

# Vertical Blue

**Designing the Subterranean Water  
System of Naples as a Landscape  
Infrastructure for socio-ecological  
and climate adaptive Public Spaces**

P5 Presentation

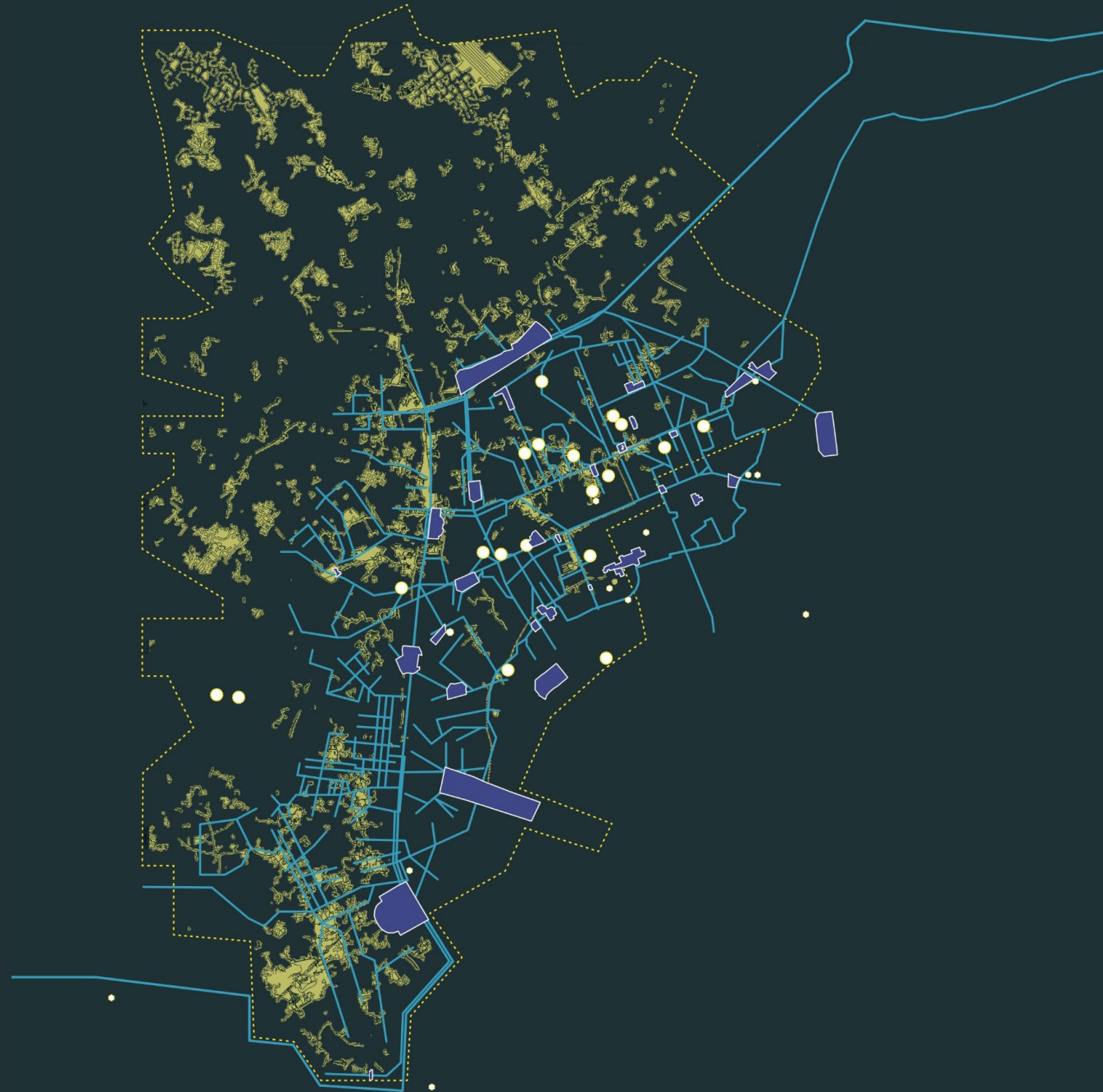
Regina Klinger, MSc Landscape Architecture

Design Lab for Landscape-Based Urbanism

1<sup>st</sup> Mentor: Steffen Nijhuis

2<sup>nd</sup> Mentor: Daniele Cannatella

External Examiner: ir. Leontine de Wit





# Historic City Centres around the World

Water history vs. Public Spaces Today

Venice, Italy



Tetouan, Morocco



Istanbul, Turkey (1838)



Naples, Italy (1880)



Pozzi-System (freshwater wells)



Skundo System (water distribution)



Aqueducts and Cisterns



Aqueducts, Cisterns and Fountains



Source Google Maps [2024], hometoitaly.com [2024]

Source Google Maps [2024], Le Sept Portes de Tétouan (A. Agshulen, 2018)

Source Google Maps [2024], istanbultarihi.ist

Source Google Maps [2024], napolicapitalediunregno.altervista.org

500 m



# Historic City Centres around the World

Water history vs. Public Spaces Today, Istanbul, Turkey



Basilica Cistern Istanbul, Turkey (1838)

Source Google Maps (2024), Wikipedia, istanbultarihi.ist





# Historic City Centre of Naples

Former relationship with water



Public Fountain without water function



Fountain transformed into vegetation support



Closed well at the parking lot of the Architecture Faculty

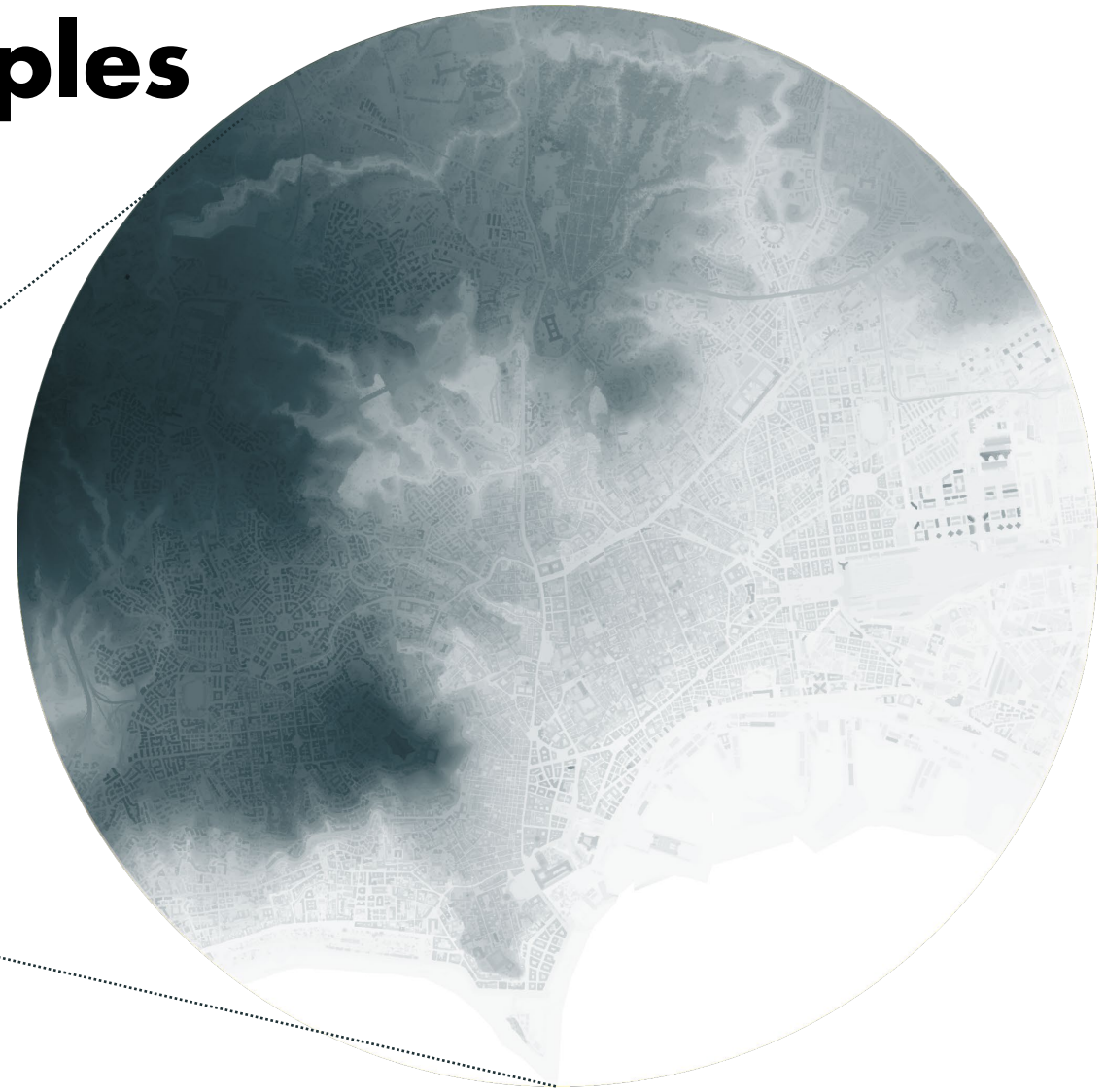


# Historic City Centre of Naples



Italy – Campania - Naples

Map created by Regina Klinger, TU Delft using data provided by: Geofabrik (2024)



Digital Surface Model of the Metropolitan City of Naples

Map created by Regina Klinger, TU Delft using data provided by: Città Metropolitana di Napoli (2025)



# Historic City Centre of Naples



*“We are a city in the global North, but in the South. And we are much more similar [...] to the South than to the North.*

*So, we have all the tools of the North, all the laws, equipment, bureaucracies [...] of the North.*

*But then we are south, we are south of the North, so everything is complicated, very complicated.”*

*-Professor Federica Palestino (2024)*



# Historic City Centre of Naples

A whole city as a heritage site

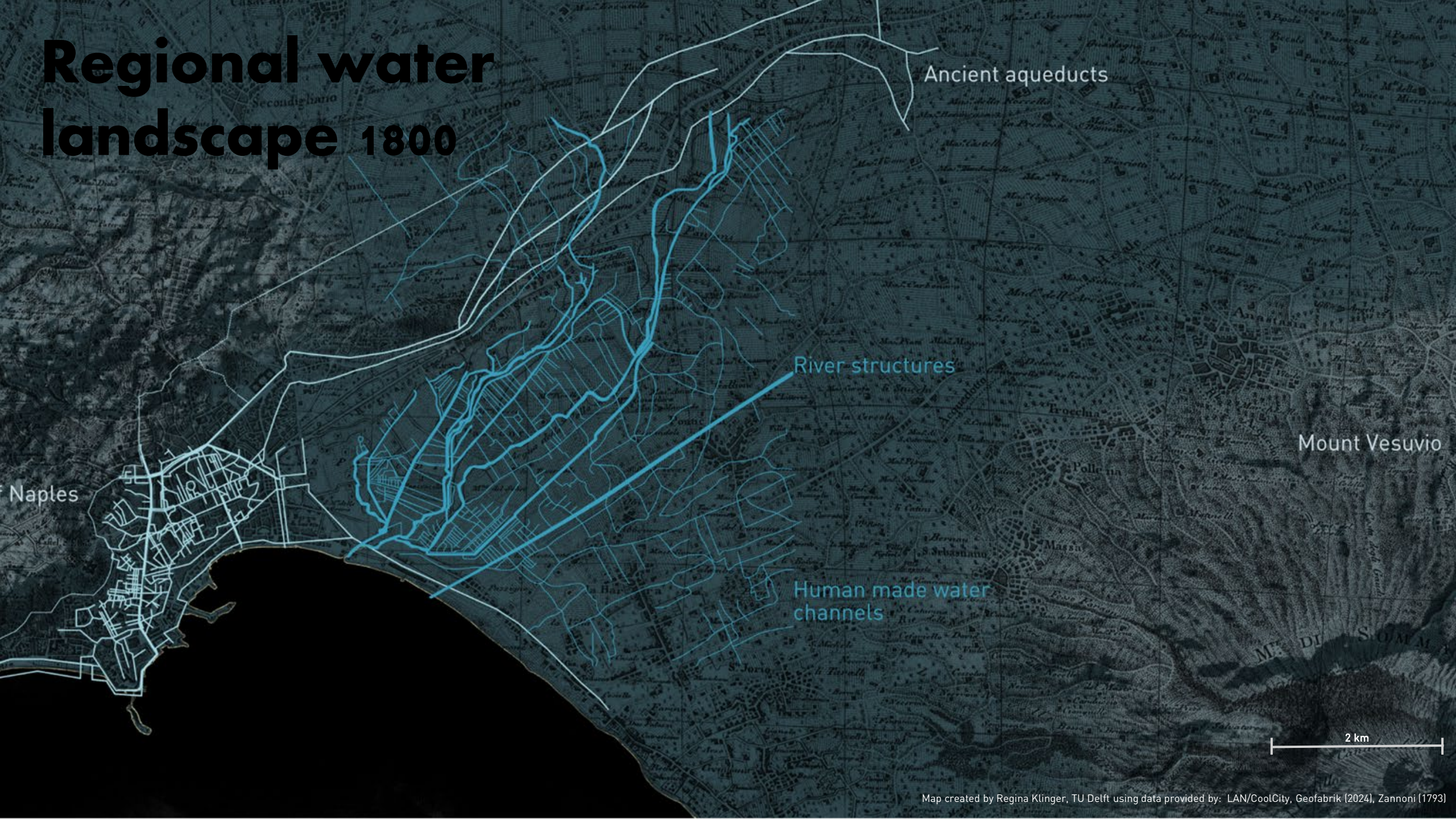


Modern reality meets UNESCO heritage



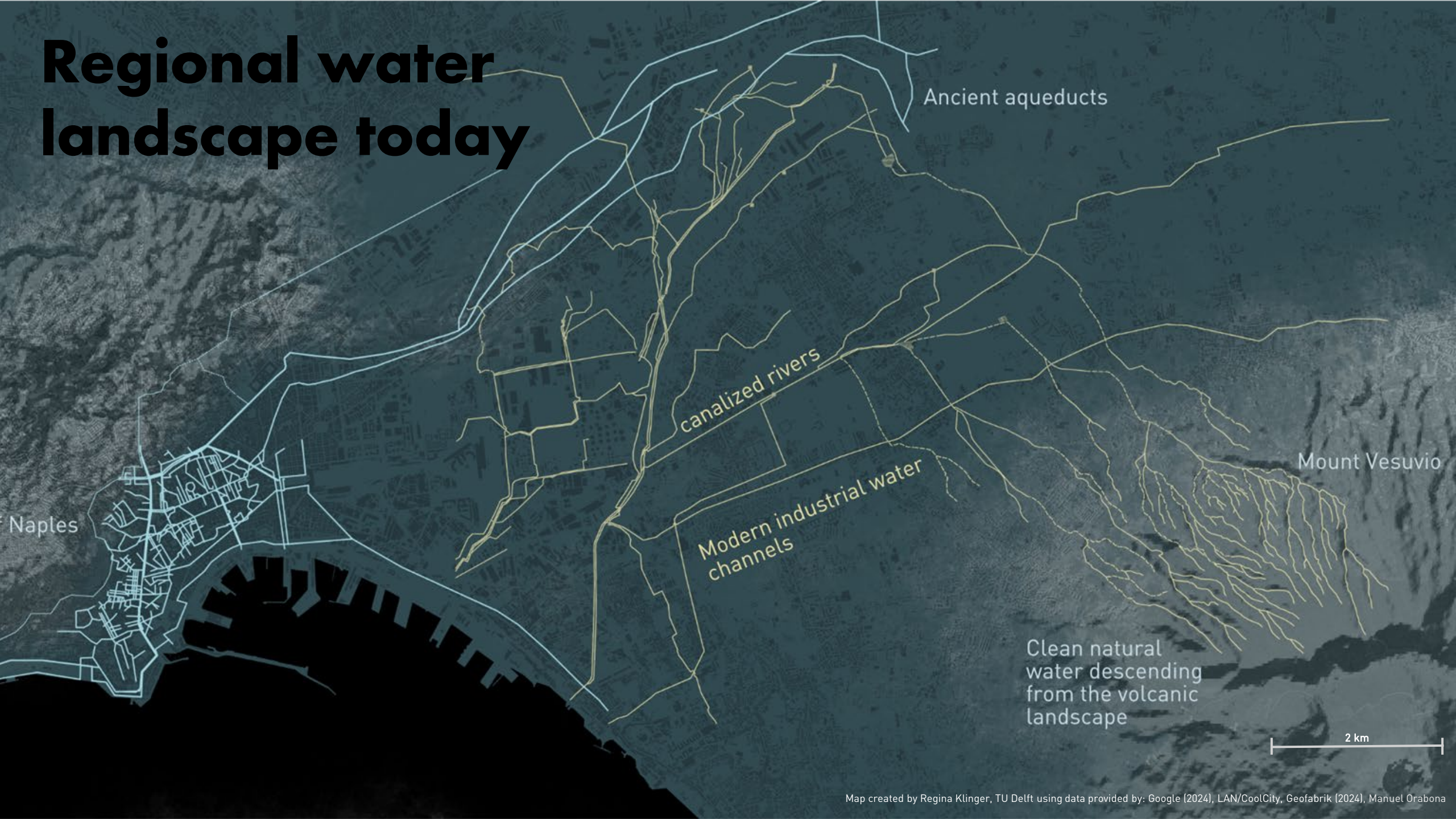


# Regional water landscape 1800



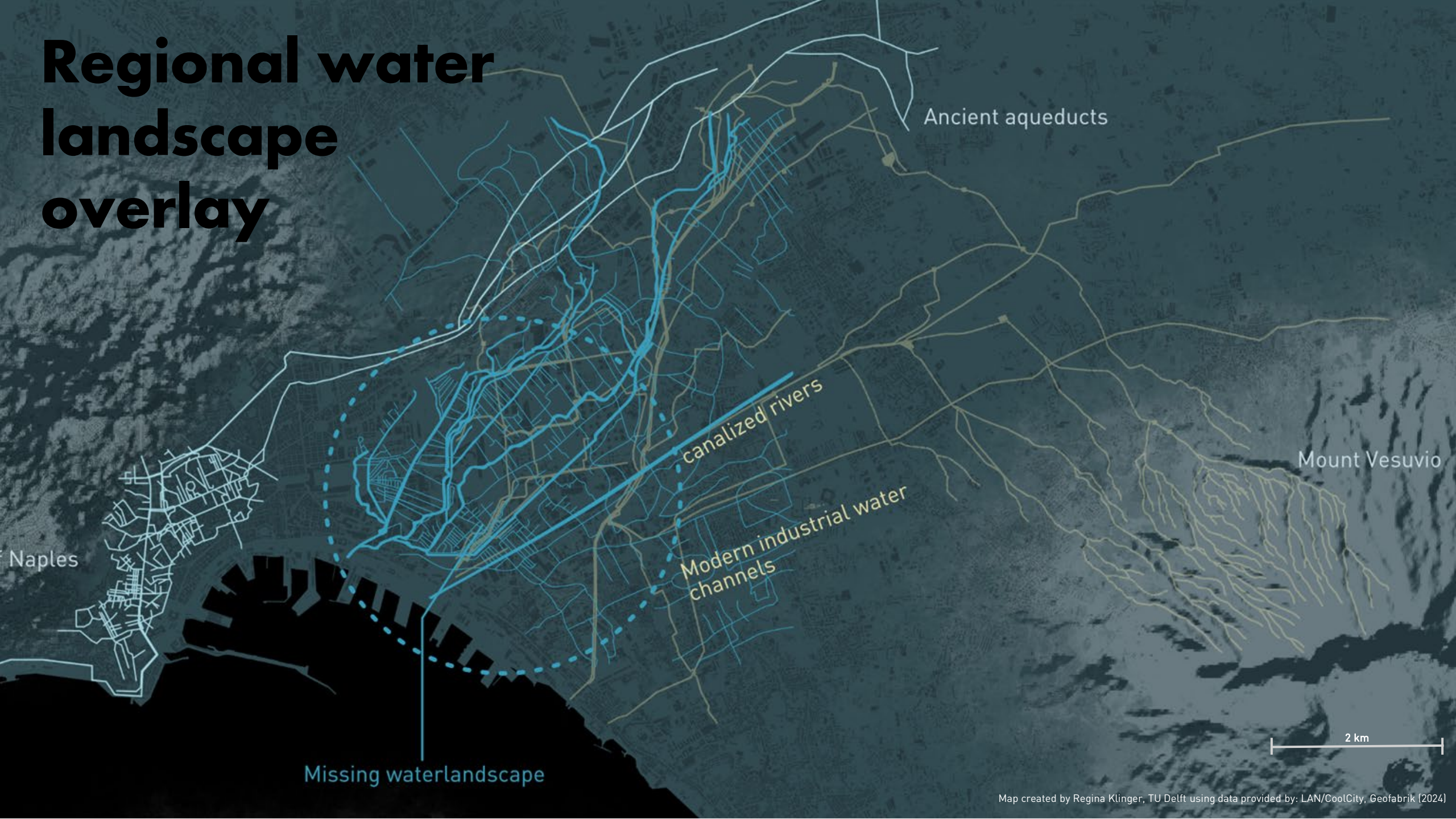


# Regional water landscape today





# Regional water landscape overlay





# Lost water places

Piazza Municipio



Piazza Municipio in the 1960 (author unknown)



After the completion of the metrostation in 2022 (Source: Fabiana Bianchi/Repubblica)

# Lost water places

Piazza del Plebiscito



Fontana del Serino" around 1900

Source: Napolidiunavolta, napolicapitale di un regno



Piazza del Plebiscito in 2024 (Source: Google Street View)



