me!"

The video explains precisely and clearly the status of 3D integrated modelling in Rotterdam right now.



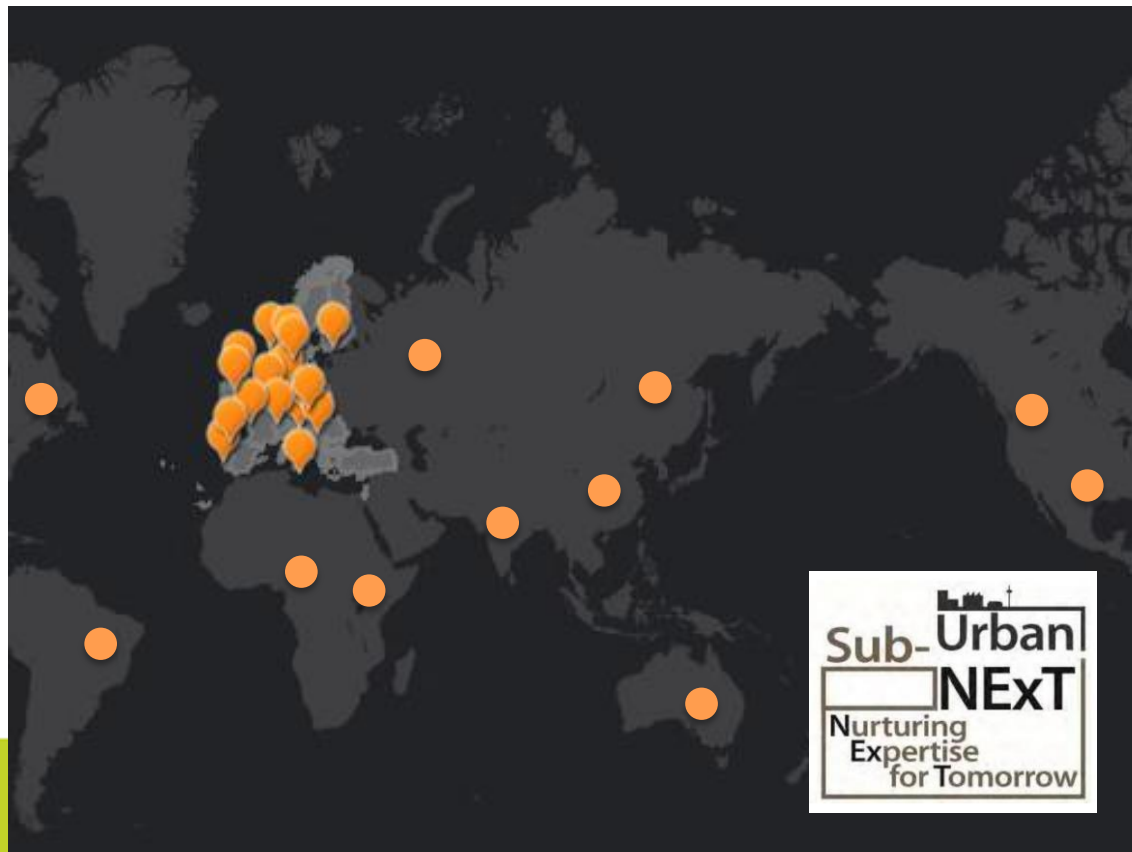
This 3D model of the upper subsurface layers is the first step towards the development of the Integrated 3D Rotterdam model that will incorporate geology, geo-hydrology and underground constructions and infrastructure and will extend to 4 km below surface.

Microsoft Outlook



Van COST SUB-URBAN naar SUB-URBAN Next:

- Met kennis en onze community naar andere steden in Europe en de rest van de wereld
- Samenwerking met andere netwerken
- Samen groeiend
- Samen naar de volgende generatie **NEXT**







Dank!

Petra van der Lugt - prm.vanderlugt@rotterdam.nl

Kees de Vette - ca.devette@rotterdam.nl

Ignace van Campenhout - ipam.vancampenhout@rotterdam.nl

<http://sub-urban.squarespace.com/>

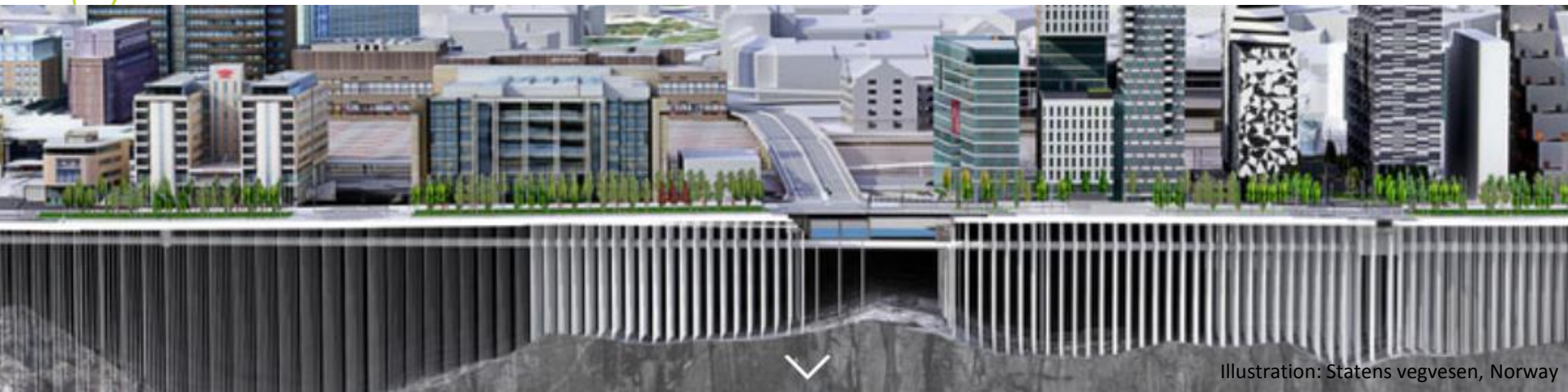
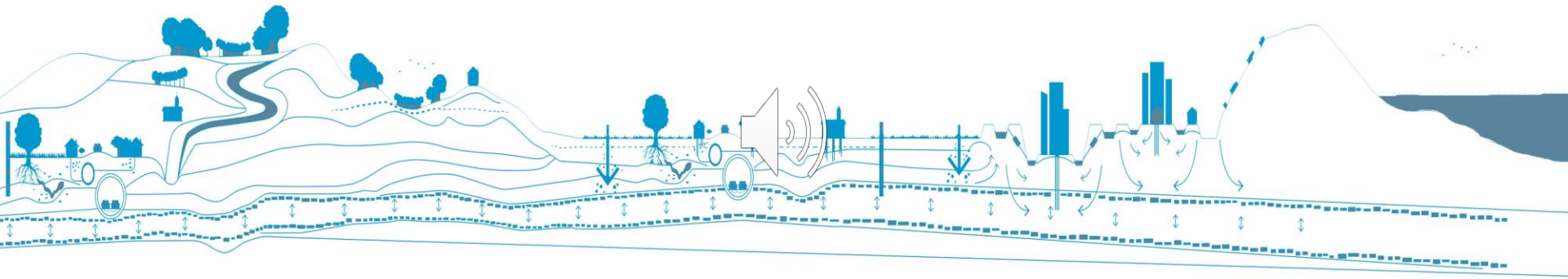


Illustration: Statens vegvesen, Norway

De architectonische representatie van de ondergrond



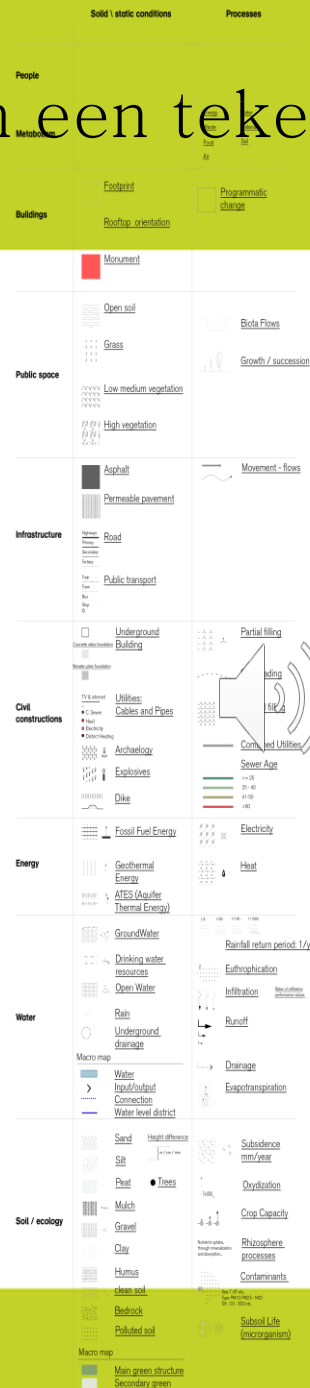
Fransje Hooimeijer

Filippo Lafleur

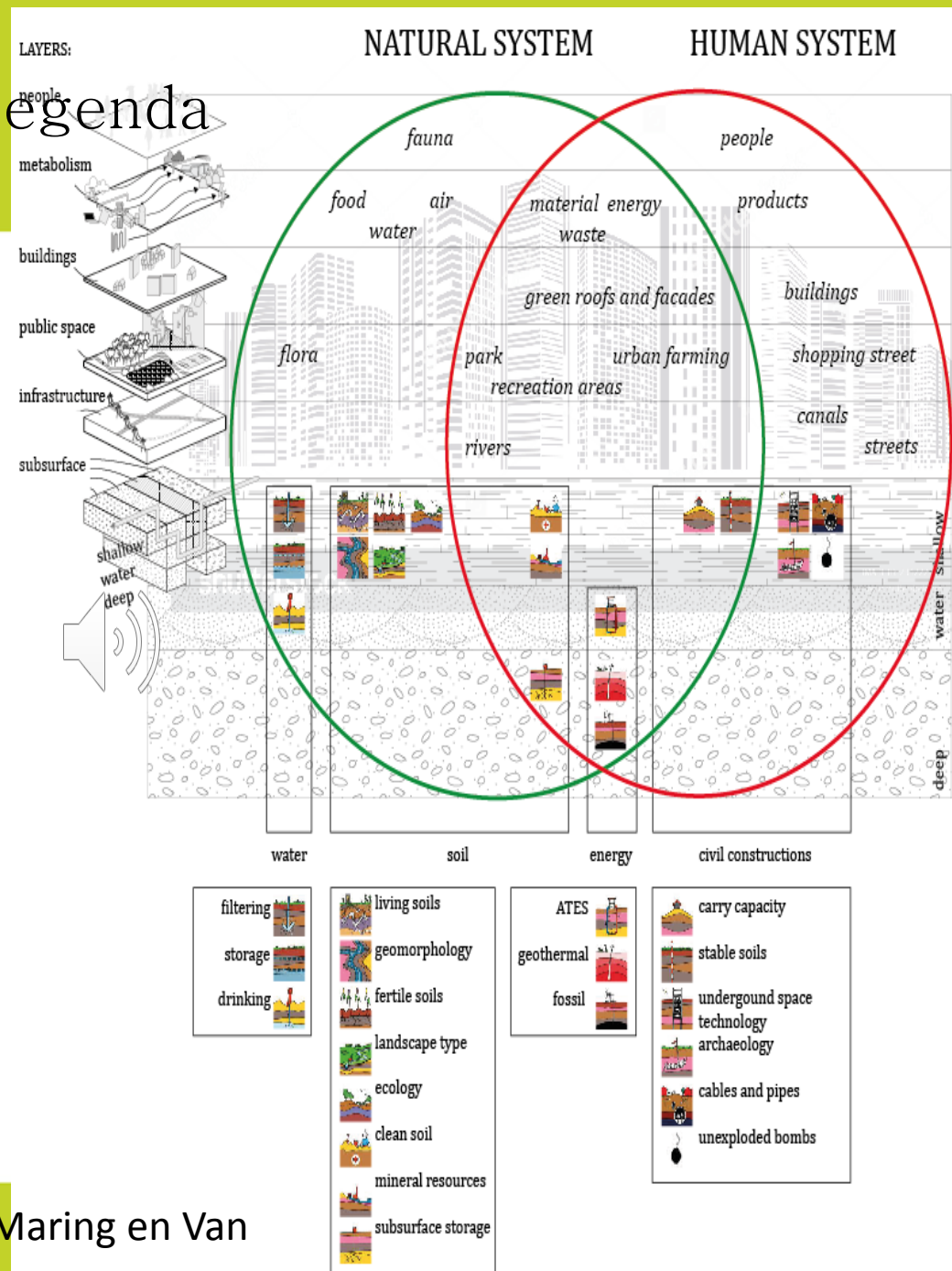
Hoe kun je de ondergrond tekenen zodat het meegenomen wordt in ruimtelijke ordening en het stedenbouwkundig ontwerp?



