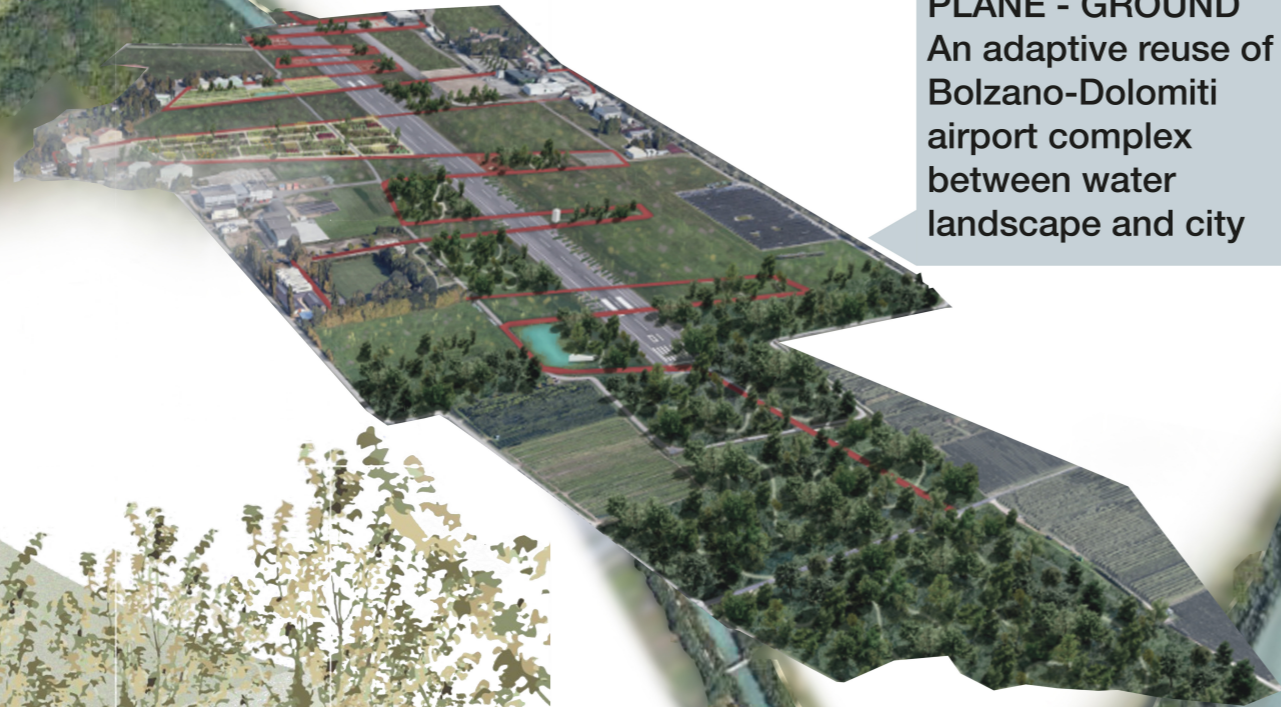


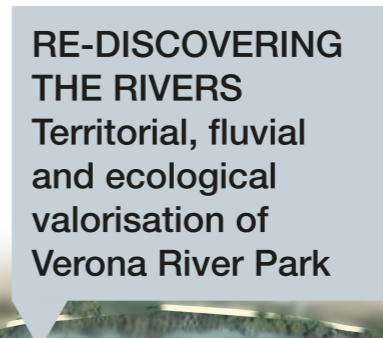
# LANDSCAPE BEYOND ENGINEERING



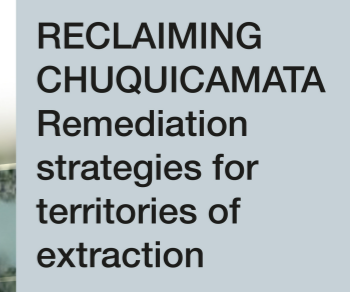
**TRENTINO ICE PARK**  
Adaptive design and parametric optimization of the skating oval in Baselga di Piné



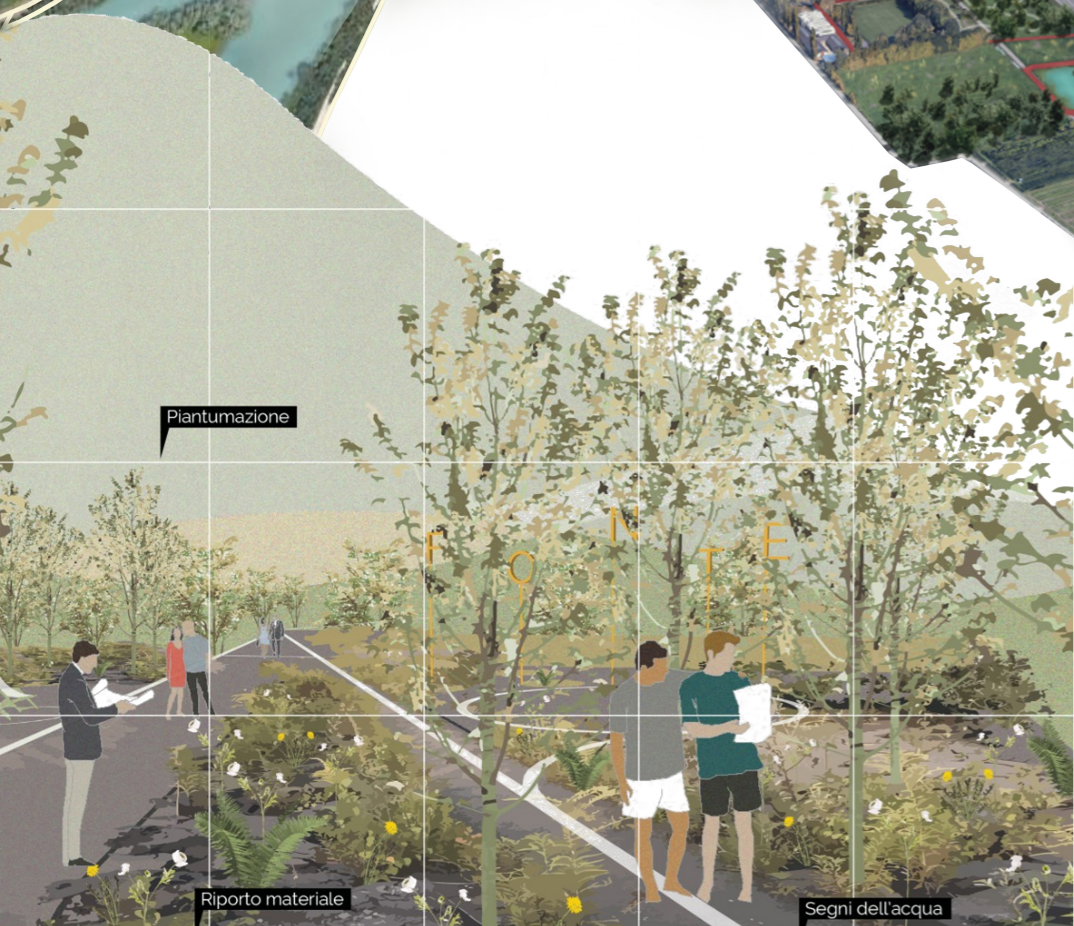
**PLANE - GROUND**  
An adaptive reuse of Bolzano-Dolomiti airport complex between water landscape and city



**RE-DISCOVERING THE RIVERS**  
Territorial, fluvial and ecological valorisation of Verona River Park



**RECLAIMING CHUQUICAMATA**  
Remediation strategies for territories of extraction



**DESIGNING ABANDONMENT**  
Strategies for conscious disposal and enhancement of Peio Fonti

**Country /City** ..... Italy / Trento  
**University / School** ..... University of Trento / Department of Civil, Environmental and Mechanical Engineering (DICAM) / Master Degree in Architecture and Building Engineering  
**Academic year** ..... 2019/2020 - 2020/2021 - 2021/2022  
**Title of the project** ..... Landscape Beyond Engineering  
**Authors** ..... Andrea Biotti, Elisa Brunelli, Giacomo Codroico, Erica Poli, Giulia Zantedeschi

## TECHNICAL DOSSIER

<b>Title of the project</b>	<b>Landscape Beyond Engineering</b>
<b>Authors</b>	Andrea Biotti, Elisa Brunelli, Giacomo Codroico, Erica Poli, Giulia Zantedeschi
<b>Title of the course</b>	Master Thesis in Architecture and Building Engineering
<b>Academic year</b>	2019/2020 - 2020/2021 - 2021/2022
<b>Teaching Staff</b>	Prof. Sara Favargiotti, Prof. Lucia Simeoni, Prof. Diego Misseroni, Prof. Ivan Giongo, Prof. Alessandra Marzadri, Prof. Guido Zolezzi
<b>Department / Section / Program of belonging</b>	Department of Civil, Environmental and Mechanical Engineering (DICAM) / Master Degree in Architecture and Building Engineering
<b>University / School</b>	University of Trento



### Written statement, short description of the project in English, no more than 250 words

Quarry, ice rink, airport, intermodal hub, river represent different (infra)structures which have had a significant impact on the landscape. Landscape architects can be engaged in the transformation of these (infra)structures, mitigating and remediating the adverse environmental impacts as well as designing new landscapes. The projects focused on ecological and regenerative design to address environmental, climatic and social challenges that impact and transform urban and natural habitats. With an interdisciplinary and transcalar methodological approach based on design experimentation, the projects develop research through design that interlinks the disciplines of architectural, urban and landscape design with climate, hydrological, ecological and geotechnical engineering. New forms of design and planning have been experimented to promote the development of diversified environments and new habitats. Within each specificity, the projects investigate innovative and effective tools and methods that can ensure quality redevelopment with a regenerative perspective, enabling aesthetic and performance enhancement as well as generating transformation processes that are more sensitive to the environmental and social context. Over time, nature will have to re-appropriate its own spaces, preserving and adapting the pre-existing ones to the new uses of the areas. This can be achieved by depaving and re-naturalising the areas, with the introduction of native species that can guarantee the biodiversity of the area and generate new habitats not only for the vegetation but also for the local animals. Landscape Beyond Engineering offers a new narrative and operational approach to enhance a more equal and just human-nature interdependence and cohabitation.

For further information

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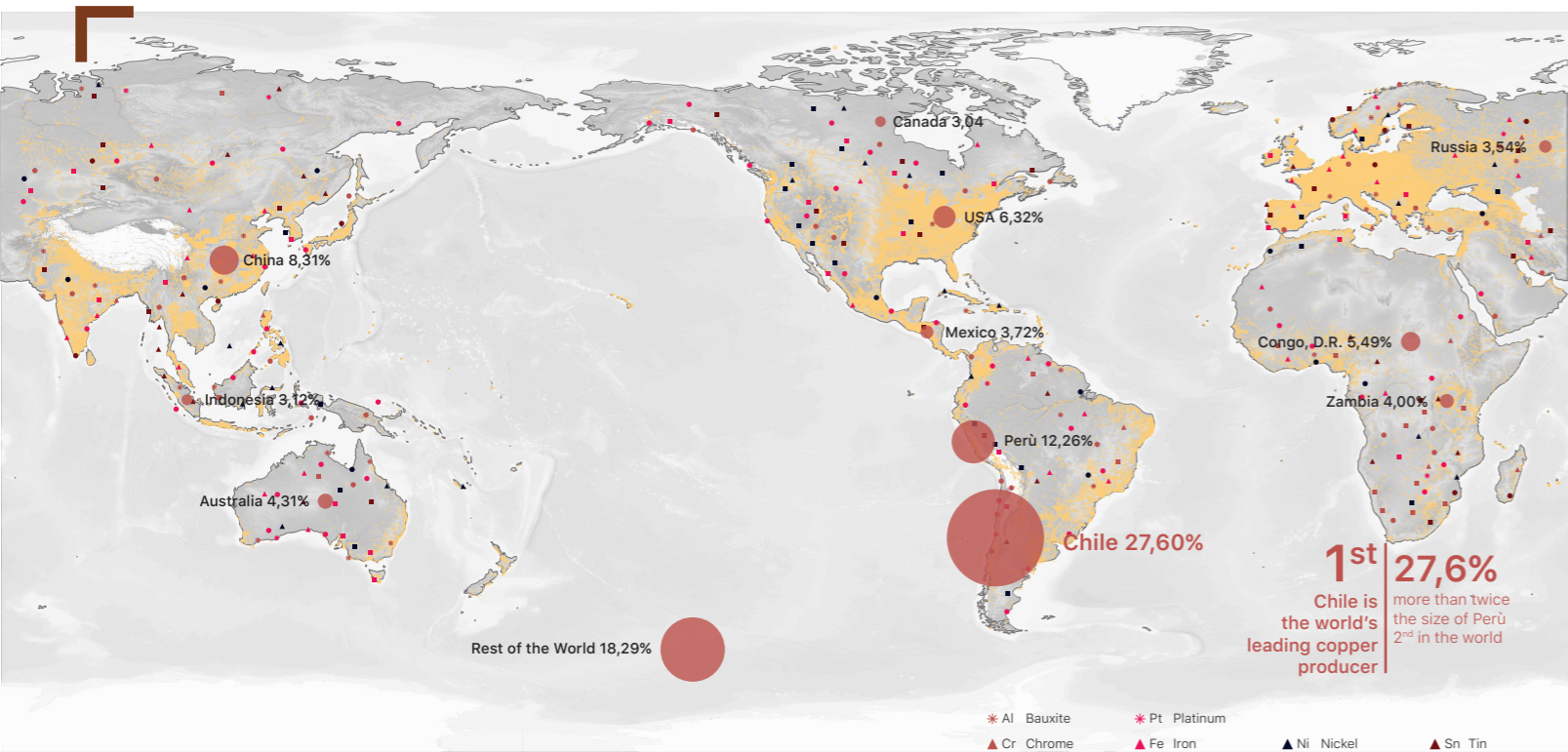
COAC - Colegi oficial d'Arquitectes de Catalunya

