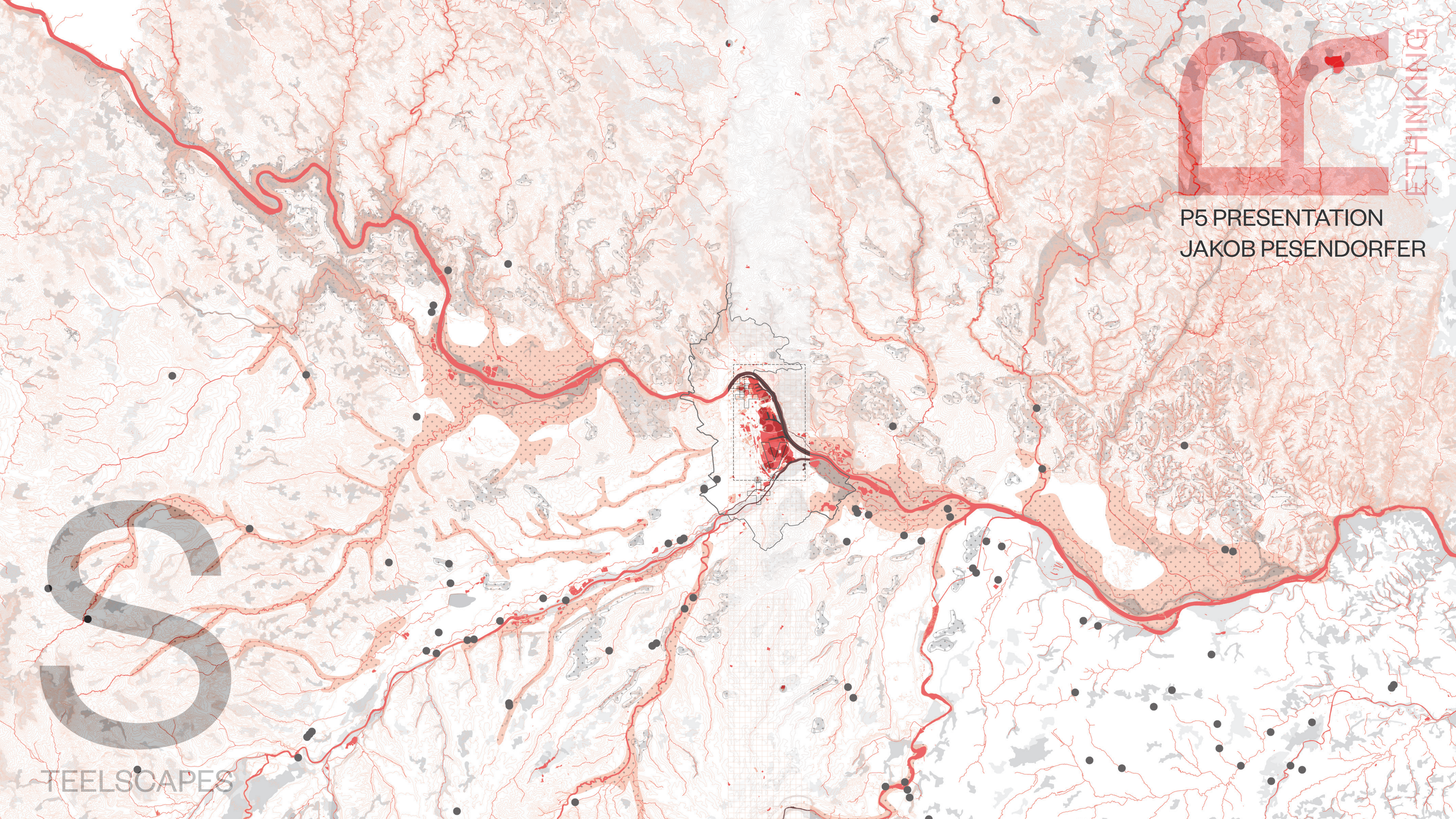
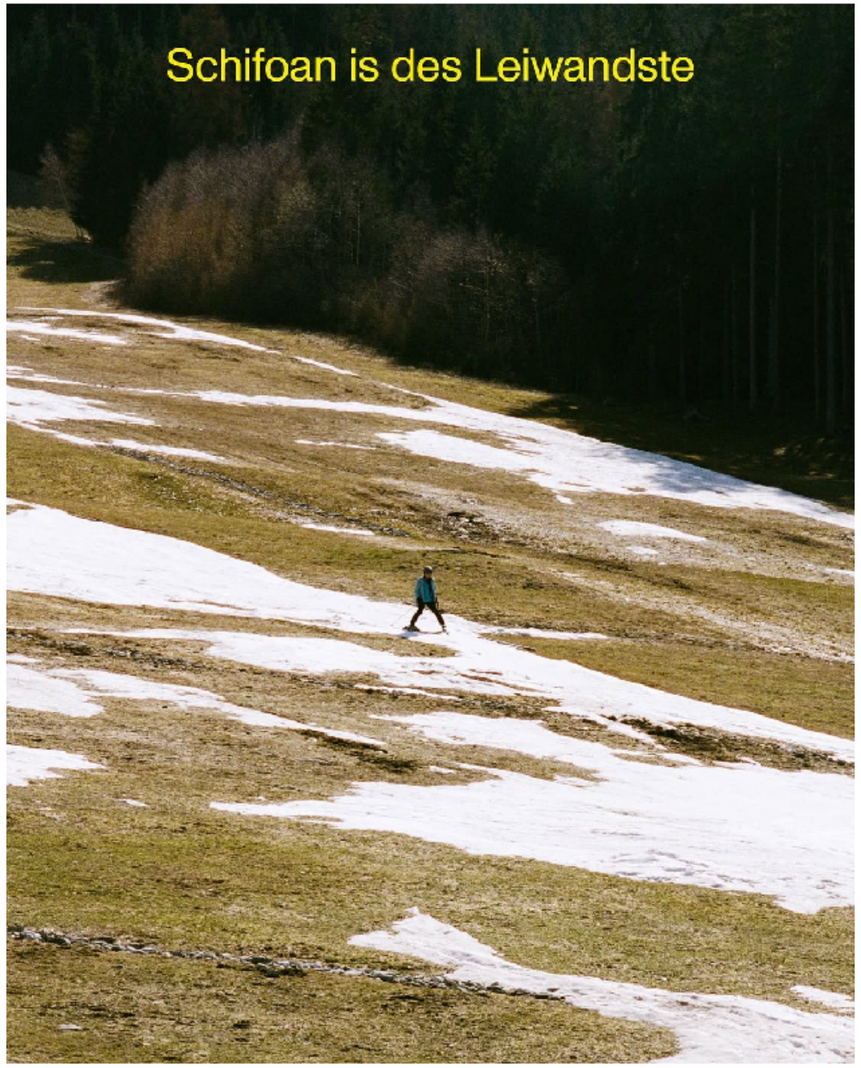