Ontwikkeling van een tekening gaat over de ontwikkeling van de legenda



Ontwikkeling van de legenda



De legenda heeft statische condities en processen of dynamische eenheden

	Solid \ static conditions	Processes
People		
Metabolism		<u>Energy</u> <u>Water</u> <u>Waste</u> <u>Material</u> <u>Food</u> <u>Soil</u> <u>Air</u>
Buildings	 <u>Footprint</u> <u>Rooftop orientation</u>  <u>Monument</u>	 <u>Programmatic change</u>
Public space	 <u>Open soil</u>  <u>Grass</u>  <u>Low medium vegetation</u>  <u>High vegetation</u>  <u>Asphalt</u>	 <u>Biota Flows</u>  <u>Growth / succession</u>  <u>Movement - flows</u>

Technical Profile

Rotterdam Bloemhof Zuid

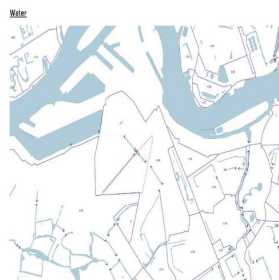
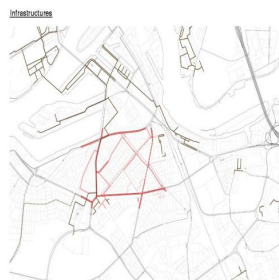
Authors:
de FJ, Hooimeijer
in: Filippo Laflur
Drawings:
in: Filippo Laflur
Jesse Dobbelaert
Elio Yip

Cartographic indication

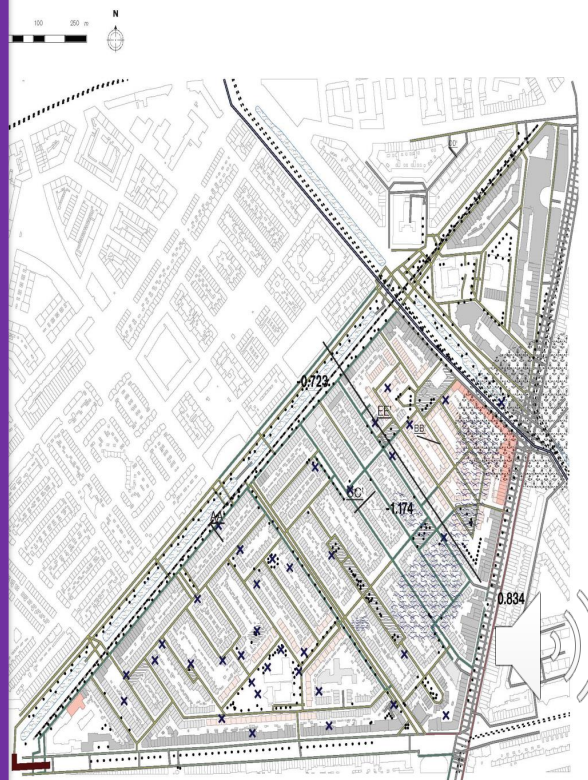


TU Delft Data, Infrastructures & Mobility Institute Urbanism

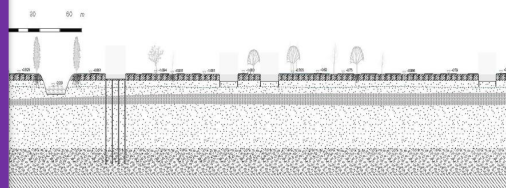
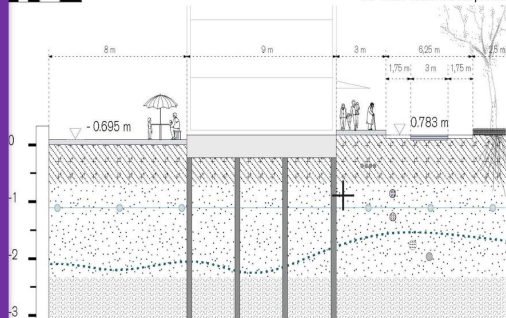
Macro scale: Territorial condition



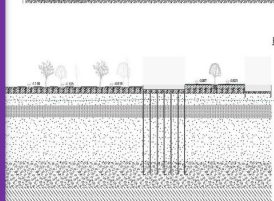
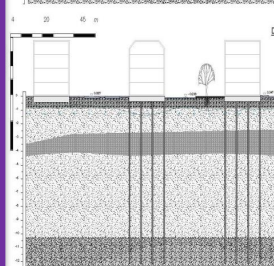
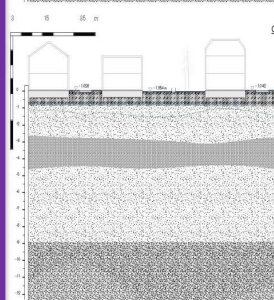
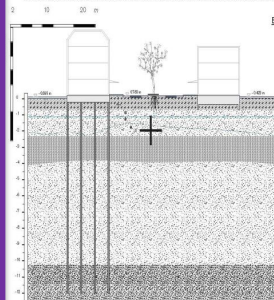
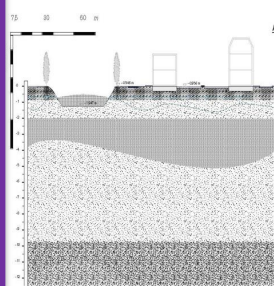
meso scale: Plan, site investigation



BB' Nano scale: Street profile



Micro scale: Technical profile,



The legend: Reading sites and territories

Conditions present in the area

Subsidence	"Land subsidence (past areas in the Netherlands) damage housing and infrastructure in other countries where past areas are located on the coast. These areas are increasingly being submerged due to land subsidence with all the inevitable harmful consequences" (Jansen, 2015)
Distortion	Distortion is the longitudinal process that leads to subsidence. Various distortions between anthropogenic and natural dynamics might reflect in speed or frequency
Polished soil	Soil pollution is the so-called invisible pollution. In this particular case is believed that the components come with asphalt that before needs to make building site preparation
Monuments on dikes	The colour shows the combination of buildings on dikes foundations and their legal and cultural condition as monuments
Monuments on wooden piles	The colour shows the combination of buildings on wooden pile foundations and their legal and cultural condition as monuments
Geopipe	Geopipe is a soil engineering movement of water in soils, often a critical problem in building foundations. It depends on several factors, including permeability of soil and other factors. Geopipe appears in the area in 1 to 2 m/s/day
NBN room	The area is active in line with NBN room regarding the height of groundwater level

Static and dynamic conditions

	Solid / static conditions	Processes
People		
Mobility		
Buildings		
Public space		
Infrastructure		
Civil constructions		
Energy		
Water		
Macro map		
Soil / ecology		

Technical Profile

Rotterdam Bloemhof Zuid

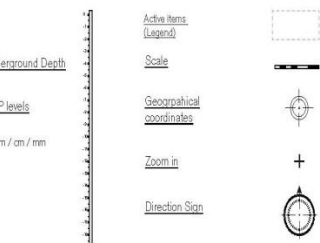
Authors:

F.L. Hooimeijer
Filippo Laflour

Drawings:

Filippo Laflour
Jesse Dobbelaars
Jeroen Yap

Cartographic indication



UDelft | Deltas, Infrastructures & Mobility Initiative | Urbanism

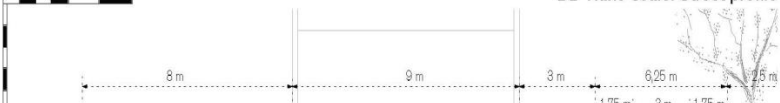
Macro scale: Territorial condition



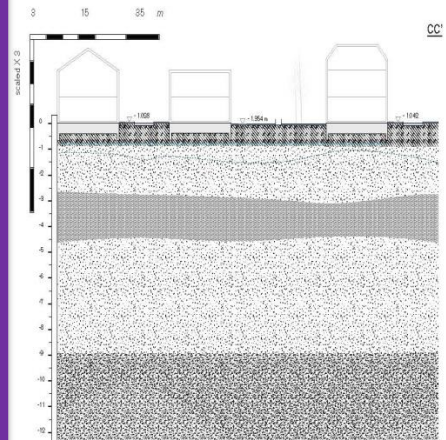
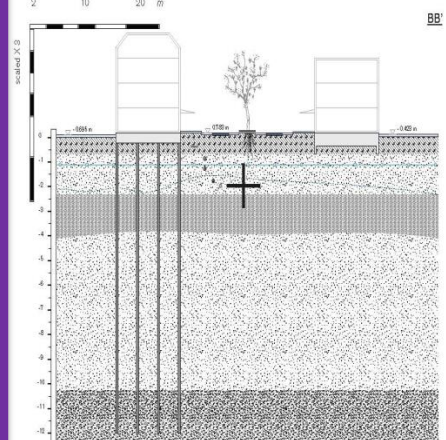
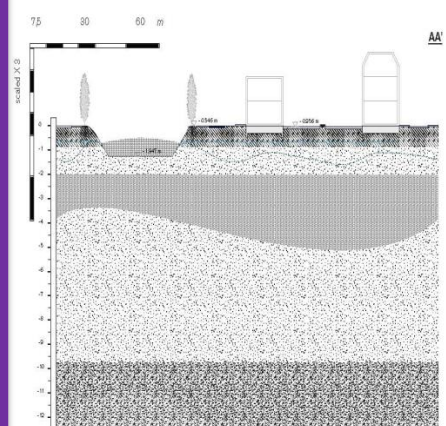
Meso scale: Plan, site investigation



BB' Nano scale: Street profile



Micro scale: Technical profile,



The legend

Conditions present

Subsidence
Oxidation
Polluted soil
Monuments on stilts
Monuments on wooden piles
Seepage
NBW norm
Static and dynamic