Carrer Arcs, 1-3  
08002 Barcelona - Spain

**12th International Biennial Landscape Barcelona**

**Barcelona November 2023**

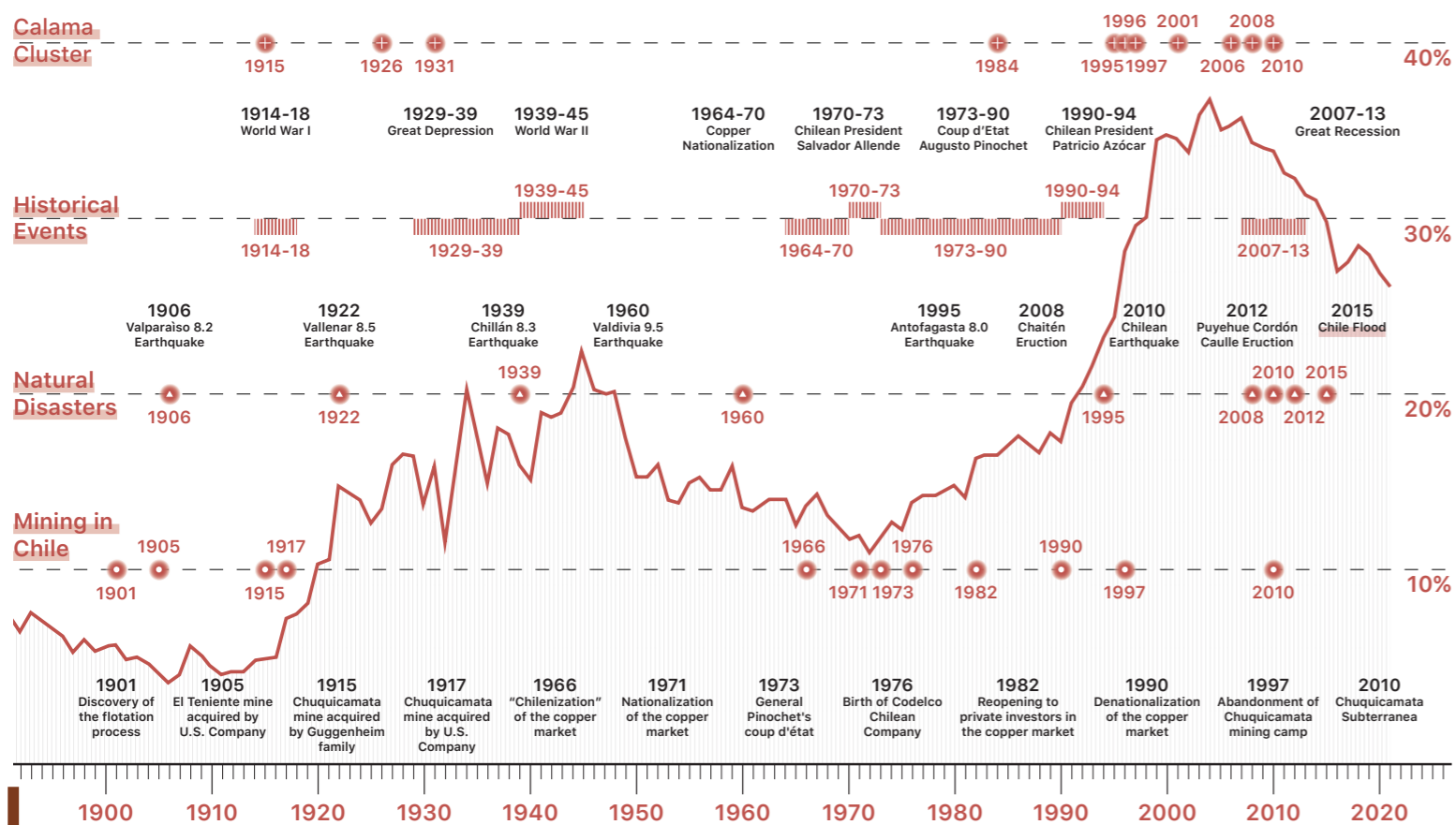
**SCHOOL PRIZE**



**World Copper Production & Main Metals Extraction Sites**



**Chilean Antofagasta Region | Calama Mining Cluster Timeline**



**Chilean Antofagasta Region | Calama Cluster Extraction Sites**

01. EL ABRA
02. RADOMIRO TOMIC
- 03. CHUQUICAMATA**
04. MINISTRO HALES

**CALAMA OASIS**  
high-level biodiversity

05. MARIA ELENA

**EL LOA RIVER**  
440 km length

06. PEDRO DE VALDIVIA

07. SPENCE

**CALAMA**  
2.260 m.a.s.l.  
145.000 inhabitants

**ANTOFAGASTA**  
40 m.a.s.l.  
300.000 inhabitants

08. SIERRA MIRANDA

09. MINERA CENTINELA

10. MINA ESCONDIDA

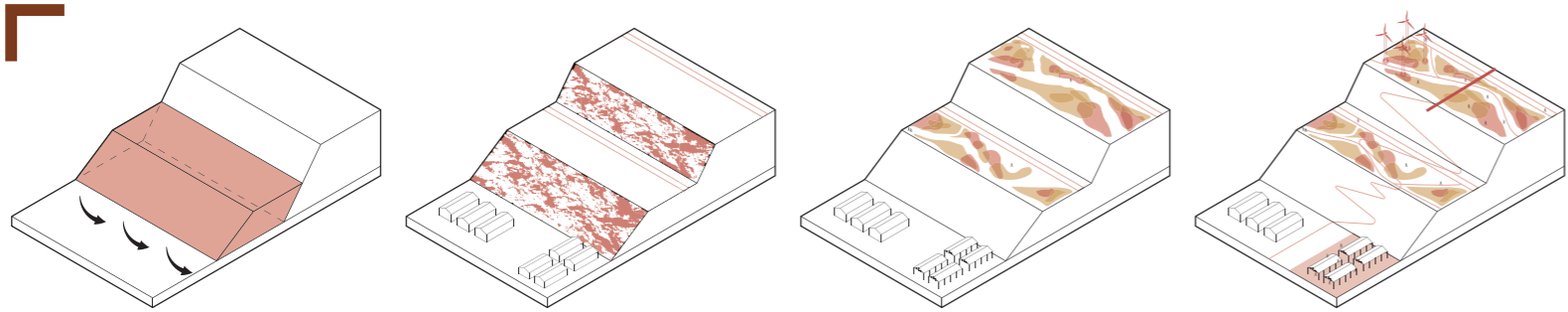
11. GABRIELA MISTRAL

12. SALAR DE ATACAMA

**Reclaiming Chuquicamata**  
Remediation Strategies for Territories of Extraction

Andrea Biotti





### 1. INCREASE SF

Use of new tailings to decrease the slope of the most inclined and break-prone sections

### 2. STABILIZE

Surface drainage system and grafting of plant species suitable for stabilizing the outermost layer of tailings

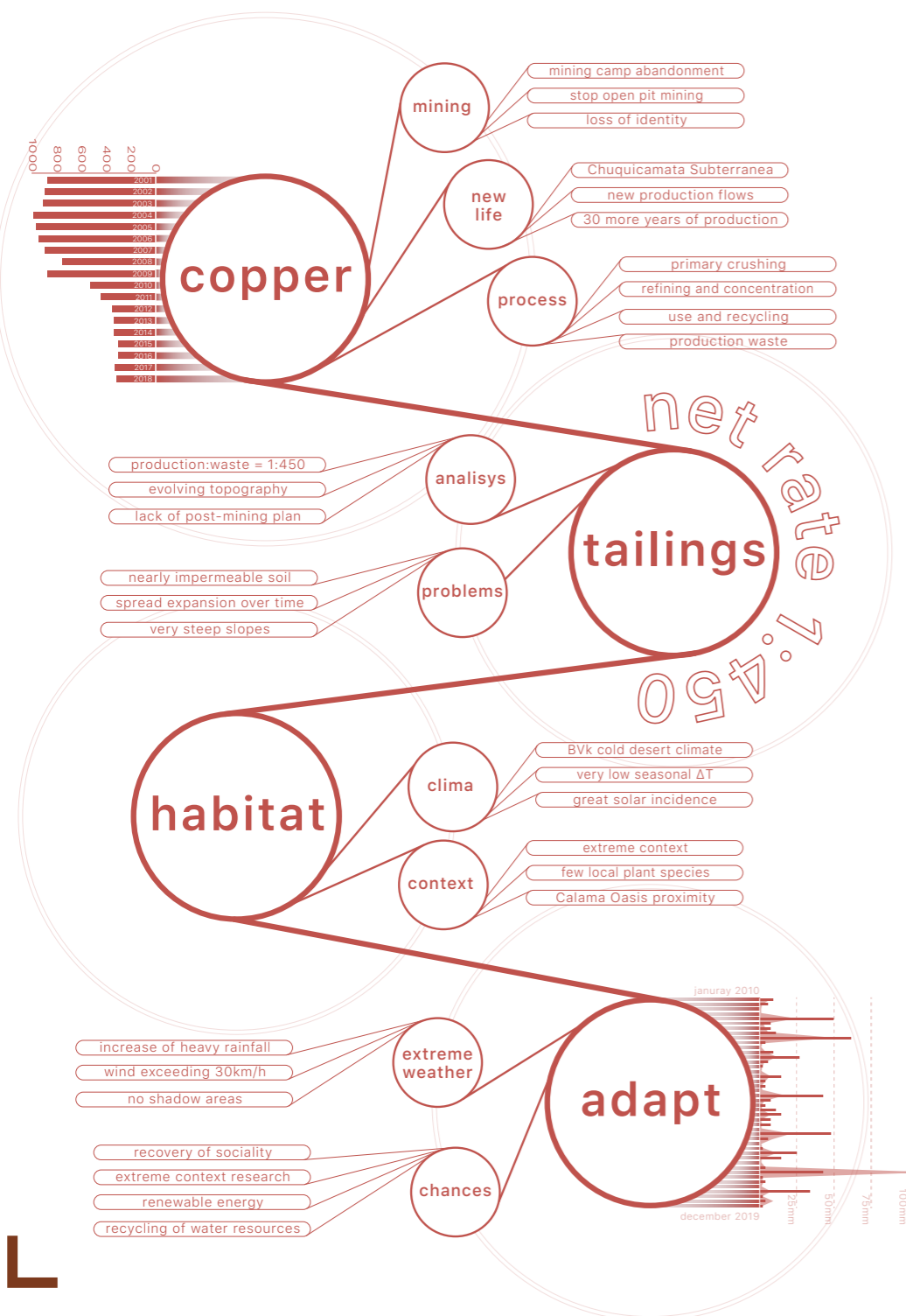
### 3. REMEDIATE

Grafting of suitable plant species to degrade, immobilize, or extract contaminants present using phytotechnological techniques

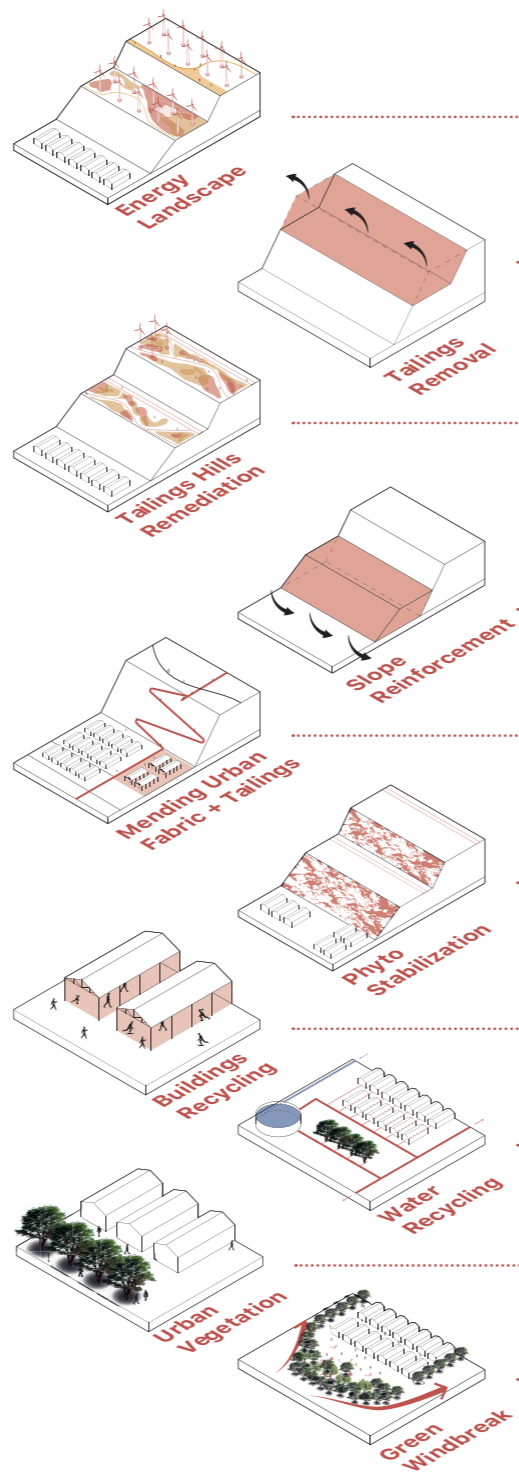
### 4. VALORIZE

New functional program on the tailings hills and in the town, to enhance the existing heritage and reconnect it to the urban environment