ETHINKING
P5 PRESENTATION
JAKOB PESENDORFER
TEELSCAPES

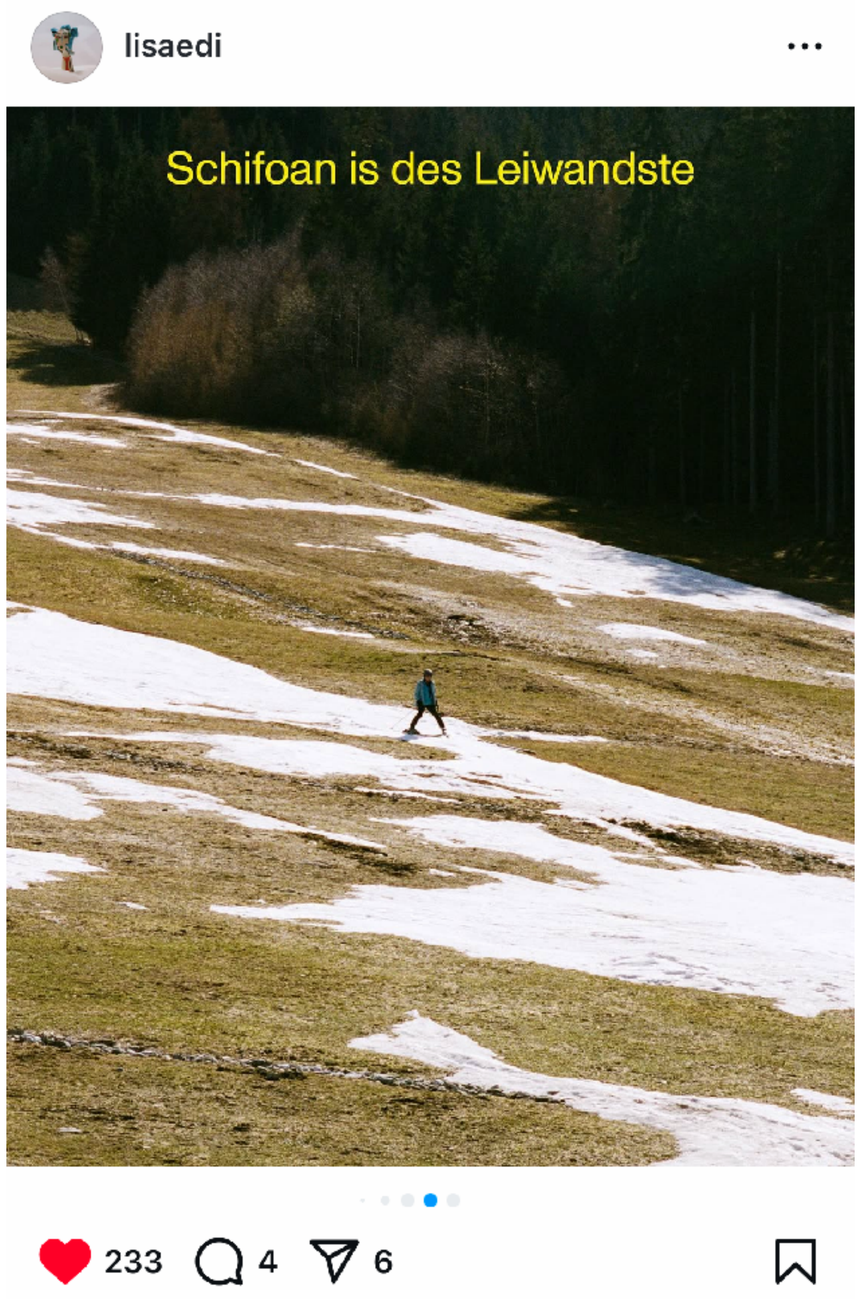
lisaedi



233 4 6

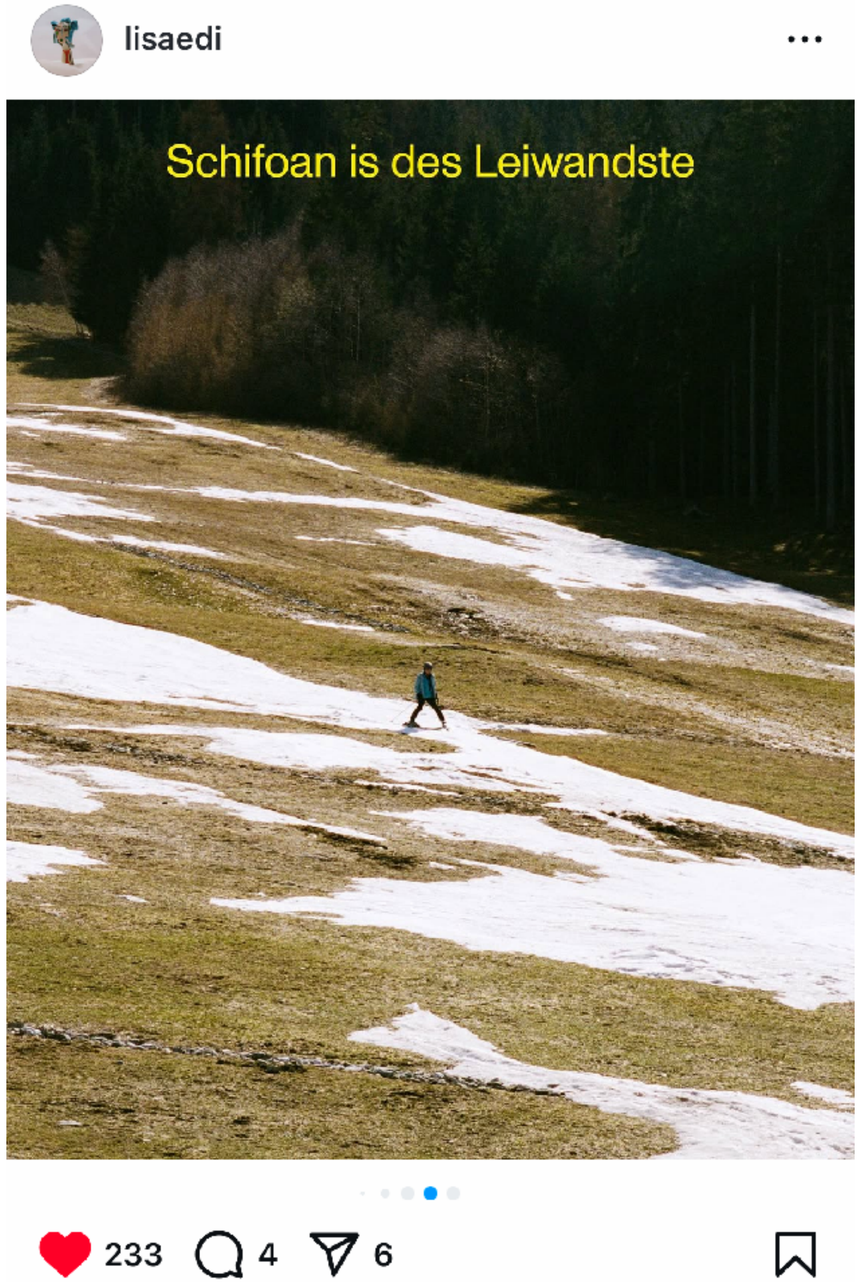


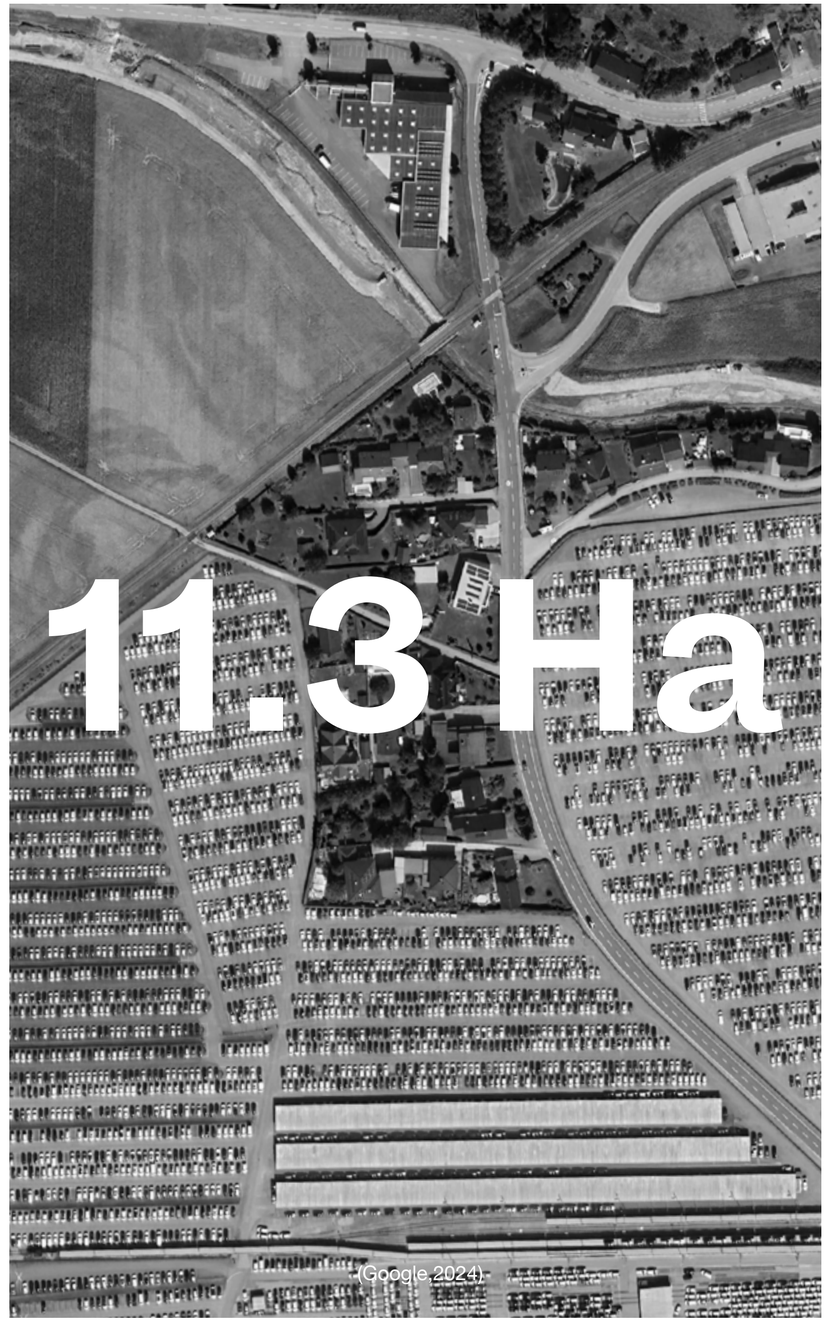
Climate Crises





Climate Crises





Way of Planning



Climate Crises



Geopolitcal Dynamics



Way of Planning



Climate Crises



Geopolitcal Dynamics



Way of Planning

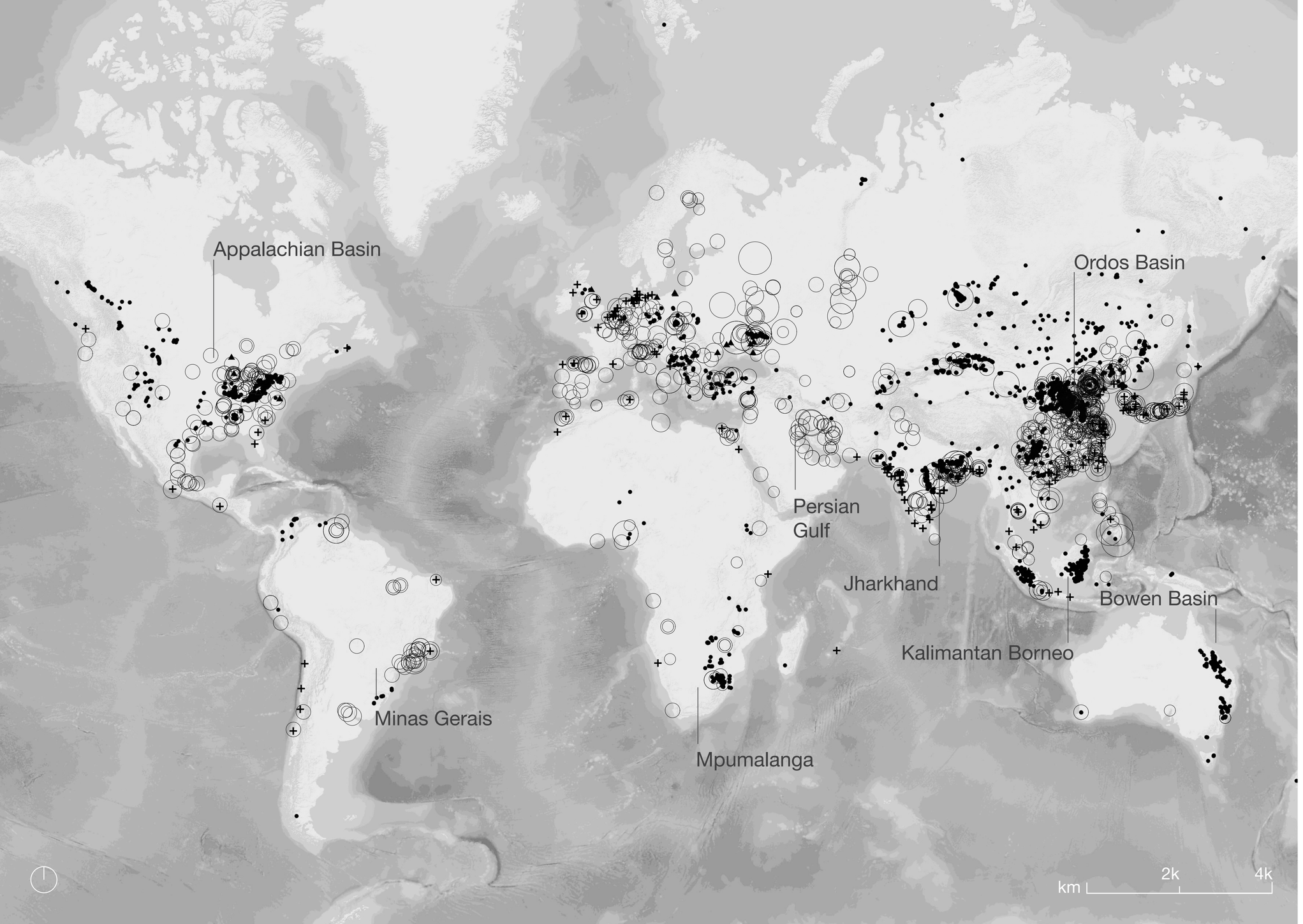


Re-thinking Steelscapes

A cross systemic Urban Design approach towards a
Sustainable Circular Society for the Metropolitan Region of Linz
48°16’37.3”N14°19’15.9”E