# Challenges



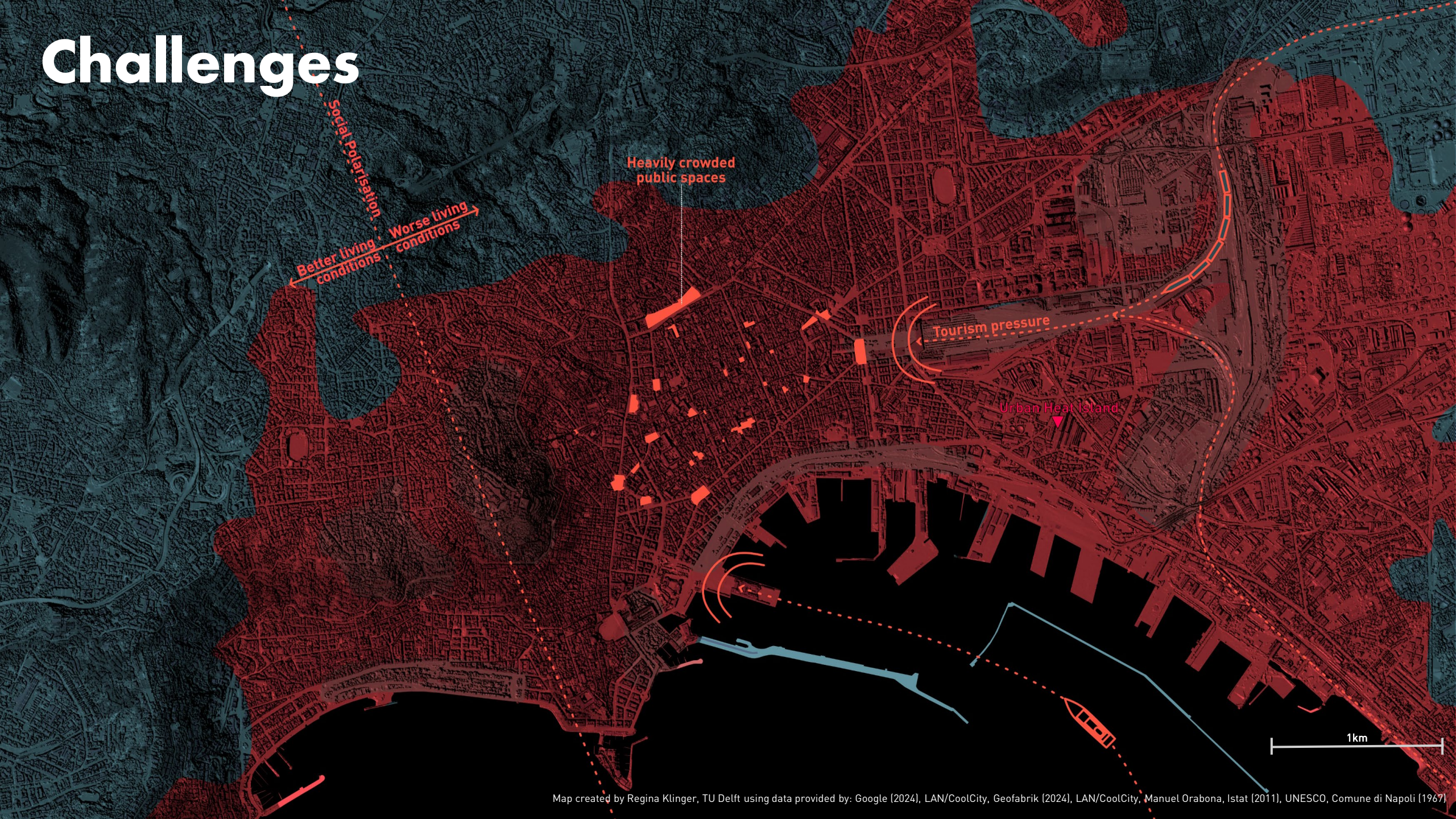


# Challenges



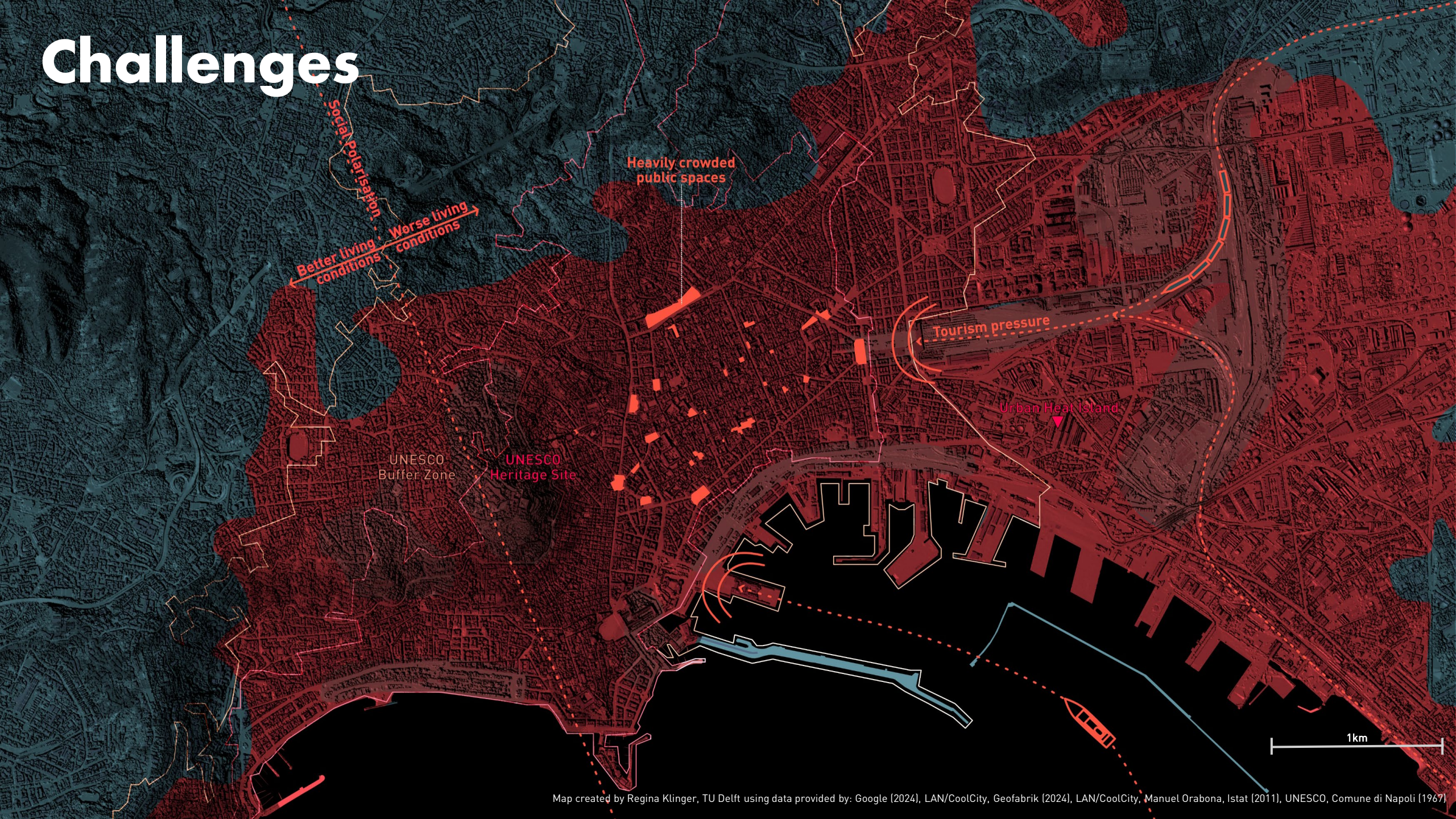


# Challenges



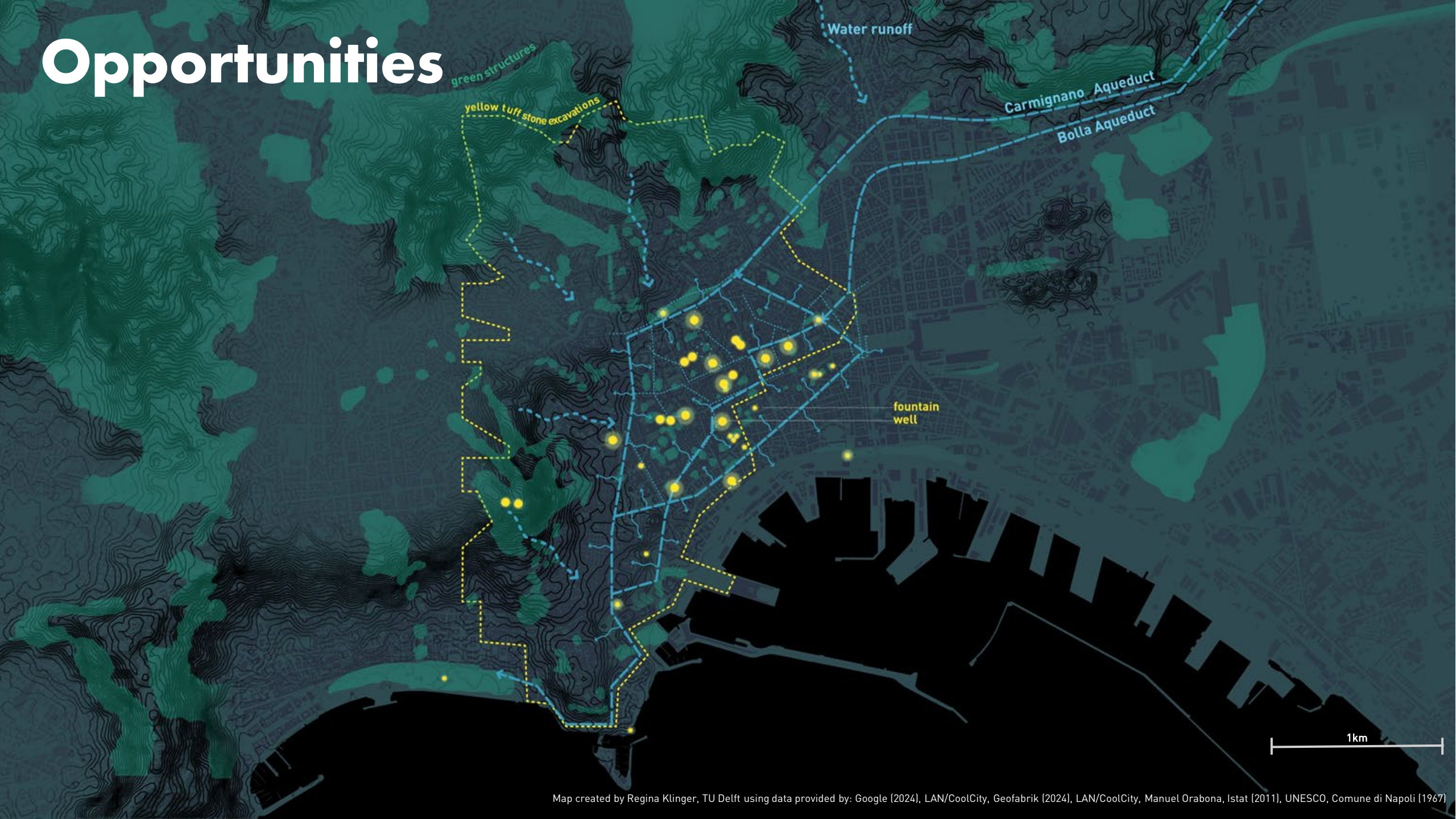


# Challenges



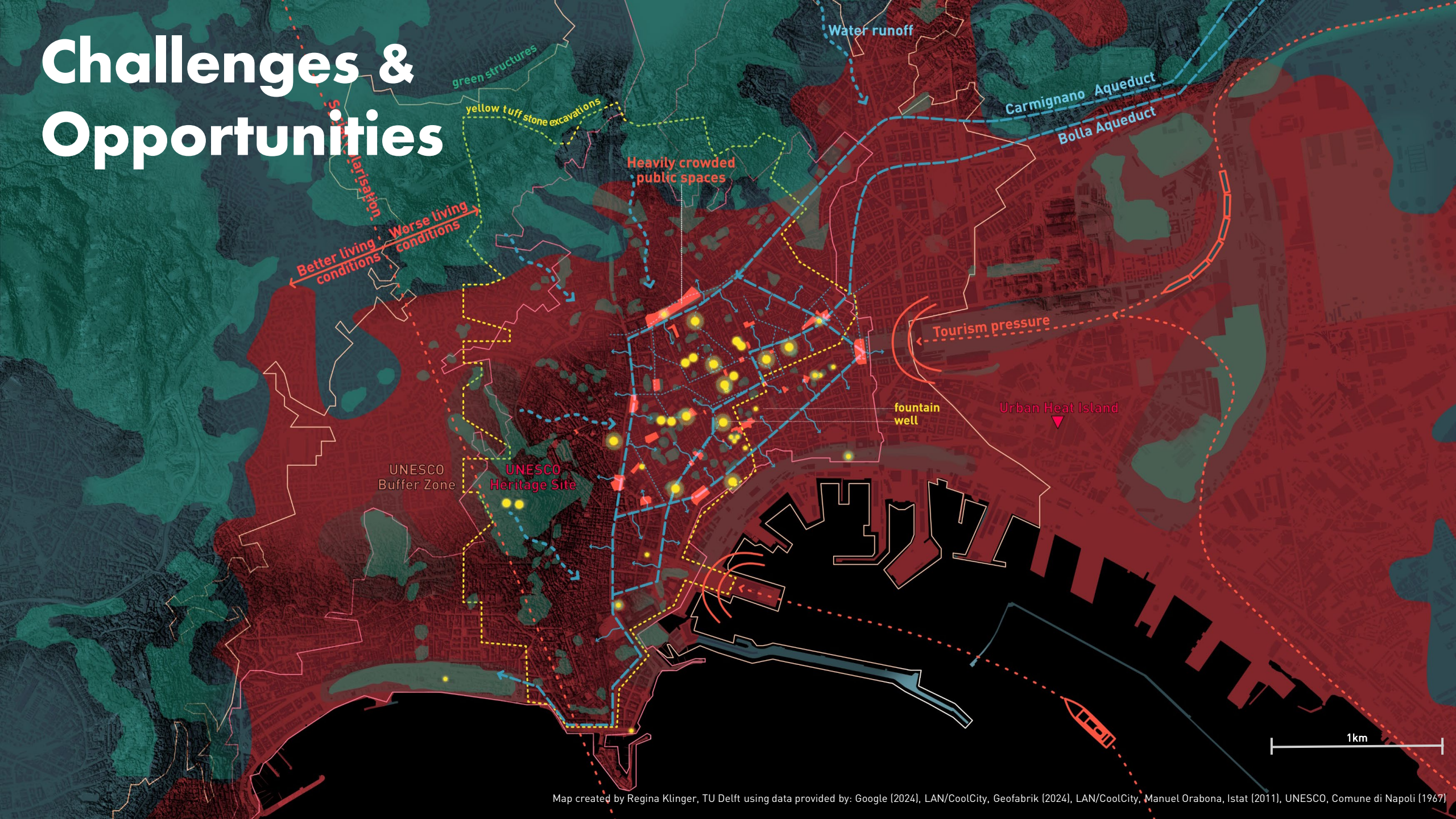


# Opportunities





# Challenges & Opportunities



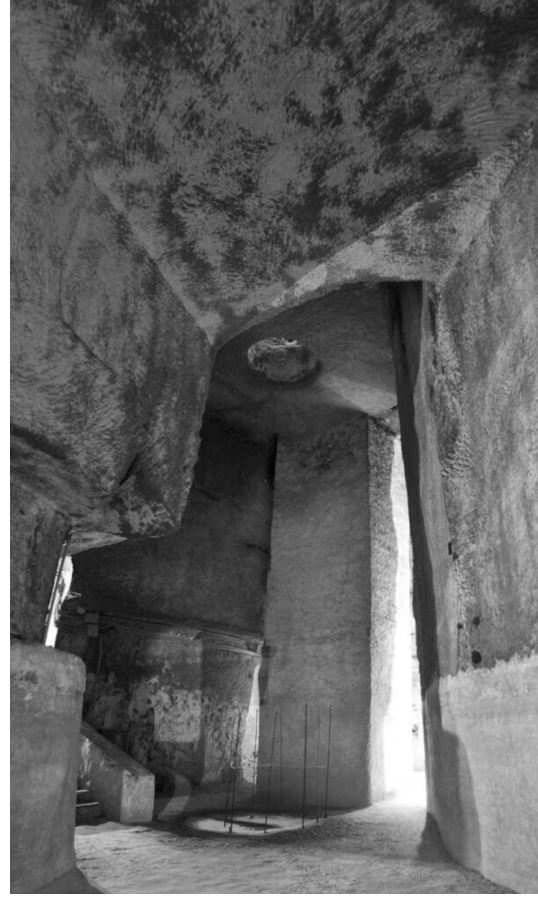


# First approaches for underground use

Underground Cisterns



Accessible tuff stone excavations



Water Museum



Exhibition Space

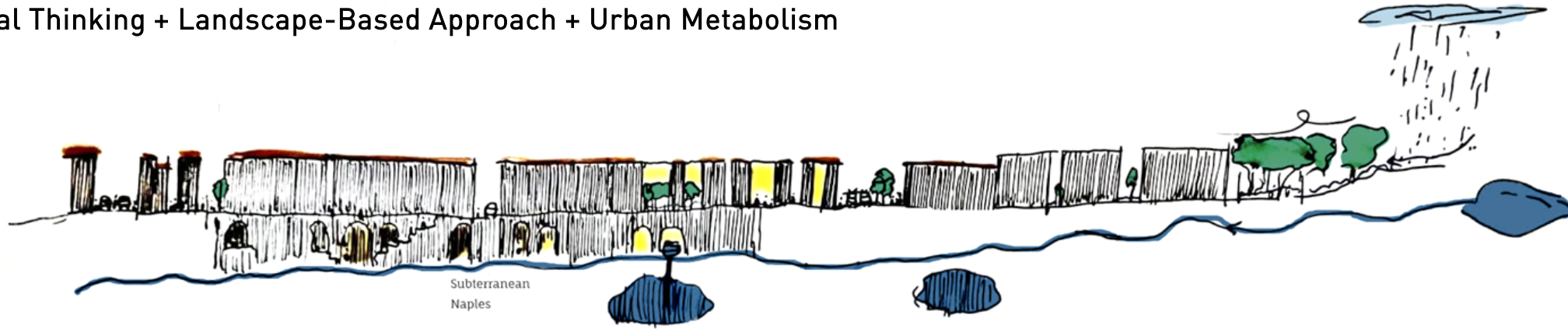




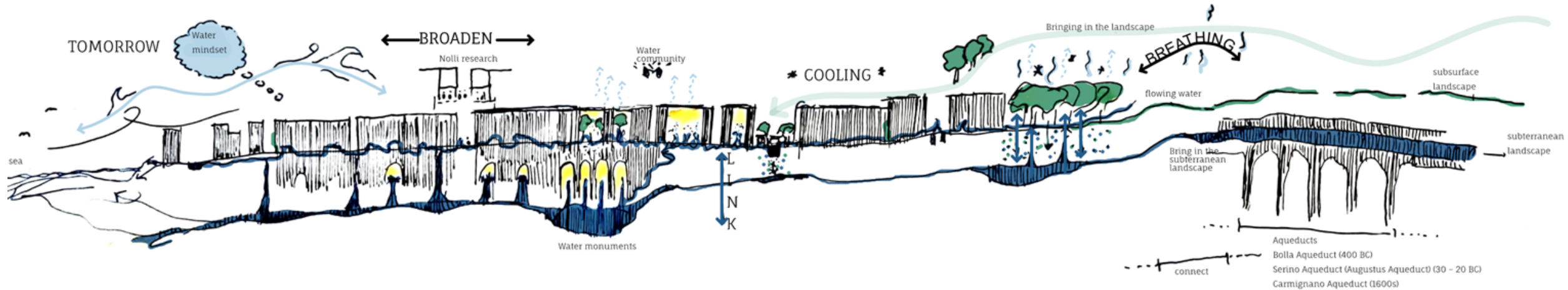
# Vision

Vertical Thinking + Landscape-Based Approach + Urban Metabolism

TODAY



TOMORROW



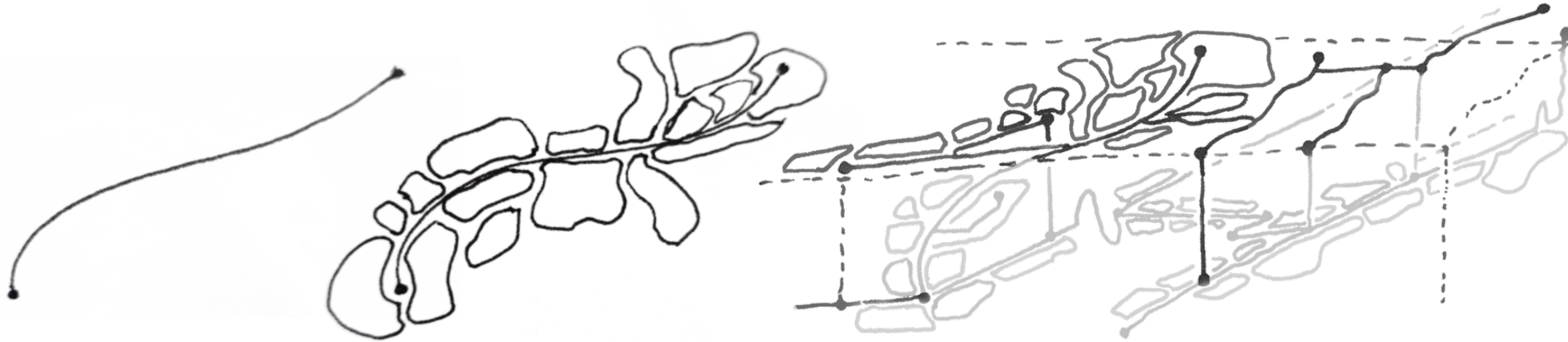


# Theoretical Framework

Single-purpose infrastructure

Multi-purpose Landscape infrastructure

Three-dimensional Landscape infrastructure

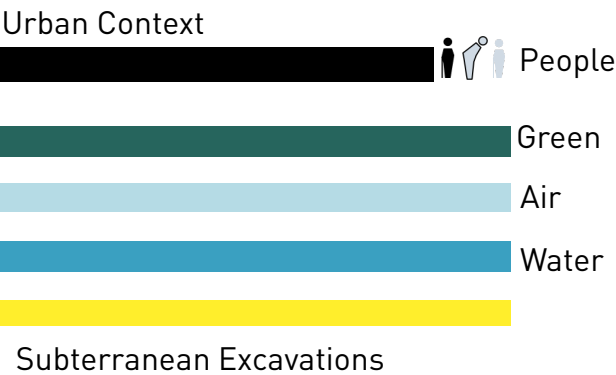


From line – to zone – to vertical landscape infrastructure



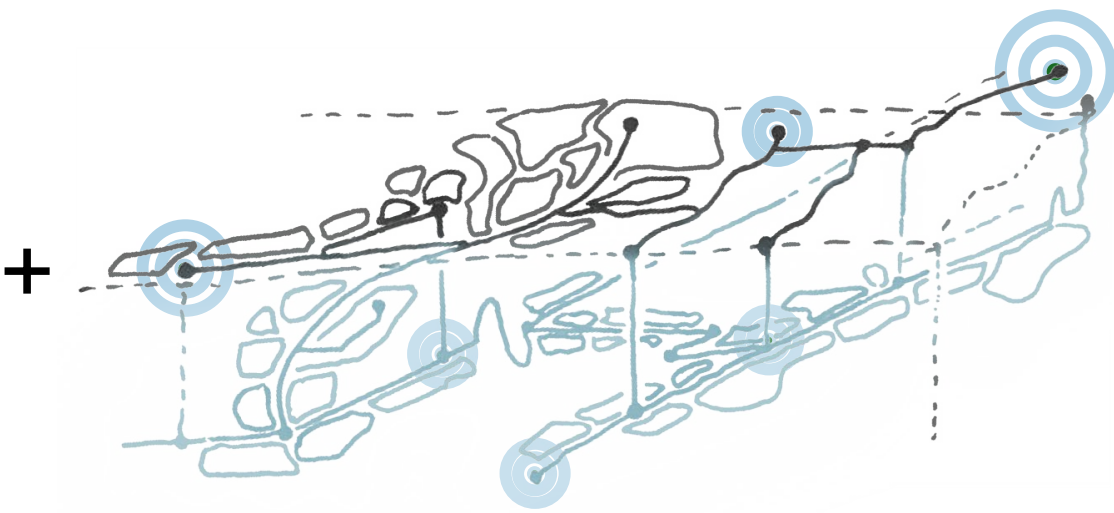
# Theoretical Framework

## Landscape-based Urbanism



**Landscape as a system on** ecological, cultural, historical, spatial and architectural level

## Urban Landscape Infrastructure



**space of places** - specific locations with unique characteristics  
**space of flows** - movement of people, goods, information, and resources

## Blue Exposure



**Visibility, accessibility, and proximity to water** influence human health, social behavior, and emotional connection to place



# Research Question

How can we utilize the **subterranean water system** of Naples as a **landscape infrastructure** for socio-ecologically inclusive and climate adaptive public space structures?