People

Metabolism

Buildings

Public space

Infrastructure

Civil constructions

Macro scale: Territorial condition



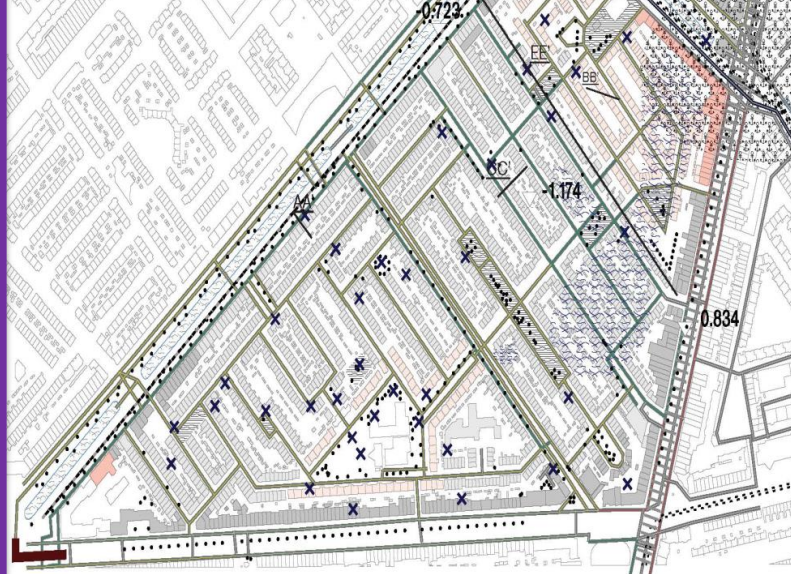
Infrastructures



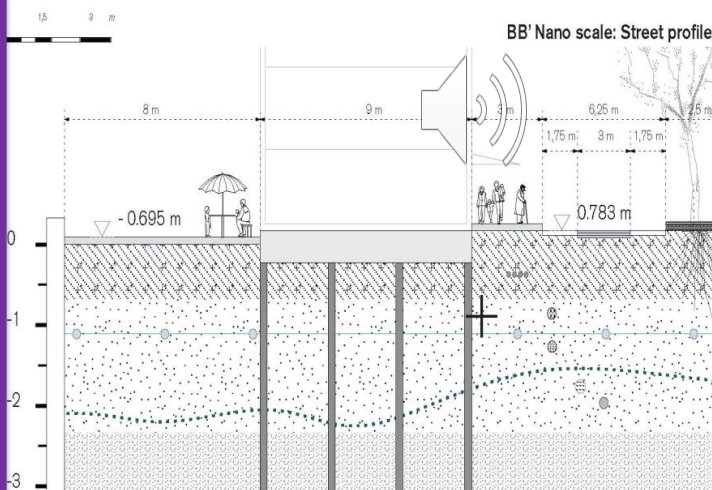
Water



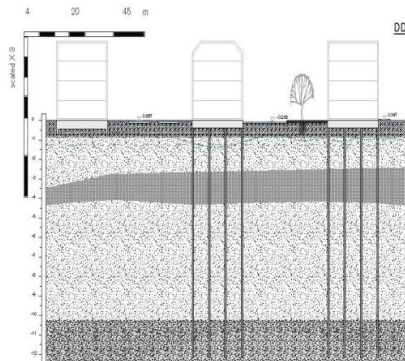
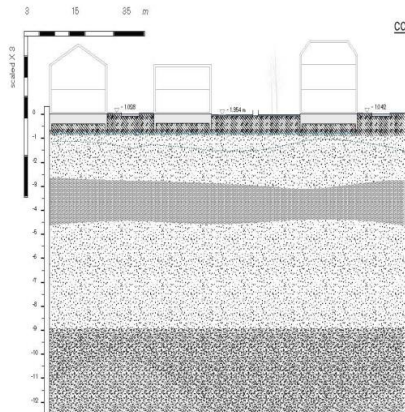
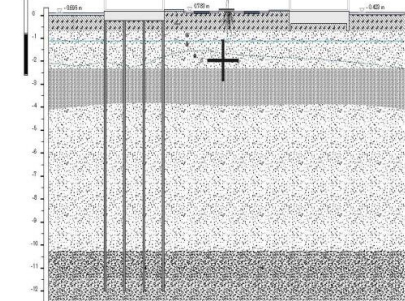
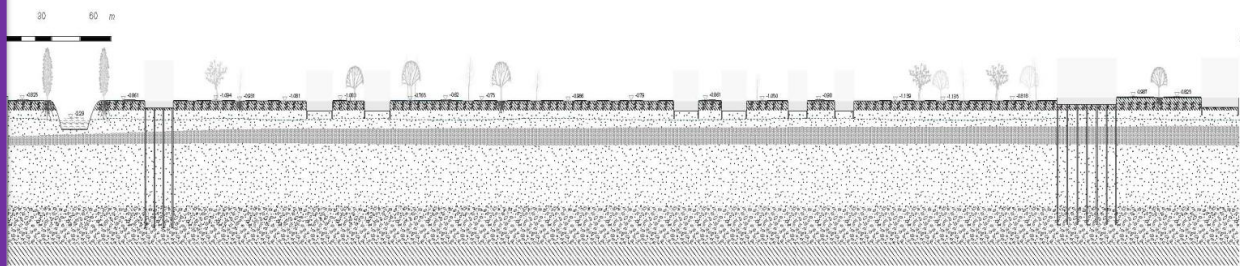
Landscape structure



section Y-Z



section X-Z



Buildings



Public space



Infrastructure



Civil constructions



Energy

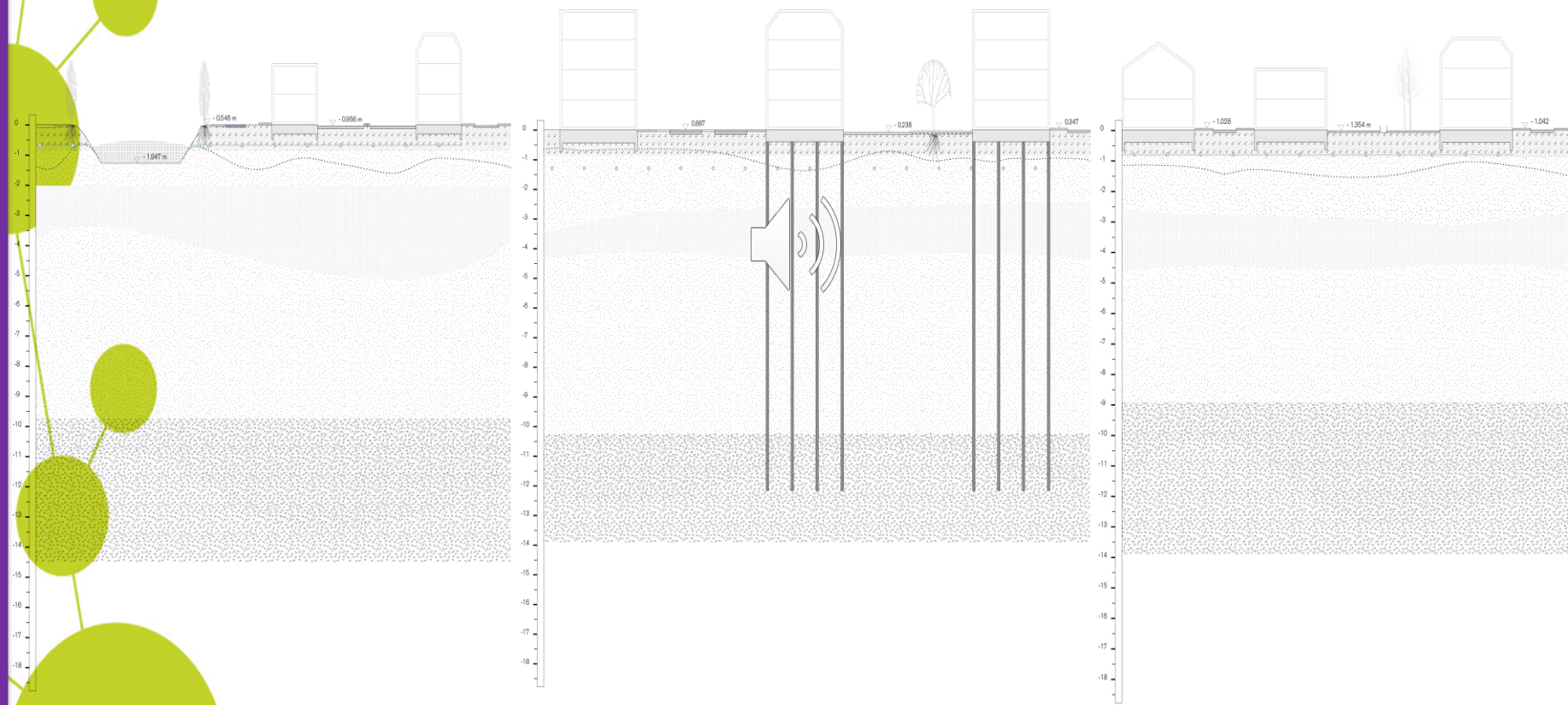
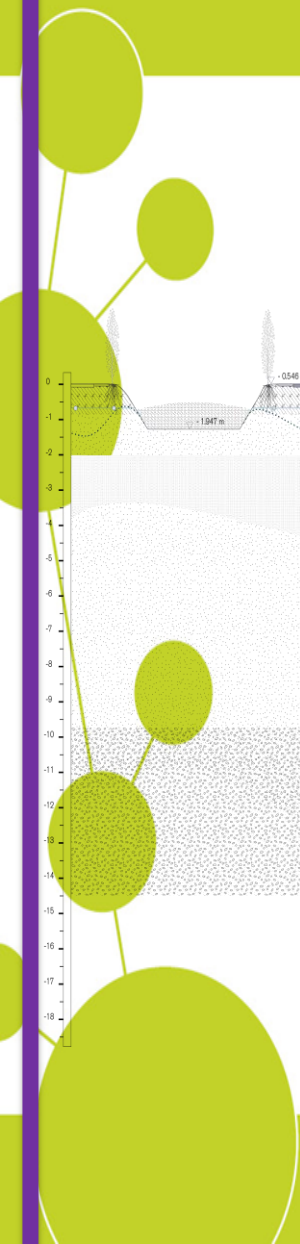