## Chuquicamata Site&Adaptation Analysis



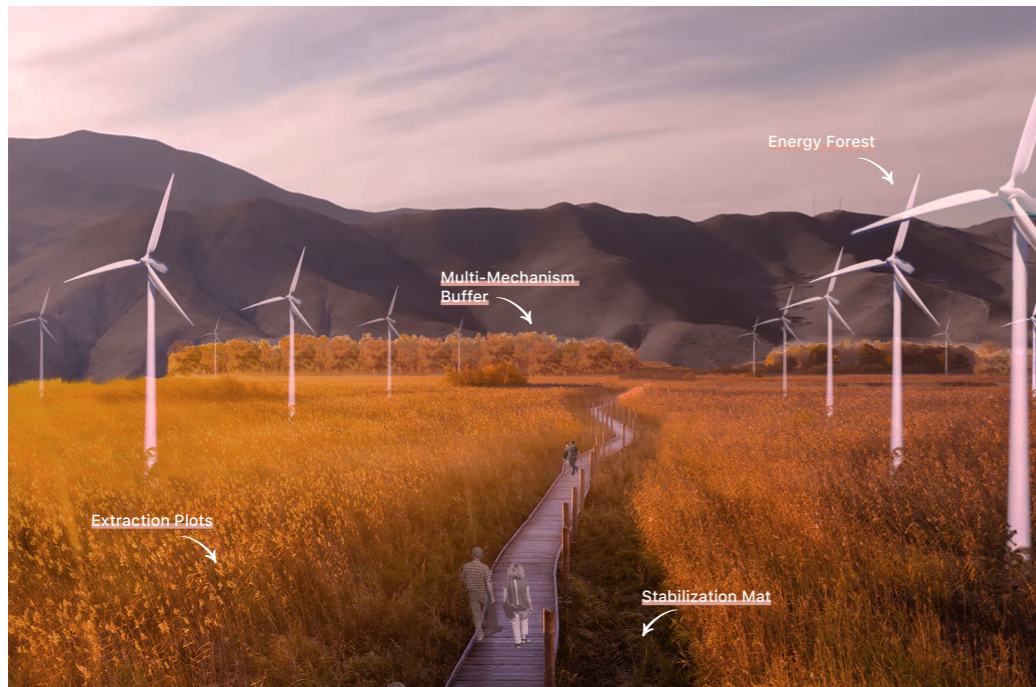
## Climate Adaptation Strategies



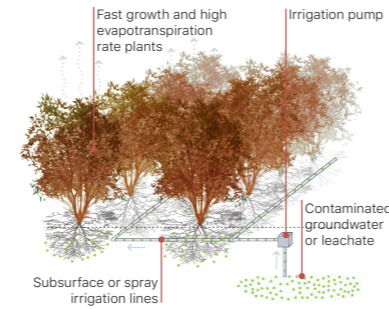
0 250m 500m 1km

## RECLAIMING CHUQUICAMATA Masterplan

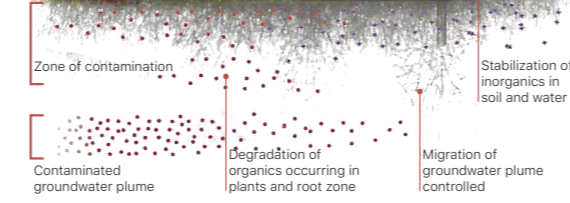
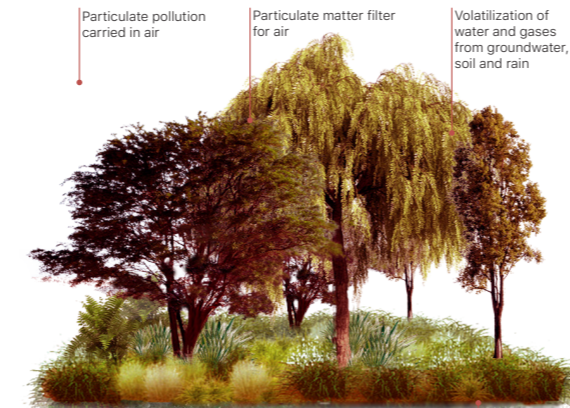




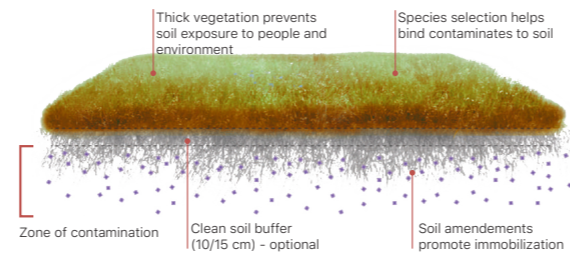
### Phyto-Irrigation



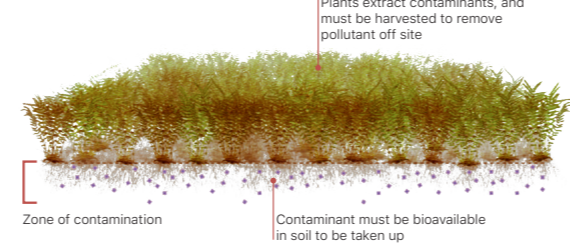
### Multi-Mechanism Buffer



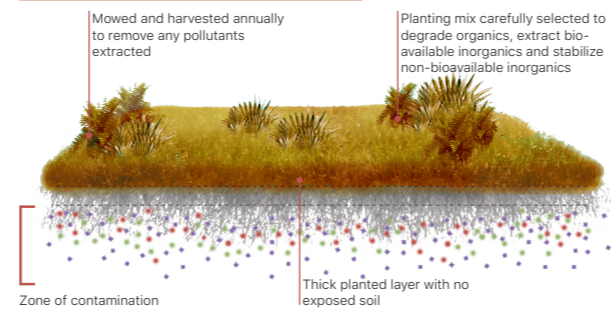
### Phyto-Stabilization Mat



### Extraction Plots



### Multi-Mechanism Cover



### Phyto-Technologies

- Phyto-extraction
- Phyto-stabilization
- Phyto-metabolism
- Phyto-degradation
- Evapotranspiration
- Rhizo-degradation

### Planted species

#### Trees

- Acacia Cyanophylla [Cu]
- Acacia Macracantha [Cu, Mb]
- Acacia Melanoxylon [Cu, Mb]
- Caesalpinia Spinosa [As, Zn]
- Casuarina Equisetifolia [Cu]
- Cupressus Macrocarpa [As, Mb]
- Ficus Goldmanii [Cu, Zn]
- Juniperus Flaccid [Cu, Zn]
- Populus Euphratica [As, Mb, CO, CD]
- Prosopis Alba [As, Cu, Mb]
- Prosopis Chilensis [As, Cu]
- Prosopis Tamarugo [Cu, Zn]
- Schinus Molle [As, Cu, Zn]
- Schinus Polygamus [As, Mb, Zn]

#### Shrubs

- Baccharis Juncea [As, Cu, Mb, CO]
- Baccharis Neglecta Britt. [As, CO]
- Baccharis Sarothroides [As, CO]
- Corradieria Atacamensis [As, Cu, Mb]
- Jathropa Curcas L. [Cu, Zn]
- Lycium Humile [As, Cu]
- Pityrogramma Calomelanos [As]
- Pteris Longifolia [As, Mb]
- Serenoa Repens [CO, CD]

#### Herbaceous

- Agrostis Tenuis [As, Cu, Mb, Zn, CO]
- Amaranthus Hypochondriacus [As, Zn]
- Bidens Humilis H.B.K. [As, Cu, Mb, Zn]
- Dryopteris Filix-mas [As, Mb]
- Paspalum Notatum [CO, CD, PM]
- Phacelia Brachyanta [As, CO]
- Phaseolus Vulgaris [As, Zn, CO, PM]
- Senecio Sp. [As, Zn, V]
- Tagetes Multiflora [As]

#### Bulbs

- Atriplex Atacamensis [As, Cu, Mb, Zn, CO]
- Atriplex Deserticola [As, Cu, Mb, Zn, CO]
- Atriplex Halimus [As, Cu, Mb, Zn, CO]
- Atriplex Nummularia [As, Cu, Mb, Zn, CO]
- Baccharis Salicifolia [Cu, CO, PM]
- Tessaria Absinthioides [As, Cu]

#### Annuals

- Atriplex Helianthus [As, Cu, Mb, Zn, CO]
- Atriplex Melanoxylon [As, Cu, Mb, Zn, CO]
- Atriplex Semibaccata [As, Cu, Mb, Zn, CO]
- Distichlis Spicata [As, Cu, Mb]
- Guardiola Tulocarpus [Cu, Zn]
- Helianthus Sp. [As, Mb]