# Sub-Questions

Understanding:

How does the (subterranean) **water-system** of Naples work and how is it **connected** to the city's public space structure?

What can I do:

What are the existing **strategies and principles** to use subterranean water systems to **activate** public space?



# Sub-Questions

Design Question:

How can we apply these findings to **design** a multi-dimensional landscape infrastructure for the city center of Naples?

Reflection:

What lessons can be **learned** by regarding subterranean water systems as leverage for developing future-proof public spaces?



# Research through the scales

## Regional scale – Water landscape



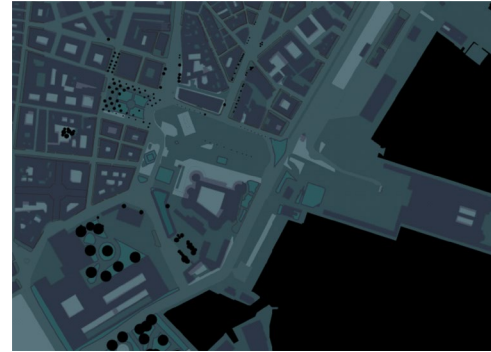
Water system  
Climate Challenges

## Urban Scale – Water Network



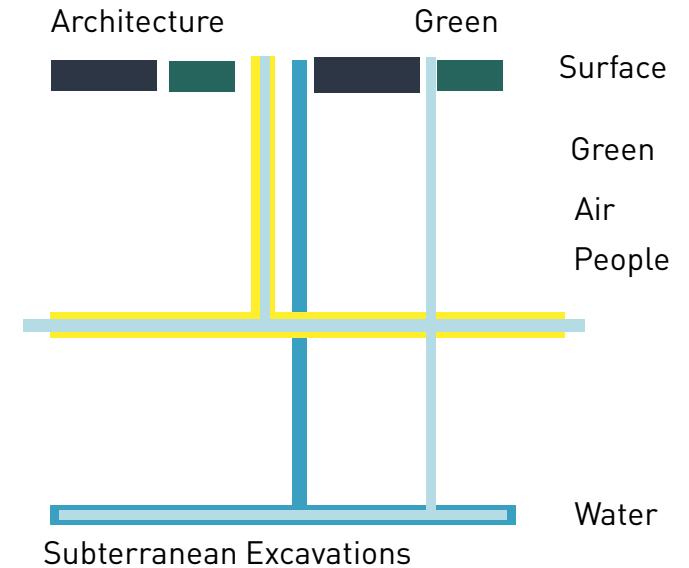
Infrastructural elements  
Spatial Networks

## District Scale – Neighbourhoods



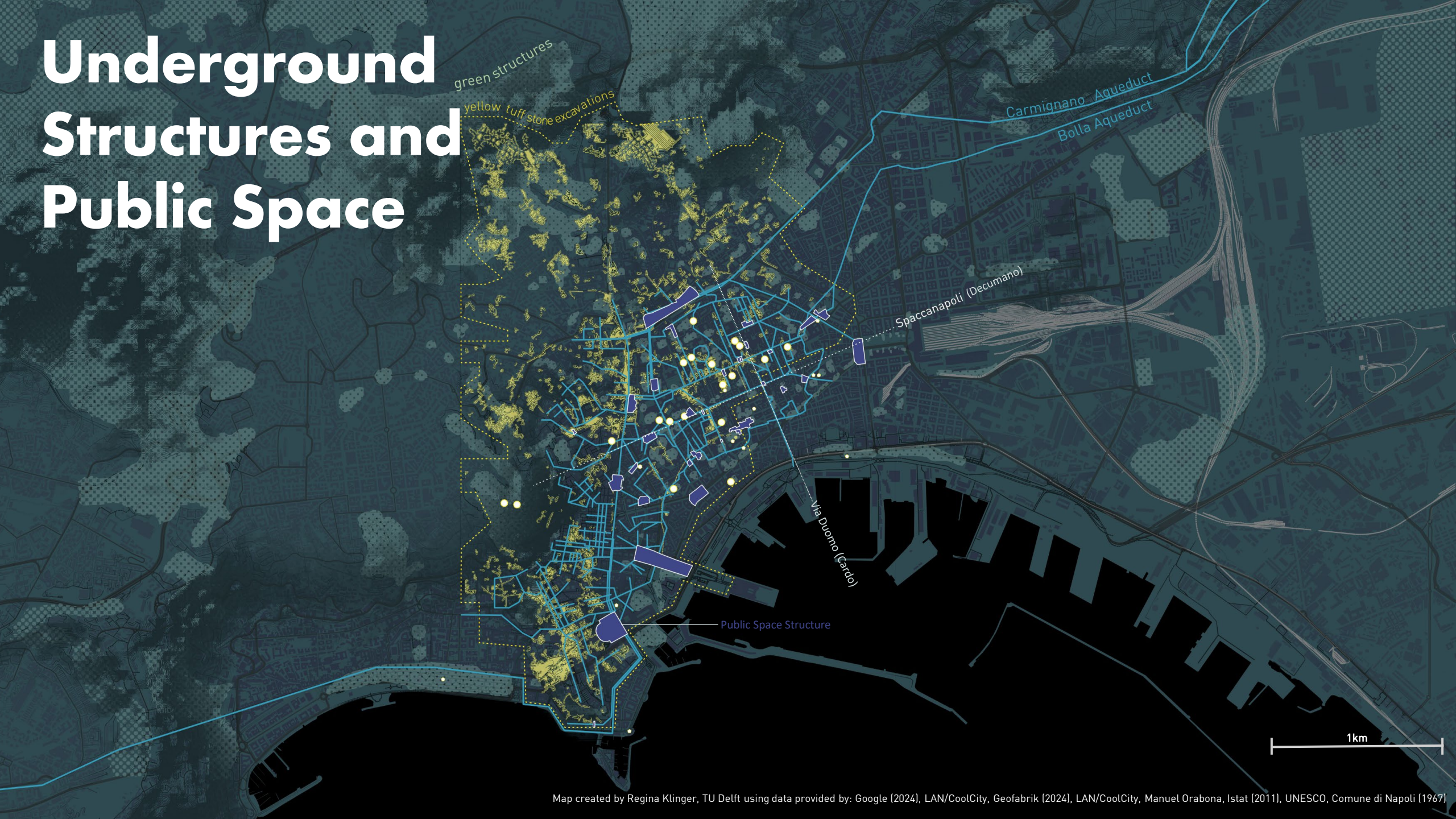
Micro Interventions  
Spatial Sequences

## Human Scale – Vertical Blue



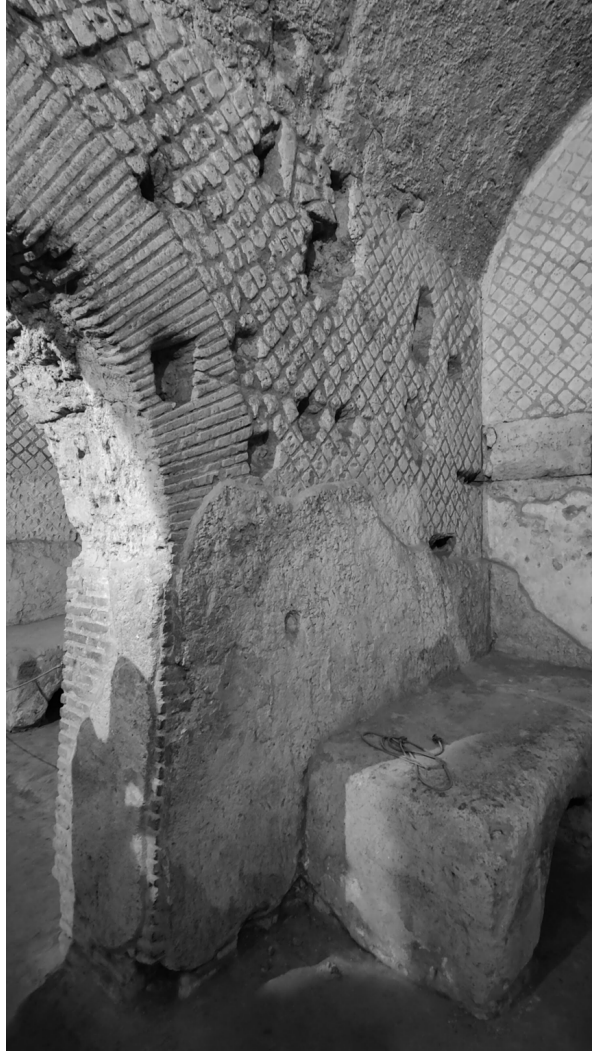


# Underground Structures and Public Space



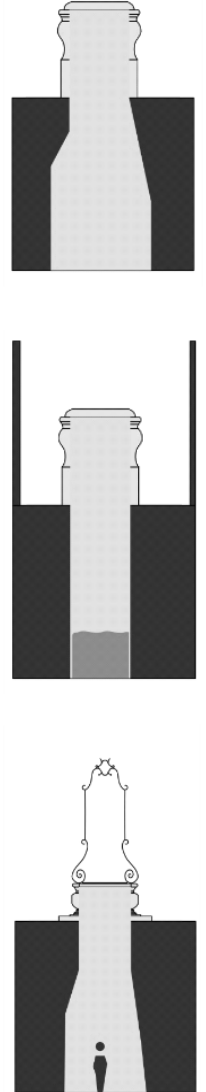


# Tuff Stone Excavations



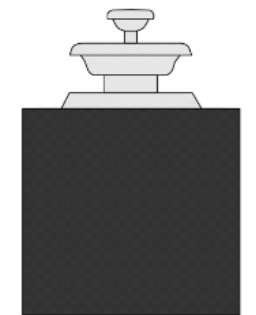
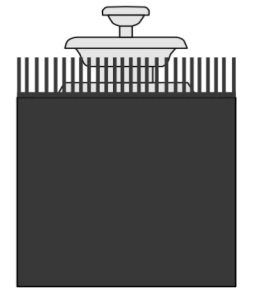
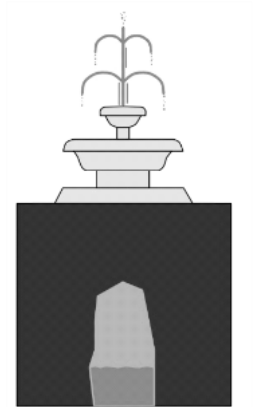


# Wells





# Fountains





# Micro Green





# Identifying Public Spaces exposed to Subterranean Structures

OVERLAY METHOD

Piazza Cavour

Piazza Enrico de Nicola  
(Porta Capuana)

Piazza Dante

Piazza Municipio

Piazza Plebiscito



Public Space with  
excavation + aqueduct + green



Public Space with  
excavation + aqueduct



Public Space with  
aqueduct



Public Space with  
excavation



Public Space Unit



Wells (physical access points)



Fountains



Aqueducts



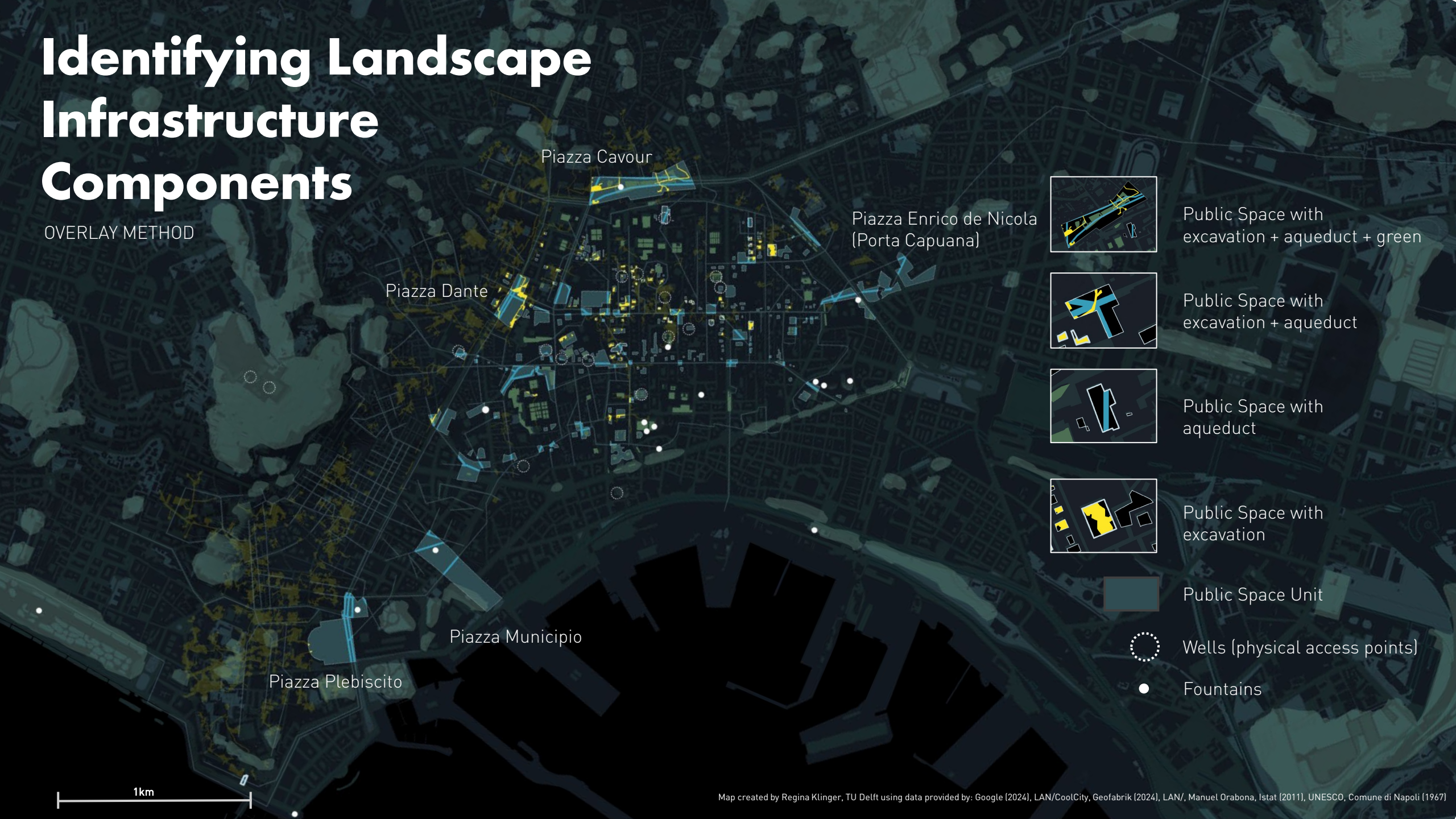
Tuff stone excavations

1km



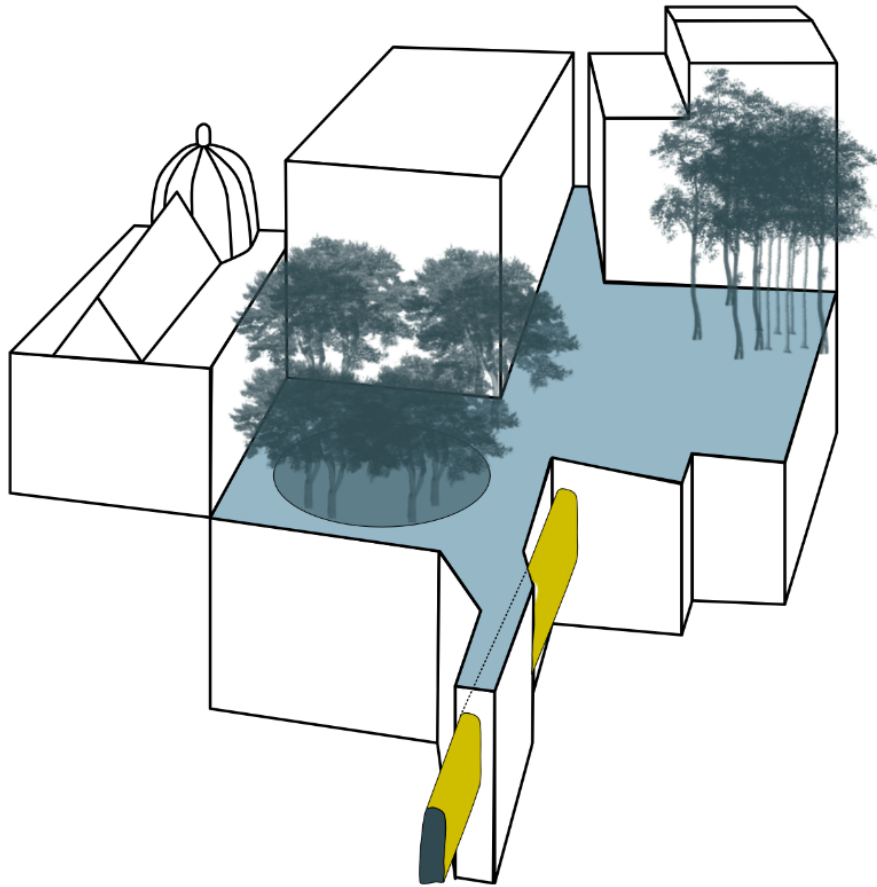
# Identifying Landscape Infrastructure Components

OVERLAY METHOD



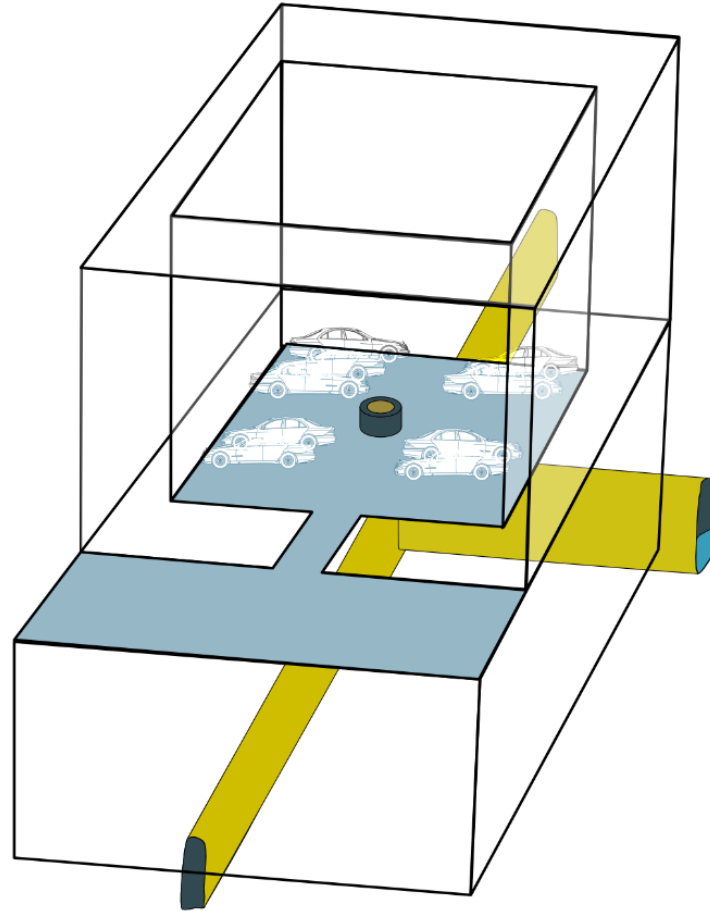


# Types of Urban Spaces



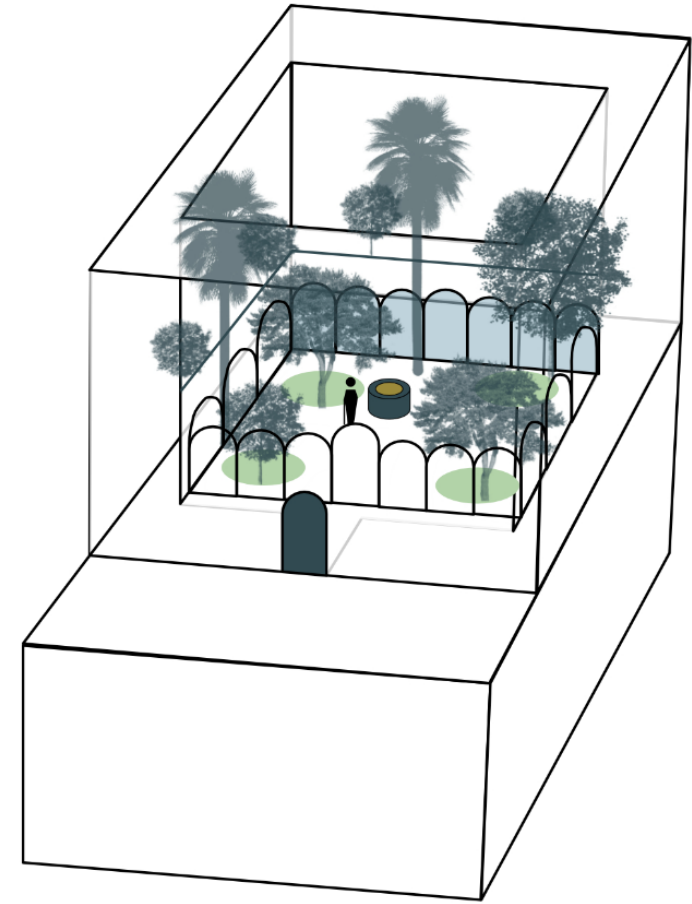
**Public Space**

Largo S. Giovanni Maggiore



**Collective Space**

Dipartimento di  
Architettura - Università  
degli Studi di Napoli  
Federico II