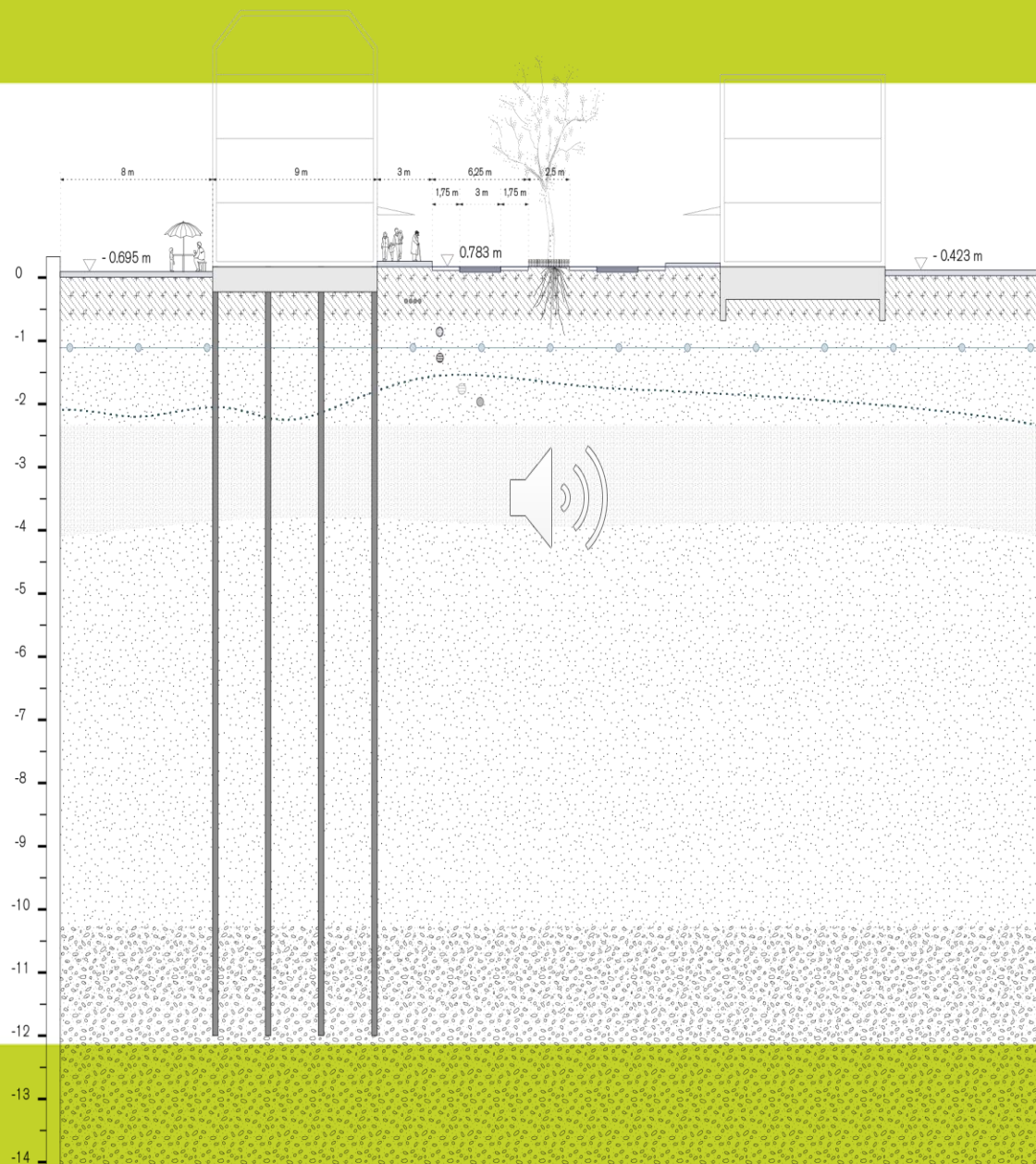
Water



Soil / ecology

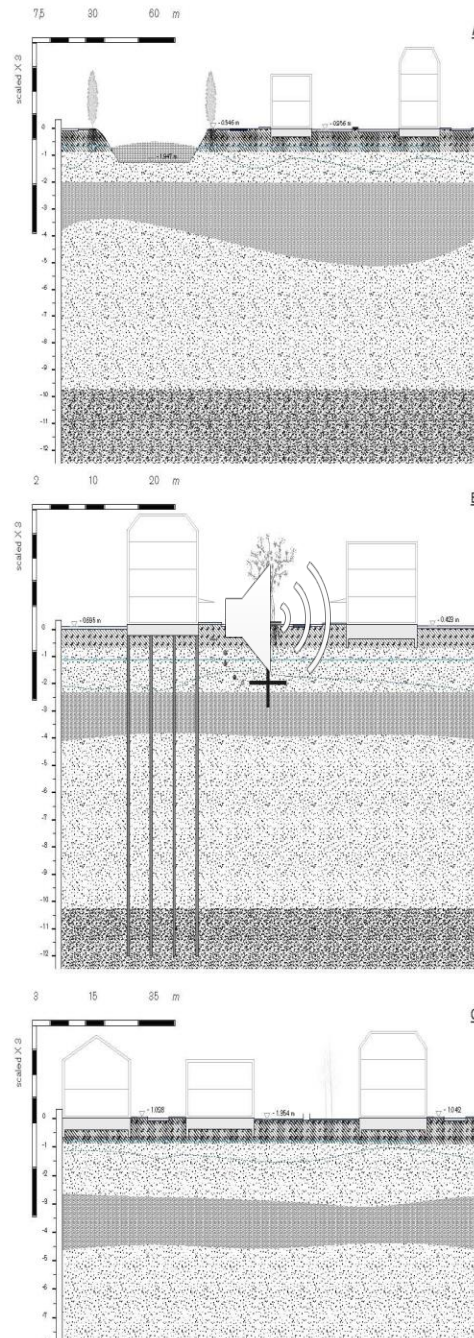
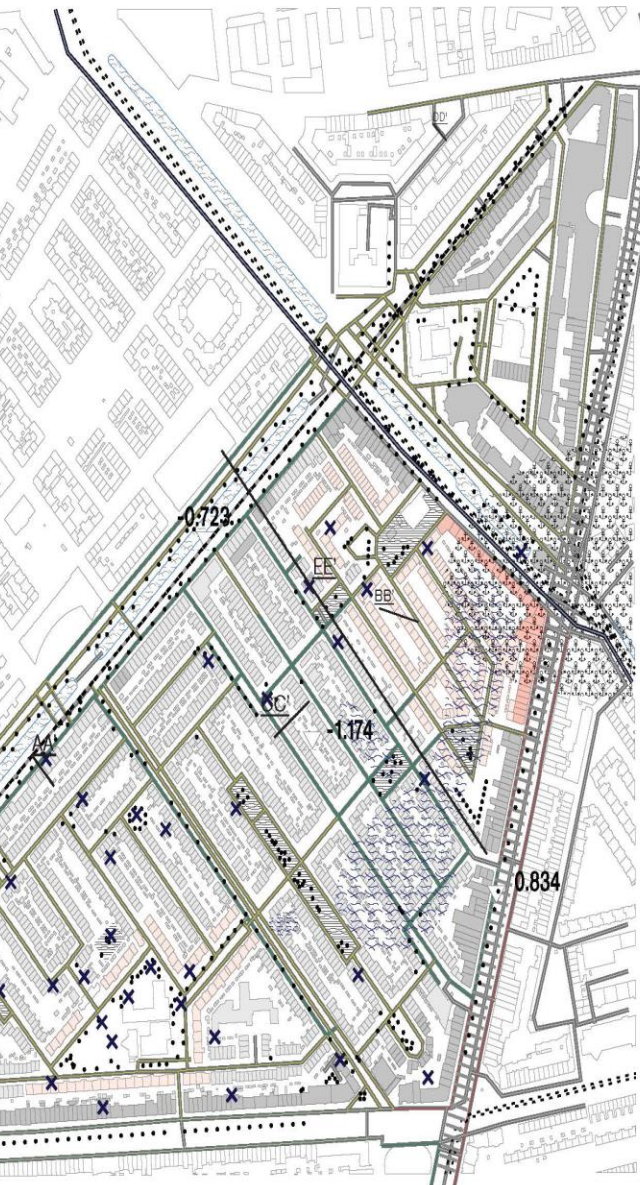






Micro scale: Technical profile,

The legend: Reading sites and territories



Conditions present in the area

Subsidence		"Land subsidence in peat areas in the Netherlands damages housing and infrastructure. In other countries where peat areas are located on the coast, these areas are increasingly being submerged due to land subsidence, with all the inevitable harmful consequences". <i>DeWaal, 2016</i>
Oxidation		Oxidation is the biogeochemical process that leads to subsidence. Various interactions between anthropogenic and natural dynamics might effect or speed up this process.
Polluted soil		Soil pollution is the so called: immobile pollution. In this particular case is believed that the contaminants came with sand from the harbour needed to make 'building site preparation'.
Monuments on slabs		The colour shows the combination of buildings on slabs foundations and their legal and cultural condition as monuments.
Monuments on wooden piles		The colour shows the combination of buildings on wooden piles foundations and their legal and cultural condition as monuments.
Seepage		Seepage, in soil engineering, movement of water in soils, often a critical problem in building foundations. It depends on several factors, including permeability of soil and other factors. <i>Geotechniek DeWaal, 2008</i> in the area is 1 to 0,1 mm/day
NBW norm		The area is not in line with NBW norm regarding the height of groundwater level.

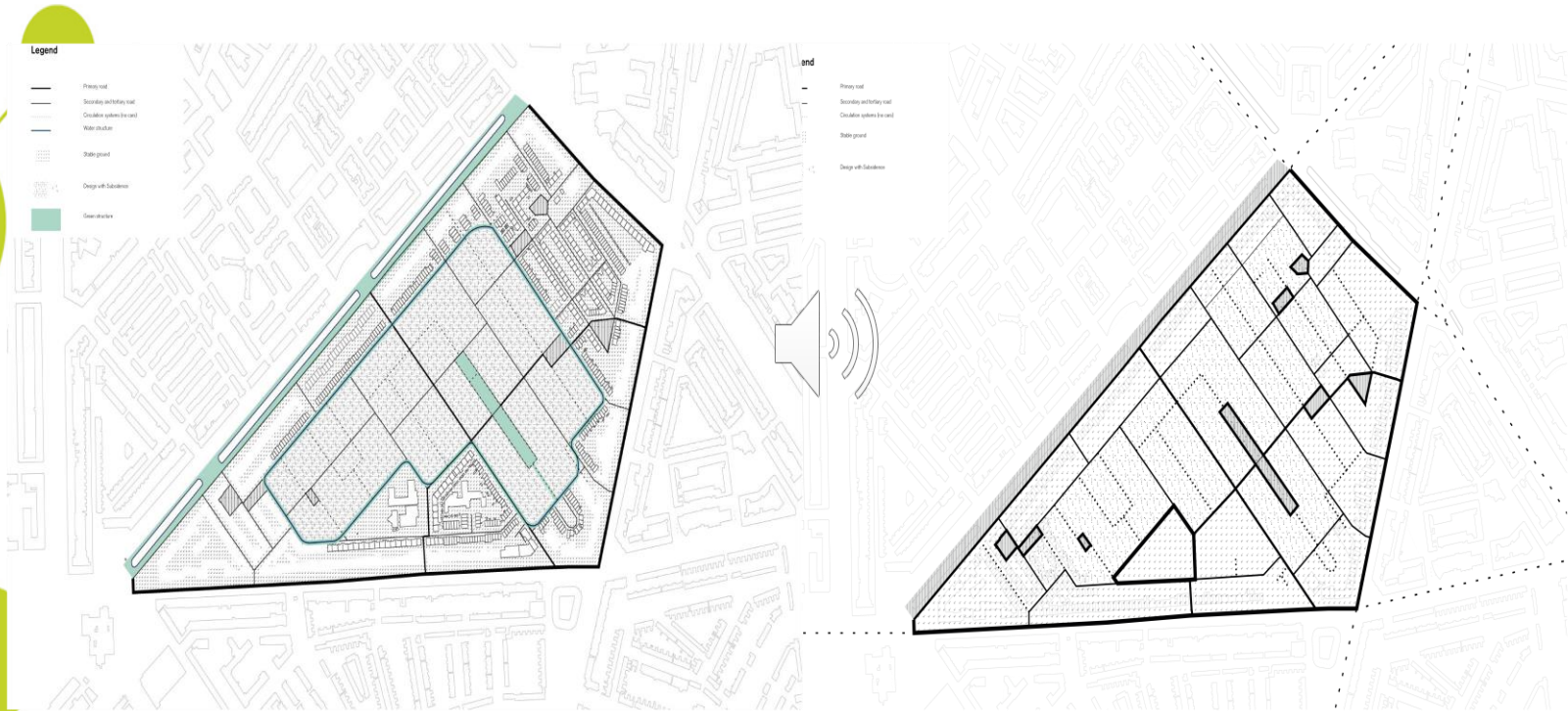
Static and dynamic conditions

	Solid \ static conditions	Processes
People		
Metabolism		Energy Water Waste Material Food Air Soil
Buildings	Footprint Rooftop orientation Monument	Programmatic change
Public space	Open soil Grass Low medium vegetation High vegetation	Biota Flows Growth / succession
Infrastructure	Asphalt Permeable pavement Road Public transport Underground Building	Movement - flows Partial filling Site Grading

Hoe kunnen de technische condities een rol spelen in een nieuwe ontwikkelingsvisie?