CONTEXT
ANALYSIS
SYNTHESIS
SCENARIOS
LEARNINGS

context



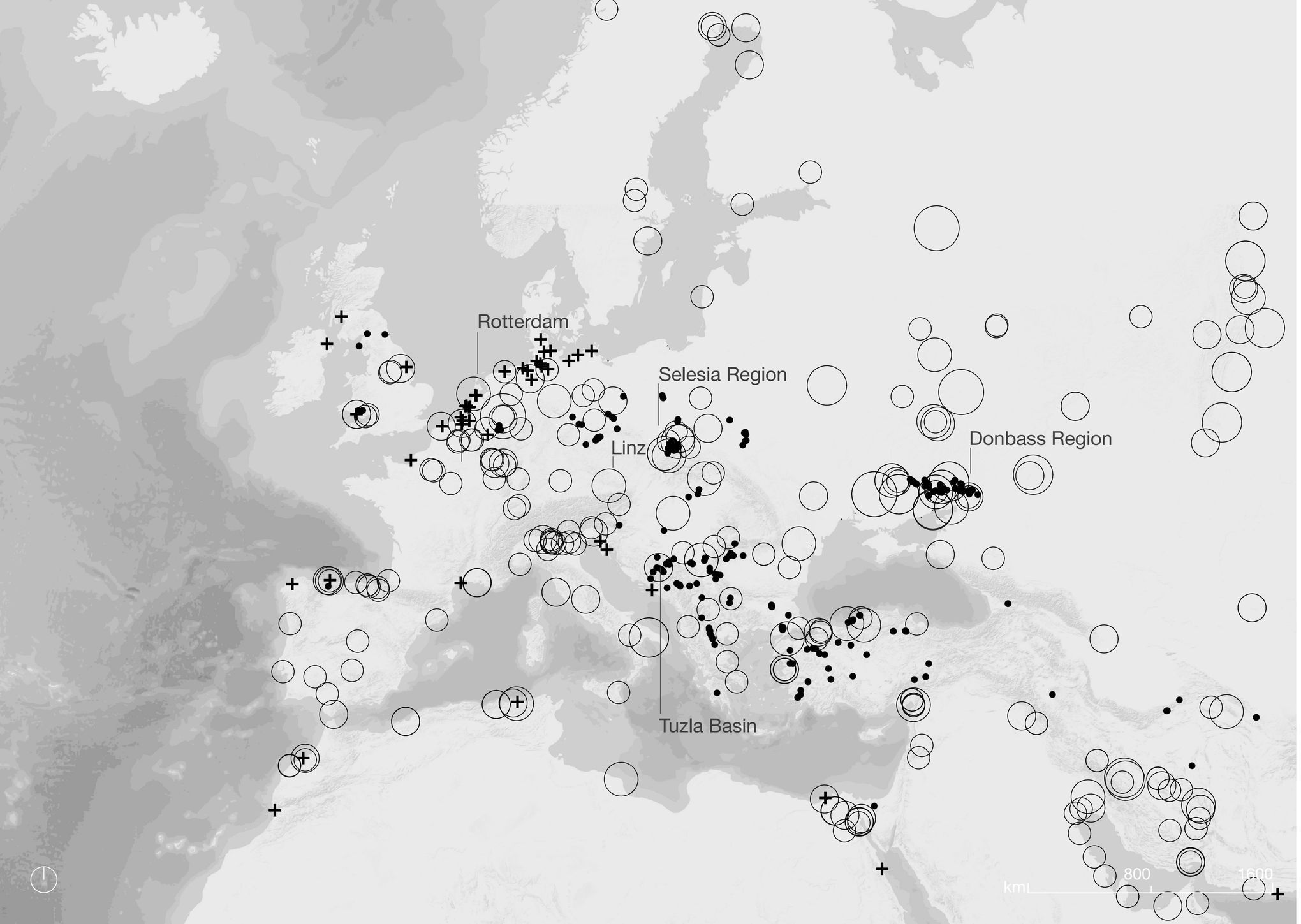
Steel Factories
Coal Mines (Bituminous)

Terminals
Coal Import/Export
Coal Import

Workforce Steel
<1400
1400 - 4400
4400 - 9400
9400 - 20000
<20000

Global Energy Monitor, Global Steel Plant Tracker (April 2024)
Global Coal Terminals Tracker (2023)

Steel Global



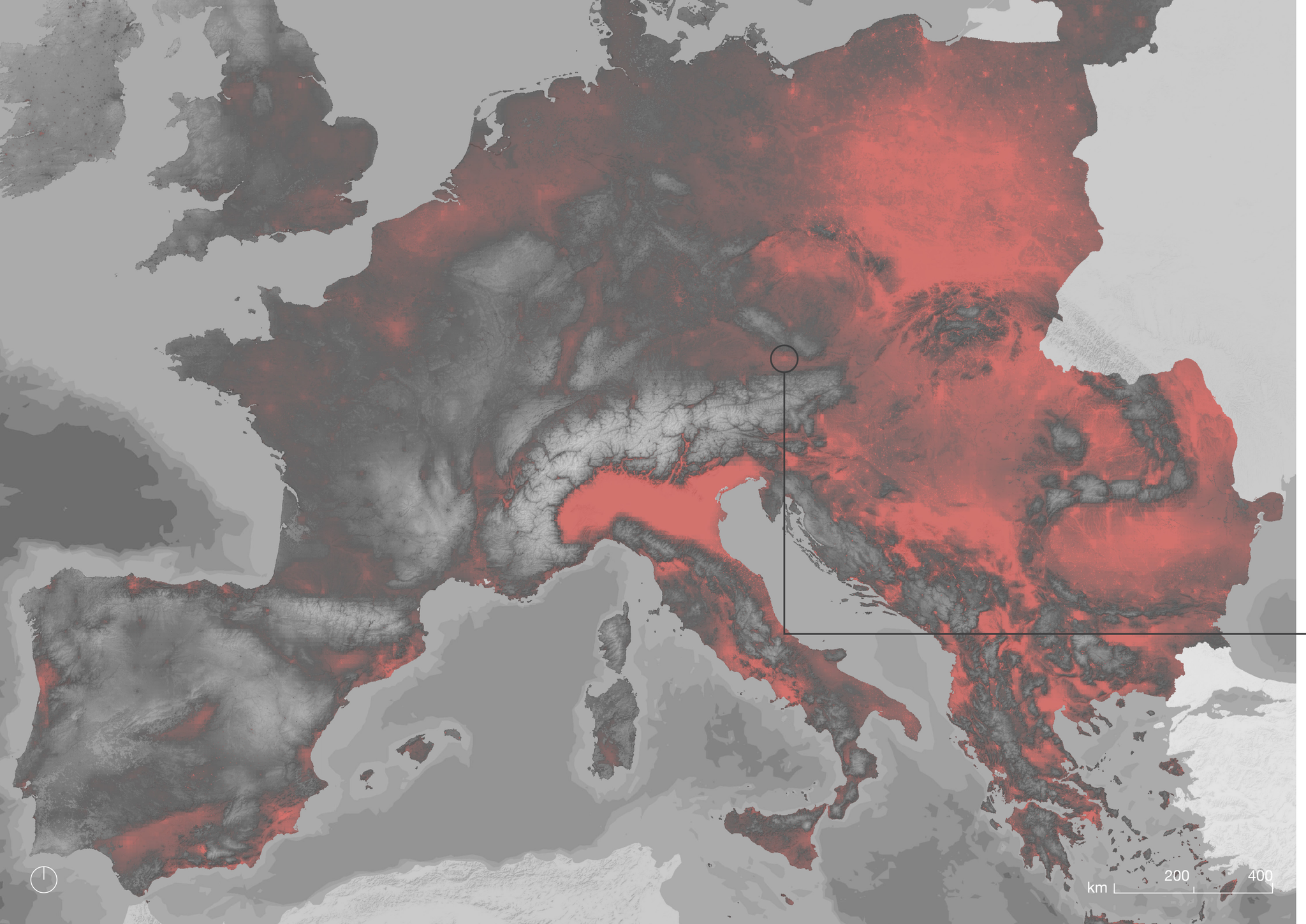
Steel Factories
Coal Mines (Bituminous)

Terminals
Coal Import/Export
Coal Import

Workforce Steel
<1400
1400 - 4400
4400 - 9400
9400 - 20000
<20000

Global Energy Monitor, Global Steel Plant Tracker (April 2024)
Global Coal Terminals Tracker (2023)

Steel Europe



Good: levels of fine particulate matter that do not exceed the annual guideline value of the World Health Organization of 5 µg/m3,

Fair: levels above 5 and not exceeding 10 µg/m3,

Moderate: levels above 10 and not exceeding 15 µg/m3,

Poor: levels above 15 and not exceeding 25 µg/m3

Very poor: levels at and above the EU limit value of 25 µg/m3.