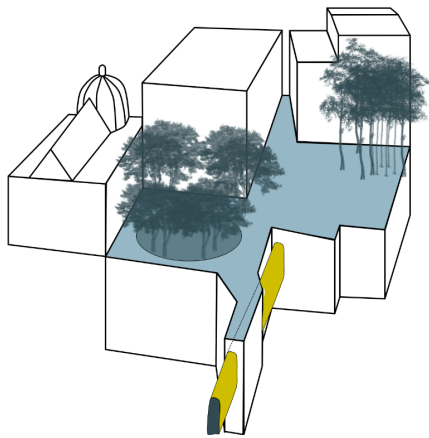


**Hidden/Private Space**

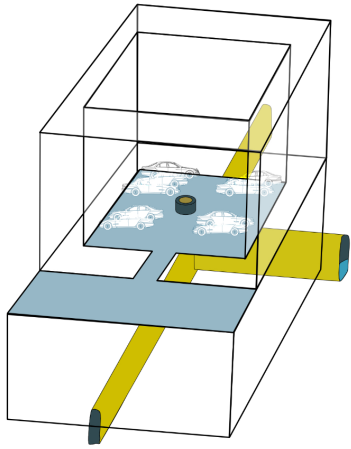
Chiostro di San Francesco



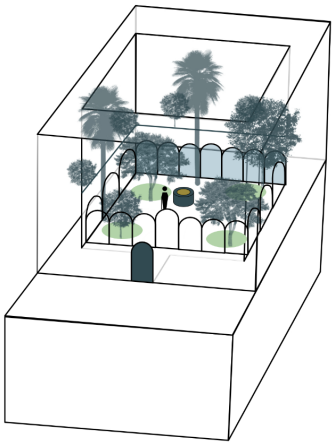
# Urban Space Configurations



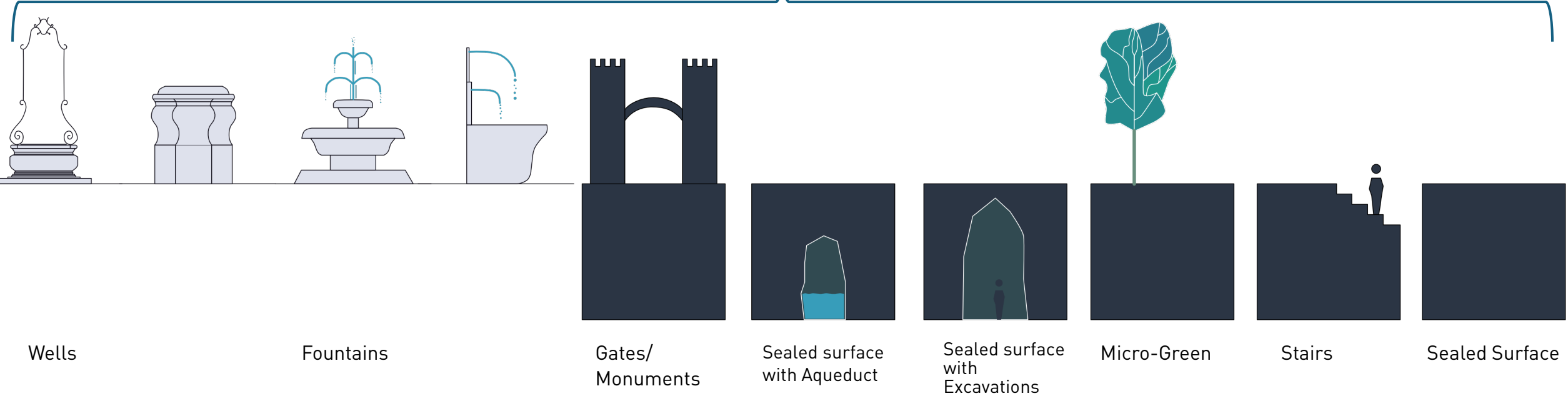
Public Space



Collective Space



Hidden/Private Space



Wells

Fountains

Gates/  
Monuments

Sealed surface  
with Aqueduct

Sealed surface  
with  
Excavations

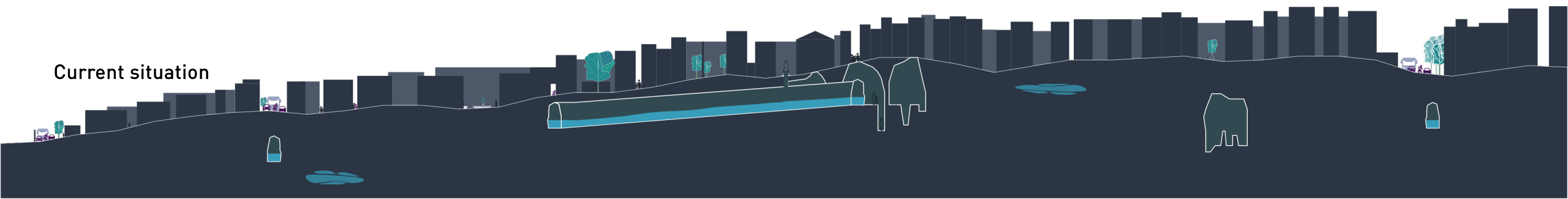
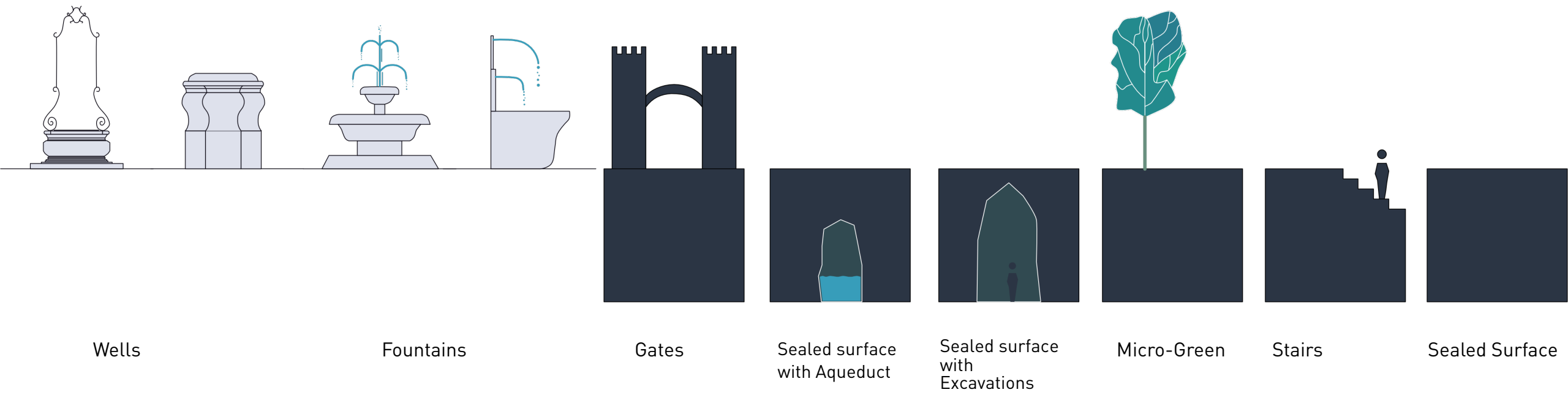
Micro-Green

Stairs

Sealed Surface

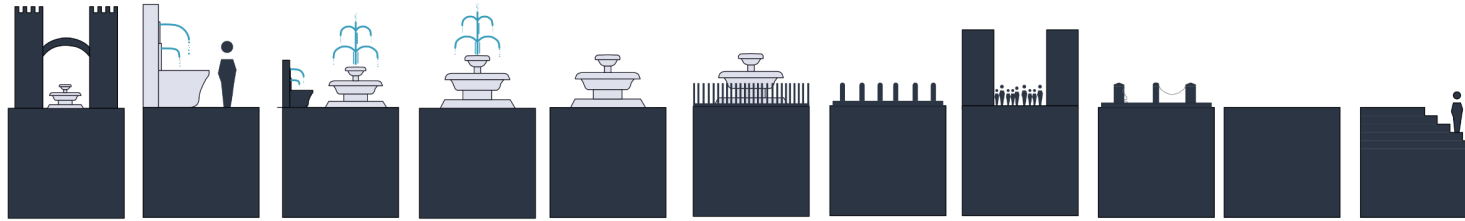
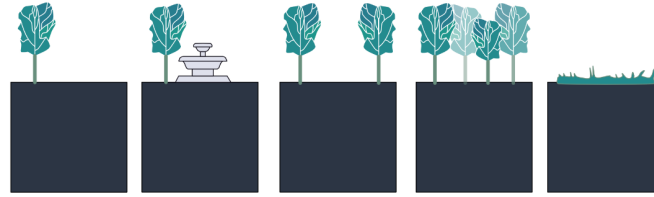


# Urban Space Configurations

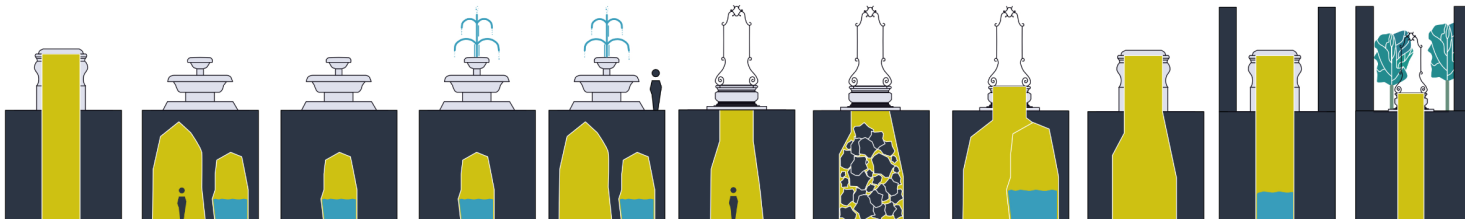




# Public Space Configurations



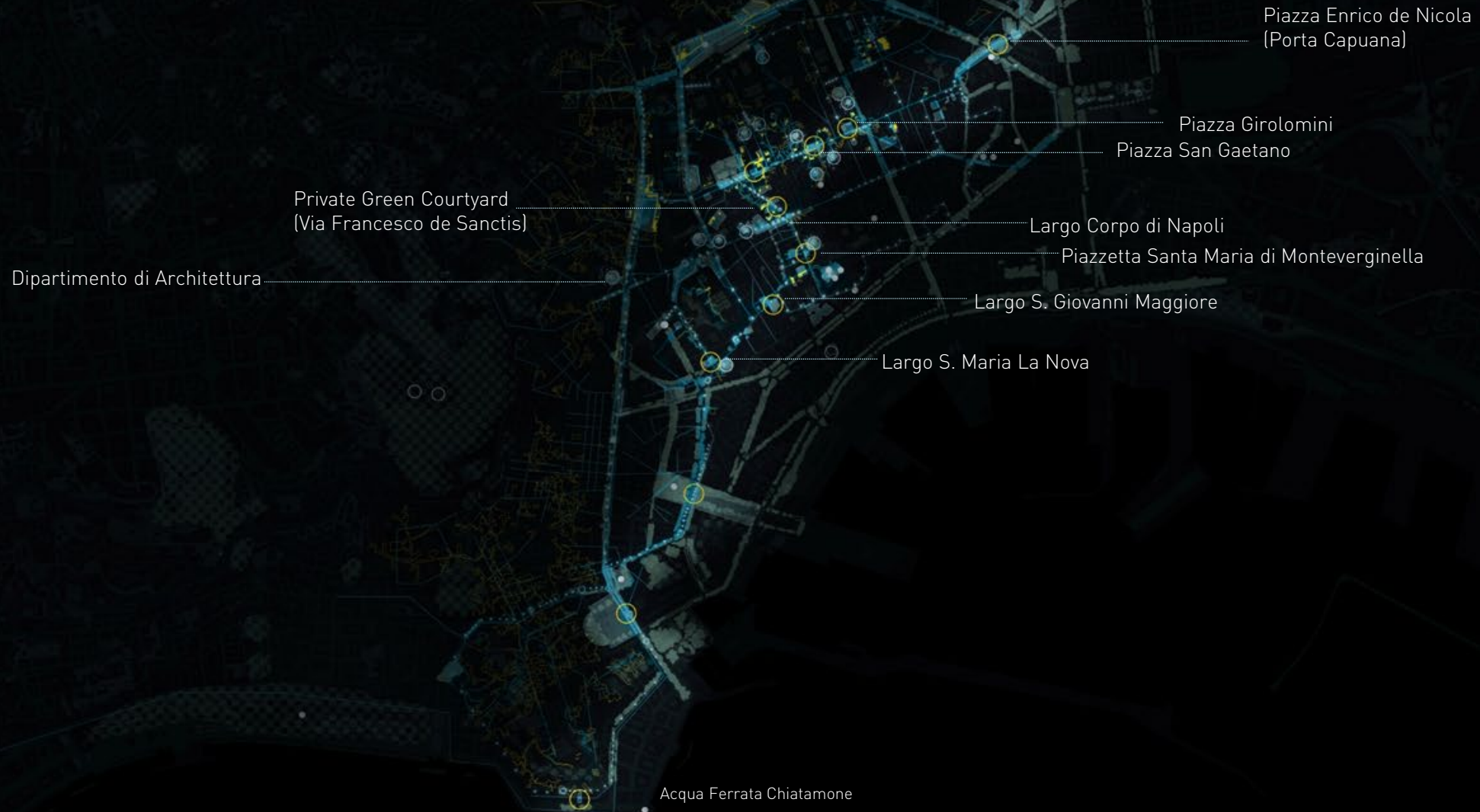
Without relationship to the subterranean world



With (unconscious) relationship to the subterranean world



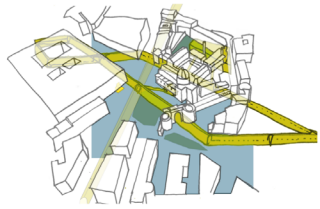
# Sequence of Public Spaces



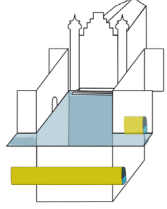


# Public Space Typologies

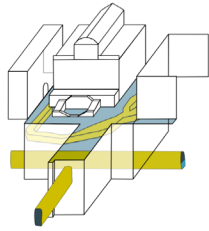
## Current two-dimensional space typologies



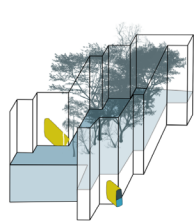
Public Space with green, hidden aqueducts and cisterns



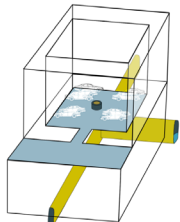
Public Space with gastronomy use



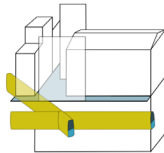
Public Space between entrance points to "Napoli Sotterranea"



Private residential green courtyard



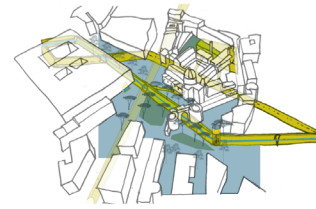
Collective parking lot with closed well in front of Basilica dello Spirito Santo



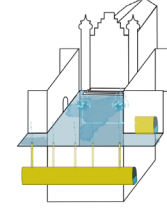
Public compact square



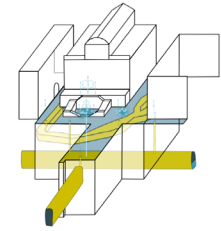
## Potential three-dimensional public space typologies



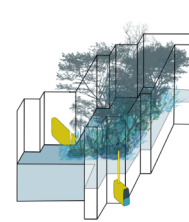
Public Space with green, walkable aqueducts and cisterns for water collection



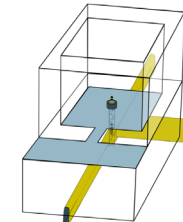
Public Space with cooling water elements and gastronomy use



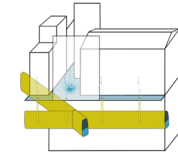
Public Space representing "Napoli Sotterranea" through air and water



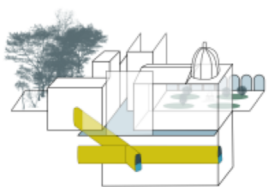
Private rewetted residential green courtyard with higher evapotranspiration



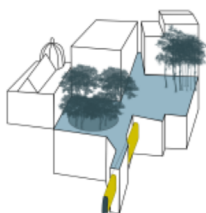
Collective space with opened well as access point in front of Basilica dello Spirito Santo



Public compact square with micro air- and water interventions



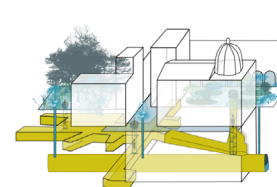
Public compact square with well and garden next to it



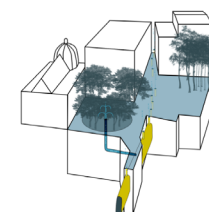
Public square with trees



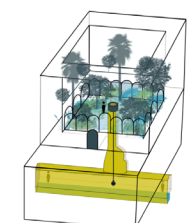
Private/Hidden cloister garden with well