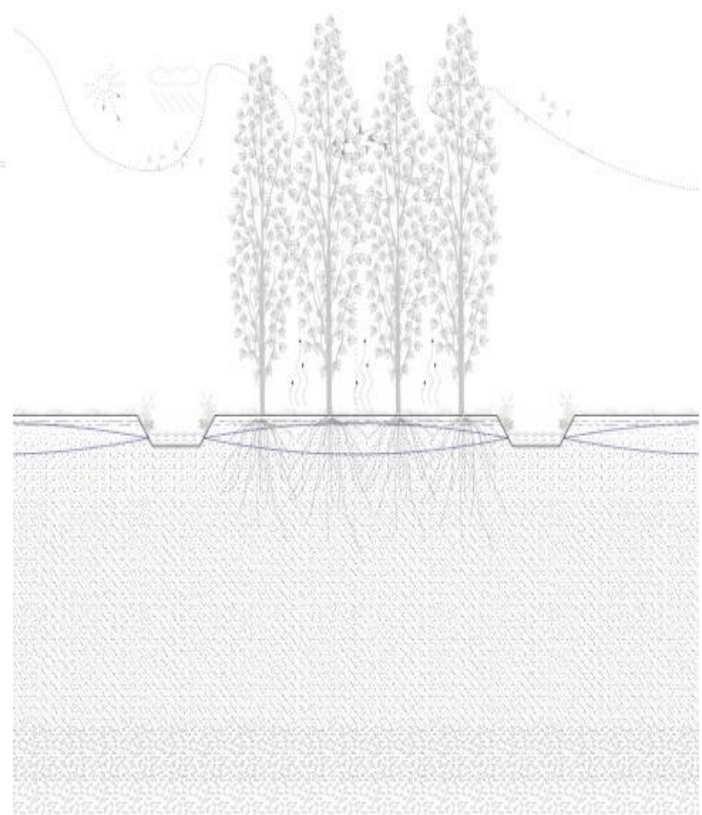
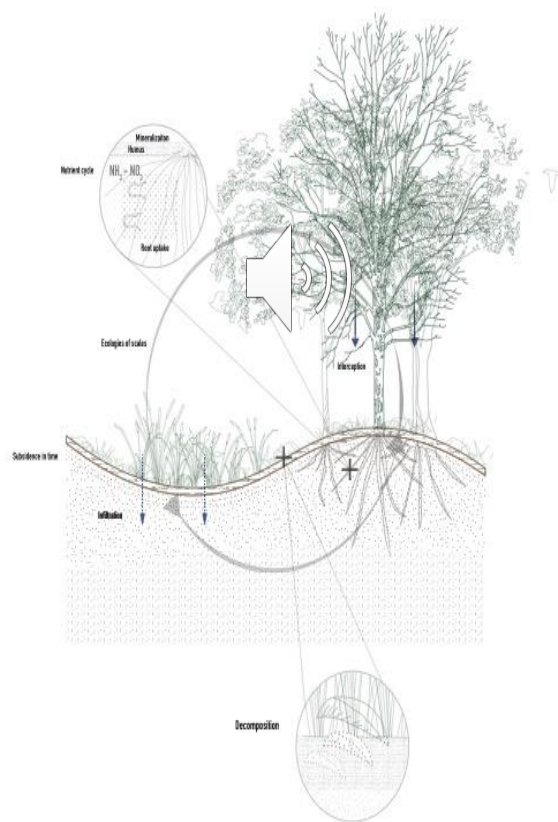
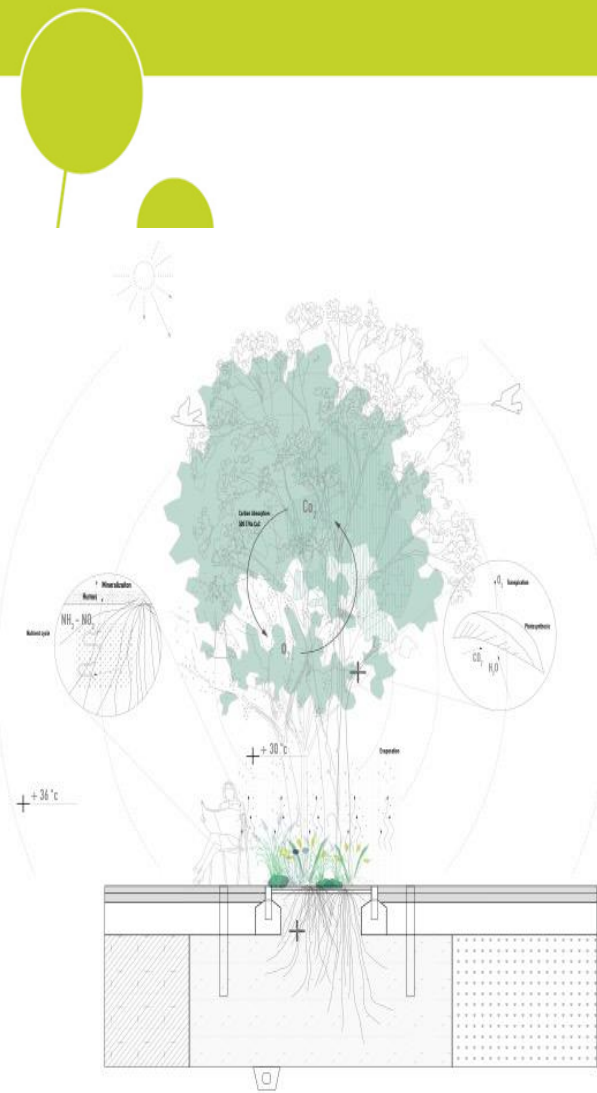


Werken met twee extreme scenario's gebaseerd op bodemdaling

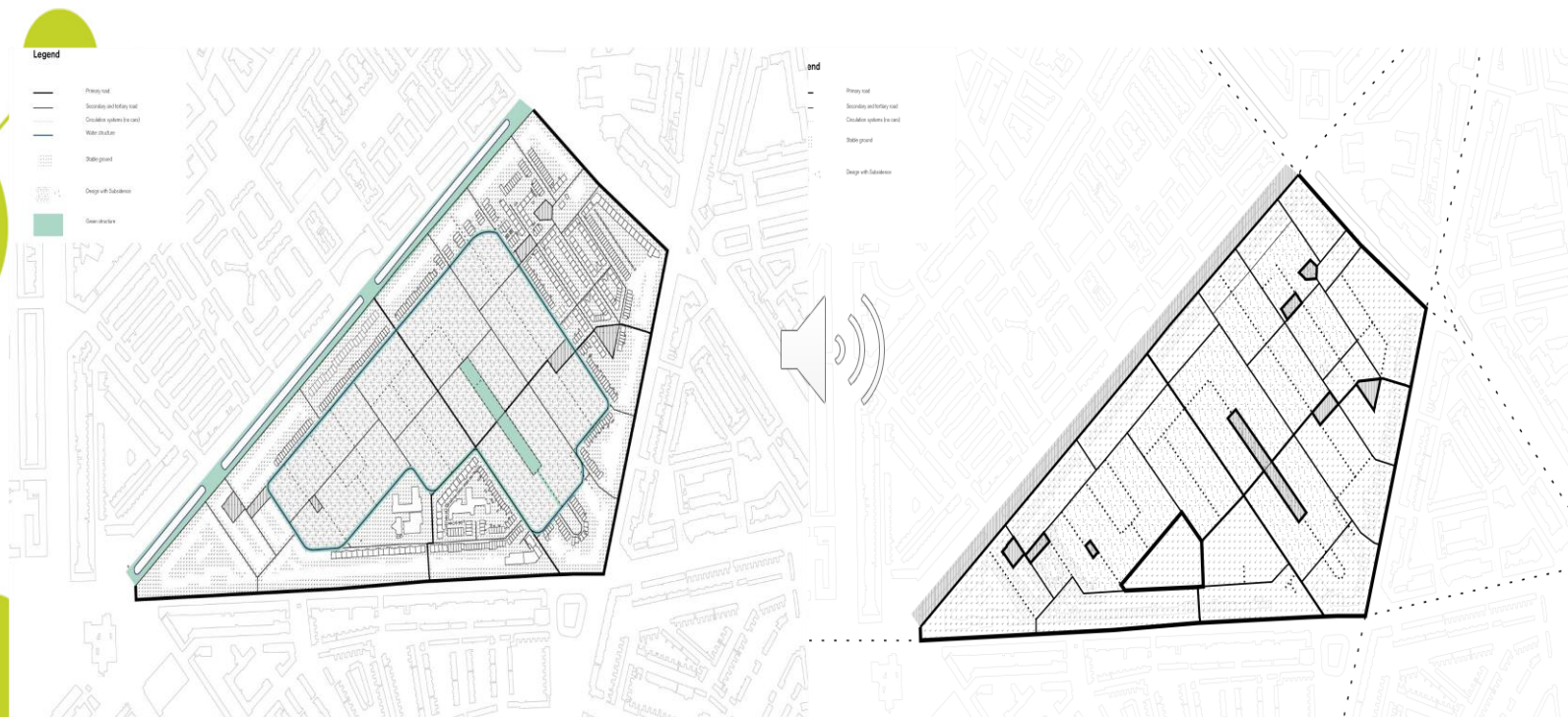


Polder in polder
palen

Bouwen op



Workshop Kritisch Konkretiseren: SWOT & Keuzes maken



Polder in polder
palen

Bouwen op

STRENGTHS

Efficiënte aanpak
De wint tijd -
ontwikkeling
kan geleidelijk

Meer groen en water (open)
in de vorm van nieuwe singels.

Gebouwen +
klimaat bestendig +

Kans voor waterberging
wateroppervlakte.

Ruimte de wijk
groener
nieuwe woningtypes
utility doet.

De overgangzone heeft
richting
infrastructuur. breuklijnen

kans over amphibisch bouwen.

OPPORTUNITIES

WEAKNESSES

Vitstel van executie.
Ruimte voor water
betekent sloop.
kwaliteit van het
(scherm)
grint en al bij

dubbele investering
- de poldermoeie
- verandering op de duur
overweldigend.

Geen flexibiliteit in het
pomp systeem - extra veel
pomp
in het gebied.



Te veel gefragmenteerde
aanpak.