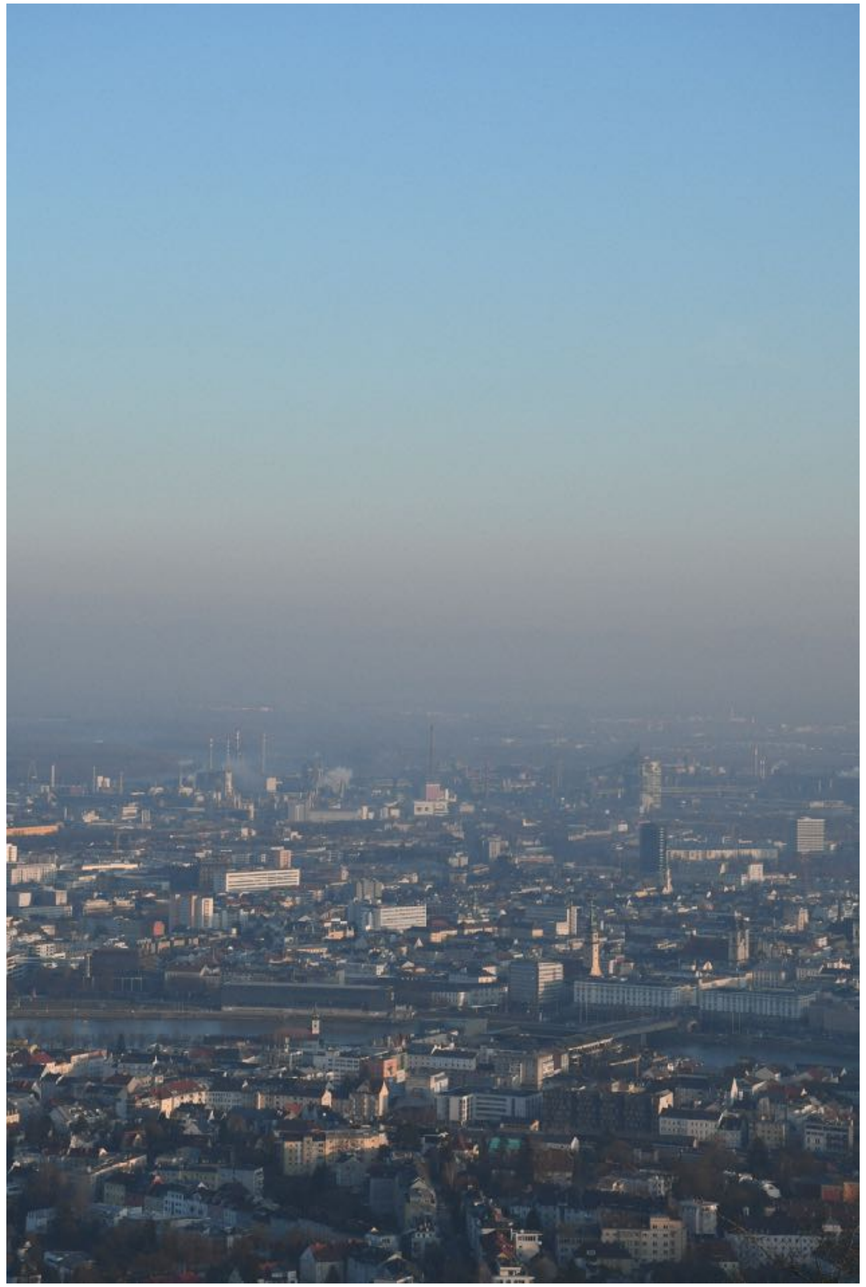
Linz, PM 2.5 | 15 ug/m3



(EEA, 2024)

Air quality in Europe | PM 2.5

Metropolitan Region Linz



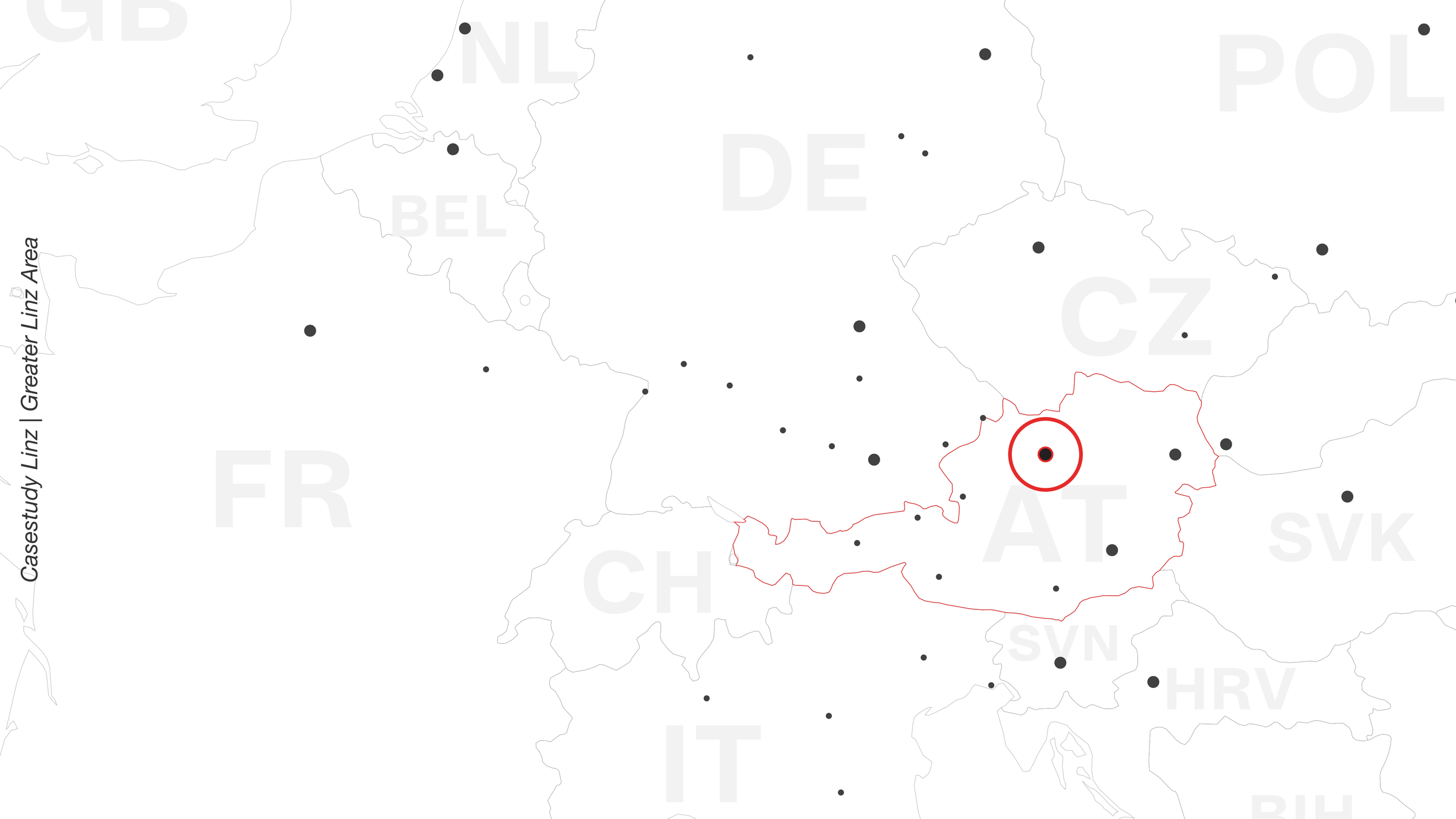
View over Linz from Pöstlingberg



View from the University of Arts towards the industrial area.