### PHASE 1 - 2022

Safety Factor Increase

### PHASE 2 - 2025

Phyto-technologies

### PHASE 3 - 2035

Activation

### PHASE 4 - 2045

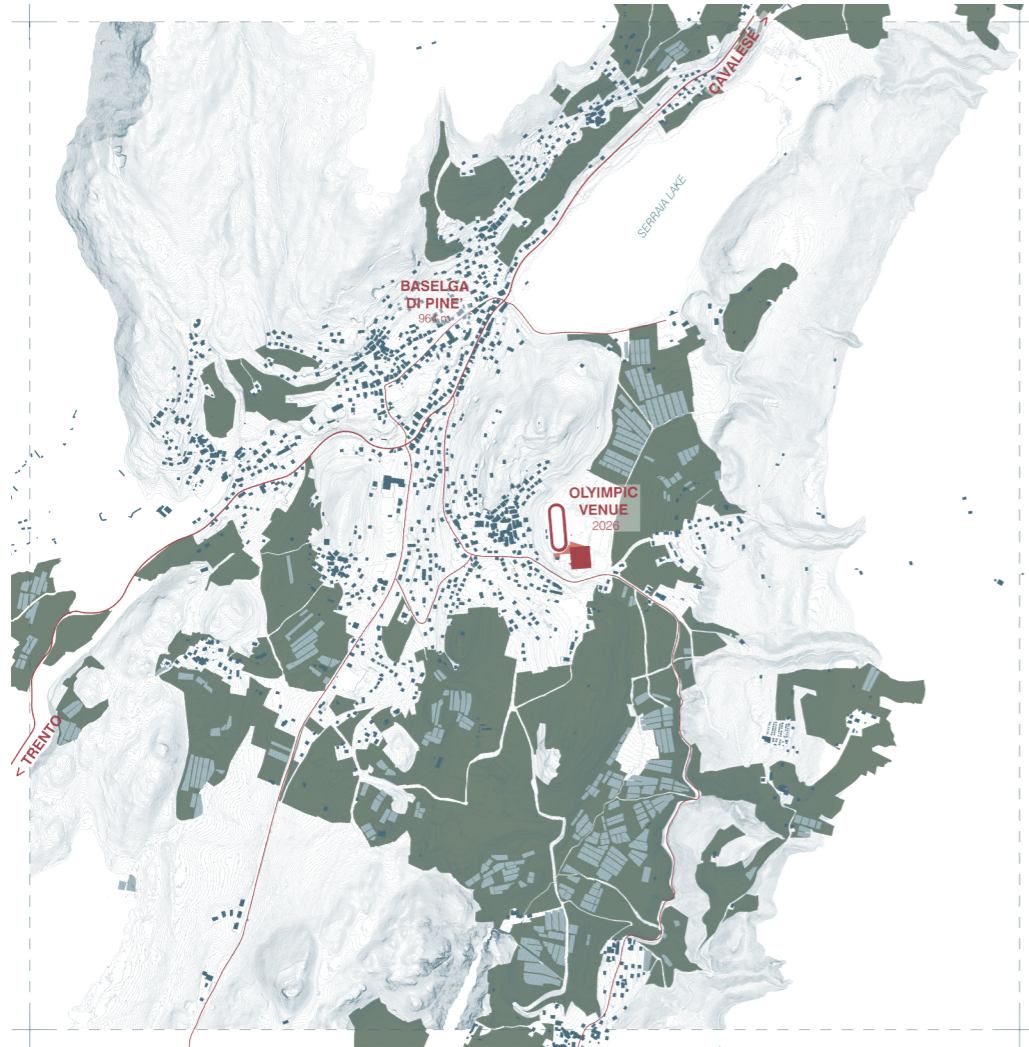
Transition

### PHASE 5 - 2050

Reclaimed Chuquicamata

2055

Mining Activities Closure

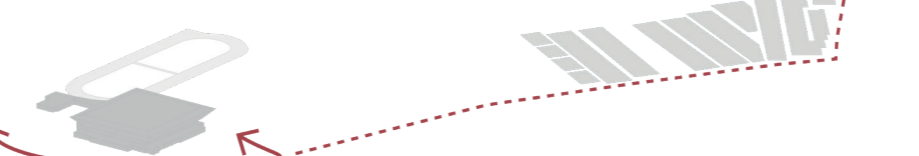


### LANDSCAPE SYSTEMS

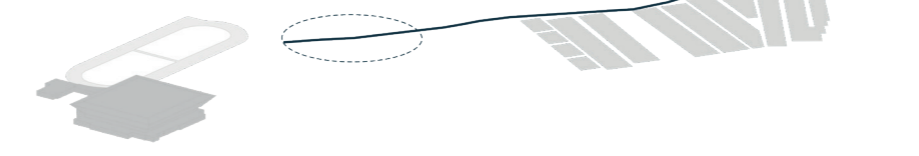
greenhouses  
orographic limit



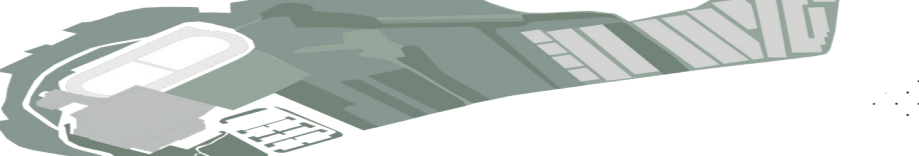
Accesses



blue infrastructure



green infrastructure

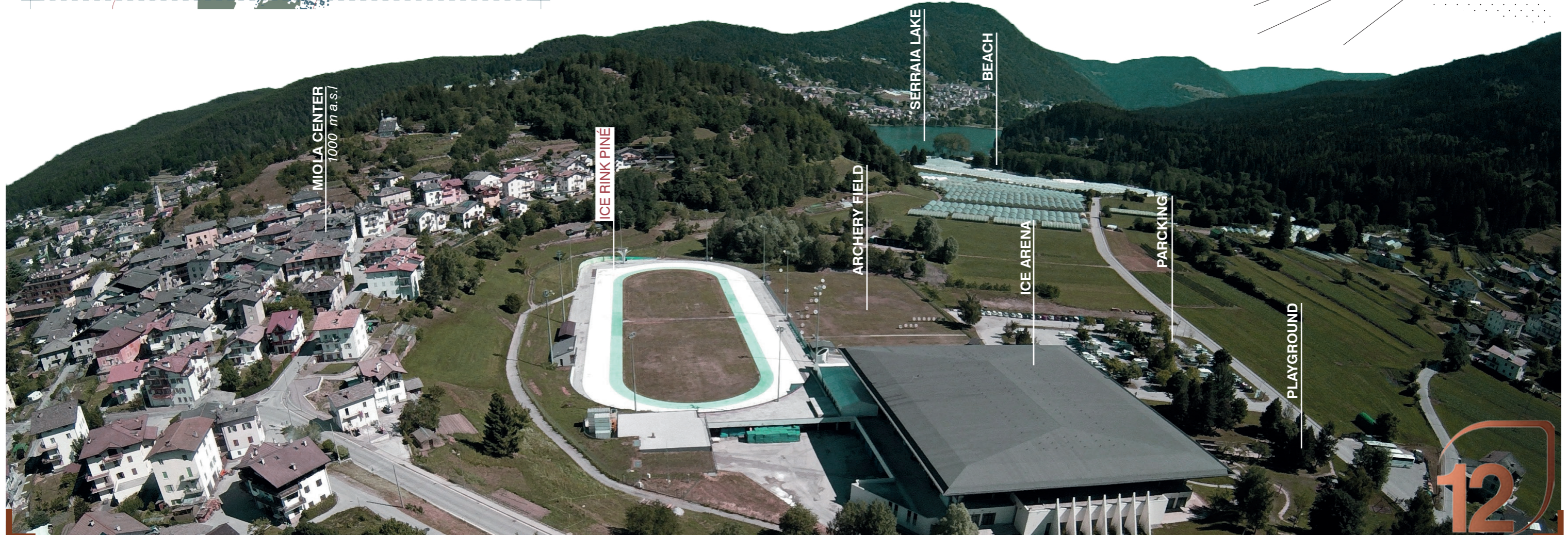
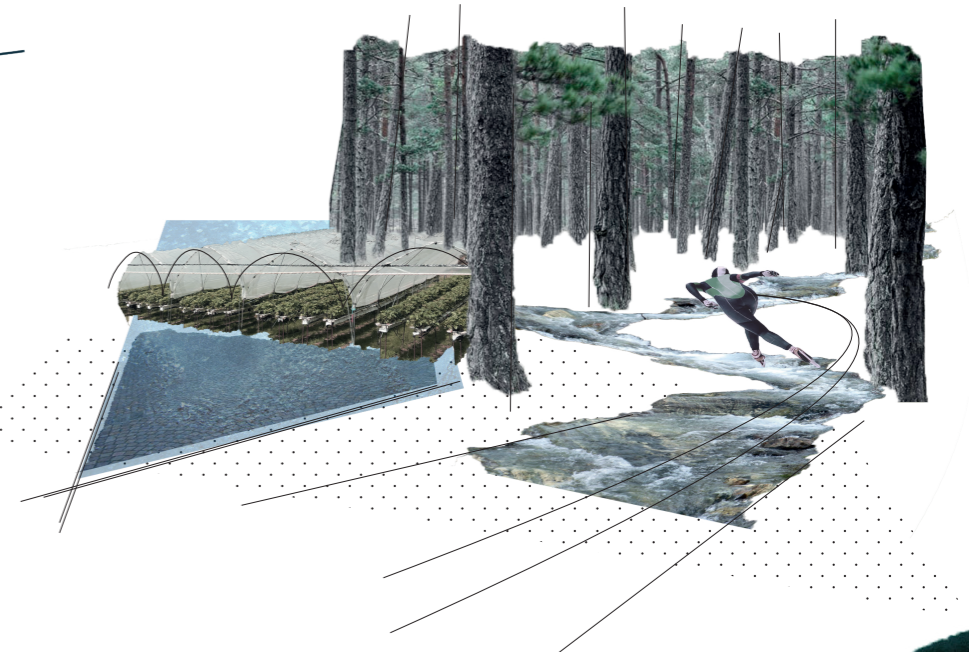


# TRENTINO ICE PARK

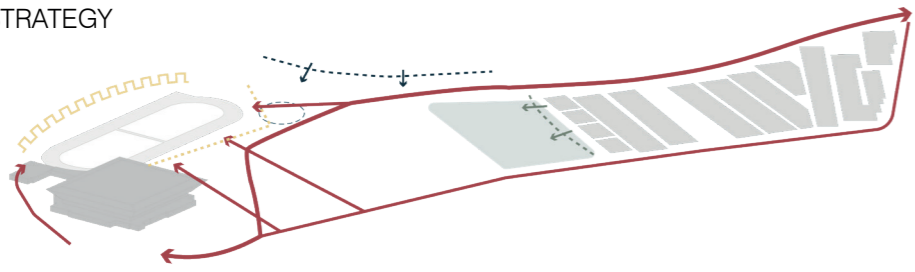
## Adaptive design and parametric optimization of the skating oval in Baselga di Piné

Elisa Brunelli

The project takes as its challenge the **Milano-Cortina 2026** Olympic bid to settle a mega-event in a mountain resort of a few inhabitants who share a passion for ice. Thanks to the study of the territory and the needs of the community, Trentino Ice Park was born, a park in continuous **transformation** that through the proposed **adaptive strategies** manages to accommodate the Olympic legacy as a regeneration of the landscape.



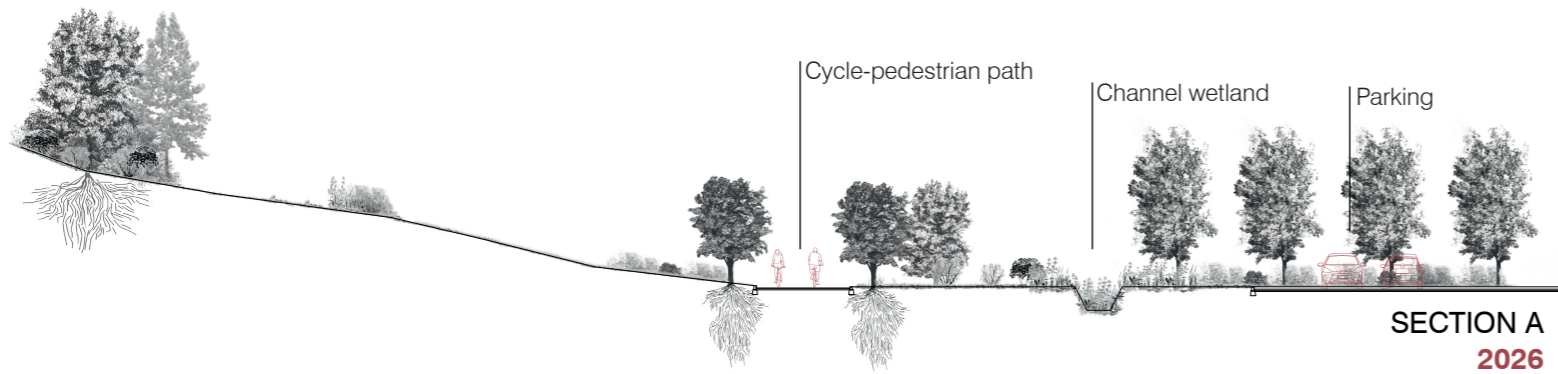
DESIGN STRATEGY



- flows
- - - visual permeability
- - - relationship with the hill
- - - wet area
- - - agricultural area limit
- - - green progress
- - - forest limit
- forest progress



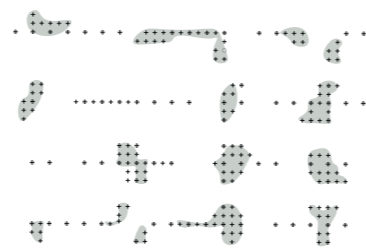
Entrances to the new arena managed through **parametric generation** processes are highlighted by new and spontaneous vegetation. The outdoor space is defined through the evolution of the surrounding vegetation, introducing **new vegetative systems** where there was parking, connecting spectators to the surrounding mountains.



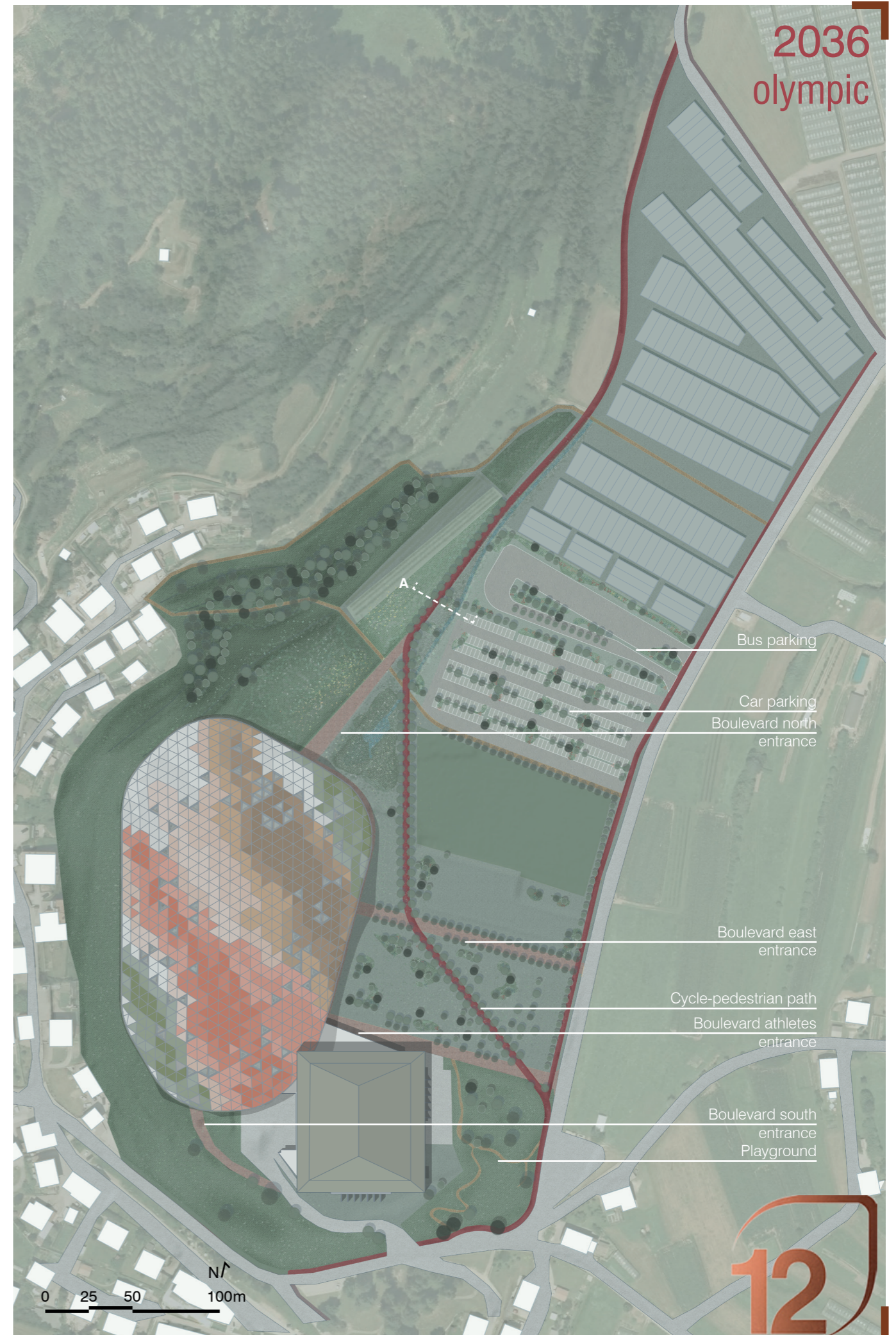
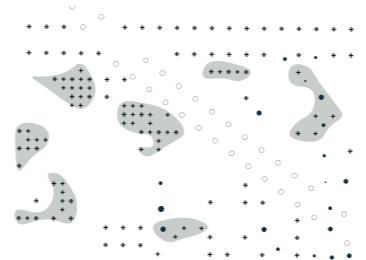
PLANTING STRATEGY