THREATS

SWOT ANALYSE BLOEMHOF

Workshop 21-09-2017

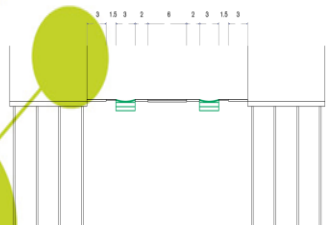
Naam	Functie
1. Eva	TV Delta
2. Jaap	ingenieur
3. Don	grondtek
4. Nanda	grondtek
5. Patrick	ecoloog
6. Franc	stedenbouw

Stap 1: bespreek met elkaar de sterktes, zwaktes, kansen en bedreigingen van dit scenario en houdt daarbij rekening met toekomstige ontwikkelingen zoals nieuwe mobiliteit, nieuwe (afval)water systemen en de energietransitie. Schrijf ze in de vier kwadranten.

Stap 2: Maak het scenario concreet met de keuzes voor straatprofielen, nieuwe technologieën en woningtypen (zie de kaartjes) en houdt daarbij (wederom) rekening met toekomstige ontwikkelingen zoals nieuwe mobiliteit, nieuwe (afval)water systemen en de energietransitie.

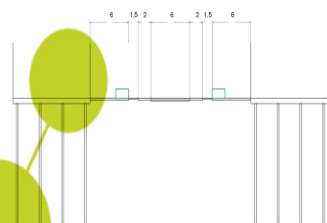
Stap 3: beantwoord wat dit scenario betekent voor je eigen werkveld (individueel)

Water Sensitive Urban Design



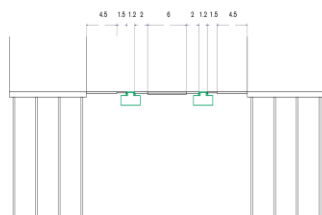
— natuurlijk
— overigen

Boulevard met bomen bovengronds in potten.



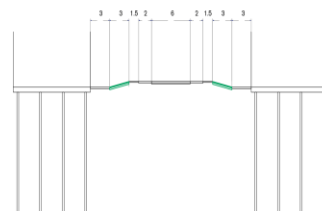
— natuurlijk
— overigen

Boulevard met bomen en waterbergende kratten.



— natuurlijk
— overigen

Groene flanken



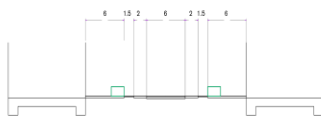
— natuurlijk
— overigen

Water Sensitive Urban Design



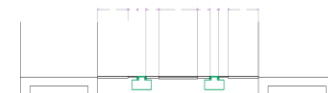
— natuurlijk
— overigen

Boulevard met bomen bovengronds in potten.



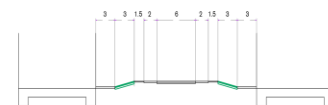
— natuurlijk
— overigen

Boulevard met bomen en waterbergende kratten.