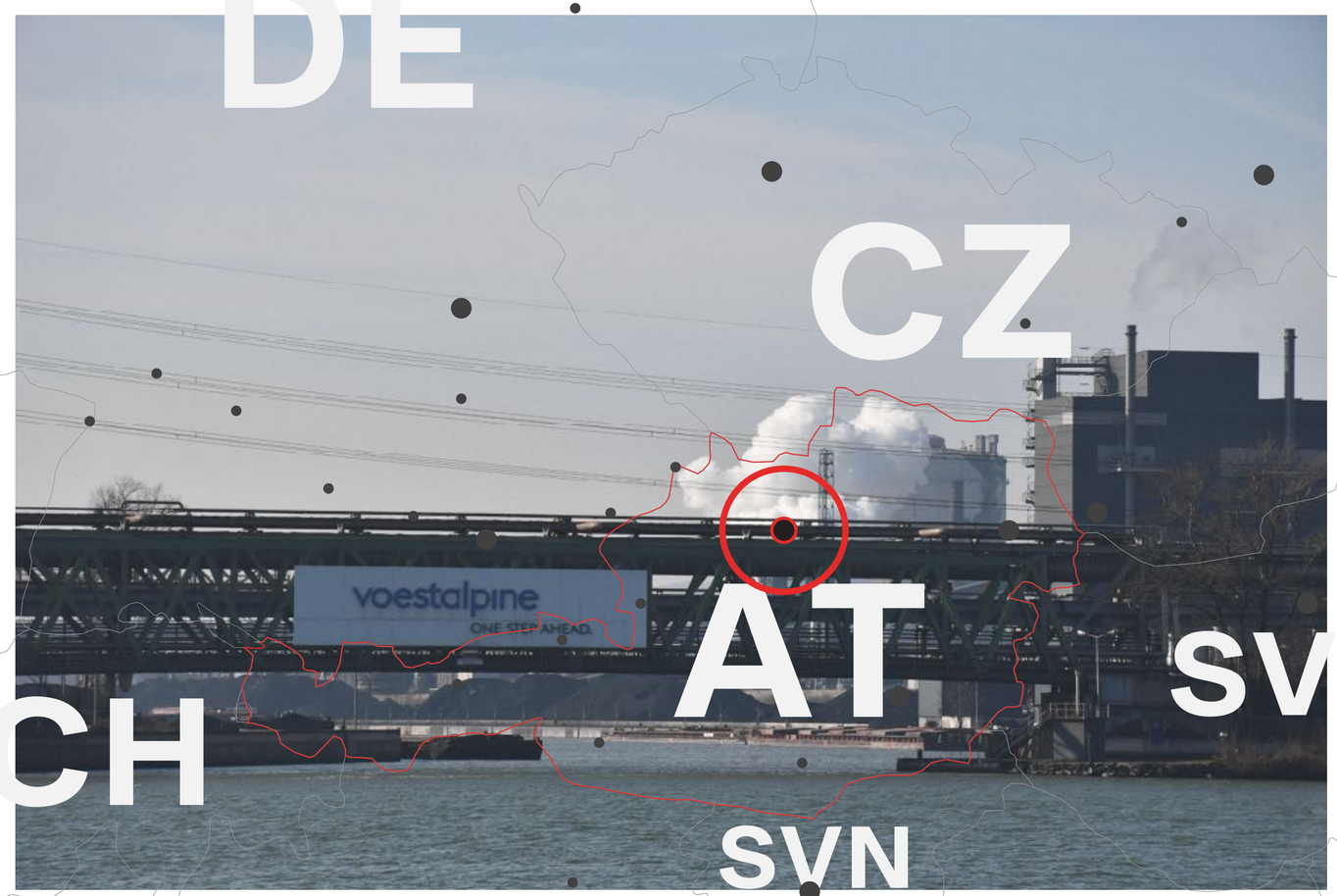


View from Steyregg torwards the voestalpine steel factory



Casestudy Linz | Greater Linz Area

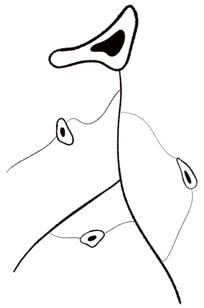

BEL
FR


DE
CZ
voestalpine
ONE STEP AHEAD.
AT
SVK
CH
SVN


GB
NL
POL
DE
BEL
CZ
FR
voestalpine
ONE STEP AHEAD.
AT
SVK
CH
SVN
HRV
IT
BIH

Spatial-morphological dimension of the steel industry in Linz





Linz 1830



Linz 1926







Linz 1945



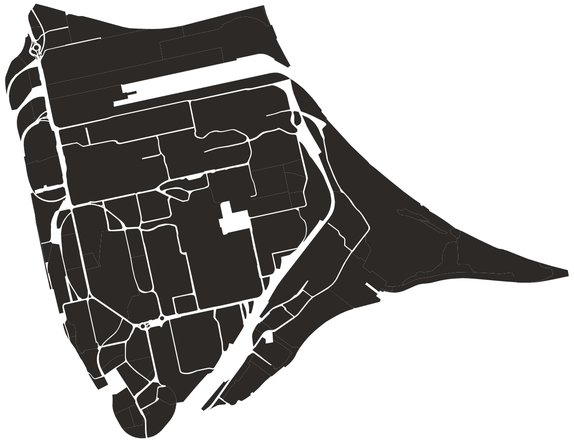
Inner City Amsterdam



Inner City Vienna



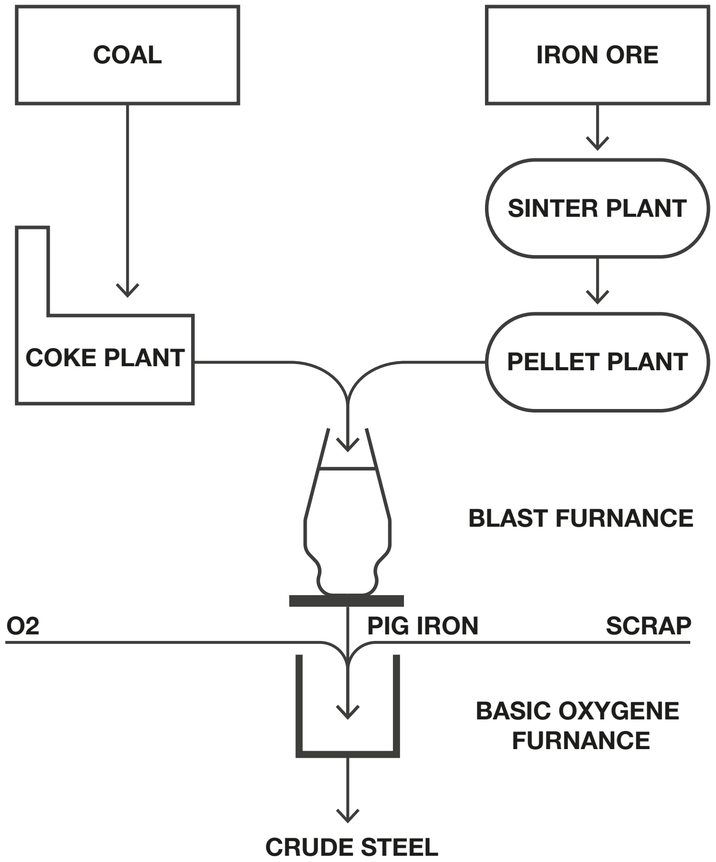
Inner City Linz



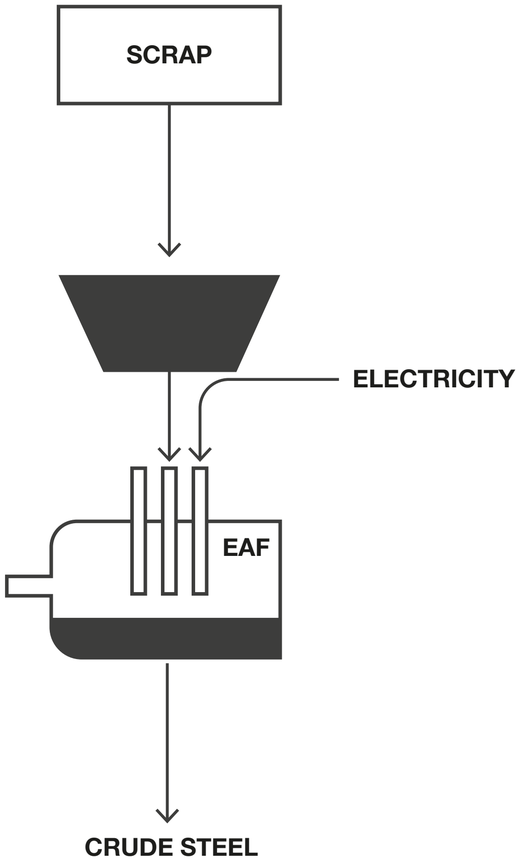
Steelfactory voestalpine Linz*

Understanding steel as a system to understand the spatial dimensions of the energy transition

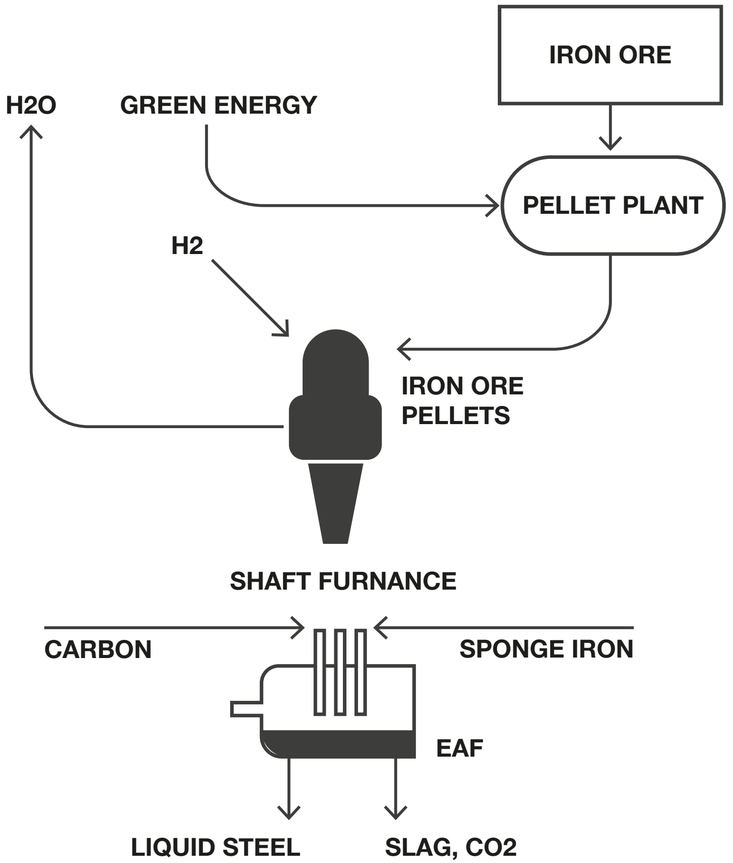
Primary Route: BF - BOF (Basic Oxygen Furnance)



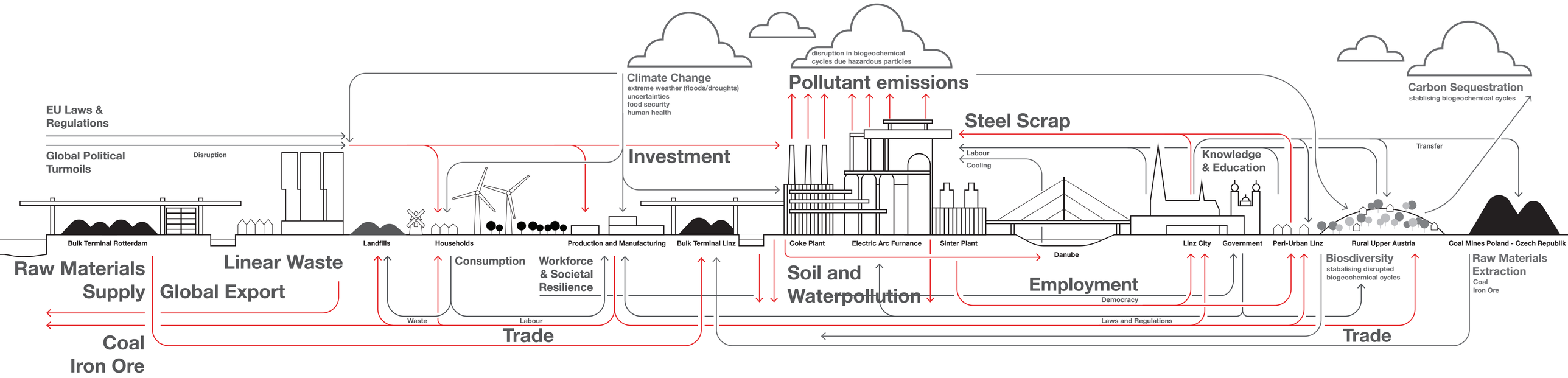
Secondary Route: EAF (Electric Arc Furnance)