ZOOM 1 | Parking area

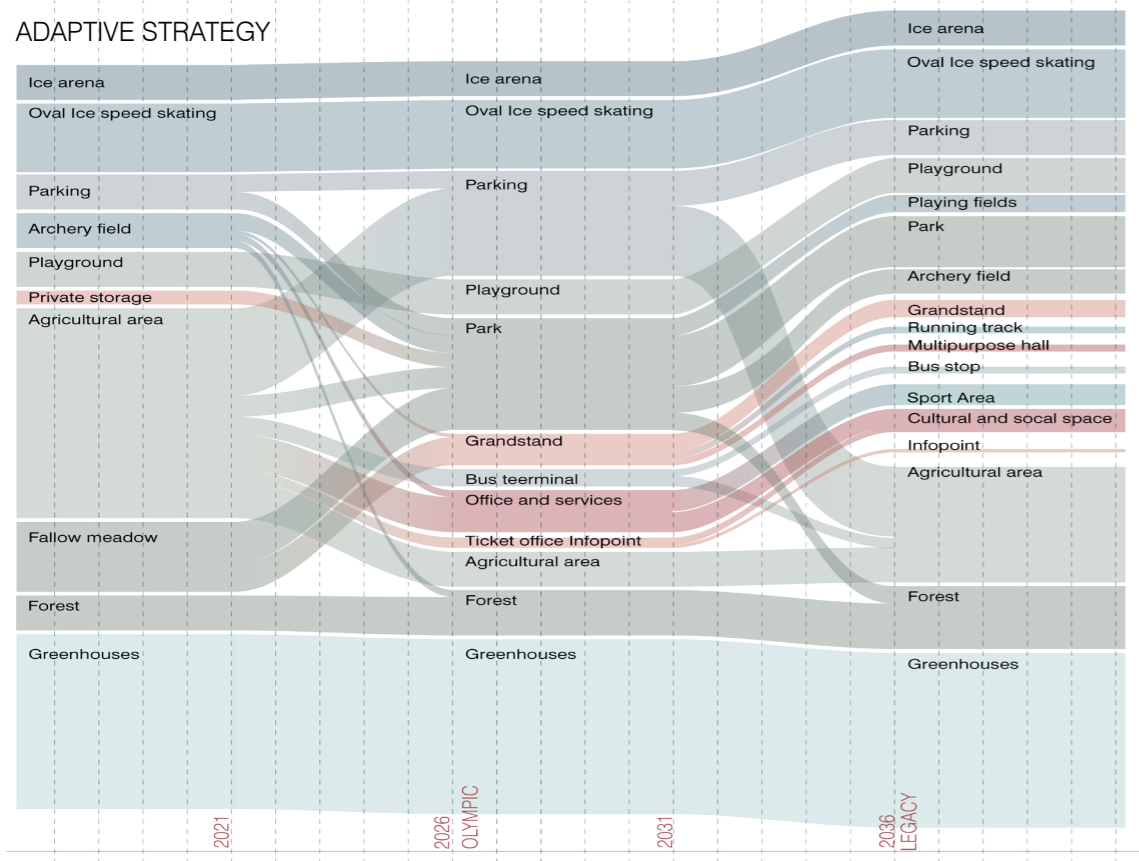


ZOOM 2 | Park

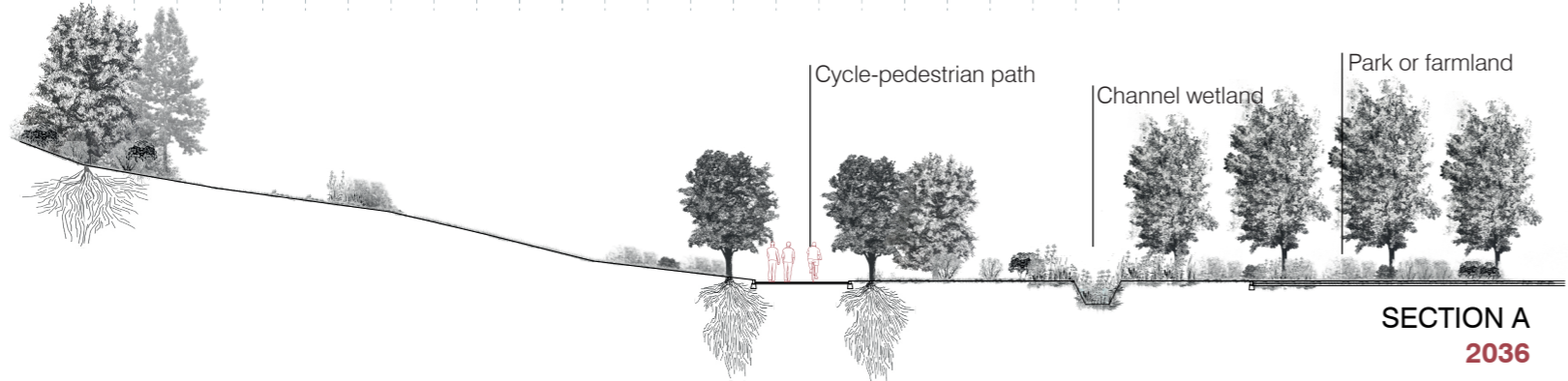
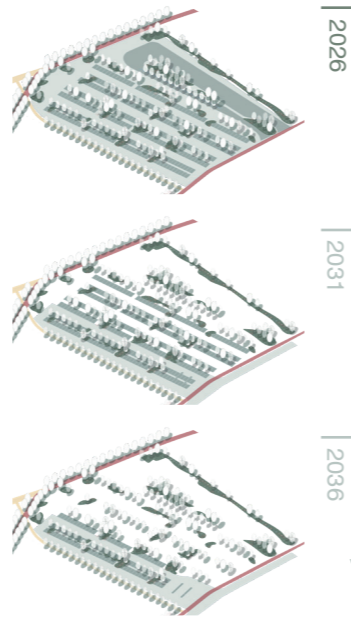


2036  
olympic

ADAPTIVE STRATEGY

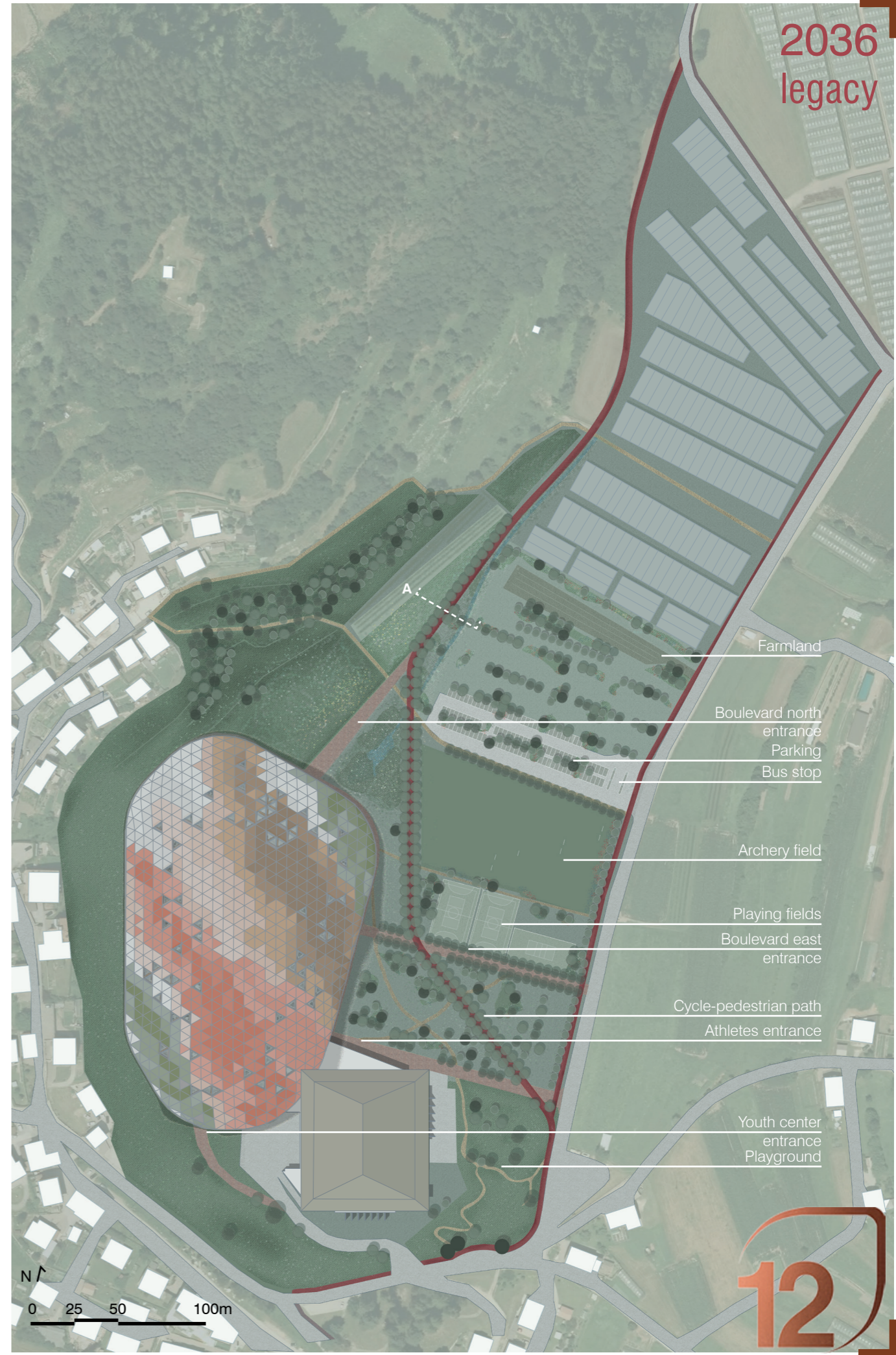


**PARKING**  
Sustainable mobility introduced as the main way to reach the event venue allows for the definition of parking that will adapt as needed over time.



SECTION A  
2036

Breaking access to the area with a path promotes the development of the park to discover the **blue infrastructure** buried over time, activating the wetland with reeds as a spot of interest.

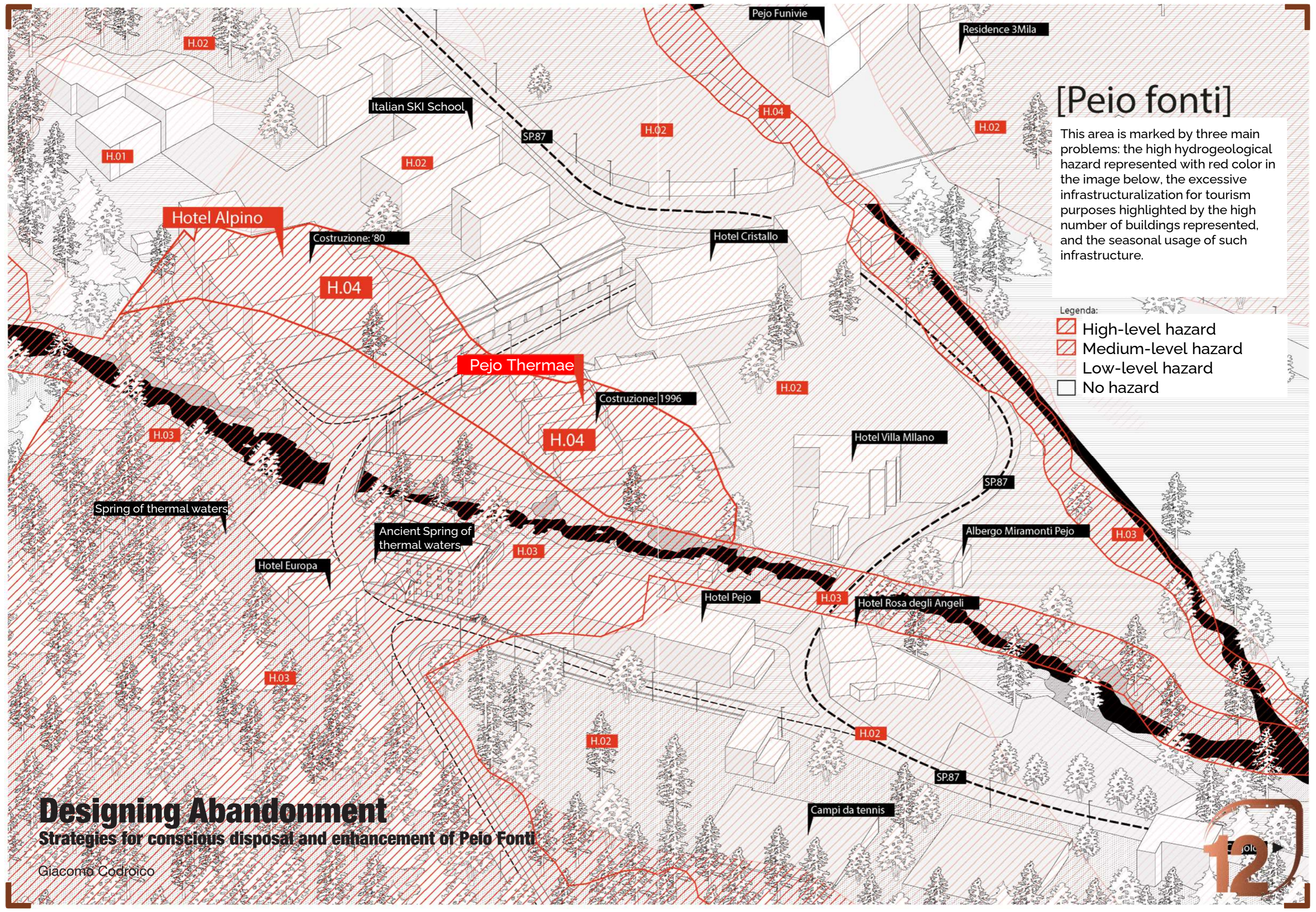




# [Peio fonti]

This area is marked by three main problems: the high hydrogeological hazard represented with red color in the image below, the excessive infrastructuralization for tourism purposes highlighted by the high number of buildings represented, and the seasonal usage of such infrastructure.

- Legenda:
- High-level hazard
  - Medium-level hazard
  - Low-level hazard
  - No hazard



## Designing Abandonment

Strategies for conscious disposal and enhancement of Peio Fonti

Giacomo Codroico



## The de-waterproofing process

Three are the main goals of the process: firstly, to reduce the hydrogeological hazard, secondly, to create urban quality and lastly, to use the least amount of resources to do so. This should also be done while emitting the least amount of CO<sub>2</sub>.

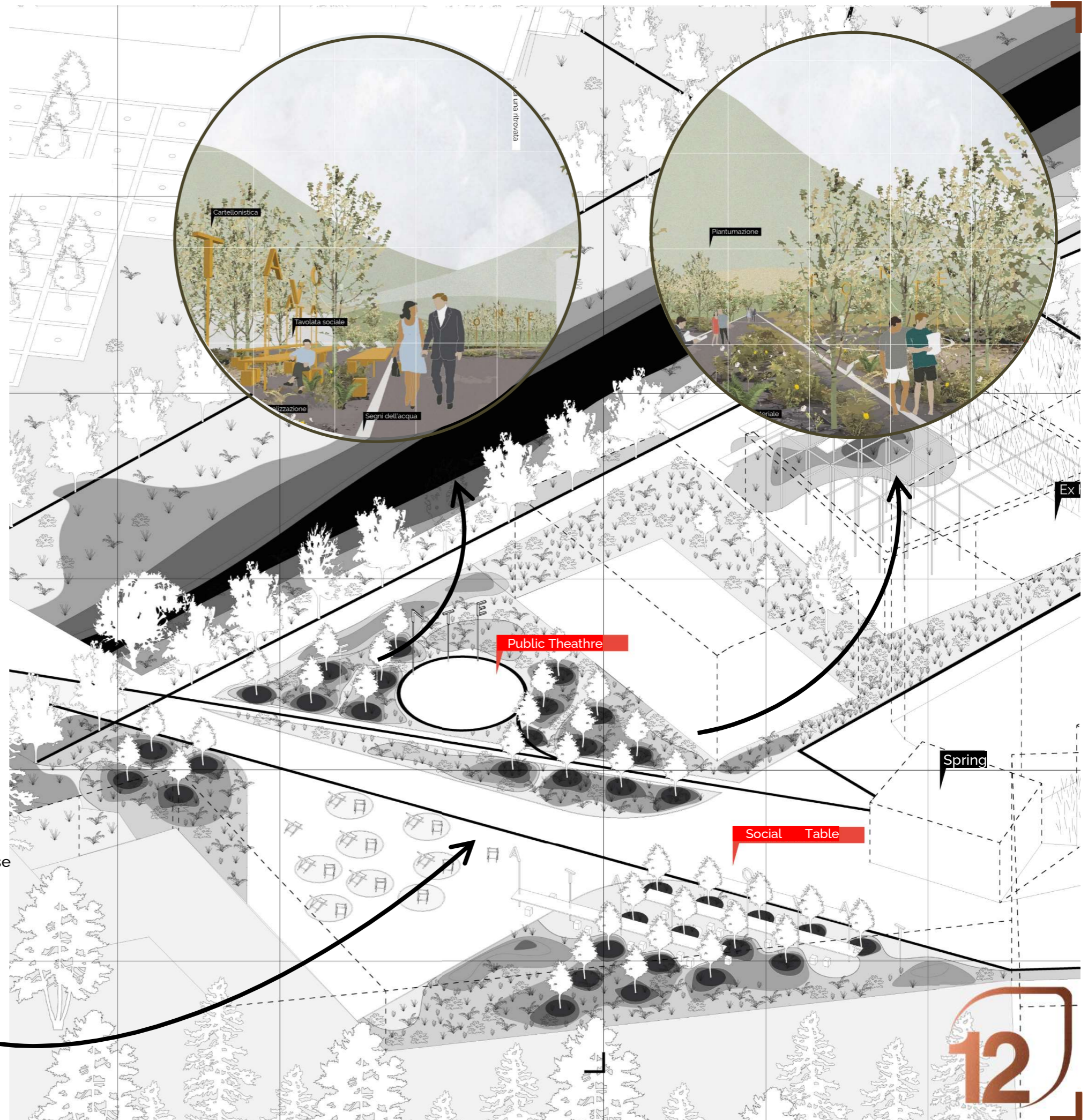
This process is based on two consequent phases, starting from the man who indents the sealed surface which is then reconquered by natura who freely takes over spaces, generating something that can be compared to a «vegetal barrier reef». When nature is then ruled by man, the functional project and urban spaces take place.