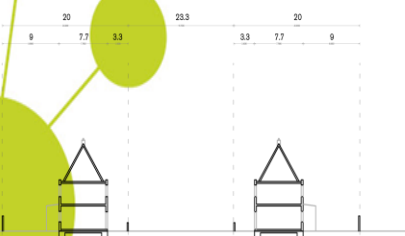
— natuurlijk
— overigen

Groene flanken

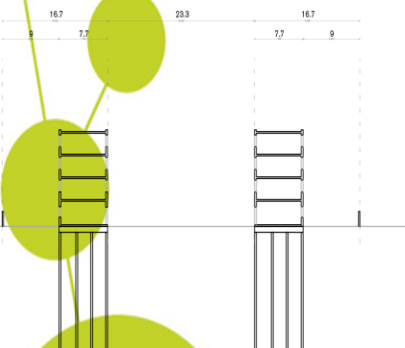


— natuurlijk
— overigen

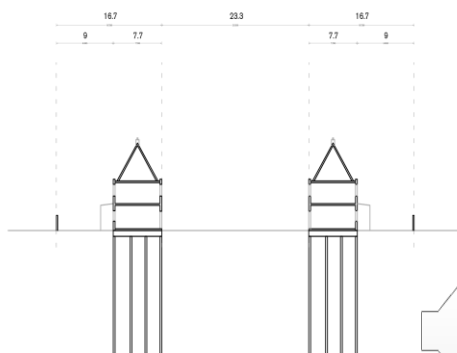
Bestaande bebouwing



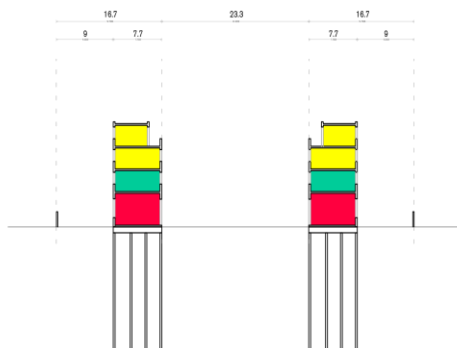
Dichtheid



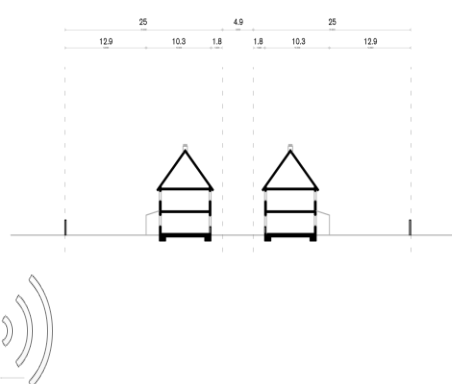
Ruimte voor meer openbare ruimte



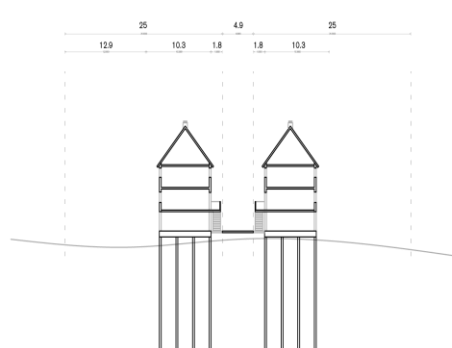
Functiemenging



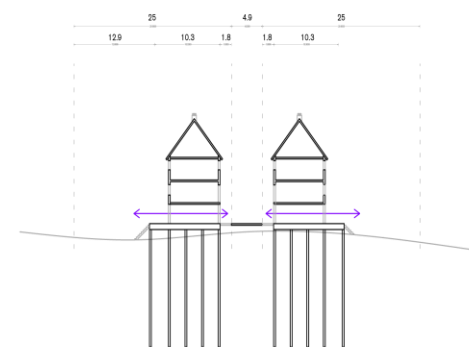
Bestaande bebouwing



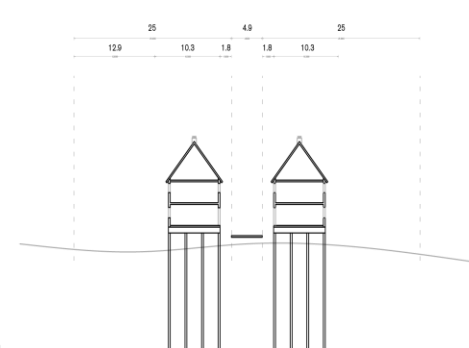
Beneden- en bovenwoning



Transparantie en functionele verbinding



Ontkoppeling van bodem met ruimte voor ecologie

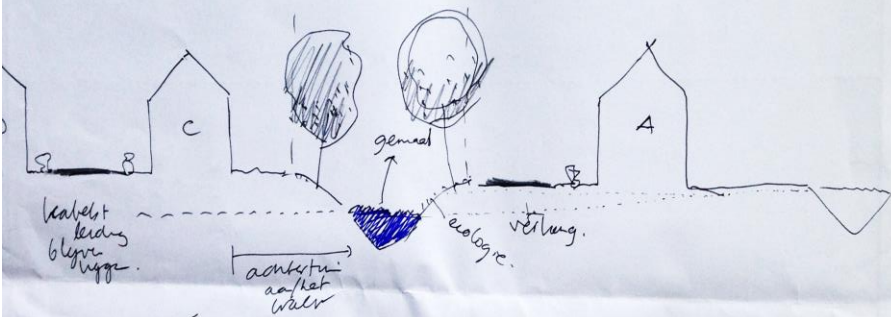


① Bestaande situatie: oevergig

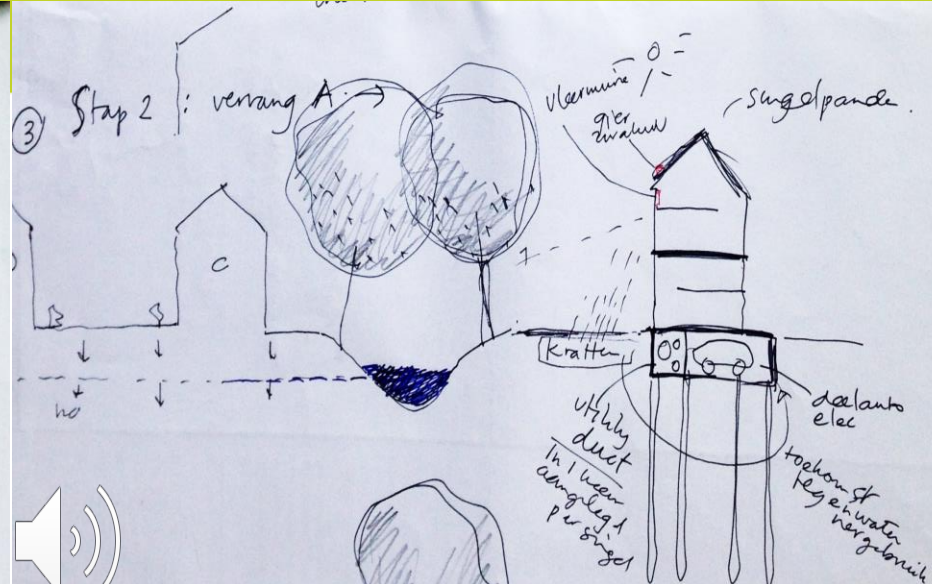


② Stap 1: sloop B → make singels

nieuwe polder ← singel → in polder



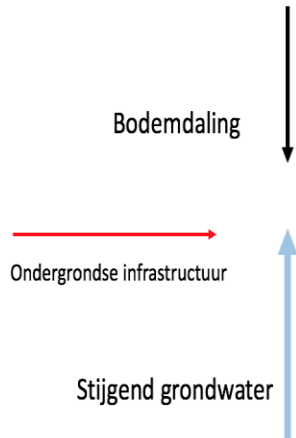
③ Stap 2: vervang A →



④ Stap 3

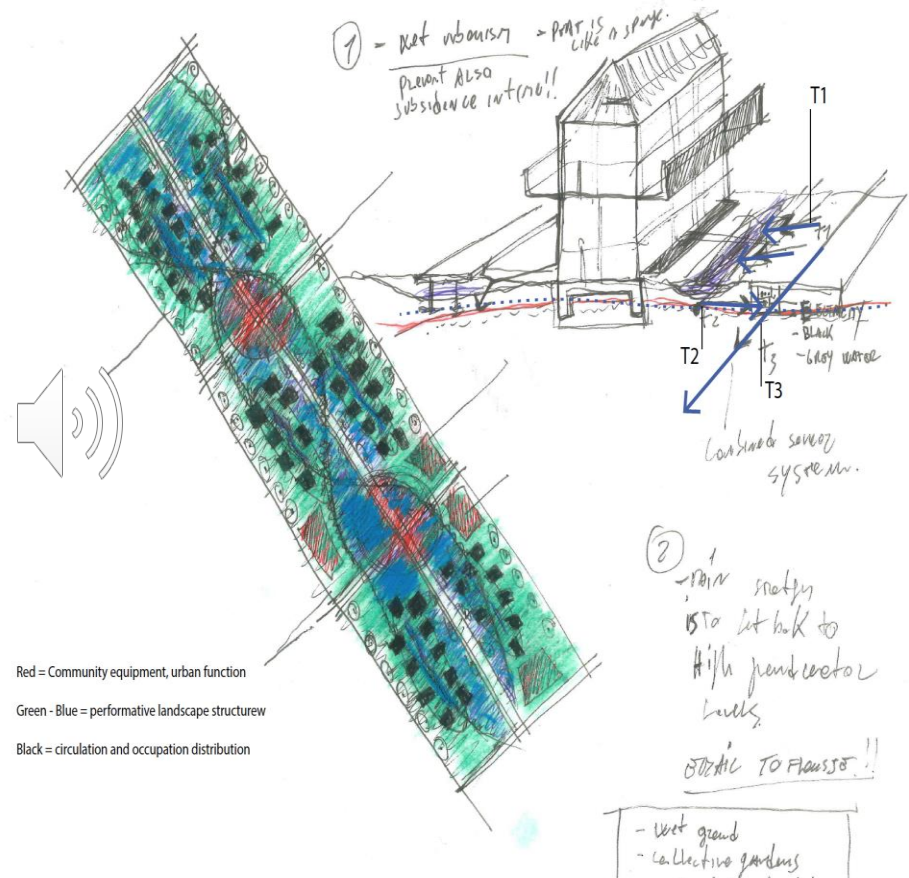


Doorwerken in scripts



- Natte ongezonde huizen op staal
- Natte openbare ruimte
- Connecties rioolsysteem
- Relatie omliggende hogere gebied met woningen op houten palen
- Van het gas af

Script 1



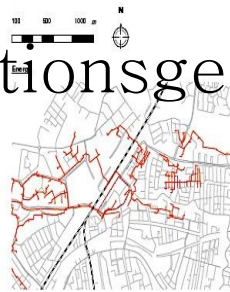
Concluderend het doel is:

- Inzicht in manieren van tekenen
- Ontwikkeling van een Technisch Profiel dat voor andere cases gebruikt kan worden
- Ontwikkelen van methodes om de integratie te stimuleren
- Ontwikkelen van manieren het mee te nemen in Omgevingsplannen



Leiden Stationsgebied

Macro scale: Territorial condition



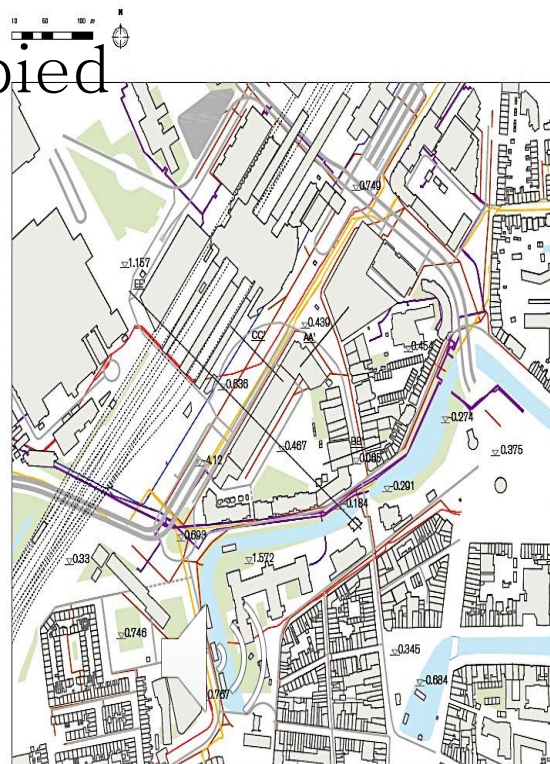
Water



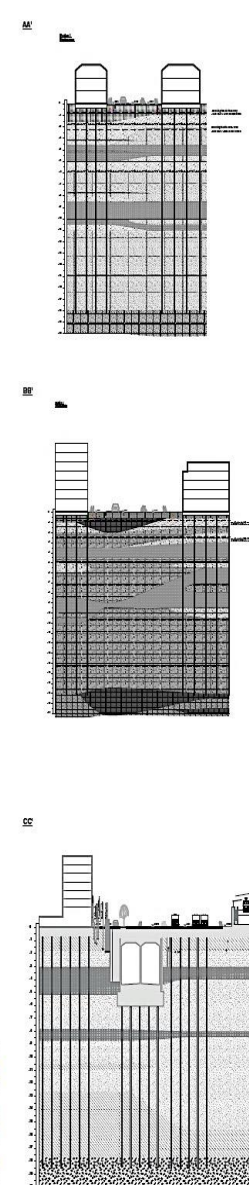
Landuse structure



Meso scale: Plan, site investigation



Micro scale: Technical Section



The legend: Reading sites and territories

Conditions present in the area

Water Network	Water Network	Water Network
Water Network	Water Network	Water Network
Water Network	Water Network	Water Network
Water Network	Water Network	Water Network

Static and dynamic conditions

	Static conditions	Dynamic conditions
People		
Infrastructure		
Buildings		
Public spaces		
Information		
Other conditions		
Energy		
Water		
Real estate		

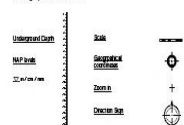
Technical Profile

Leiden

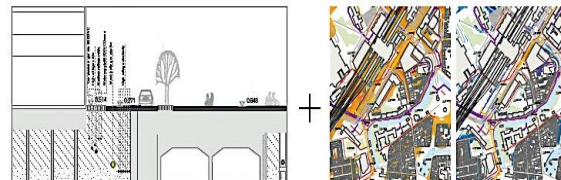
Authors:
dr. F.L. Hoogwerf
ir. P. P. L. L. L.

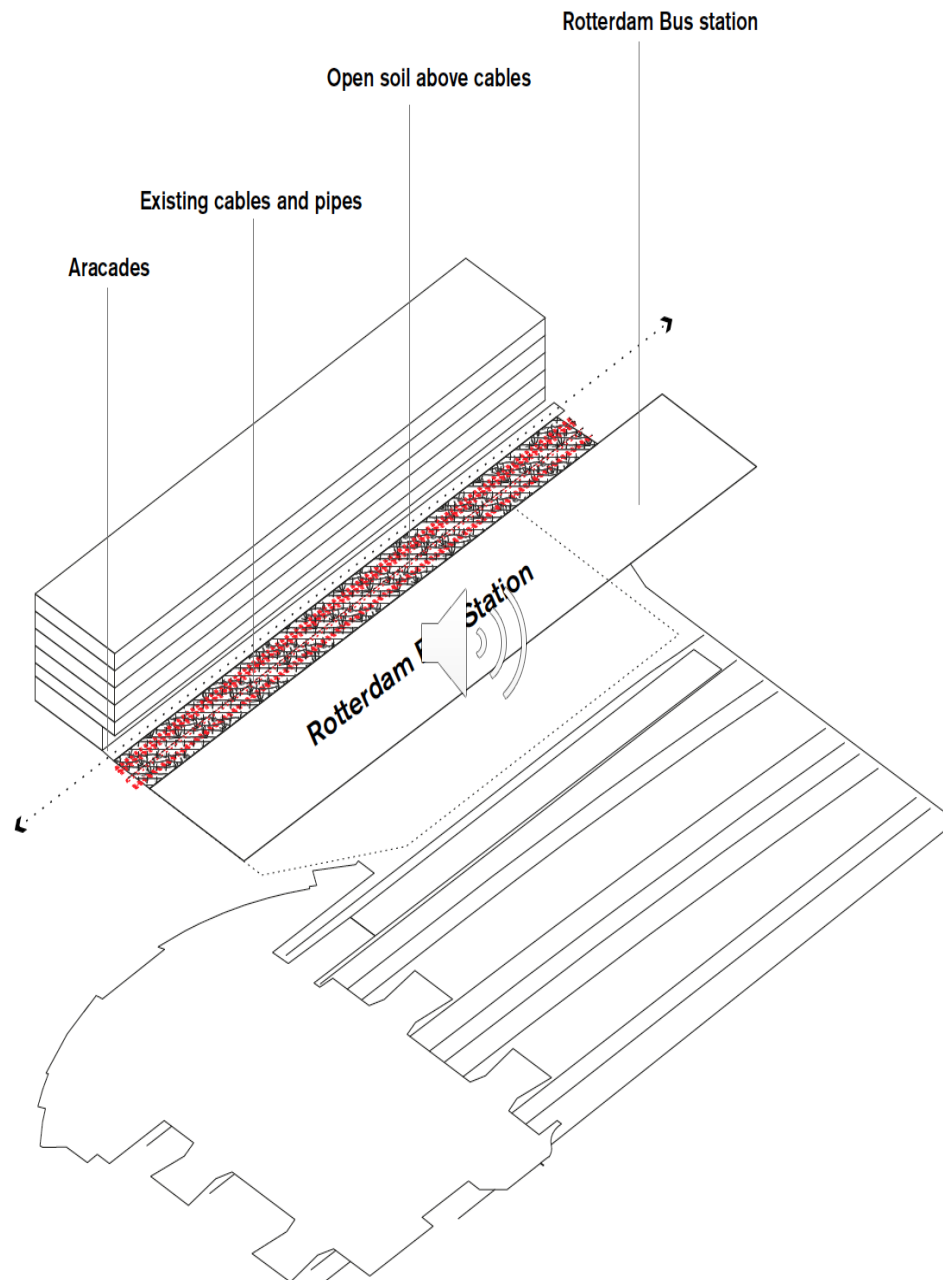
Drawings:
ir. P. P. L. L. L.
ir. P. P. L. L. L.
ir. P. P. L. L. L.