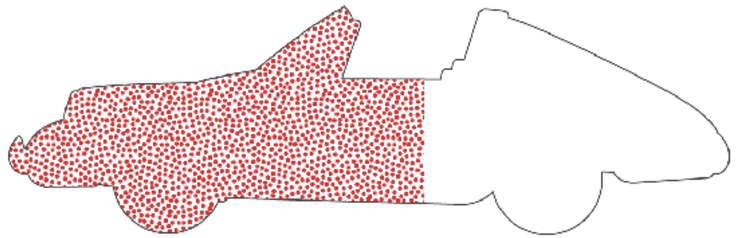


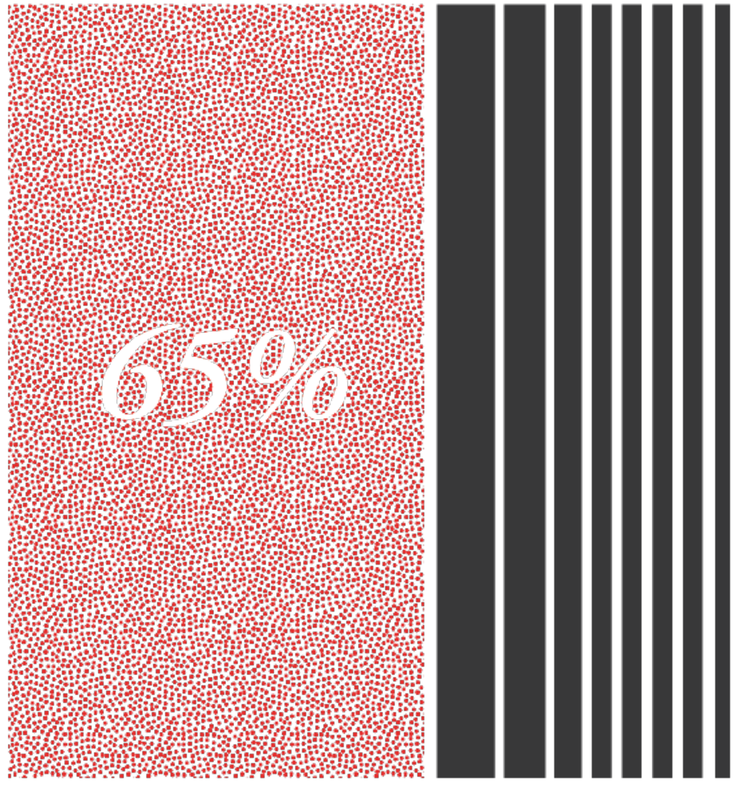
DRI - Direct Reduced Iron - EAF



Adapted from (Ito, Langefeld, & Götz, 2020)


EU Laws &
Regulations
Global Political
Turmoils
Disruption
Climate Change
extreme weather (floods/droughts)
uncertainties
food security
human health
disruption in biogeochemical
cycles due hazardous particles
Pollutant emissions
Carbon Sequestration
stablising biogeochemical cycles
Steel Scrap
Investment
Labour
Cooling
Knowledge
& Education
Transfer
Bulk Terminal Rotterdam
Landfills
Households
Production and Manufacturing
Bulk Terminal Linz
Coke Plant
Electric Arc Furnance
Sinter Plant
Danube
Linz City
Government
Peri-Urban Linz
Rural Upper Austria
Coal Mines Poland - Czech Republik
Raw Materials
Supply
Linear Waste
Global Export
Consumption
Workforce
& Societal
Resilience
Soil and
Waterpollution
Employment
Democracy
Biosdiversity
stabalising disrupted
biogeochemical cycles
Raw Materials
Extraction
Coal
Iron Ore
Waste
Labour
Laws and Regulations
Trade
Trade
Coal
Iron Ore





Austria

Province

Ferrous Metals

Plastics

Aluminium

Rubber

Electrics

Textiles

Copper

Glass

Fluids

- Magna Steyer
- BMW Austria
- Pierer Industry
- AVL List
- Bosch Austria
- ZKW Group
- Kromberg & Schubert
- BRP-Rotax
- Miba
- Rosenbauer
- Stayer Automotive
- Rheinmetall Austria
- Gebauer & Griller
- Polytec
- Knorr-Bremse
- Hirschmann Automotive
- Wilhelm Schwarzmüller
- Mahle
- Pankl Racing Systems
- Banner

Current urgencies


Shifting Industries


Global Dynamics – Local Impacts



Learning, Re-learning, or Unlearning?

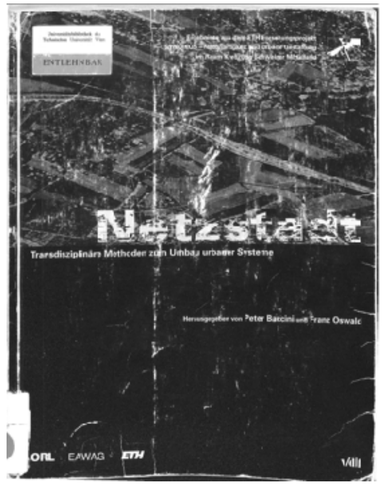
How can transformations in the steel industry of Linz act as a catalyst for the **spatial and programmatic organisation of urban and peri-urban settlements** and **industrial districts,** fostering the integration of **industrial innovation** and **societal shifts** towards a **Circular Society.**

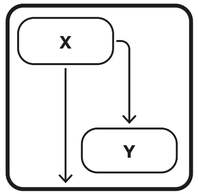
Netzstadt, 1998

Oswald, F., & Baccini, P. (1998). Netzstadt. Hochschulverlag AG an der ETH Zürich.

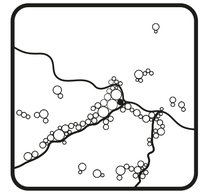
Key Takeaways

- combined spatial phenomena (morphology) and systems (physiology)
- Cross-disciplinary approach between circular economy principles and Urban Design
- No main focus on Society





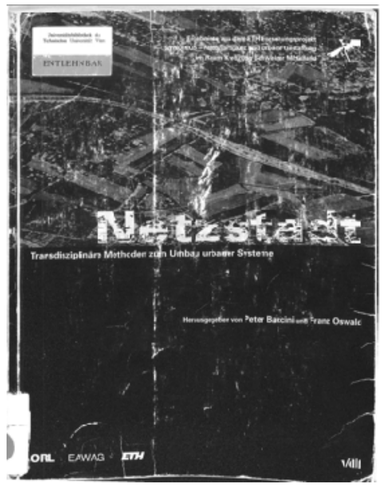
Physiology

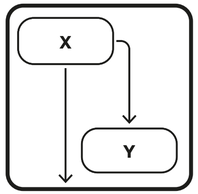


Morphology

Netzstadt, 1998
Oswald, F., & Baccini, P. (1998). Netzstadt. Hochschulverlag AG an der ETH Zürich.

Key Takeaways
- combined spatial phenomena (morphology) and systems (physiology)
- Cross-disciplinary approach between circular economy principles and Urban Design
- No main focus on Society



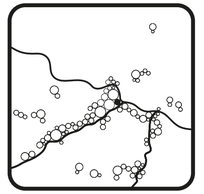


Physiology

*new



Circular Society



Morphology



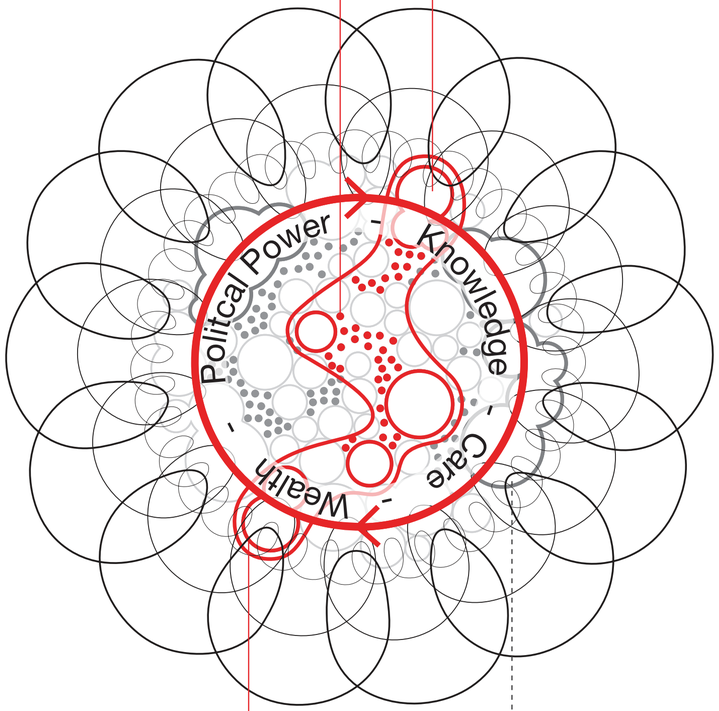
Seven Socio-Ecological Cycles, 2023
Calisto Friant, M., Vermeulen, W. J. V., & Salomone, R. (2023). Transition to a Sustainable Circular Society: More than Just Resource Efficiency. Circular Economy and Sustainability, 4(1), 23–42. https://doi.org/10.1007/s43615-023-00272-3

Key Takeaways
- Argue that current circular strategies often overlook the social dimension, focusing mainly on material and resource flows.
- Talks about a ‘Circular Society’
- No focus on spatial dimension