Indenting surfaces

Vegetal barrier reef

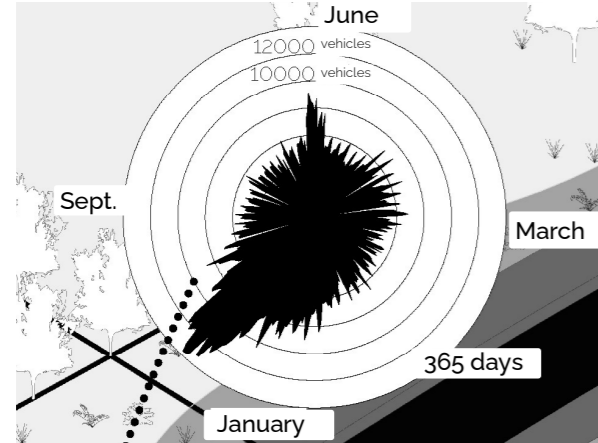
First phase

Second phase

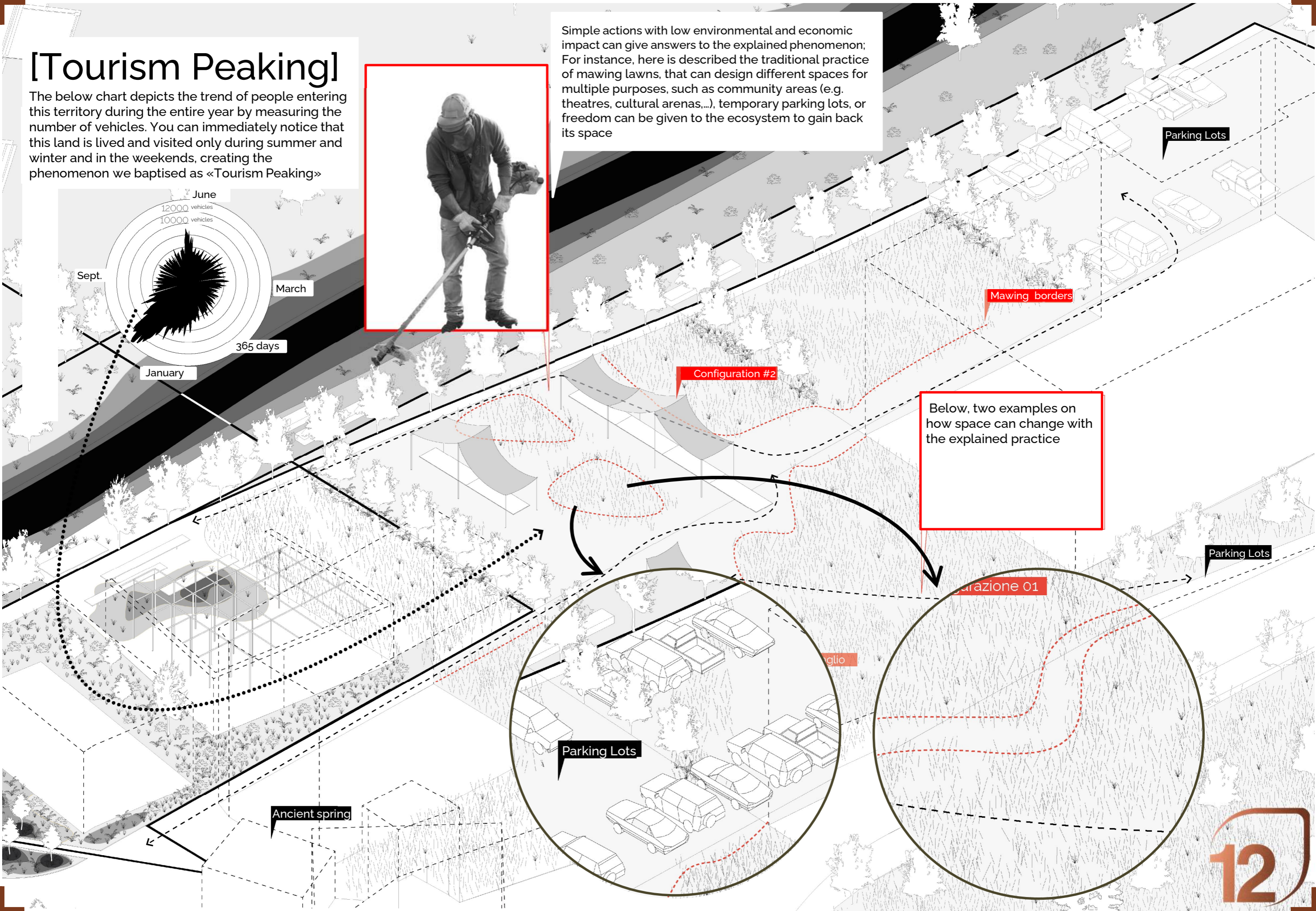


# [Tourism Peaking]

The below chart depicts the trend of people entering this territory during the entire year by measuring the number of vehicles. You can immediately notice that this land is lived and visited only during summer and winter and in the weekends, creating the phenomenon we baptised as «Tourism Peaking»



Simple actions with low environmental and economic impact can give answers to the explained phenomenon; For instance, here is described the traditional practice of mowing lawns, that can design different spaces for multiple purposes, such as community areas (e.g. theatres, cultural arenas,...), temporary parking lots, or freedom can be given to the ecosystem to gain back its space



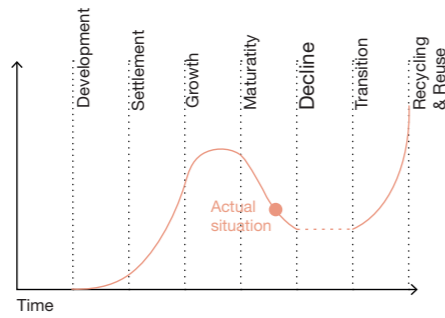
Below, two examples on how space can change with the explained practice

# Plane - Ground

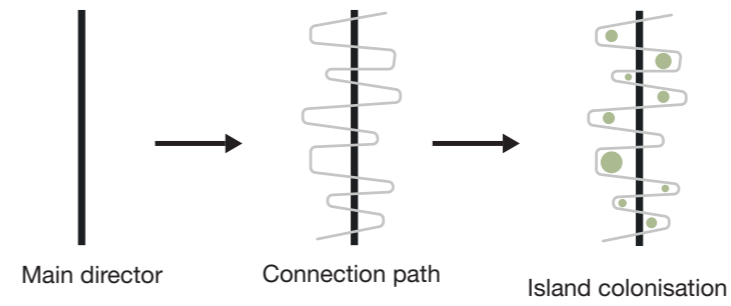
## An adaptive reuse of the Bolzano-Dolomiti airport complex between water, landscape and city

Erica Poli

The programme of this project will bring the Bolzano-Dolomiti Airport from the actual situation of an operative infrastructure to a second life as an urban park through an **ecological transition**



The concept sees the existing airway overlaid from a second path that create a sort of backbone, the area between this two path will be occupied by different activities of the park and the rest will be **renaturalised**



Grassland



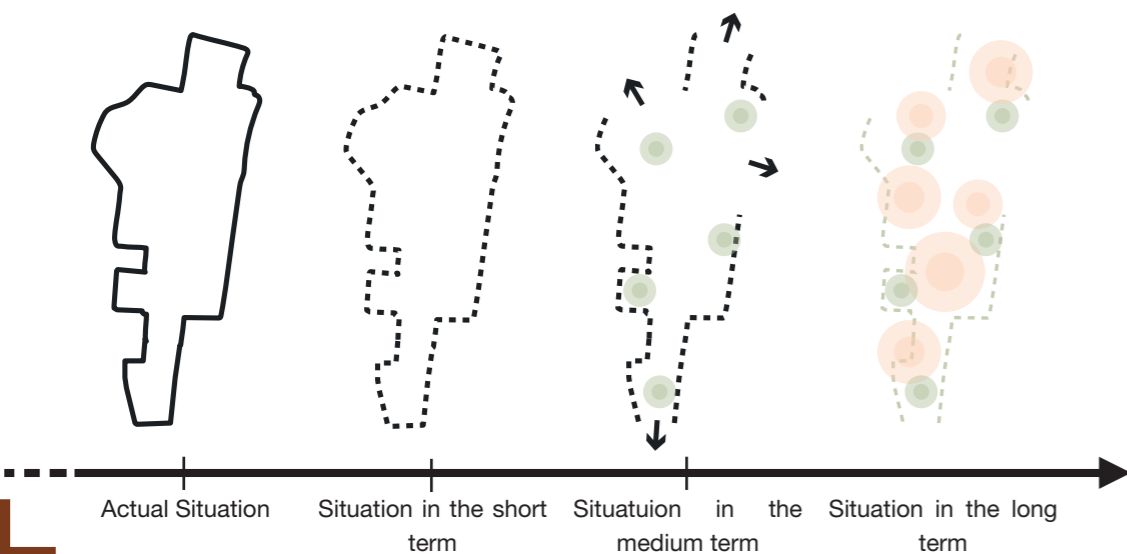
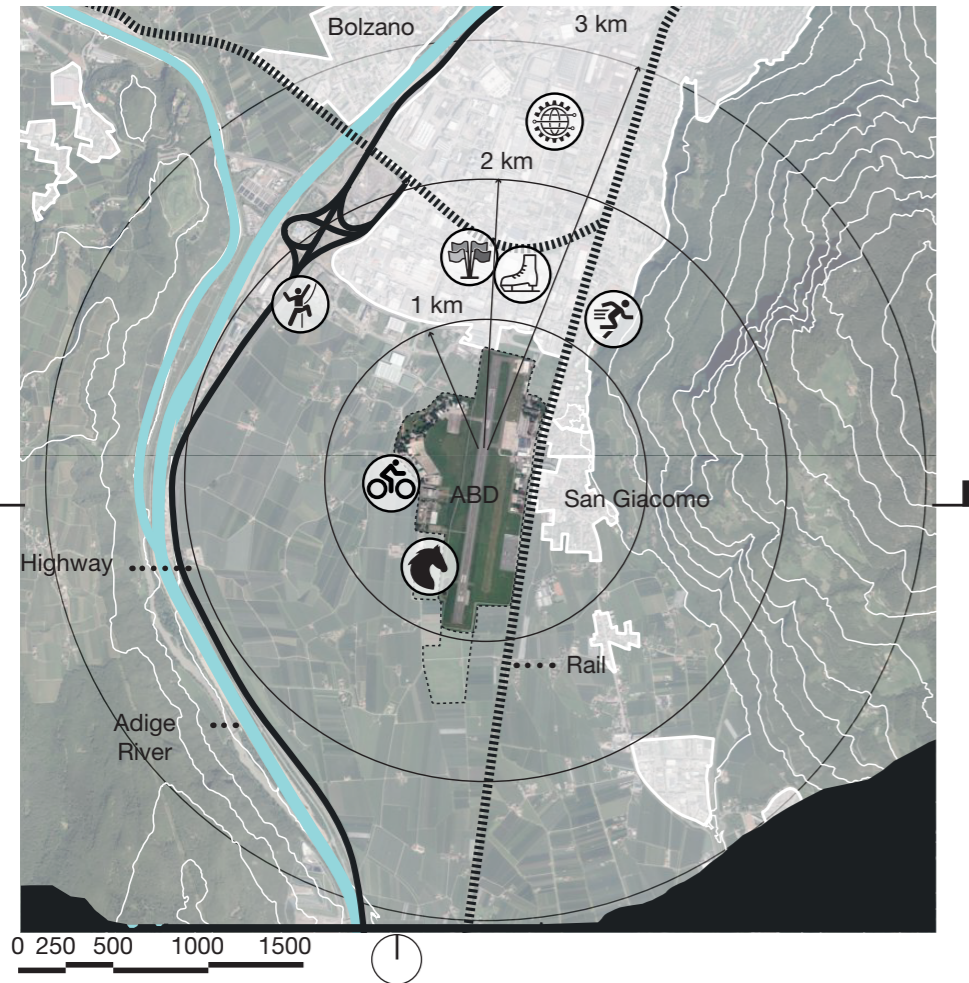
Shrubland