Public compact square connected to well and garden



Public square with irrigation and air pipes

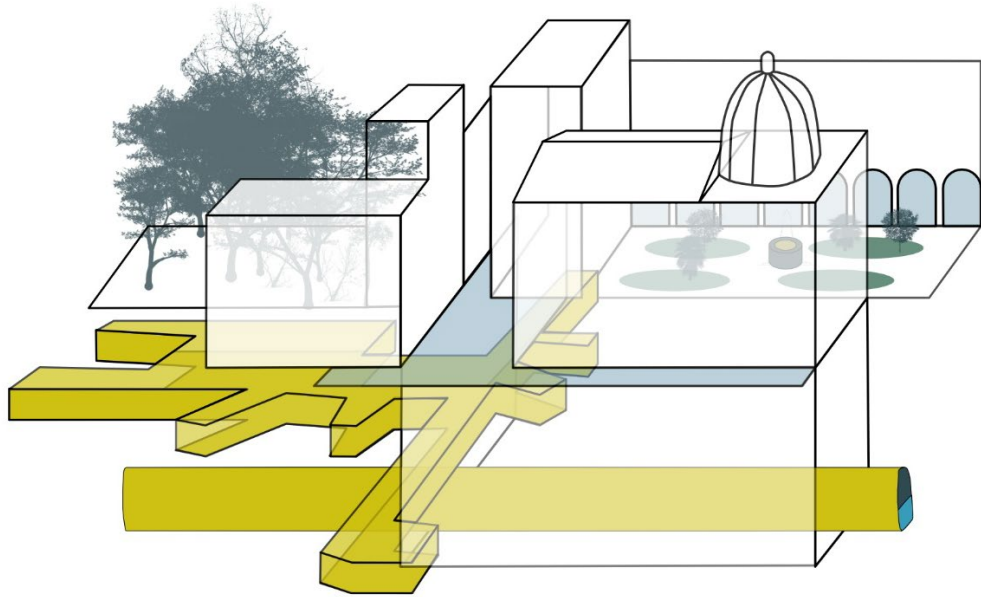


Private/Hidden cloister garden with public connection to well



# Public Space Typologies

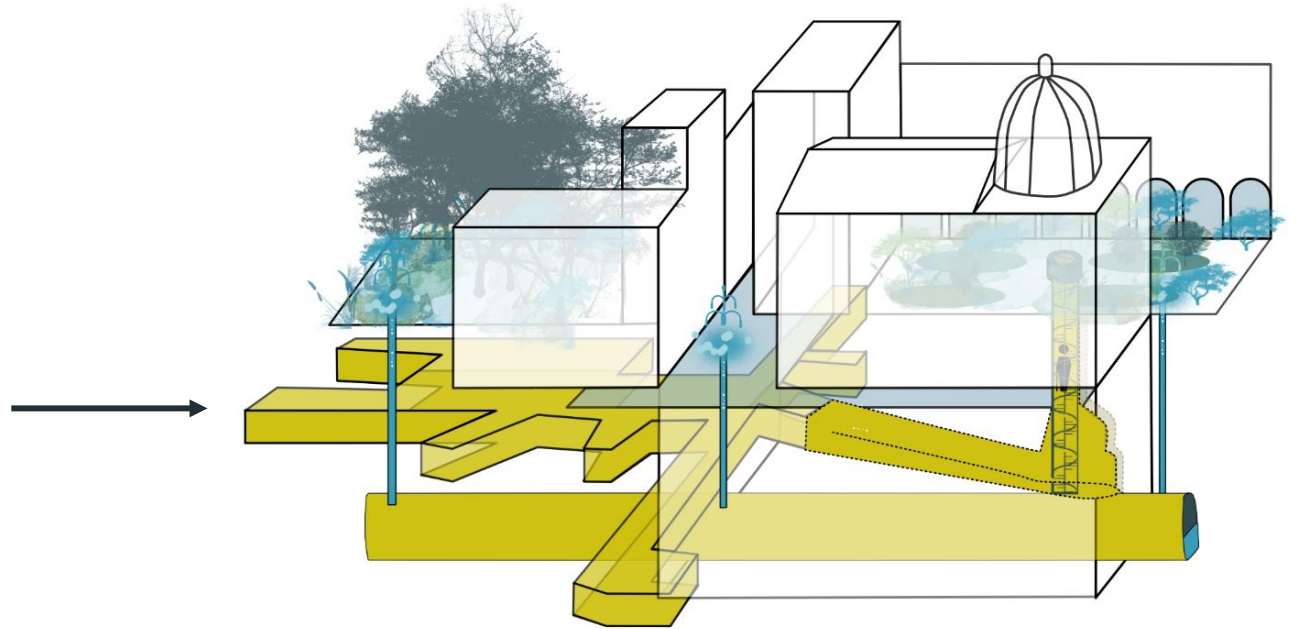
Current two-dimensional space



**Public compact square with well and garden next to it**

Santa Maria di Monteverginella  
Via Giovanni Paladino

Potential three-dimensional public space



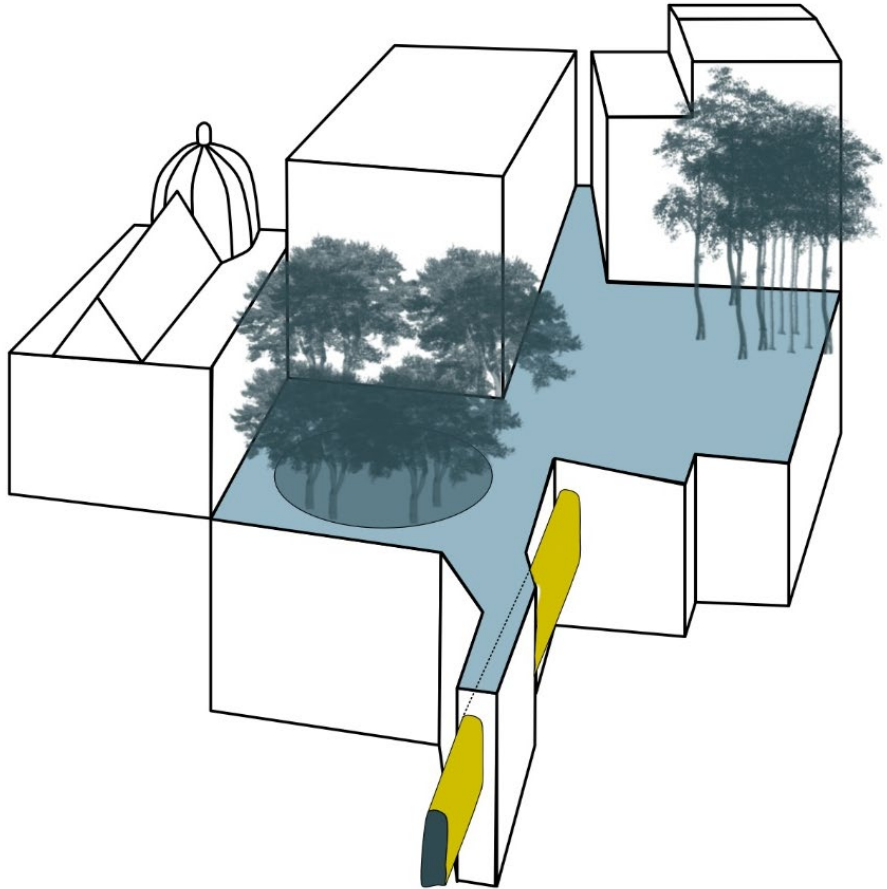
**Public compact square connected to well and garden**

Santa Maria di Monteverginella  
Via Giovanni Paladino



# Public Space Typologies

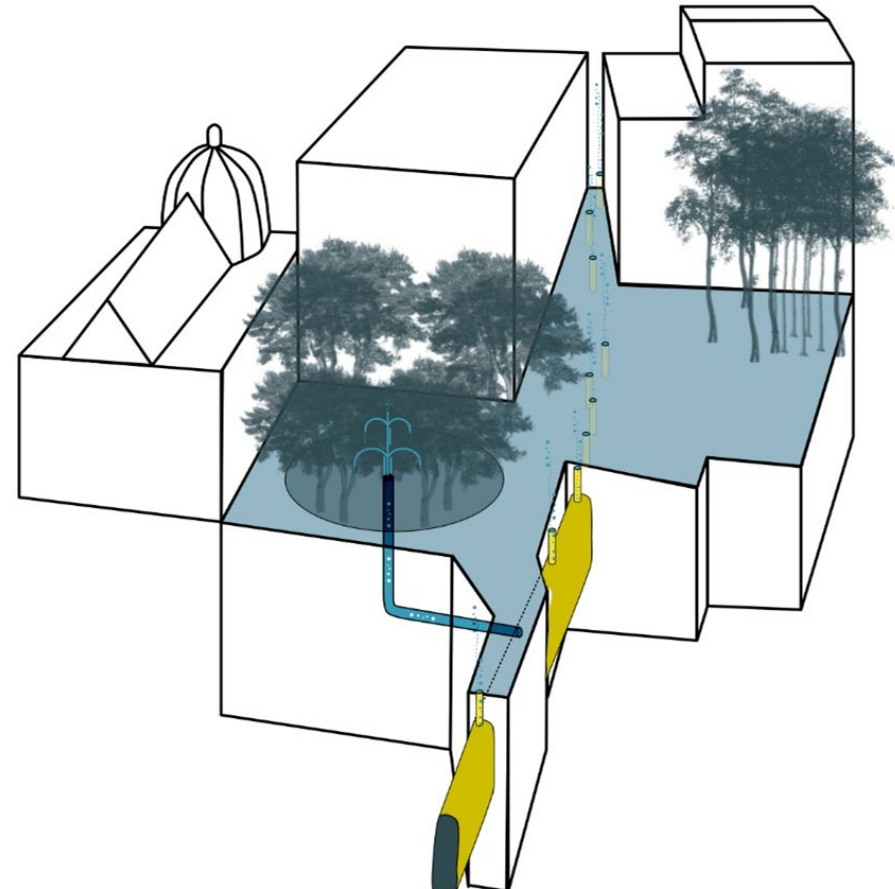
Current two-dimensional space



**Public square with trees**

Largo San Giovanni Maggiore  
Via Candelora

Potential three-dimensional public space



**Public square with irrigation  
and air pipes**

Largo San Giovanni Maggiore  
Via Candelora



# Public Space Typologies

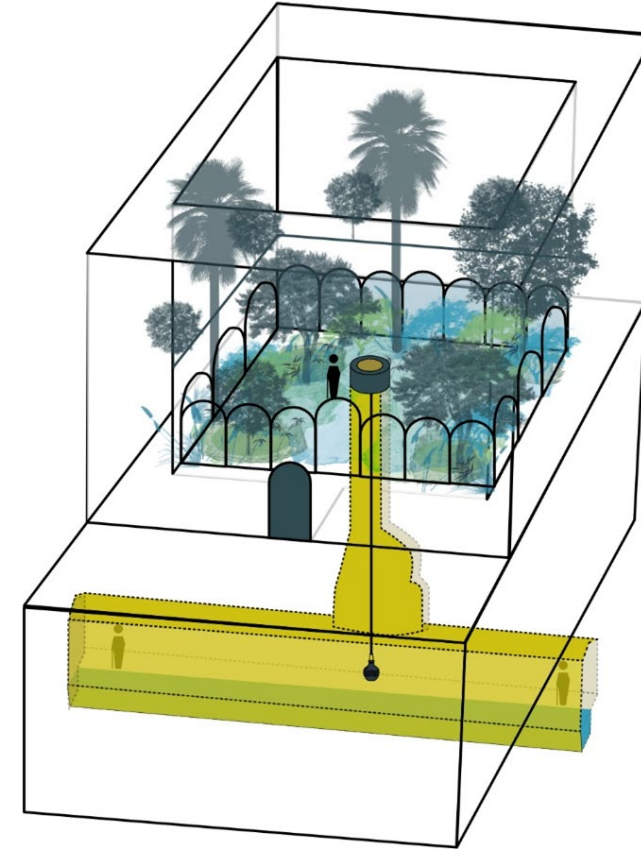
Current two-dimensional space



**Private/Hidden cloister garden  
with well**

Chiostro di San Francesco  
Via Santa Maria la Nova

Potential three-dimensional public space



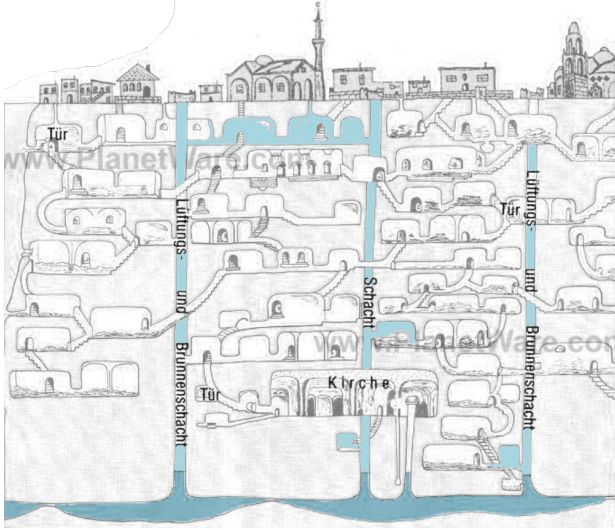
**Private/Hidden cloister garden  
with public connection to well**

Chiostro di San Francesco  
Via Santa Maria la Nova



# Case Studies

Subterranean City of Derinkuyu (TR)



Underground living within Derinkuyu (PlanetWare)

Cisterna Basilica Istanbul (TR)



Subterranean Basilica Cistern painted as a landscape (istanbultarihi.ist)

De Ruien Antwerp (B)



Subterranean Walkway through the Sewage System (De Ruien)

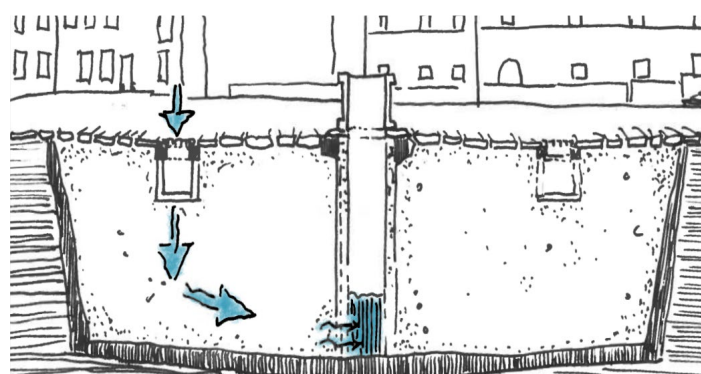
Chalandri (GR)



Irrigation point along the Hadrian Aqueduct in Chalandri (Cultural HIDRANT FB page)

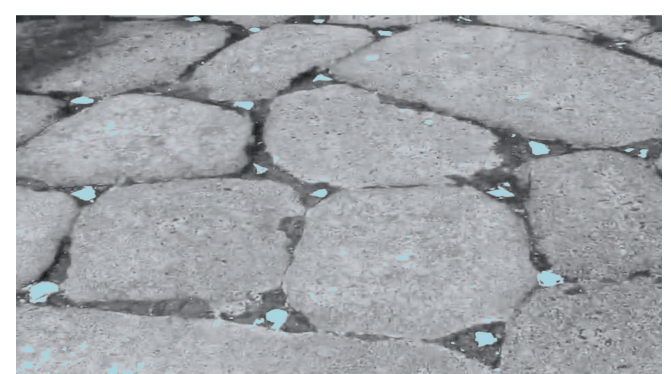


Fresh Water Wells Venice (IT)



On-the-spot water catchment within the salt lagoon of Venice

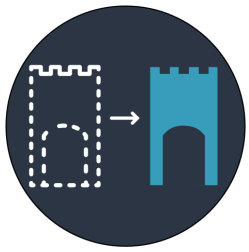
Moon Stones, Pompeii (IT)



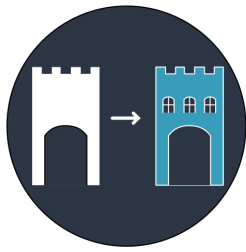
High-Visibility stones in Pompeii's streets that light up during the night when moonlight falls on them (The Archaeologist)



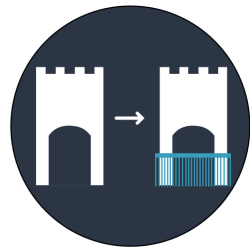
# Combining Ideas with archaeology-sensitive Design Principles



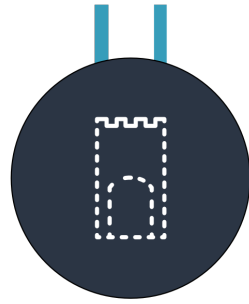
1. Reconstruct



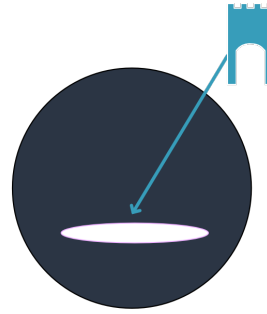
2. Transform



3. Juxtapose



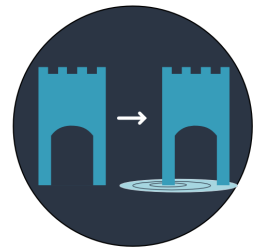
4. Stage



5. Cite



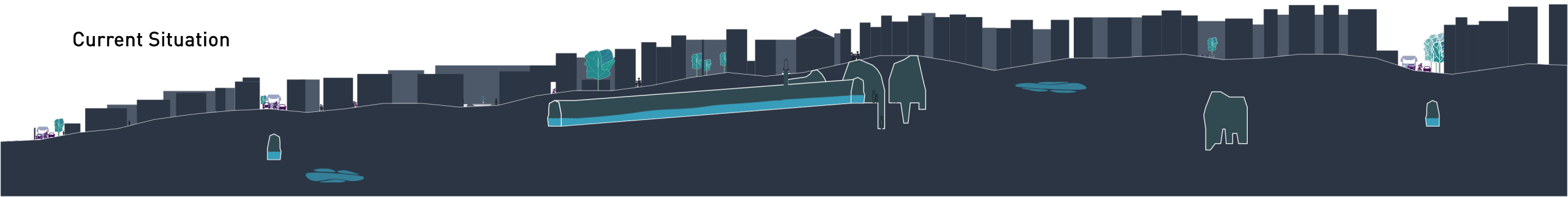
6. Accentuate



7. Reactivate

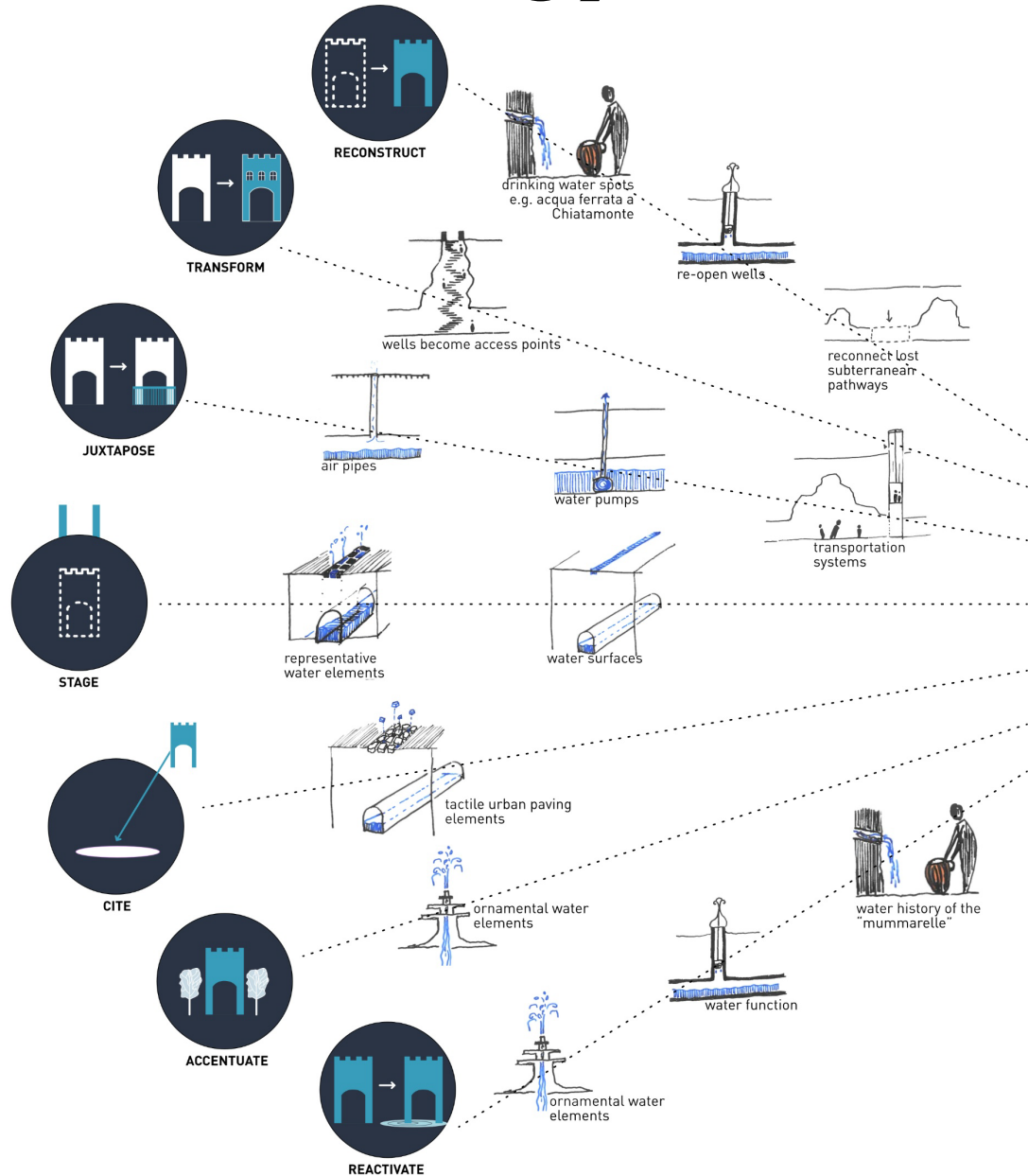
Adviesbureau Cuijpers (Marrewijk & Haytsma, 2004)

Current Situation





# Archaeology-sensitive Design Principles



**1. Reconstructing** lost or partially lost structures, e.g. functional wells, fountains, or former links between the different excavation spaces,

**2. Transforming** a historical element into a new function or form that follows its historical logic, e.g. a cooling route that follows a buried aqueduct,

**3. Juxtaposing** old and new structures in dialogue and without losing the value of the original structure (adding access points to the underground structures),

**4. Staging** elements to evoke the atmosphere of a disappeared spatial layer, e.g. through integrating a walking route on the surface along the same path as the subterranean excavations,

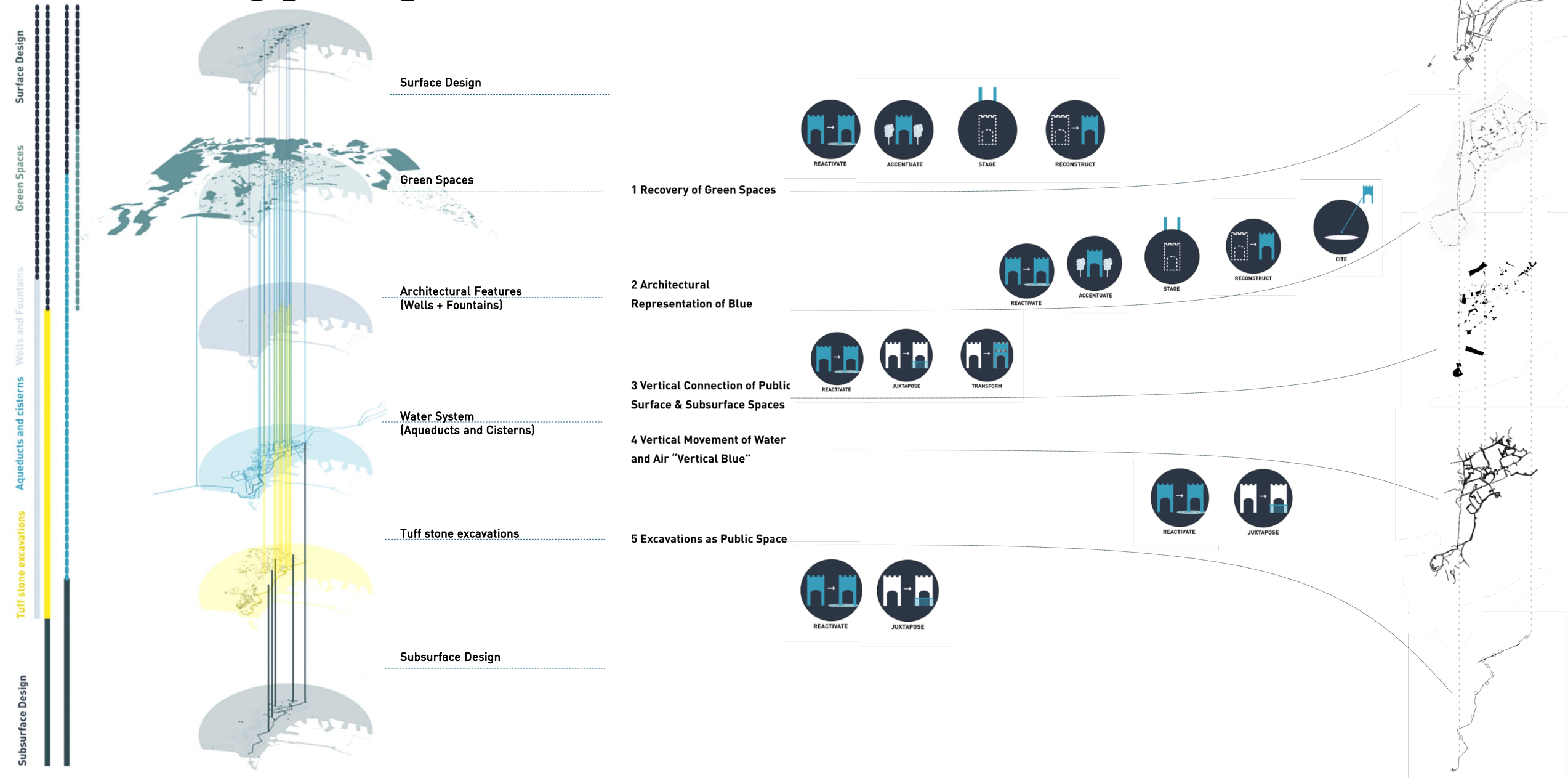
**5. Citing** historic elements in new places, e.g. using historic design techniques from another region to integrate into Naples' context,

**6. Accentuating** the presence of hidden heritage through subtle spatial gestures or materials, e.g. outlining a buried element with trees.