Conceptual Framework

Human Networks
central system to create
a circular society

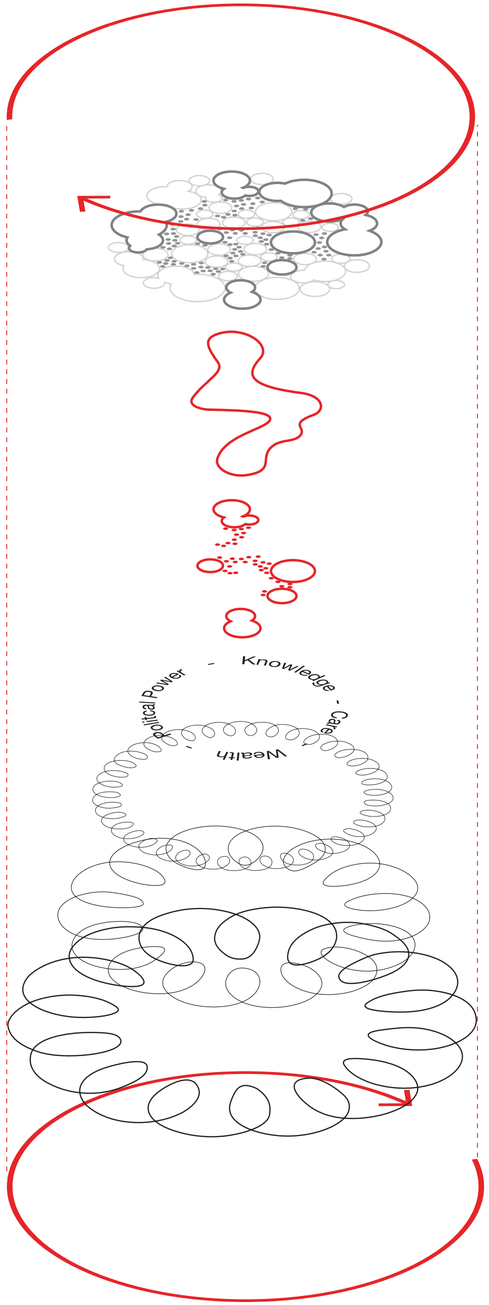
Emerging Technologies
New economies eneable
new jobs and knowlege-transfer



Circular Steel Production
Re-Use of steel slag, wastewater
steel dust and filter Dust
waste heat and flue gases

Coal extraction phase out
Phasing out the coal industry
brings potentials in alternative
energy production modes.
Balacing the disruped
biogechemical cycles

- Morphological Sphere
- Human System
- Physiological Sphere
- Steelscapes
- Biogechemical cycles
- Resource cycles
- Ecosystem cycles
- Circular Flows



Morphology

+

Physiology

+

Steelscapes

+

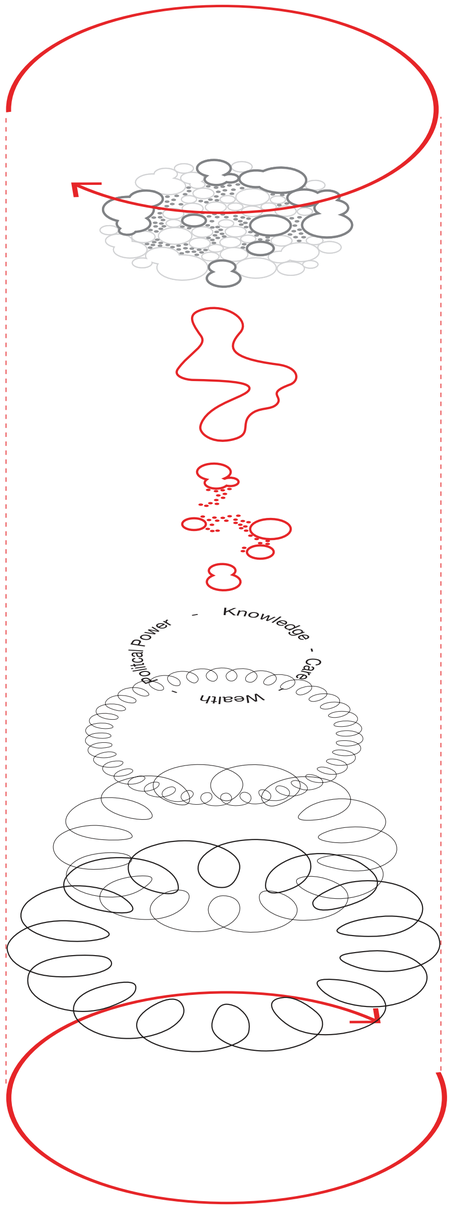
Seven Socio-ecological Cycles

=

Steelscape Metabolism

*adapted on the base of the conceptual diagram by Calisto Friant et al. (2023)

Operational Framework



B
Biogechemic Cycles

E
Ecosystem Cycles

R
Resource Cycles

P
Politicle Power Cycles

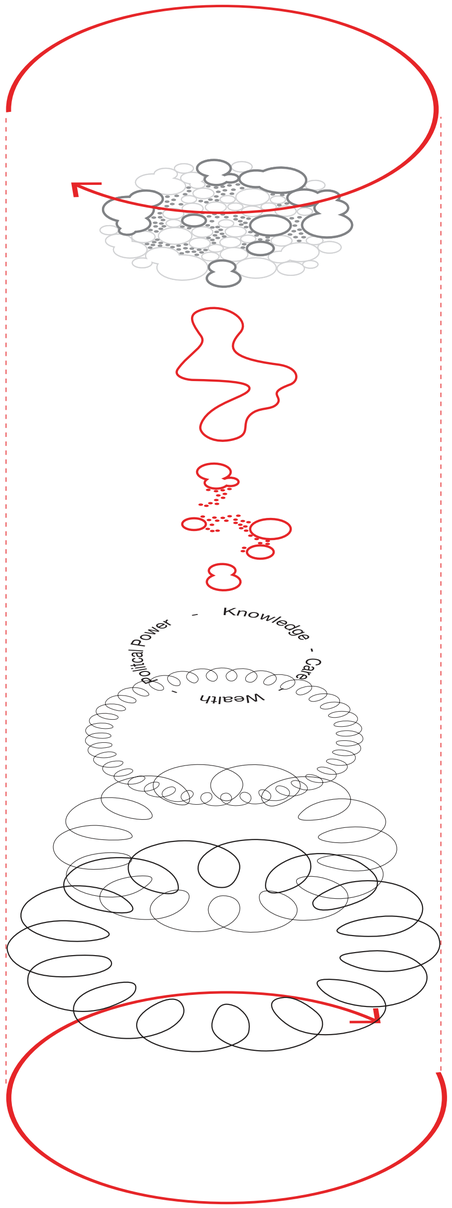
W
Economic Cycles of We

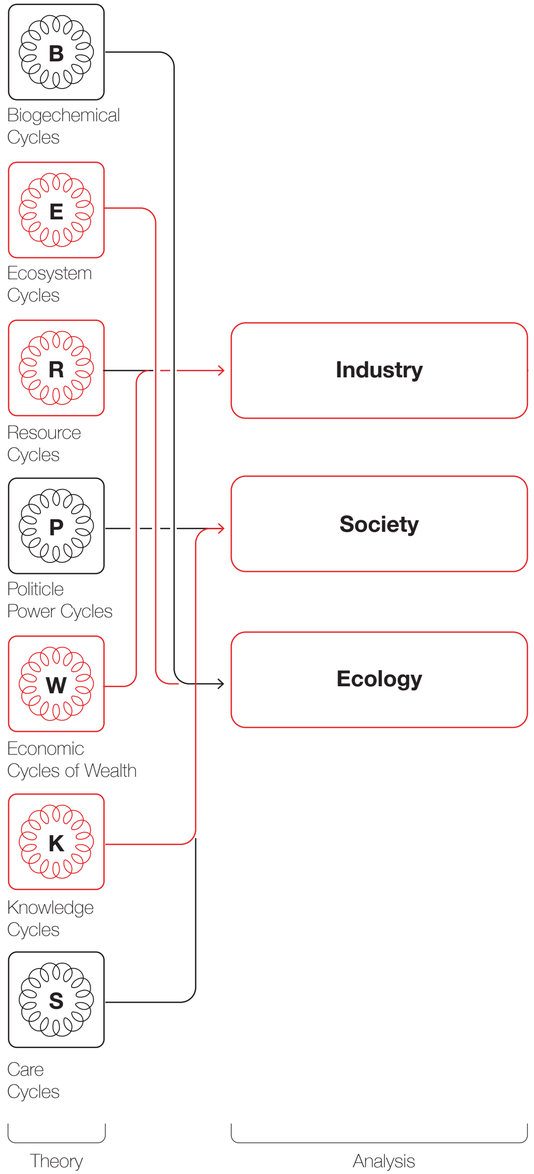
K
Knowledge Cycles

S
Care Cycles

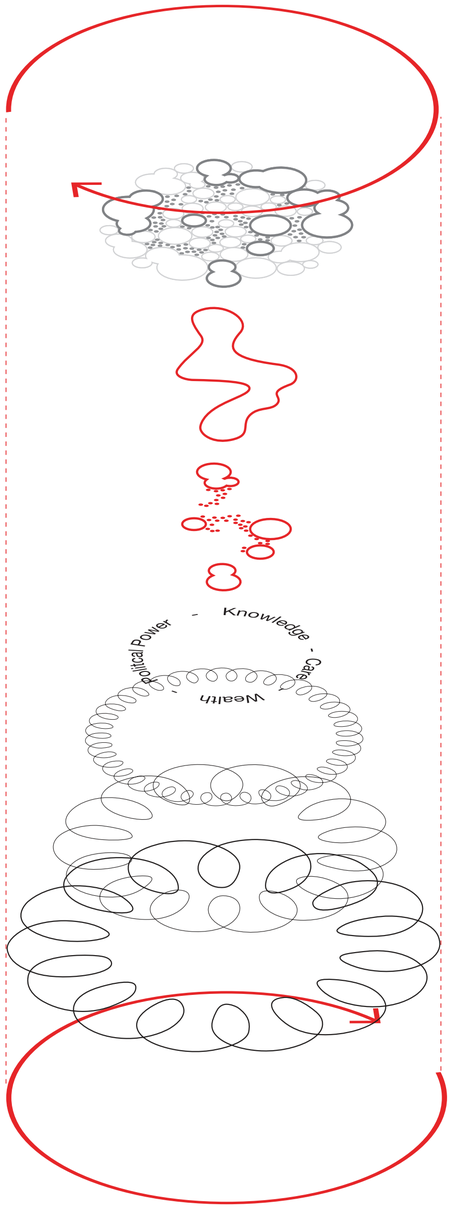
Theory

Operational Framework





Operational Framework



B
Biogechemical Cycles

E
Ecosystem Cycles

R
Resource Cycles

P
Politicle Power Cycles

W
Economic Cycles of Wealth

K
Knowledge Cycles

S
Care Cycles

Industry

Society

Ecology

SC of Making
- Steelfactory
- Coke Plant
- Scap Plant

SC of Manufacturing
- Automotive Industry
- Construction Industry

SC of Sourcing
- Coal Mines
- Iron Ore Mines
- Recycling Facilities

SC of Flows
- Soil Recycling Plant
- Road/Rail Infrastructure
- Waterways

SC of Living
- Workers Settlements
- Urban Settlements
- Peri-Urban Settlements

SC of Learning
- Appranticeship Schools
- LLL Institutions
- Universities + Research