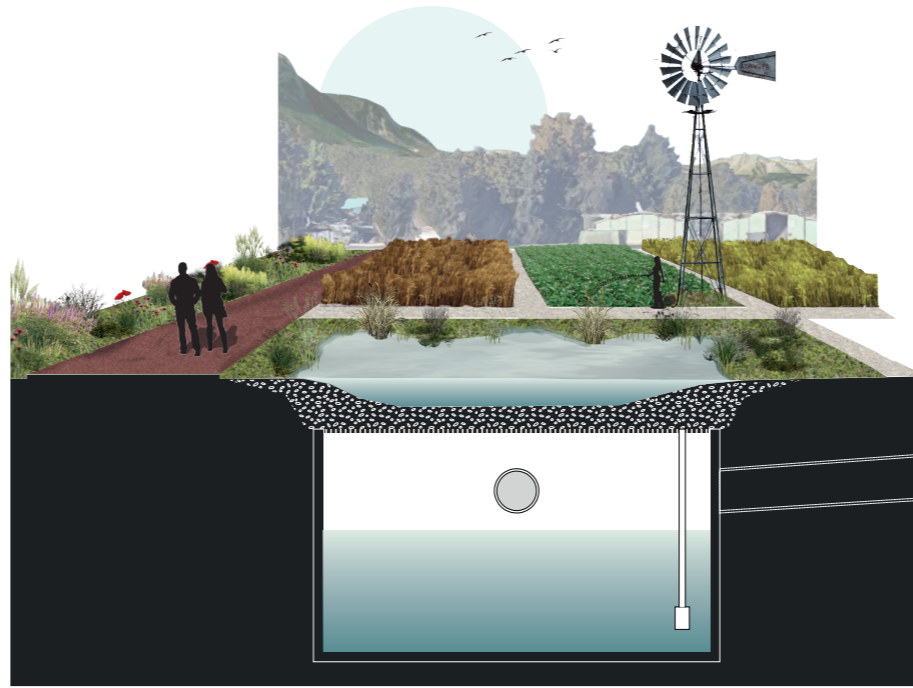
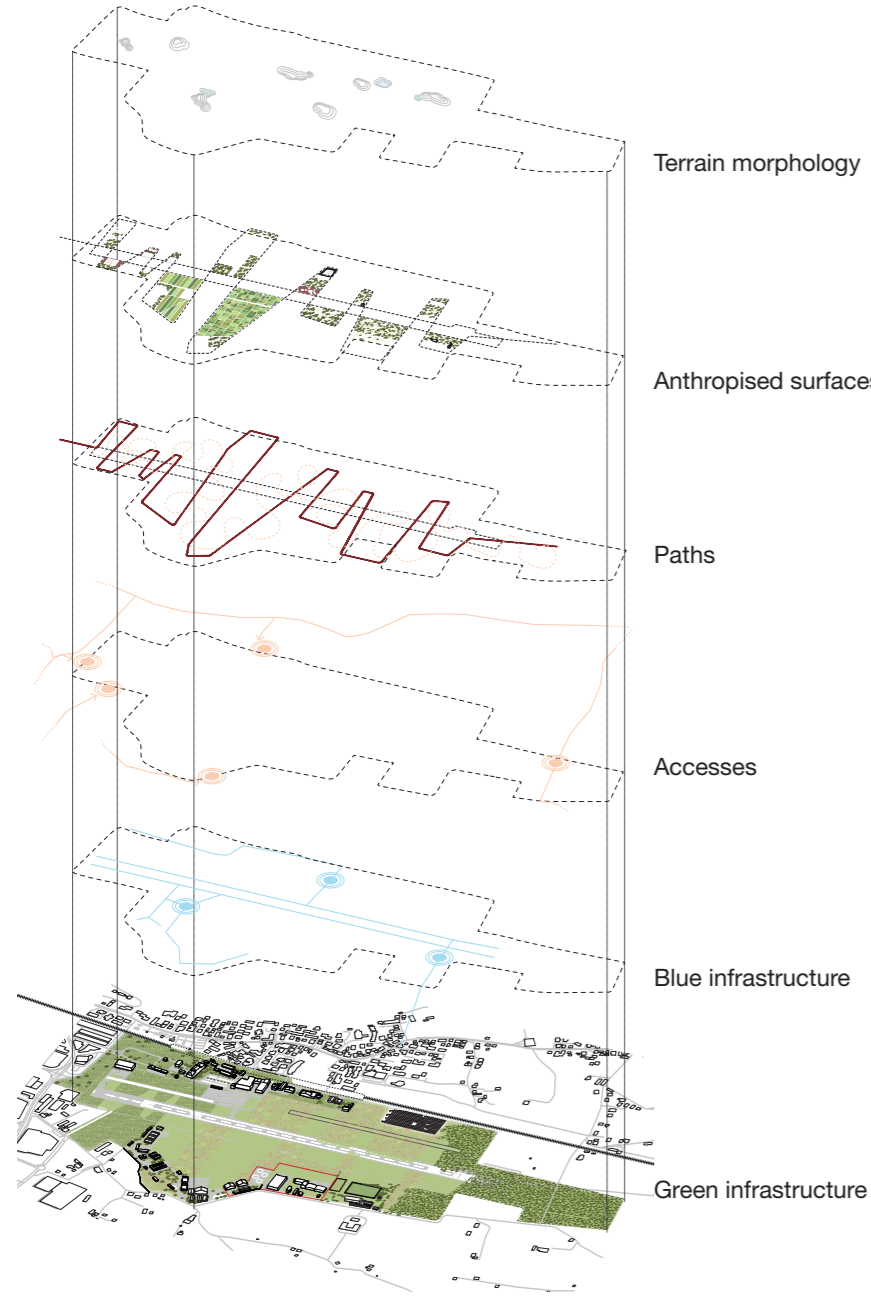
Wetland



Woodland



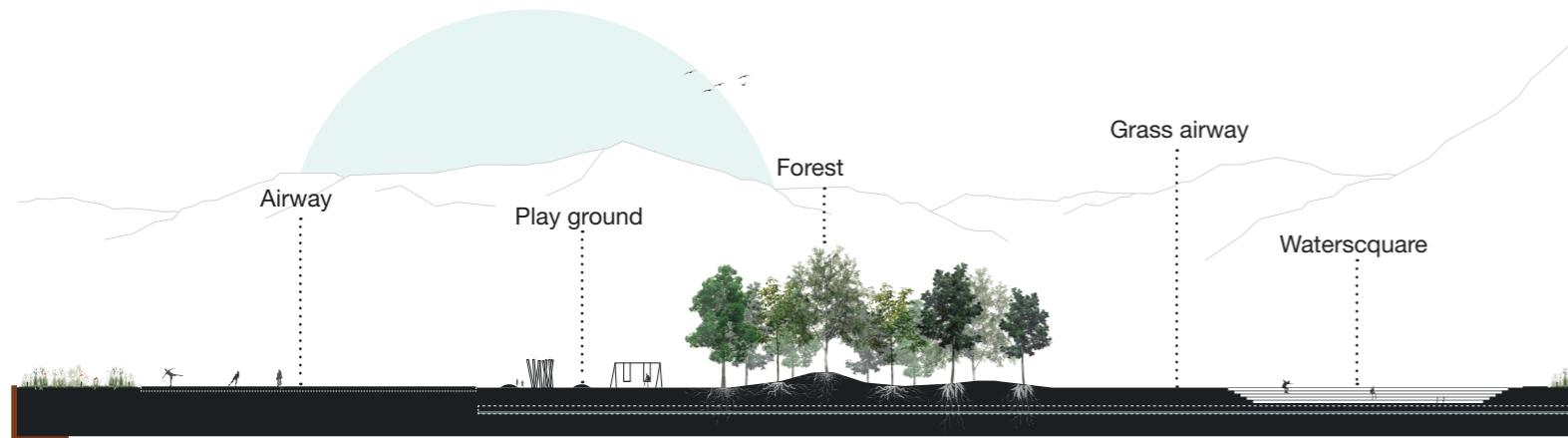
The project can be described as the overlapping of several layers, from the green and blue infrastructure to the new paths and accesses of the new urban area. In the areas enclosed between the red line and the track, numerous activities are developed such as sports fields, urban gardens, aroma therapy areas and so on.



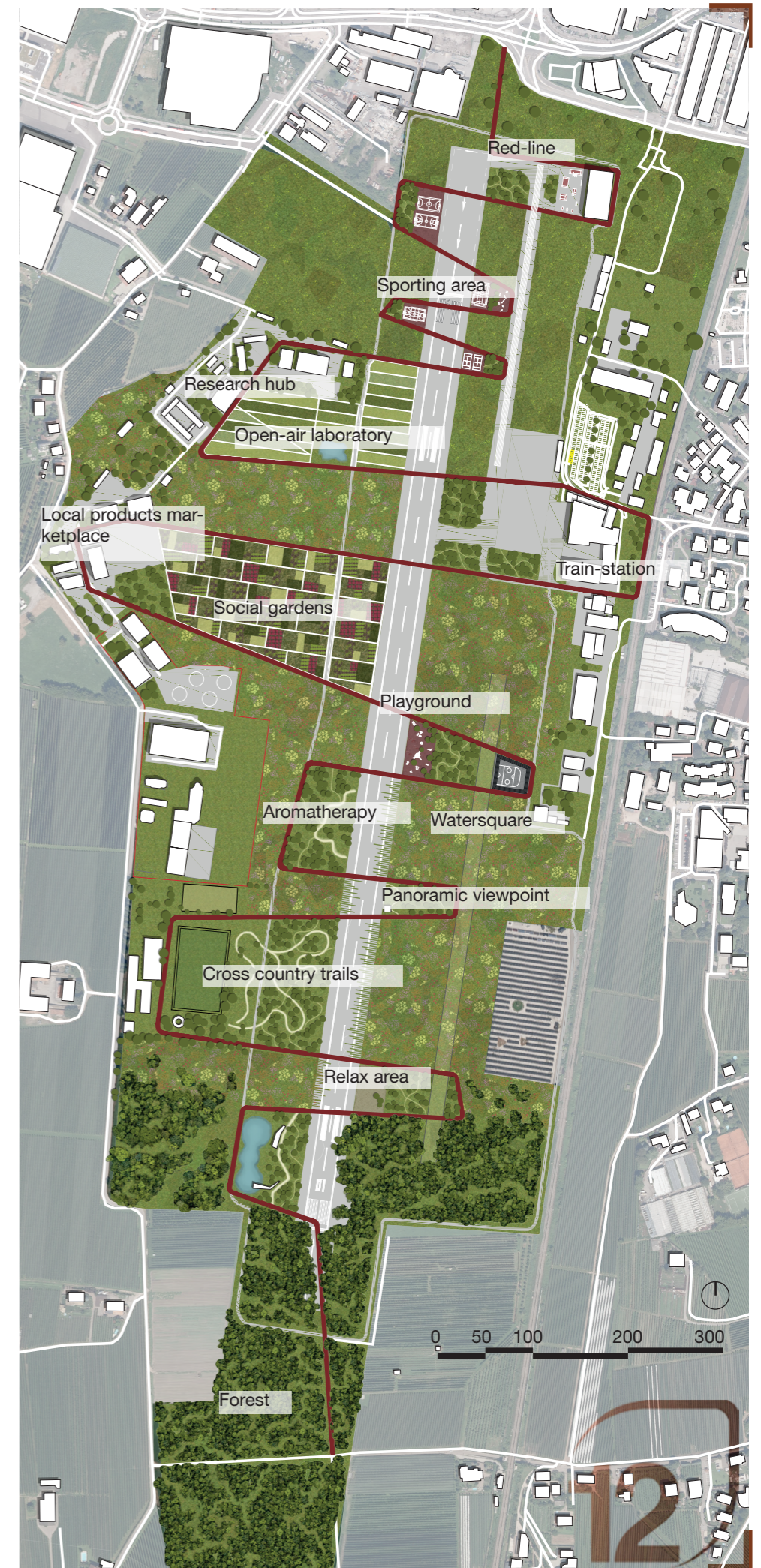
Collecting tank for water reuse

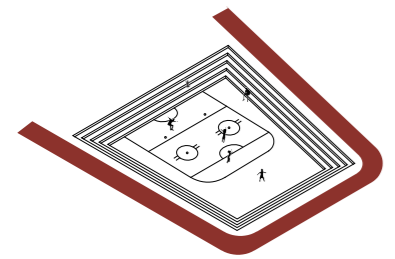
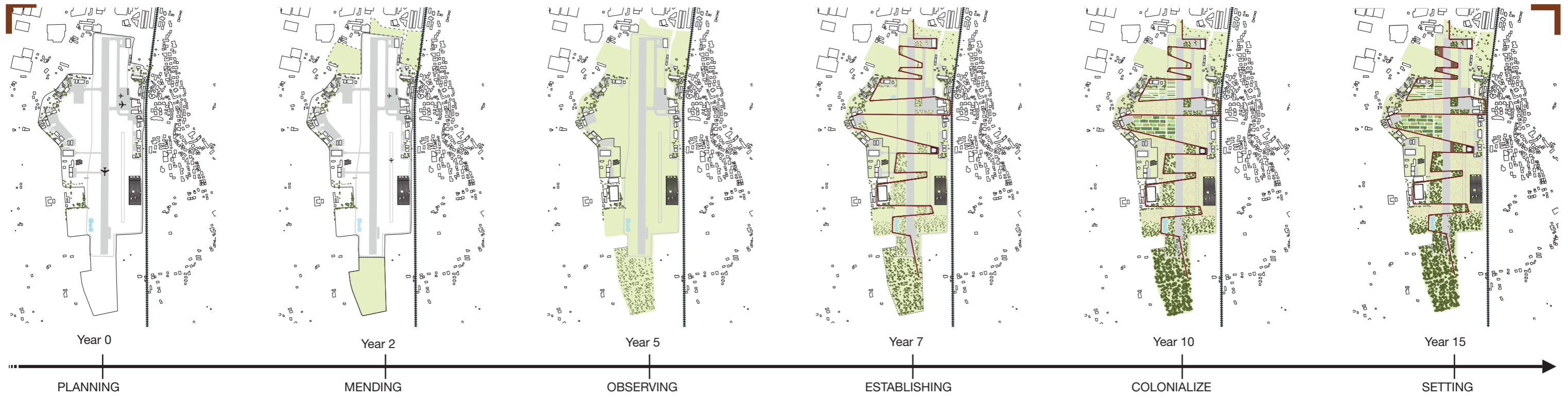


Social gardens

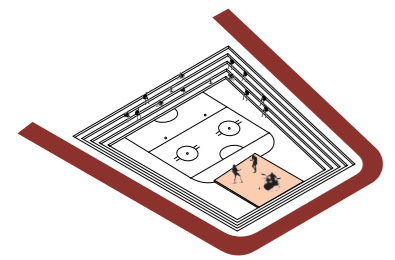


A very important role is played by the rainwater collection tanks, one of which will be used to collect and reuse water for irrigating the fields, while the other will be a watershed, with the task of collecting the water and gradually releasing it into the ground.