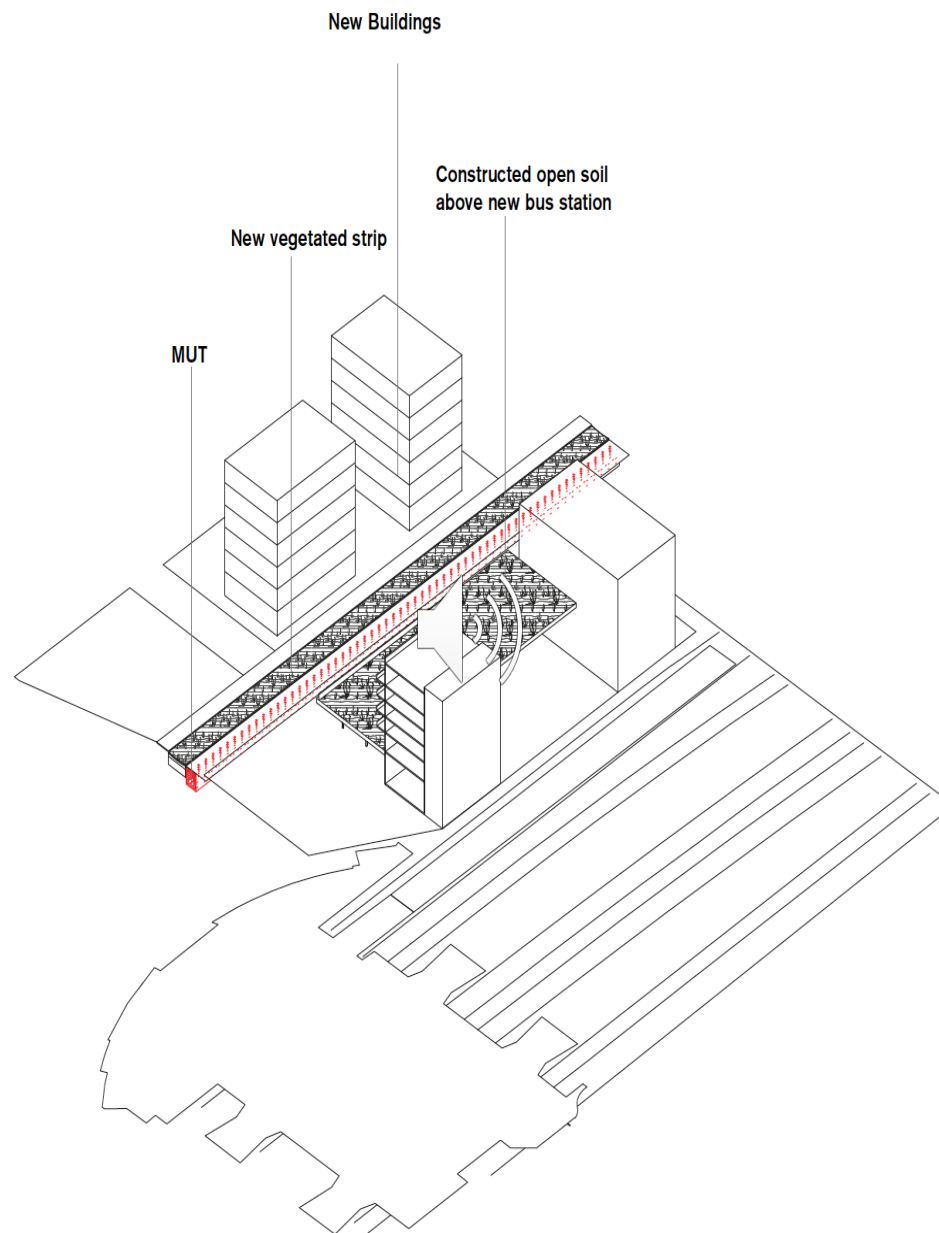
Cartographic indication

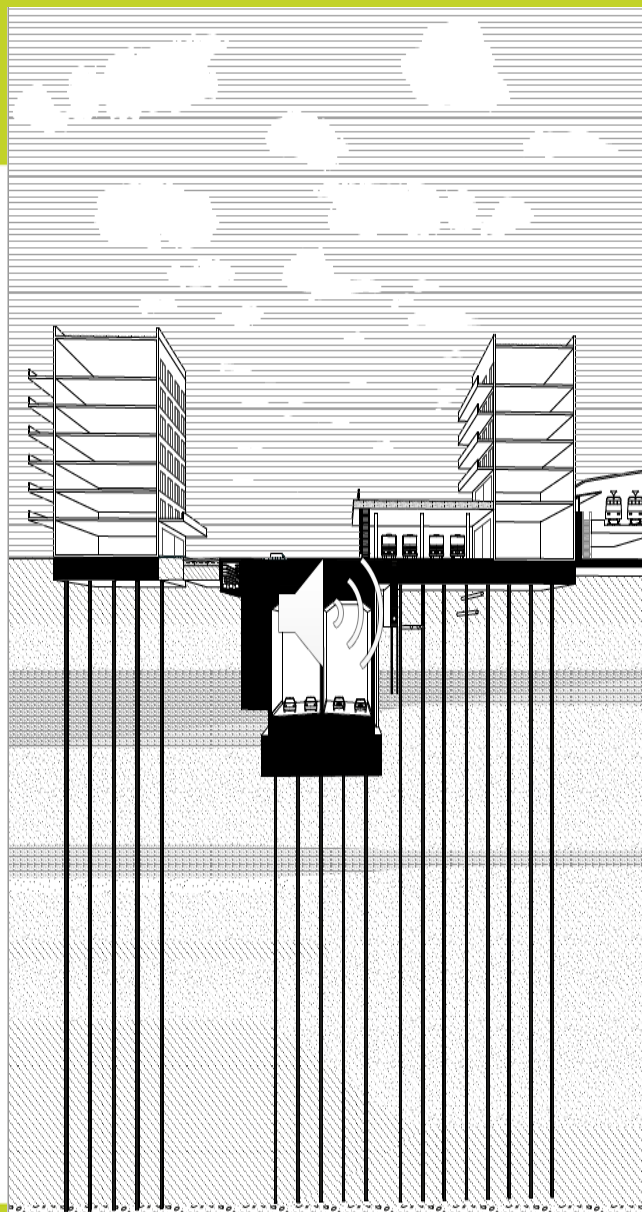


Nano scale: Street profile









Danku!



Vragen: f.l.hooimeijer@tudelft.nl

symposium

bodem breed

expertise
bodem en ondergrond

Inzicht in én inzichtelijk maken van de waarde van de ondergrond in ruimtelijke planprocessen



Gemeente Rotterdam

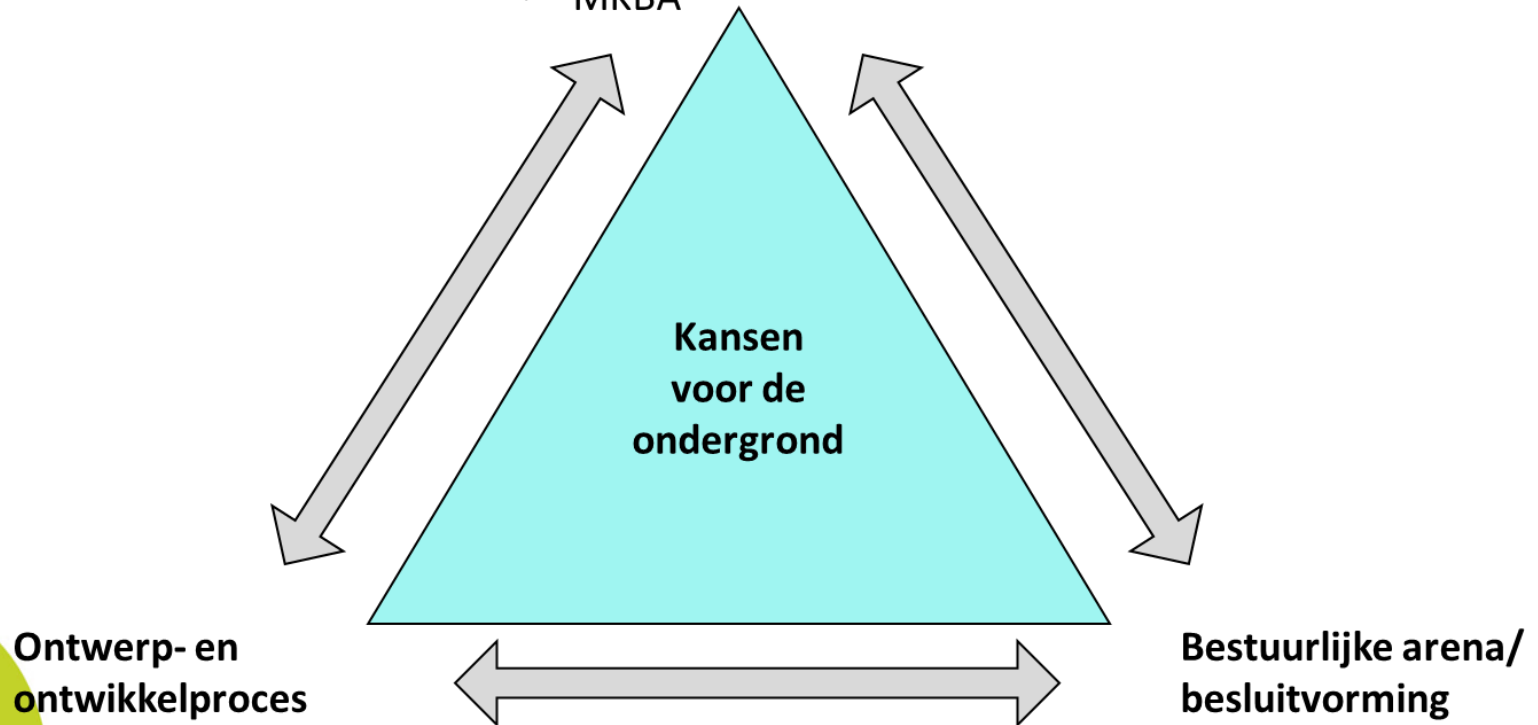


Kansen voor de ondergrond

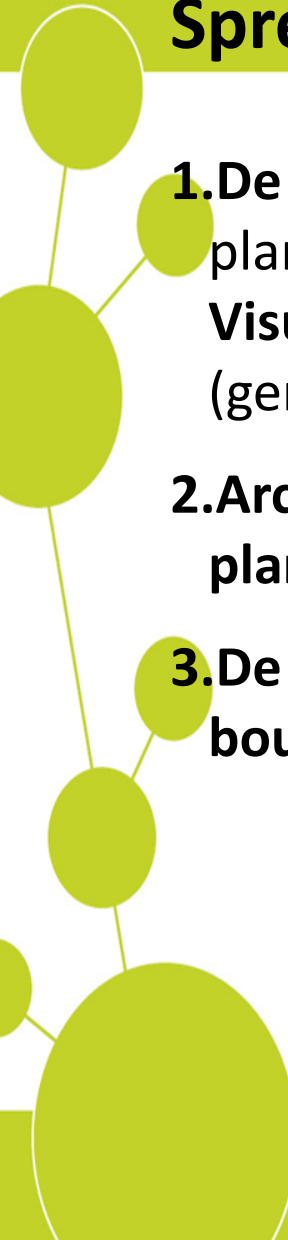
WETEN

Kennis- en informatietools:

- Informatie van de ondergrond
- Visualisaties
- MKBA



WERKEN



Sprekers

- 1. De SUB-URBAN Toolbox:** Ondergrondspecialisten en urban planners samen aan de slag én **De Ondergrond inzichtelijk: 3D Visualisaties in de ondergrond** - Ignace van Campenhout (gemeente Rotterdam)
- 2. Architectonische representatie van de ondergrond in planningsdocumenten** - Fransje Hooimeijer (TU Delft)
- 3. De maatschappelijke en economische waarde van ondergronds bouwen** - Geert Roovers (Saxion, COB)



Korte presentaties

- Wat heb je ontwikkeld / gedaan?
- Wat beoog je ermee? Hoe gaat dit ons helpen – wat gaat het ons brengen?
- Wat zijn de dilemma's waar je tegenaan bent gelopen?
- Welke resultaten heb je bereikt
- En werkt het?



Discussie

- Gaan deze tools ons helpen?
- Wat is daarbij écht essentieel c.q. belangrijk?
- Wat is daarvoor nodig?
- Ga jij ze morgen gebruiken in jouw werk?
- Wat zijn de plus- en minpunten van de getoonde tools/onderzoeken?
- Wat is een gewenste richting voor de doorontwikkeling van deze tools?