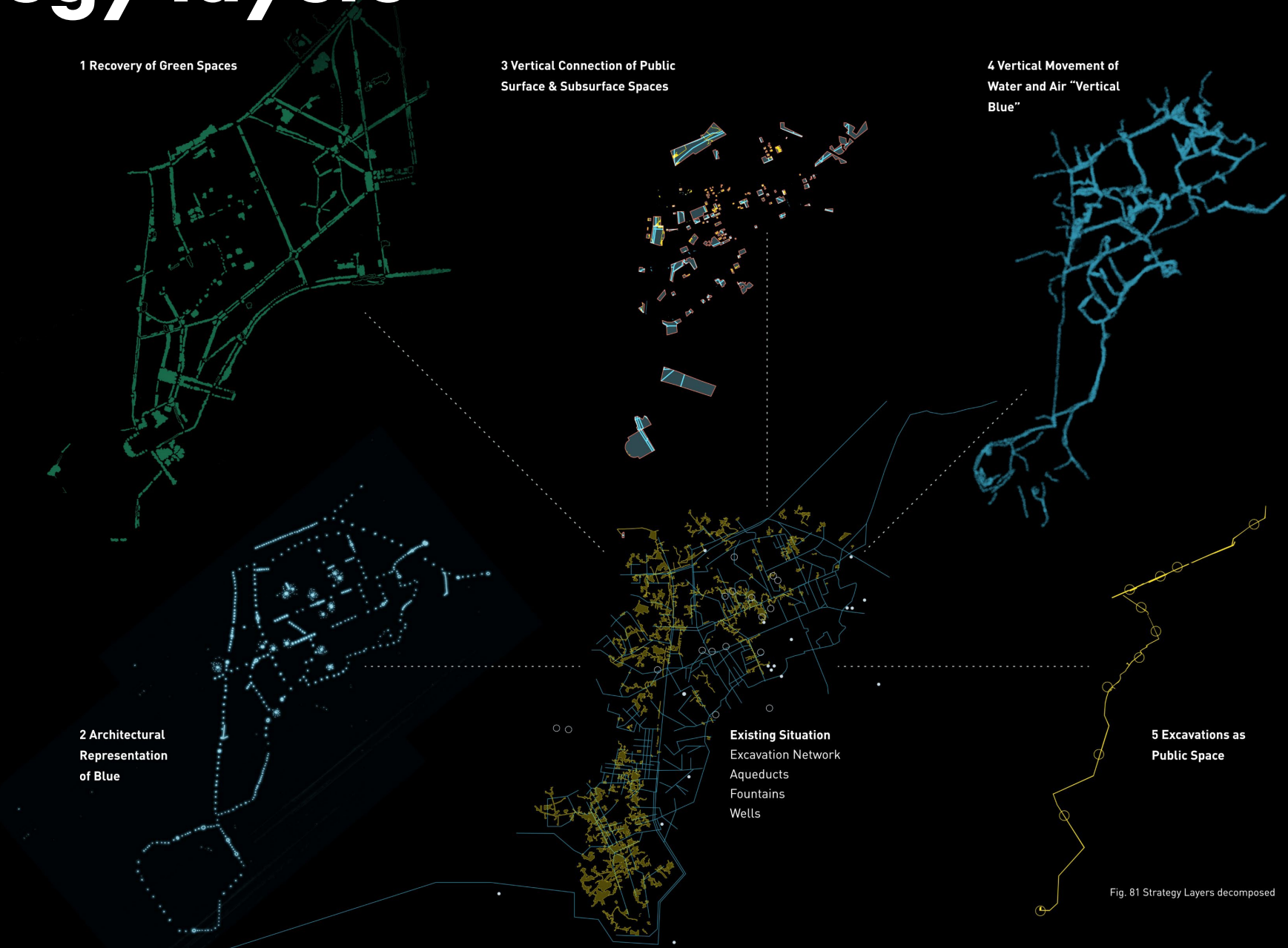
**7. Reactivating** a historic element's function, e.g. reconnecting an empty cistern to a water-arm to reinstall its function as a water storage



# Strategy layers



# Strategy layers



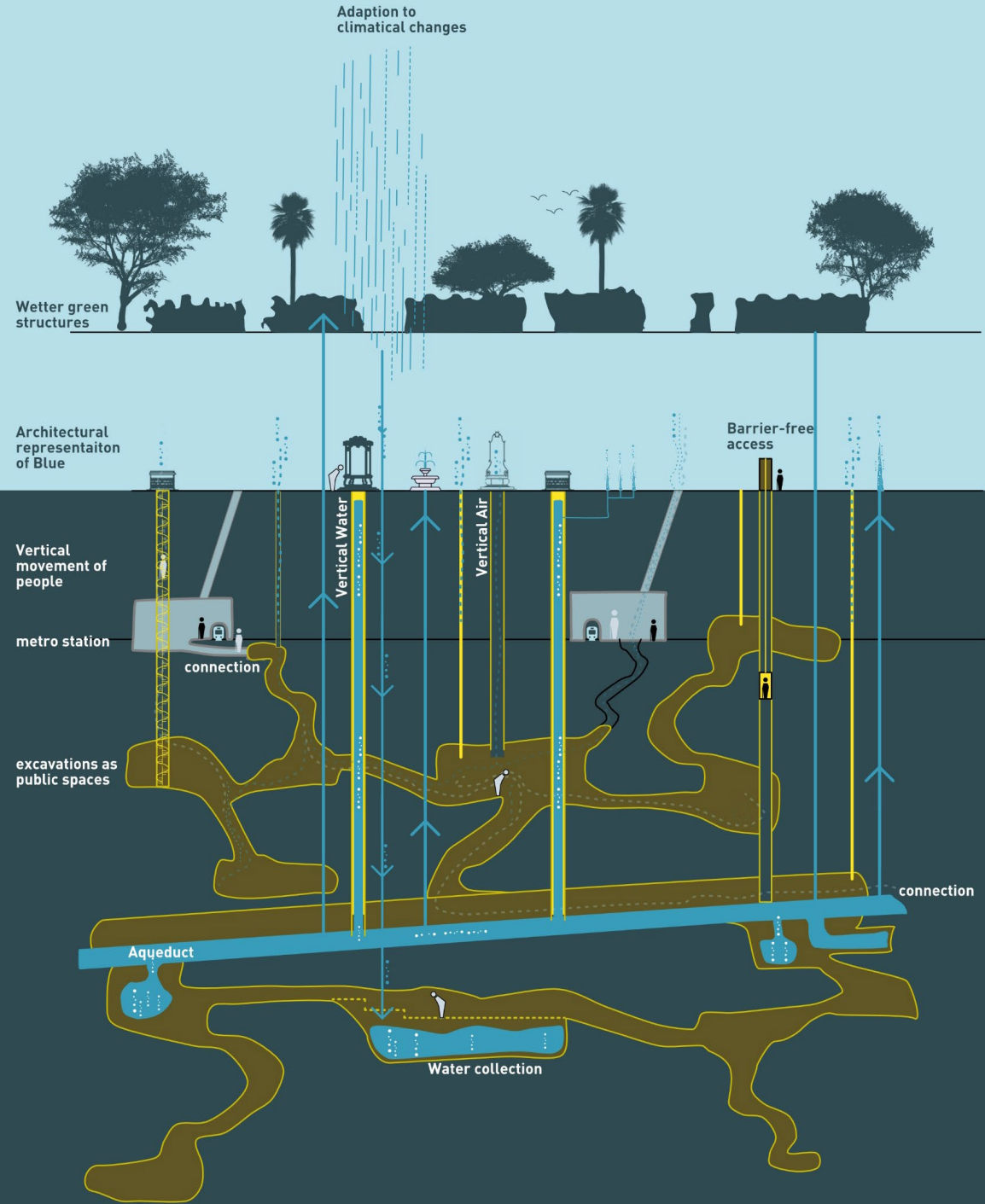


# Strategy





# Concept Vertical Blue





# Design Location: Porta Capuana

Entrance point of the Bolla Aqueduct and home to subterranean cavities



Google Maps (2024)

## Setting

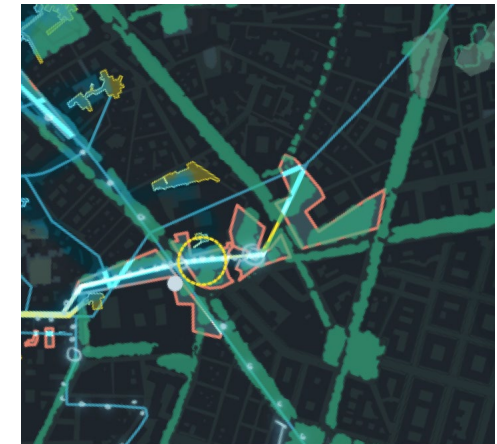


Aqueduct

Fountain

Excavations

## Strategy

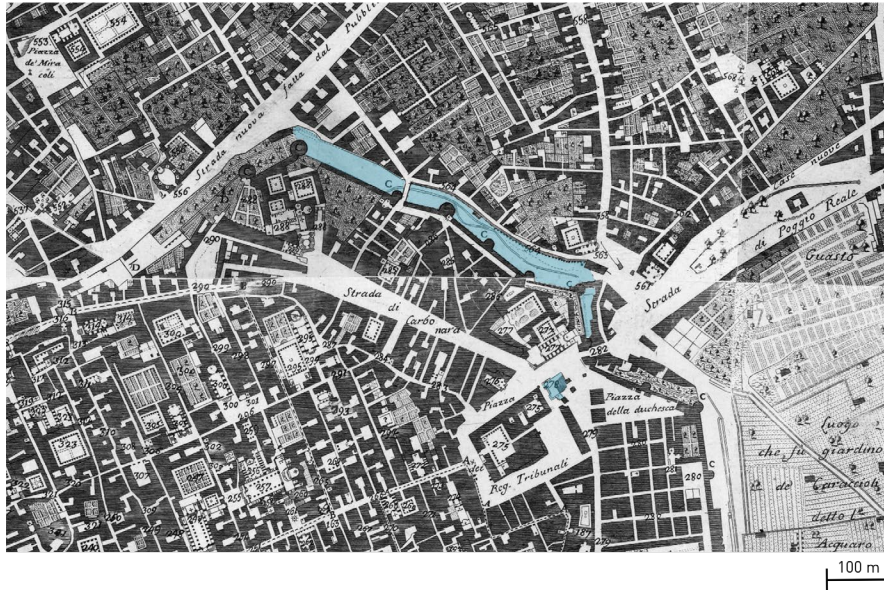




# Porta Capuana in the past



Map of Duca di Noja [1750]



Author unknown, Lithography, 1900



# Porta Capuana in the past



Google Earth (2007)



Berthold Werner, 2013



Scene out of the Documentary Film "Porta Capuana" by  
Marcello Sannino, 2018



# Porta Capuana today



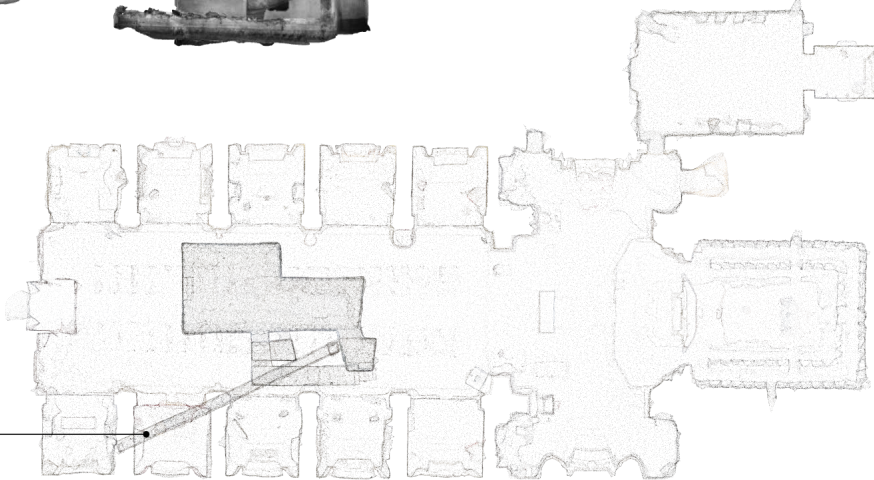


# Porta Capuana today





# Underground cavities



Arm of the Bolla  
Aqueduct

10 m



5 m

Church: Chiesa di Santa Caterina a Formiello + Bolla Aqueduct

Data provided by: LAN/CoolCity



# Current Setting Surface

- heavy traffic
- exposed to sunlight
- little shading
- lack of vegetation





# Current Setting Subsurface

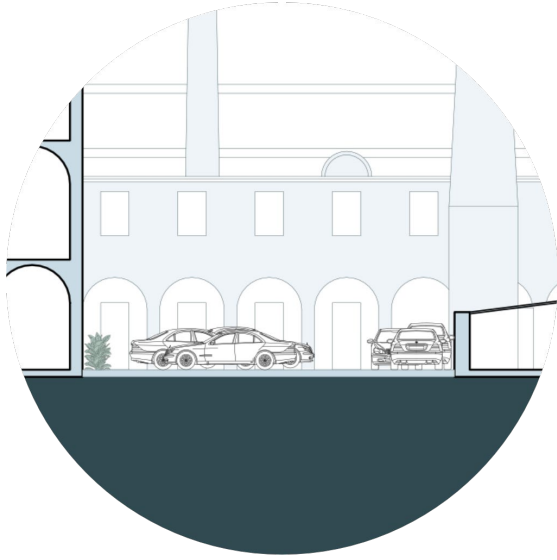


- public spaces exposed to subterranean structure
- relationship with green

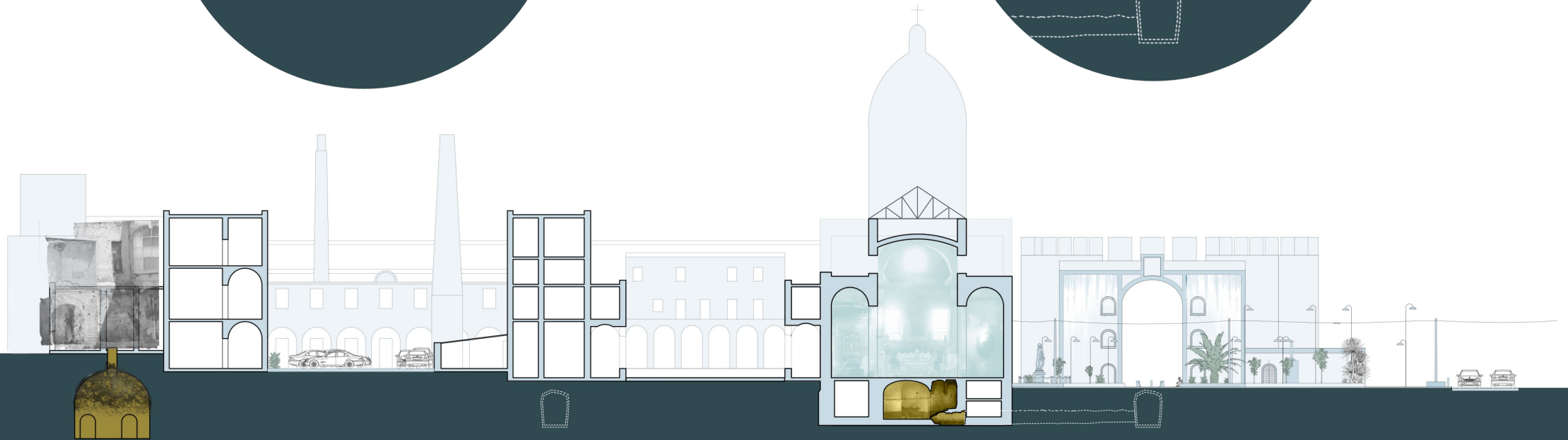
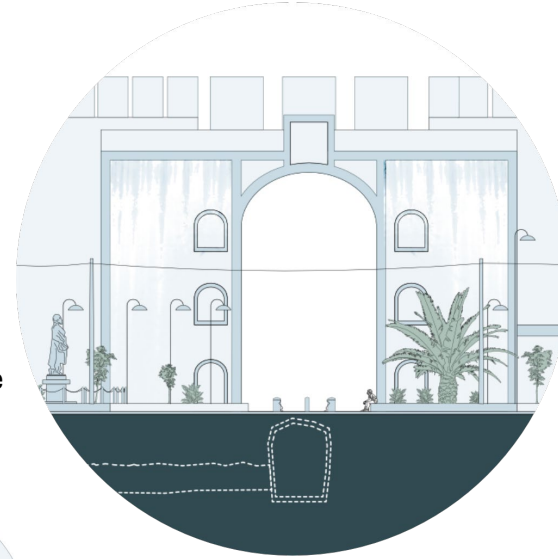


# Current Situation

Former cloister  
garden as parking lot



Abandoned  
entrance gate



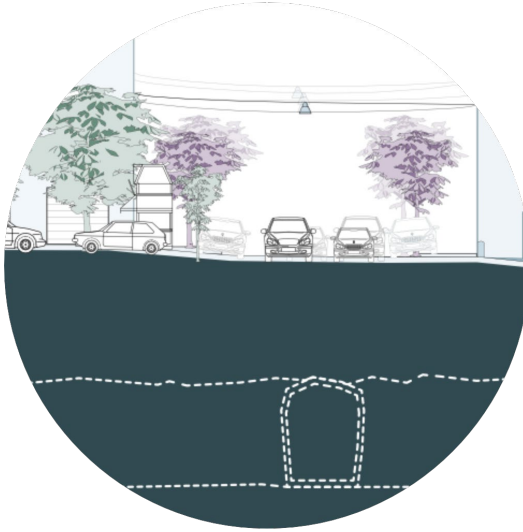
10 m



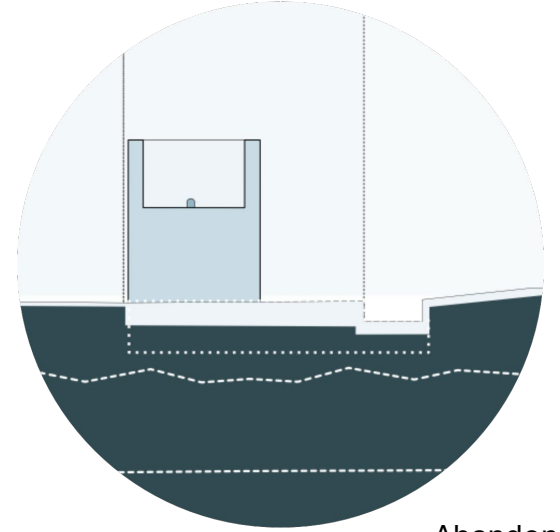
# Current Situation



Mainly car use



Busy streets



Abandoned water infrastructure



10 m

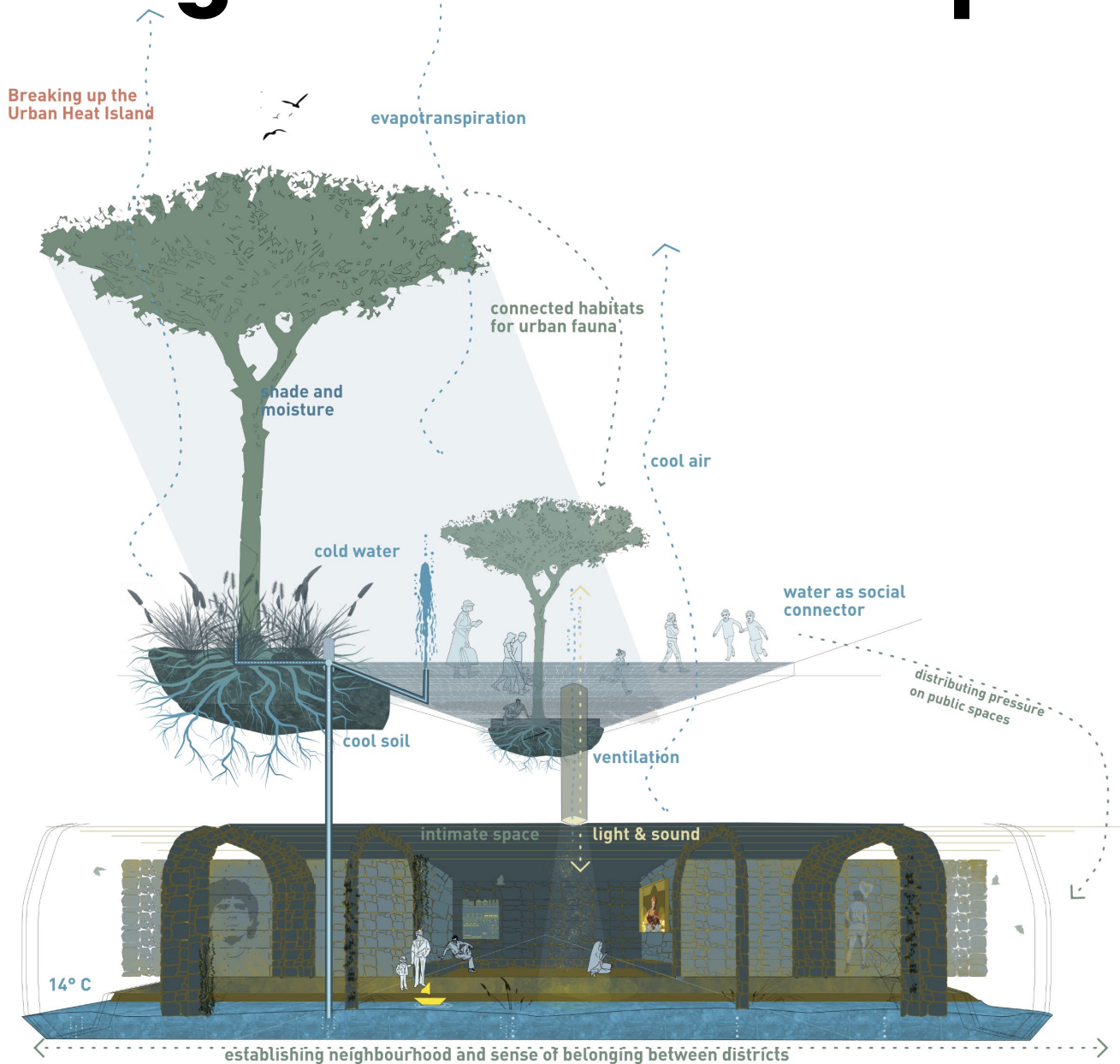


# Human scale





# Design of the Landscape Infrastructure



## Excavation Layer

Reactivating cisterns and aqueduct cavities as breathing, walkable underground corridors