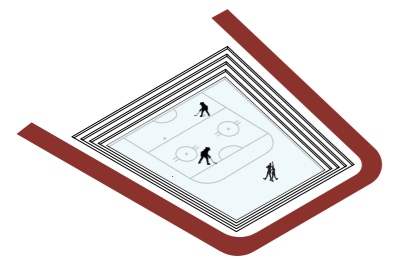




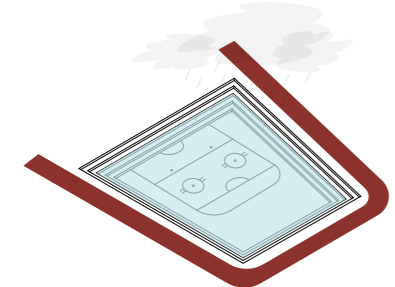
Square as play-ground



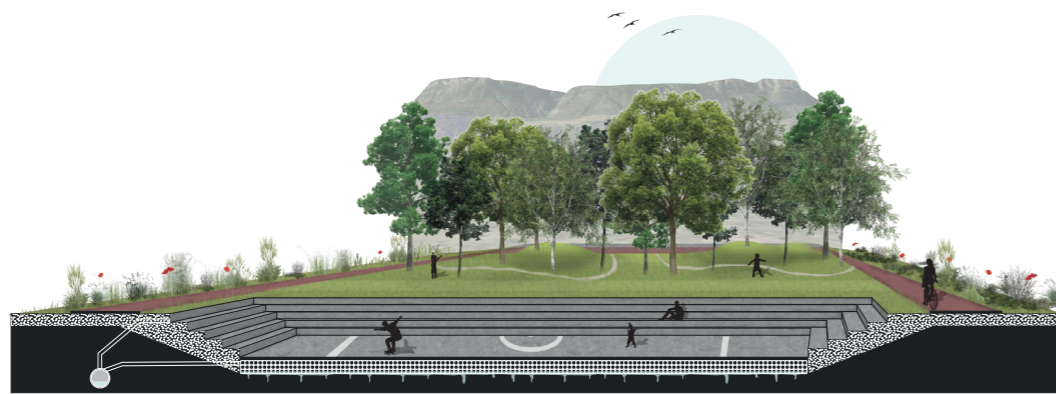
Square as auditorium for event



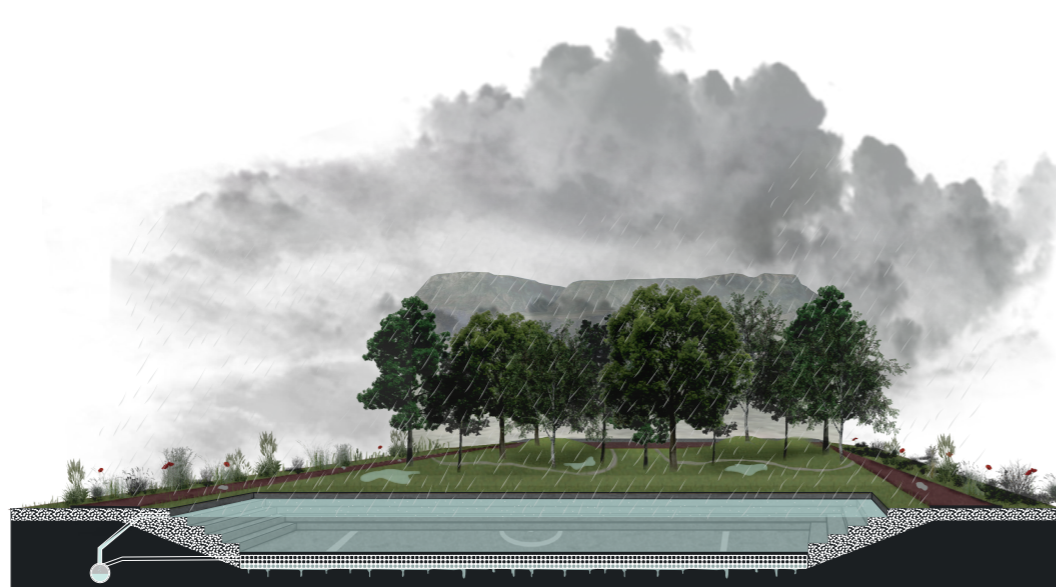
Square as skating rink



Square as water collection tank



Watersquare without rain



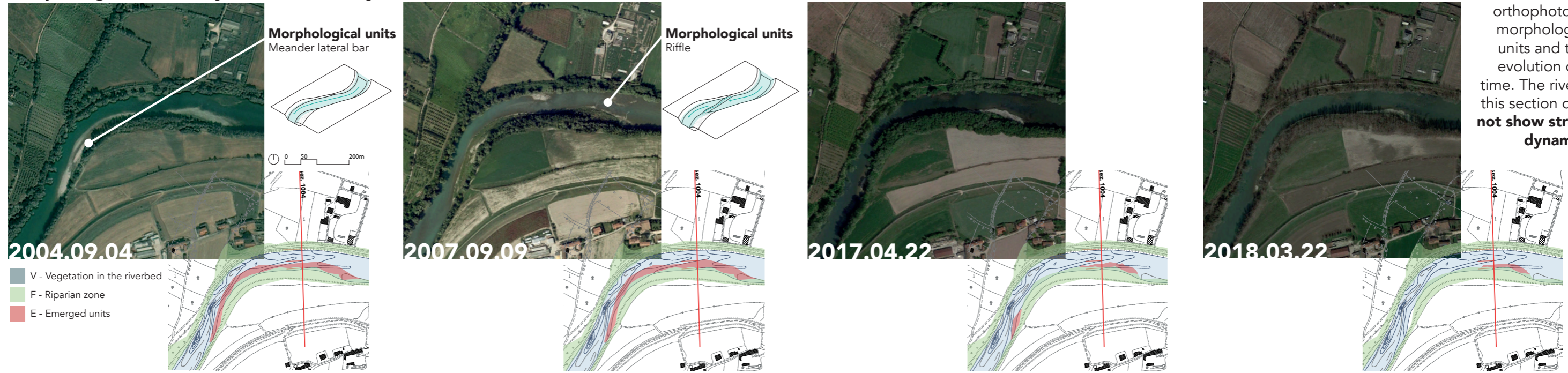
Watersquare by storm

**Watersquare** can be used in a variety of different ways, depending on the season and weather conditions, as well as on the wishes of the inhabitants. In the project the **co-evolution** of the urbanized and the natural areas are separated by the red-line and the runway, trees will be planted following a grid pattern and their conformation will vary with their growth, while in all the external areas the vegetation will be spontaneous.

The infrastructure transition process can be roughly divided into six actions, which will be summarised as follows: planning, mending, observing, establishing, colonising and finally settling.

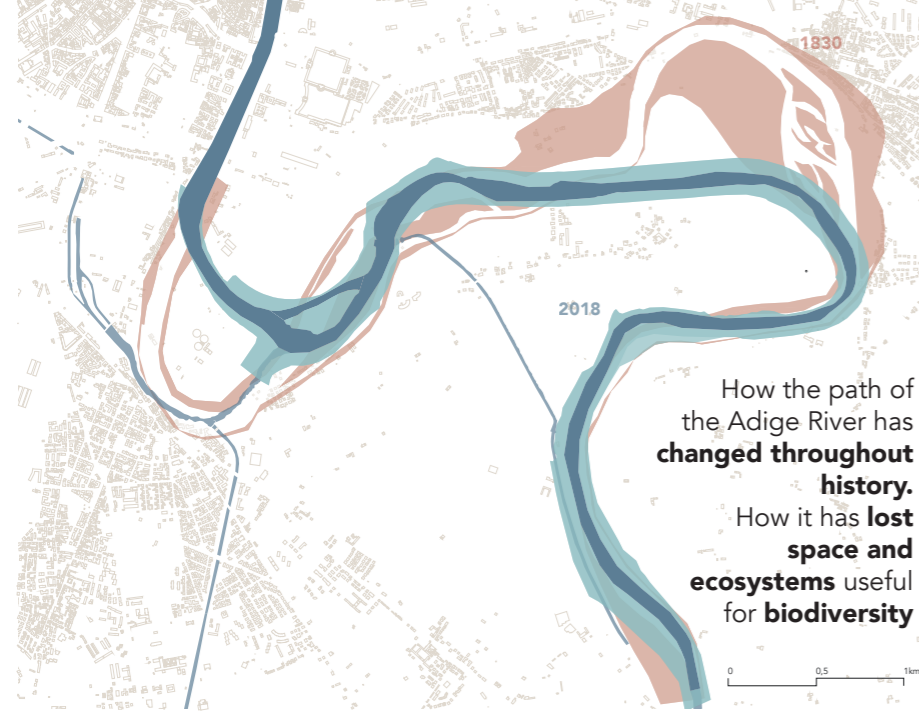


## Morphological unit analysis of the river system



Observation by orthophotos of morphological units and their evolution over time. The river in this section does **not show strong dynamics**.

## Historical analysis



Comparison of historical Habsburg cartography dated 1830, the current and the project configuration of the Adige River.

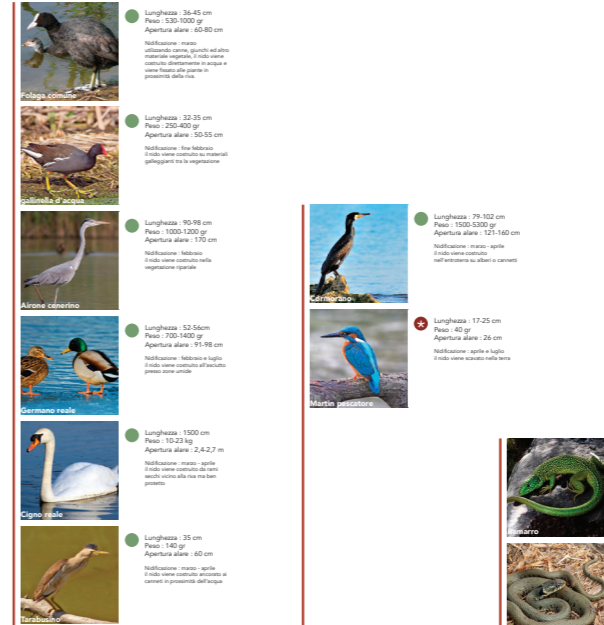
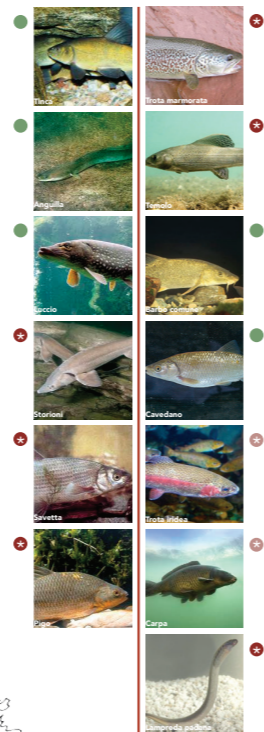
Adige Riverbed Area  
1830 : 2.954.636 m<sup>2</sup>  
2018 : 1.293.915 m<sup>2</sup>

## Fluvial ecosystem

Elaboration of model section with **river wildlife environment**

Legend:

- Species detected
- ✱ Declining species in the environment
- ✱ Invasive alien species published by INSPIRA



**RE-DISCOVERING THE RIVERS**  
territorial, fluvial and ecological valorisation of Verona River Park



Giulia Zantededeschi

Representation of the San Pancrazio district, the Lazaretto and the Adige River dated 1758





1

● Main path in the Adige River Park

● Direct connection between the Lazaretto and the platforms on the Adige River



2

● New pedestrian bridge connecting the two banks of the river

● Main path in the Adige River Park

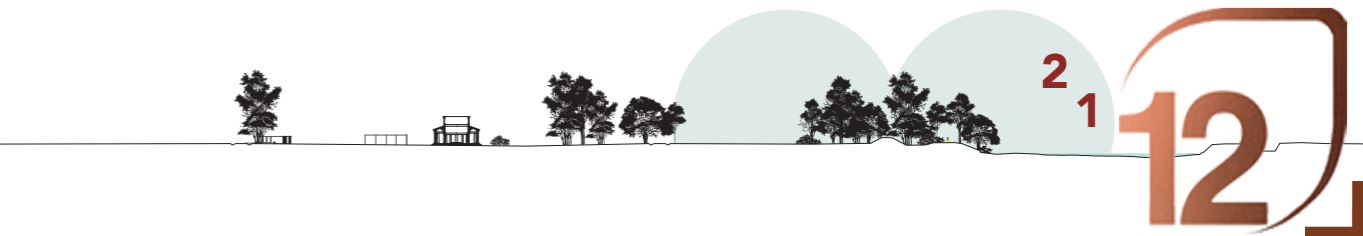
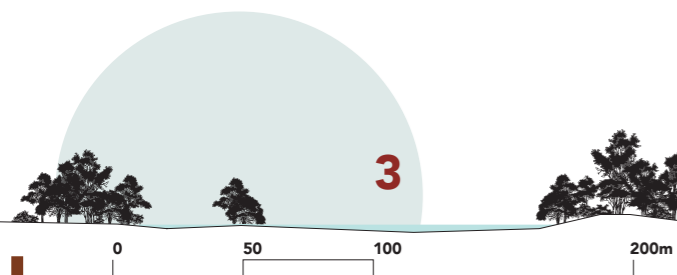


3

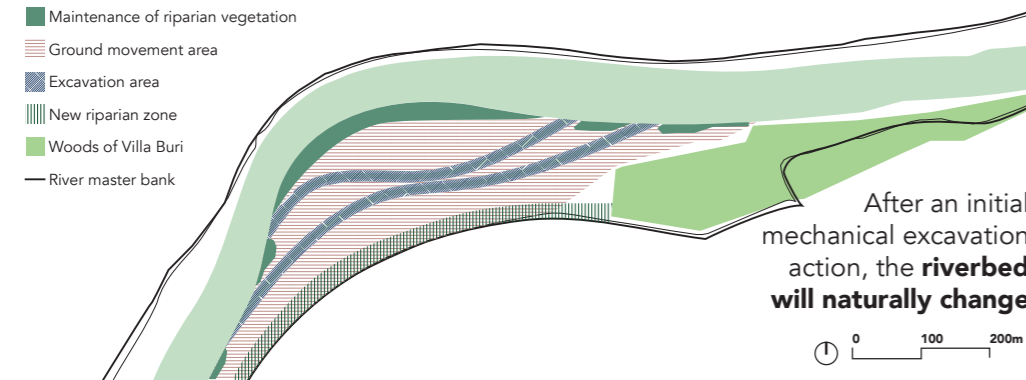
● River requalification intervention with the creation of secondary channels

● New riparian zone

● Main path in the Adige River Park







Detail section of the river requalification operation with the creation of secondary channels to widen the river section and the creation of new ecosystems.



Detail section of new accesses to the river through the construction of new platforms crossing the riparian zone.

**Excavation operations** and insertion of platforms to as new viewpoints of the river through the riparian zone and able to adapt to different river flows