## Water Layer

Juxtaposing vertical pipes and pumps to surface

## Architectural Layer

Embedding tactile micro-needling, reflective stone paving and subterranean access points to the subterranean

## Green Layer

Recover removed vegetation and cloister gardens with vertical water irrigation, tuff stone humidity and soft canopy trees to restore shade and ecology

## Social Layer

Transforming public space into shared urban living room along vertical and horizontal reach



# Masterplan Surface

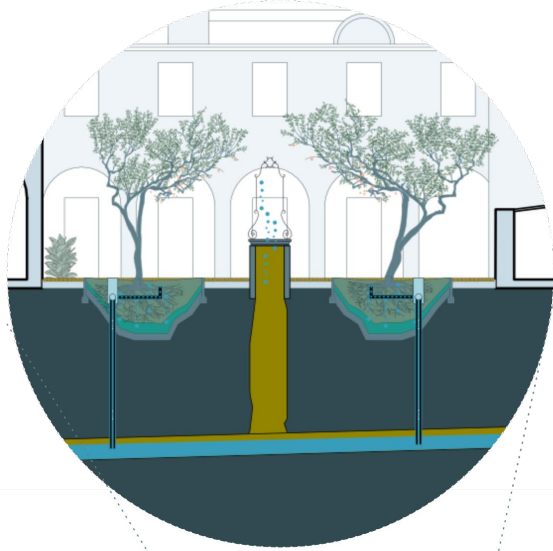




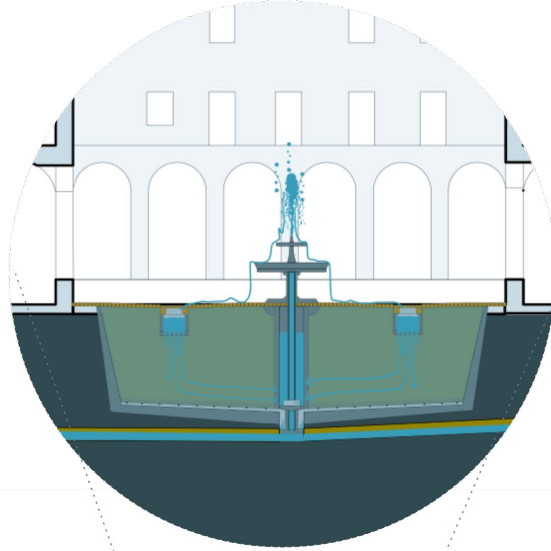
# Masterplan Subsurface



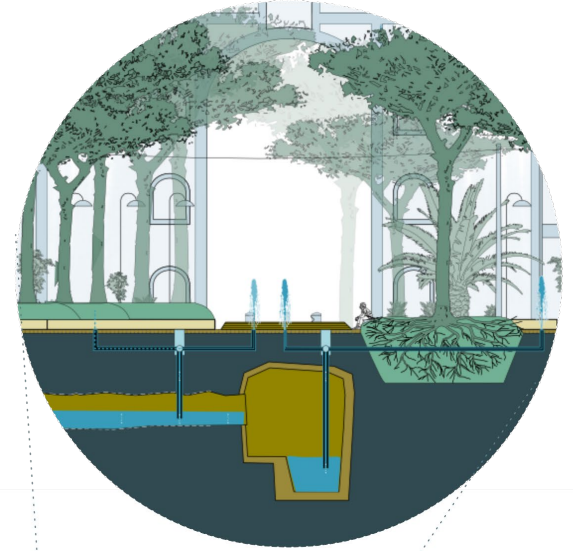
# Space Gradient



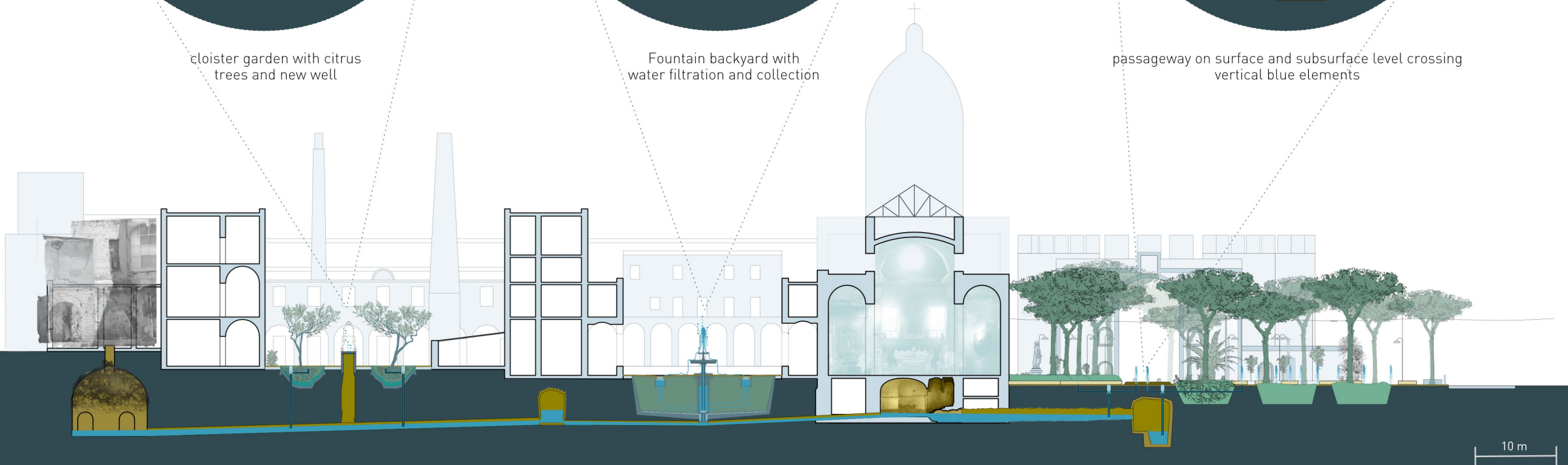
cloister garden with citrus trees and new well



Fountain backyard with water filtration and collection



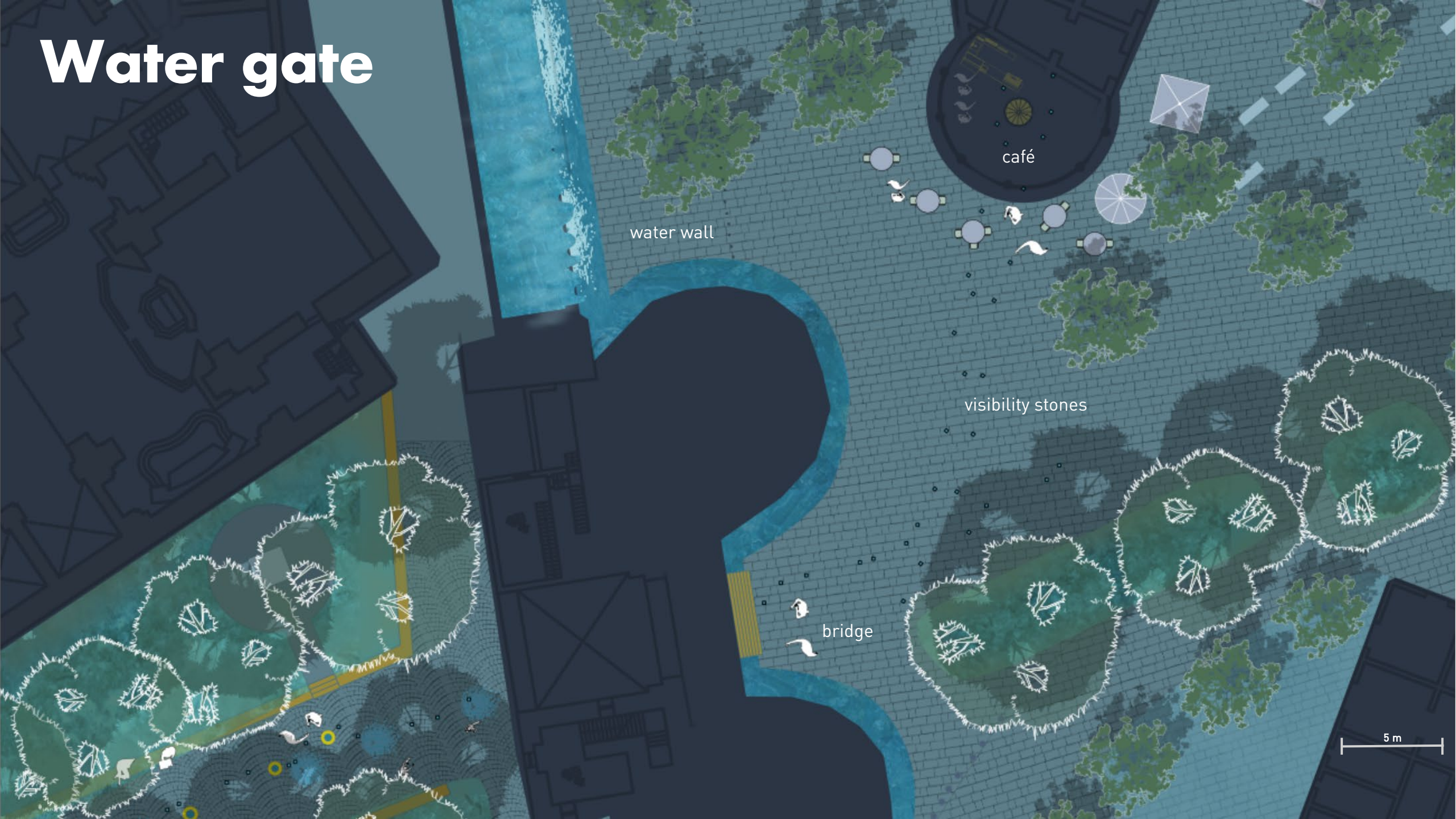
passageway on surface and subsurface level crossing vertical blue elements



10 m

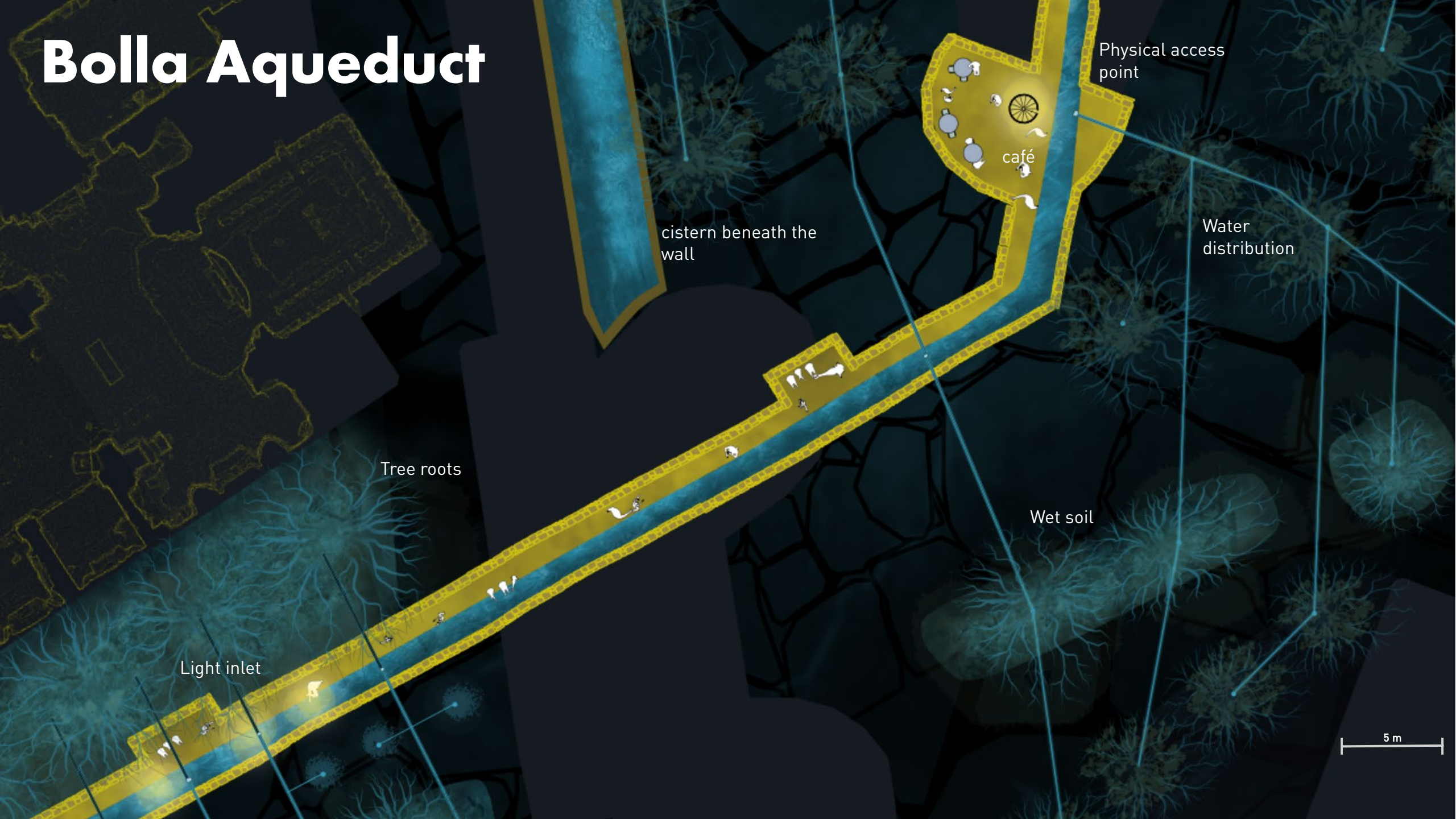


# Water gate



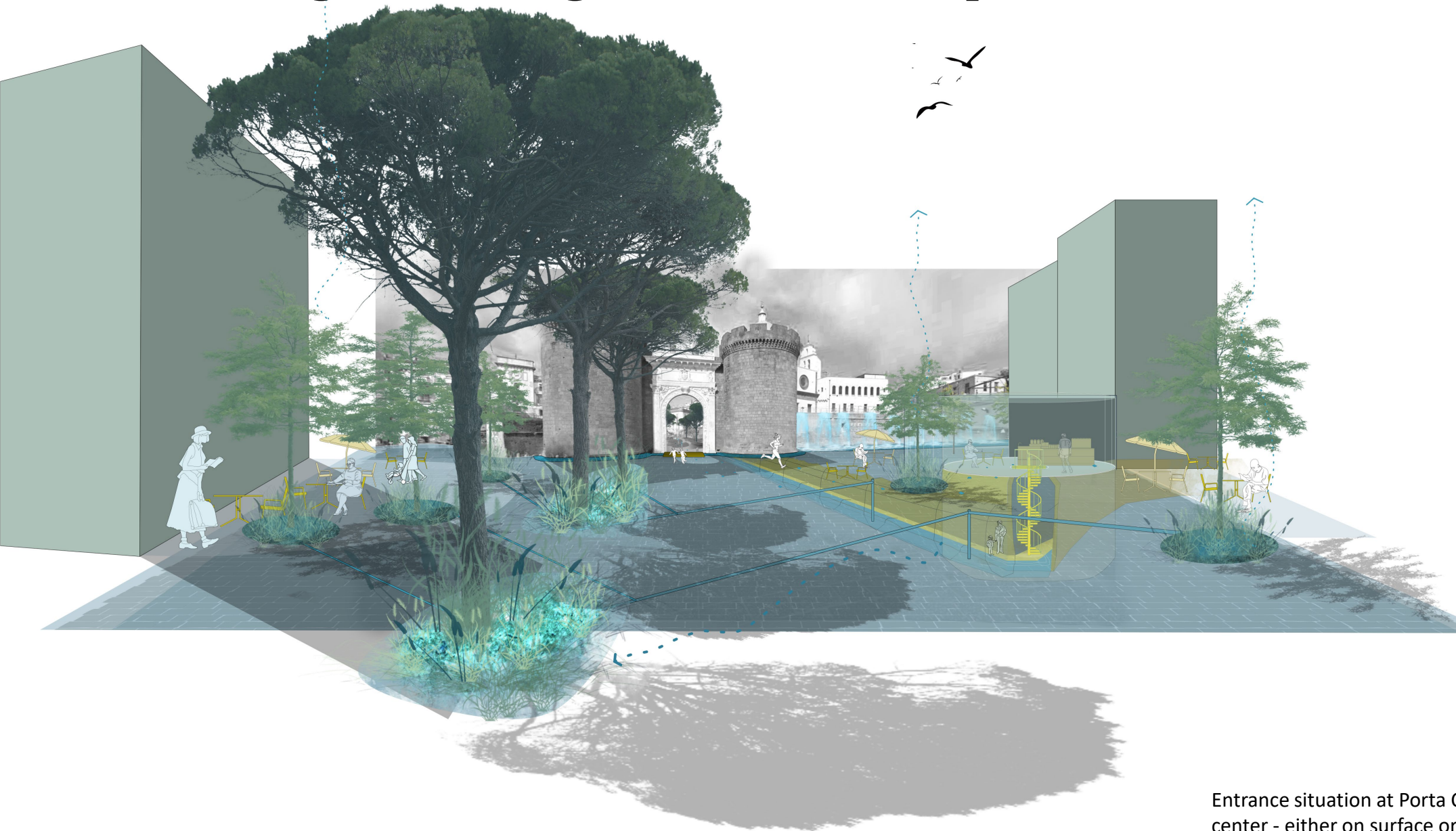


# Bolla Aqueduct





# Walking through Porta Capuana

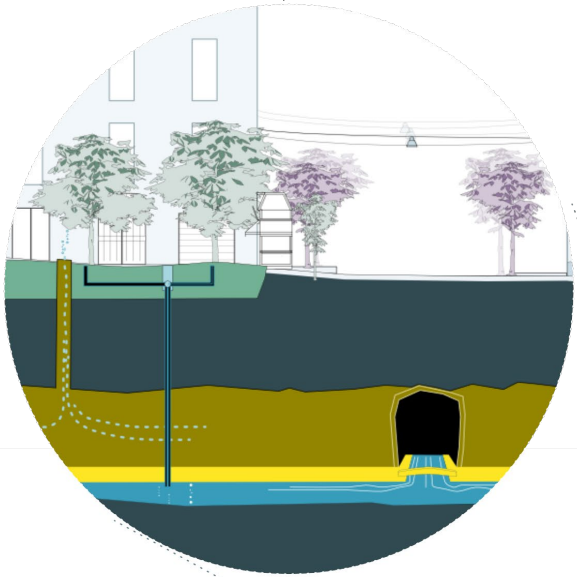


Entrance situation at Porta Capuana towards the city center - either on surface or subsurface

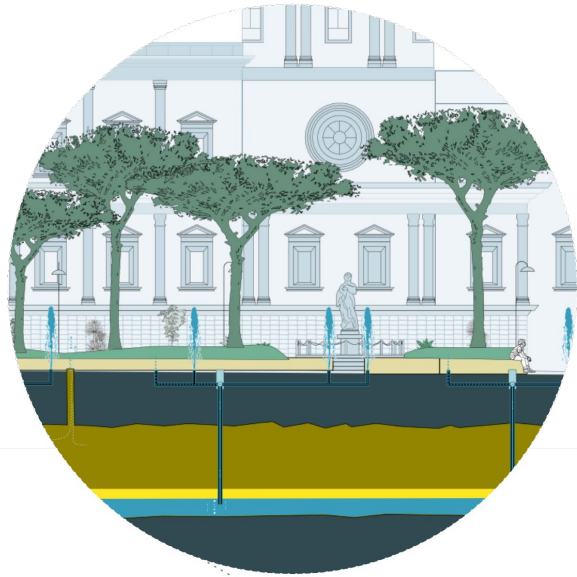


# Threshold to the Historic Center

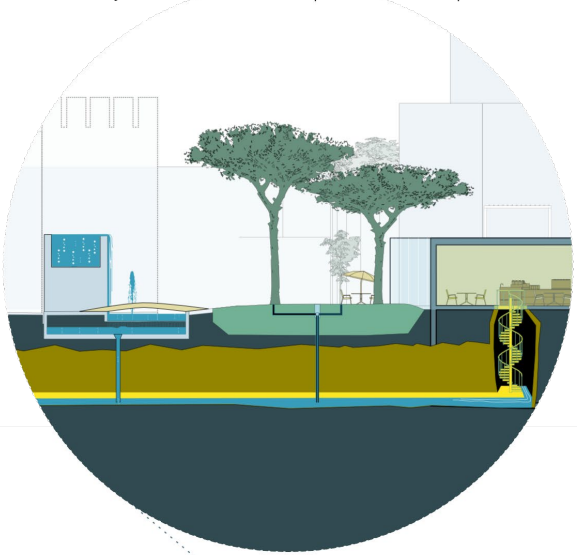
underground passage way  
over the aqueduct's water



waterplaza in front of the  
church



entrance situation honouring the former streams along  
the city walls and access point to the aqueduct



CITE  
moon stones from Pompeii



JUXTAPOSE  
water pumps



REACTIVATE  
aqueduct



TRANSFORM  
aqueduct into walkable  
structure



STAGE  
presence of the aqueduct  
through water line



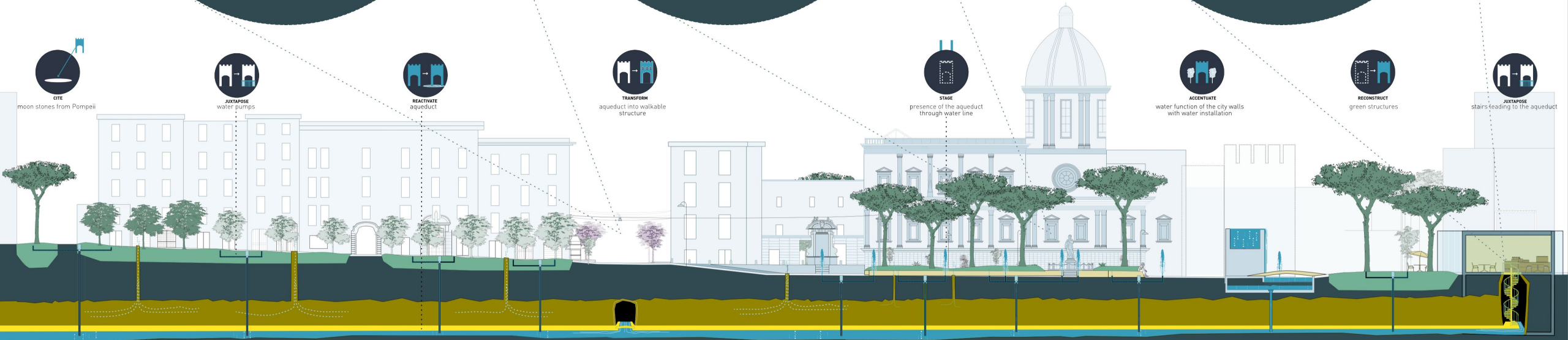
ACCENTUATE  
water function of the city walls  
with water installation



RECONSTRUCT  
green structures

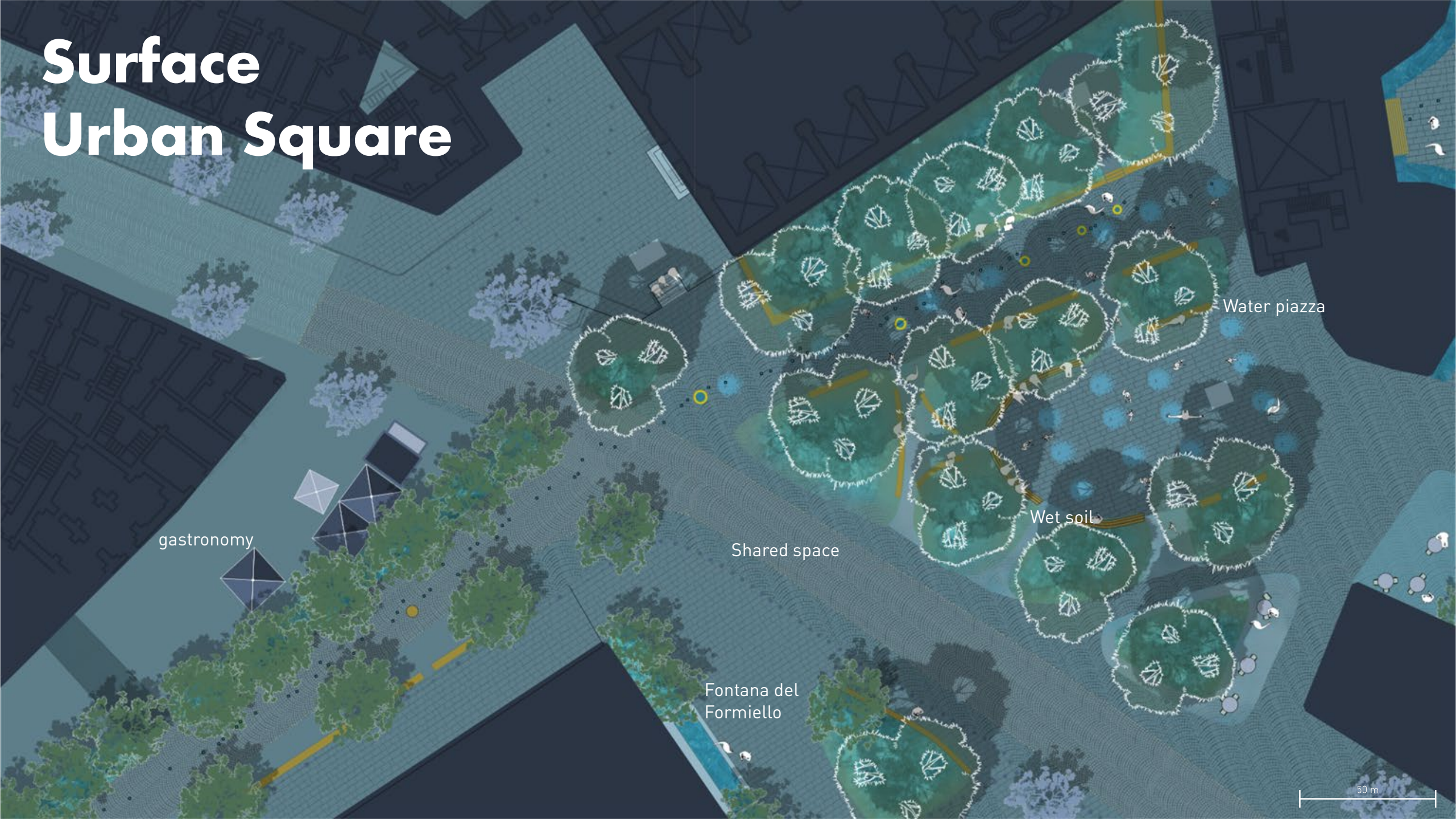


JUXTAPOSE  
stairs leading to the aqueduct





# Surface Urban Square



Water piazza

Wet soil

Shared space

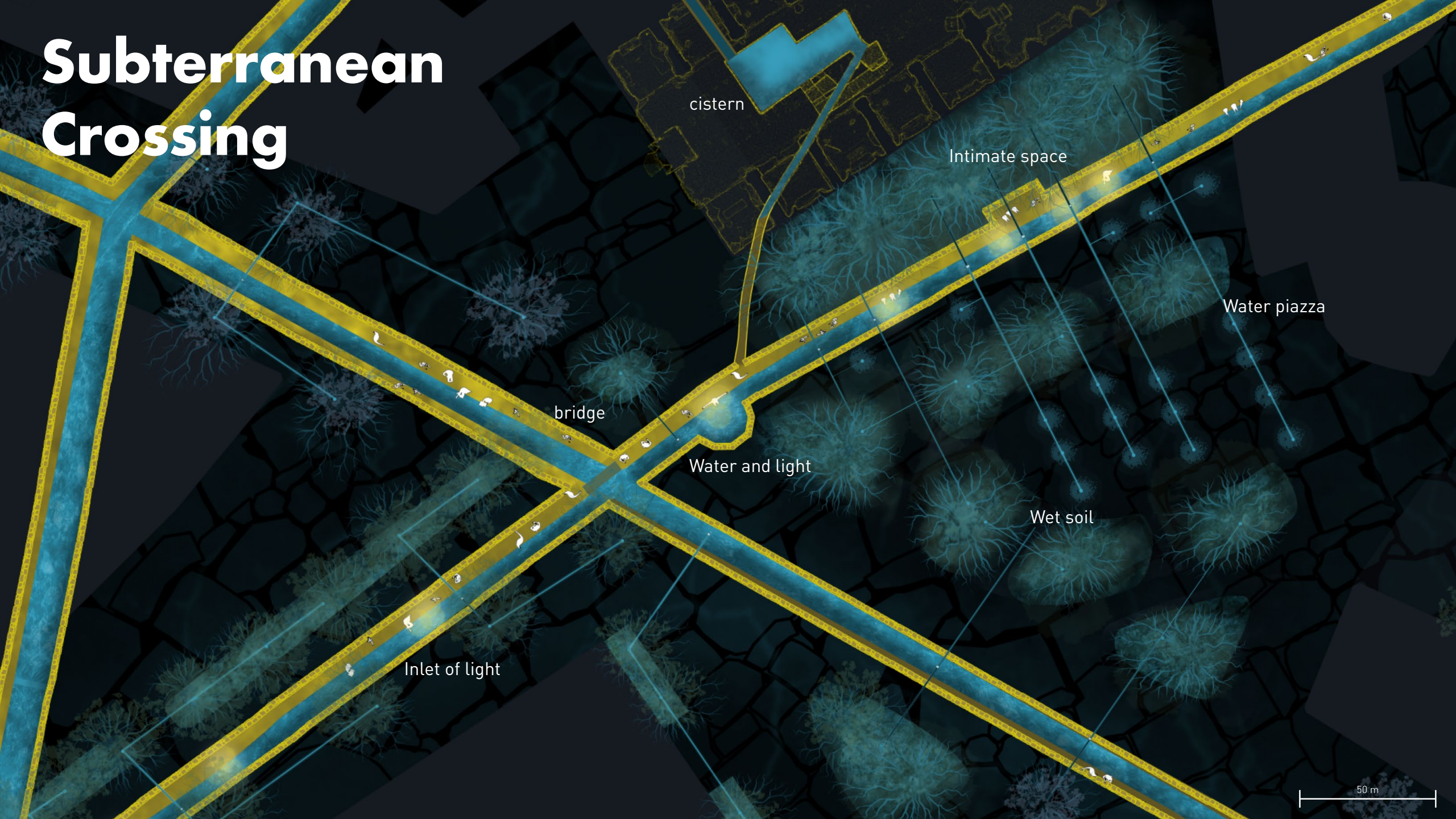
Fontana del  
Formiello

gastronomy

50 m



# Subterranean Crossing



cistern

Intimate space

Water piazza

bridge

Water and light

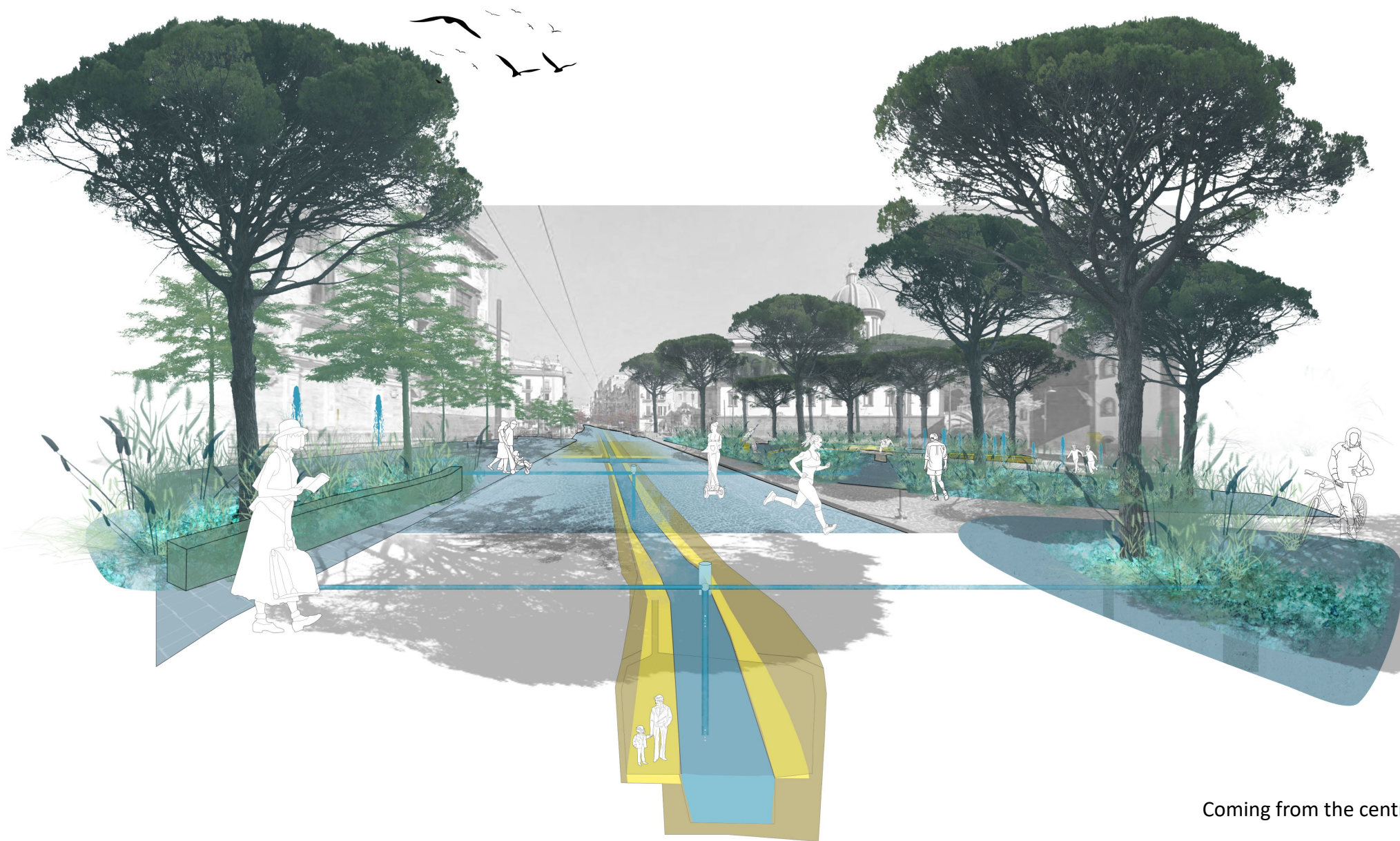
Wet soil

Inlet of light

50 m



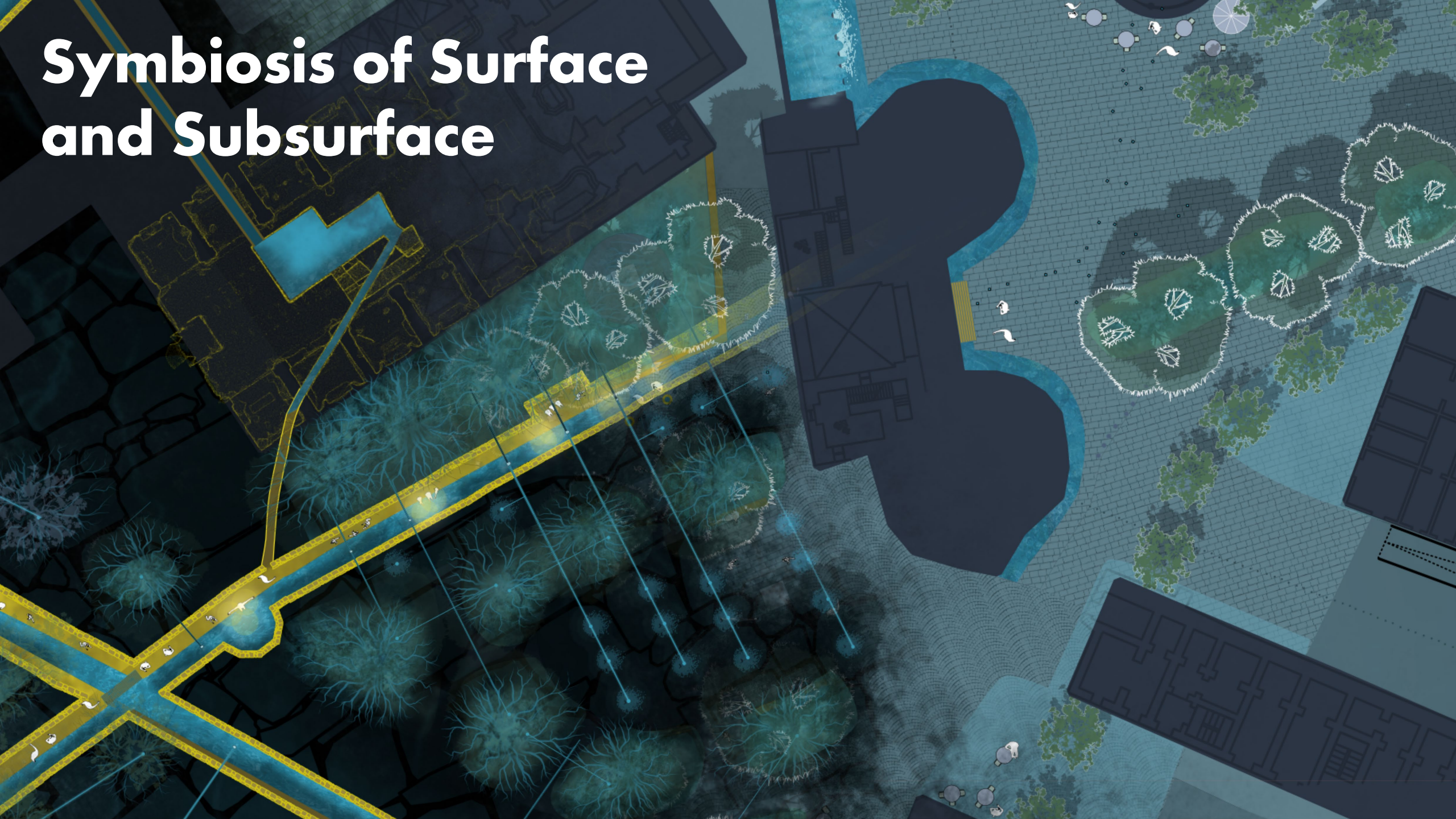
# Walking towards the water piazza



Coming from the central train station to Porta Capuana



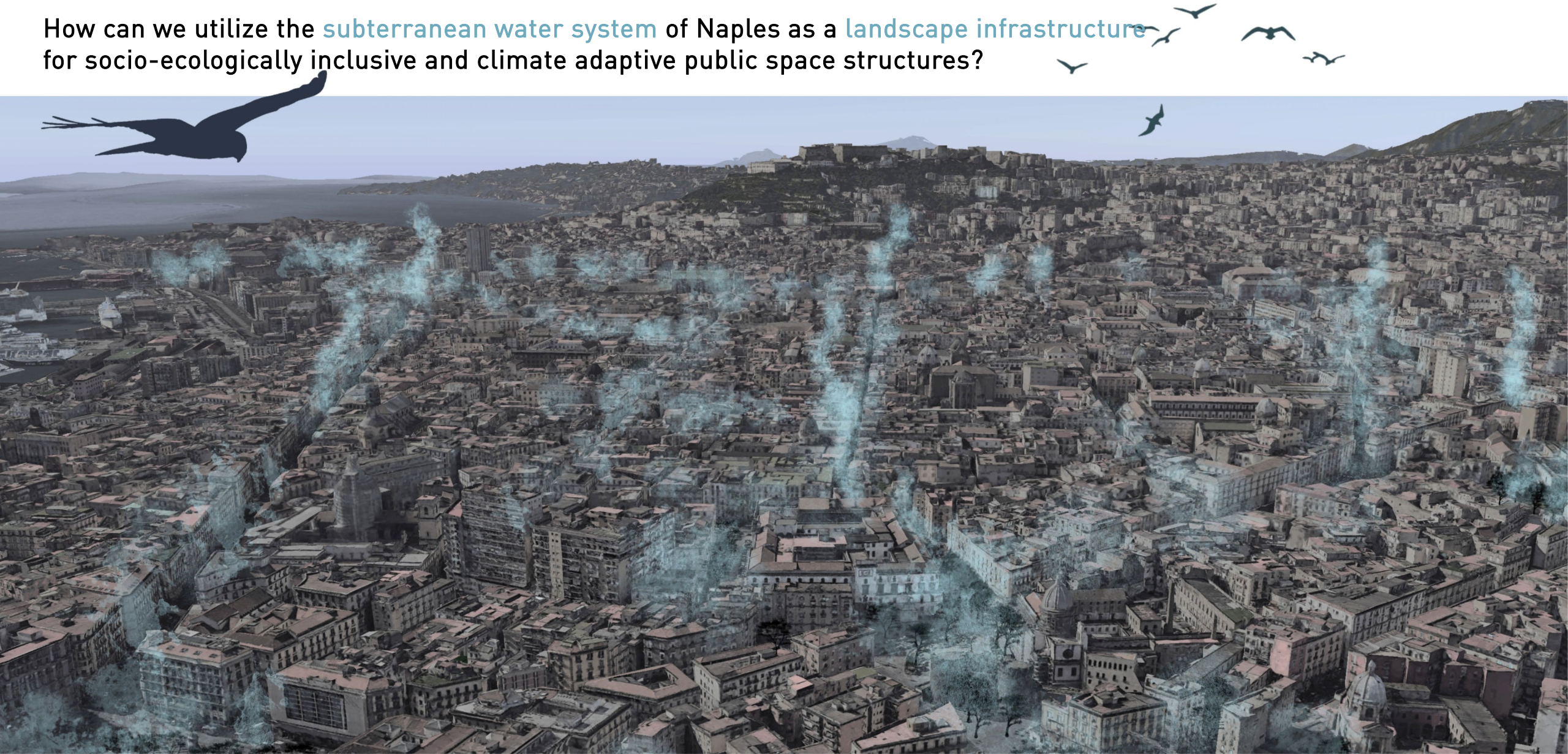
# Symbiosis of Surface and Subsurface





# Looking back

How can we utilize the **subterranean water system** of Naples as a **landscape infrastructure** for socio-ecologically inclusive and climate adaptive public space structures?





# Findings





# Learnings & Limitations





# Personal Reflection





Landscape is not just what we see, but what connects us to  
the past, to each other, and to the future.