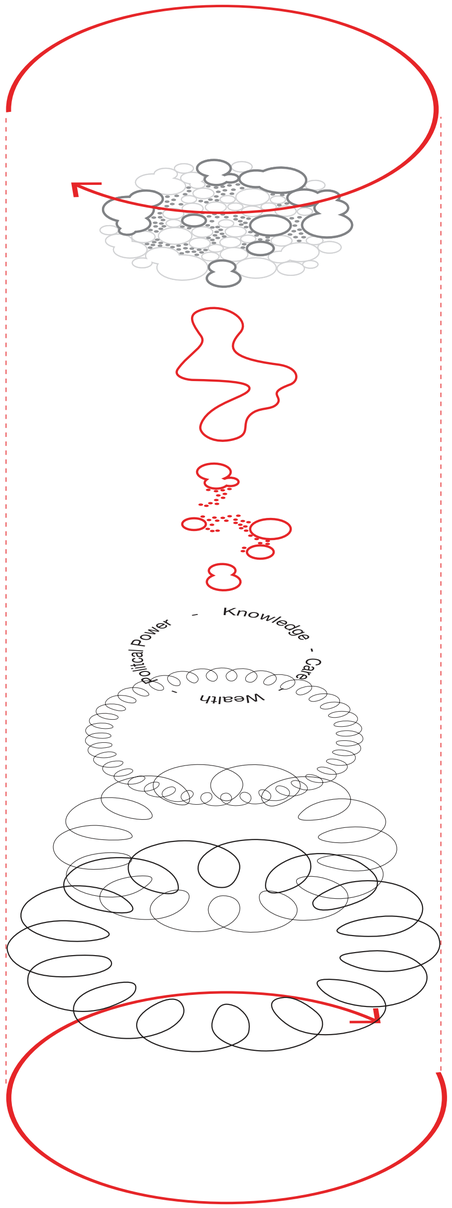
SC of Regeneration
- Nature Resorts
- Forests
- Floodplains

Theory

Analysis

Steelscapes

Operational Framework



- B — Biogechemical Cycles
- E — Ecosystem Cycles
- R — Resource Cycles
- P — Politicle Power Cycles
- W — Economic Cycles of Wealth
- K — Knowledge Cycles
- S — Care Cycles

Theory

Analysis

- **Industry**
- **Society**
- **Ecology**

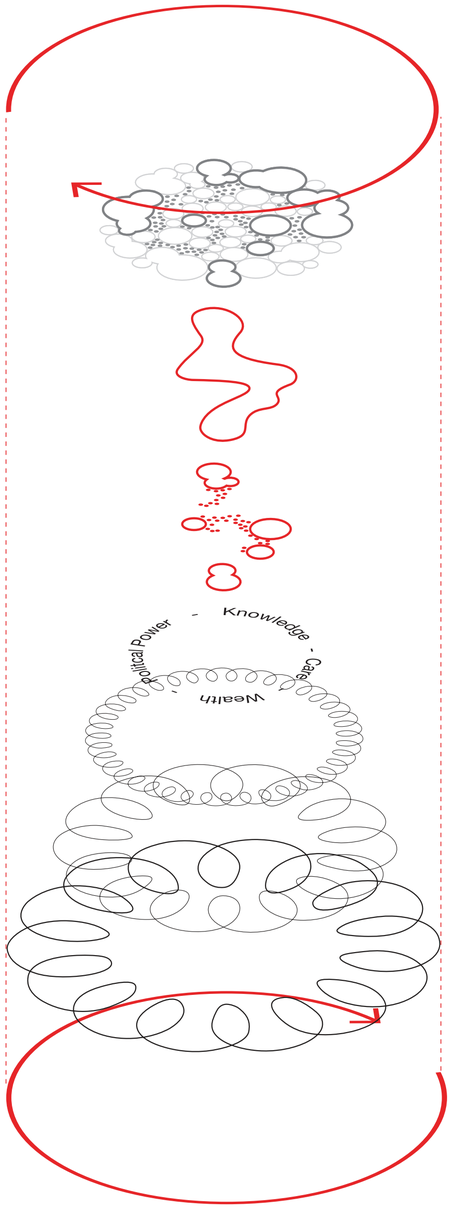
Steelscapes

- SC of Making
  - Steelfactory
  - Coke Plant
  - Scap Plant
- SC of Manufacturing
  - Automotive Industry
  - Construction Industry
- SC of Sourcing
  - Coal Mines
  - Iron Ore Mines
  - Recycling Facilities
- SC of Flows
  - Soil Recycling Plant
  - Road/Rail Infrastructure
  - Waterways
- SC of Living
  - Workers Settlements
  - Urban Settlements
  - Peri-Urban Settlements
- SC of Learning
  - Appranticeship Schools
  - LLL Institutions
  - Universities + Research
- SC of Regeneration
  - Nature Resorts
  - Forests
  - Floodplains

Scope

- Make
- Live
- Learn

Operational Framework



Itaration

B
Biogechemical Cycles

E
Ecosystem Cycles

R
Resource Cycles

P
Politicle Power Cycles

W
Economic Cycles of Wealth

K
Knowledge Cycles

S
Care Cycles

Industry

Society

Ecology

SC of Making
- Steelfactory
- Coke Plant
- Scap Plant

SC of Manufacturing
- Automotive Industry
- Construction Industry

SC of Sourcing
- Coal Mines
- Iron Ore Mines
- Recycling Facilities

SC of Flows
- Soil Recycling Plant
- Road/Rail Infrastructure
- Waterways

SC of Living
- Workers Settlements
- Urban Settlements
- Peri-Urban Settlements

SC of Learning
- Appranticeship Schools
- LLL Institutions
- Universities + Research

SC of Regeneration
- Nature Resorts
- Forests
- Floodplains

Make

Live

Learn

Theory

Analysis

Steelscapes

Scope

Loops

Defining *Steelscapes*



346.000 m2 greenfield surface parking for car logistics | Schwertberg



Steelscapes are not only the facilities of steel production and the land where steel is processed but also the broader interconnected spatial systems, including **ecosystems, infrastructural networks, settlement structures** and **related manufacturing activities.**

These **territories reflect the interdependencies** between industrial activity, environmental conditions, and the socio-economic fabric of communities.

346.000 m2 greenfield surface parking for car logstics | Schwertberg

Steelscapes of Making
- Steel Factory
- Coke Plant
- Scrap Plant

voestalpine Linz



Steel producer

Steelscapes of Manufacturing
- Automotive Industry
- Enegeneering Industry
- Construction Industry

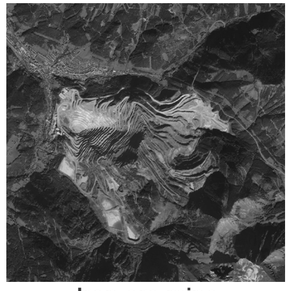
Rosenbauer Leonding



Fire engine producer

Steelscapes of Sourcing
- Coal Mines
- Iron Ore Mines
- Hydrogene Plants

Erzberg Eisenerz



Iron ore mine

Steelscapes of Re-use
- Recycling Facilities
- Scrap yards
- Soil recycling plant

Loacker Götzis



Steel Scrap

Steelscapes of Flows
- Road Infrastrucutre
- Rail Infrstructure
- Waterways

A1 Westautobahn



Highway

Steelscapes of Living
- Workers Settlements
- Urban and Peri-Urban Livelyhoods

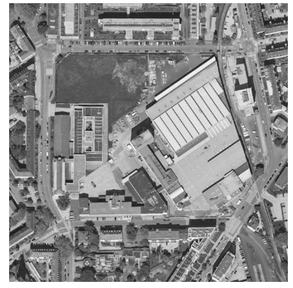
Bindermichel-Keferfeld



Workers Settlement

Steelscapes of Learning
- Apprenticeship schools
- Higher Education Institutes
- Universities

Berufsschule 3 Linz



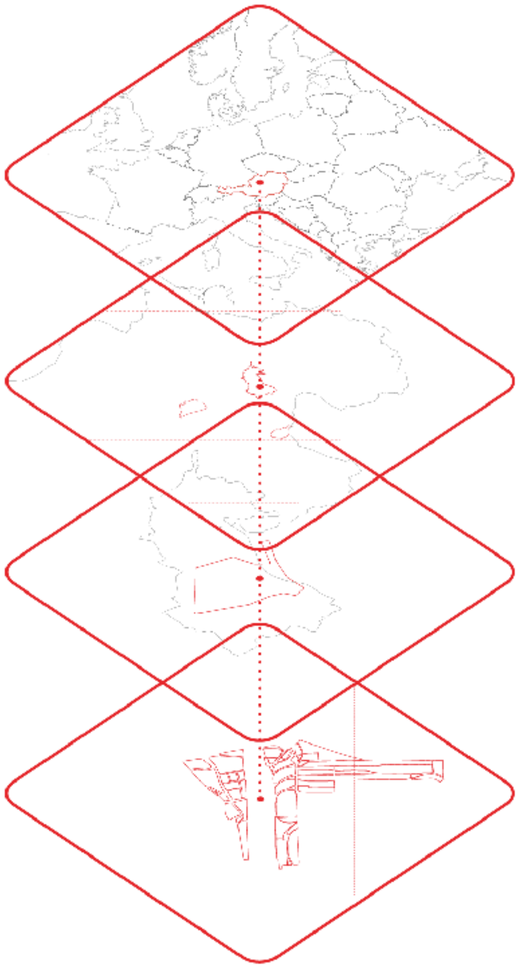
Applied Schools

Steelscapes of Regeneration
- Nature Resorts
- Forests

Nature reservoir Traun
Donau Auen

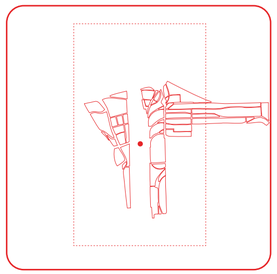


Ecosystems

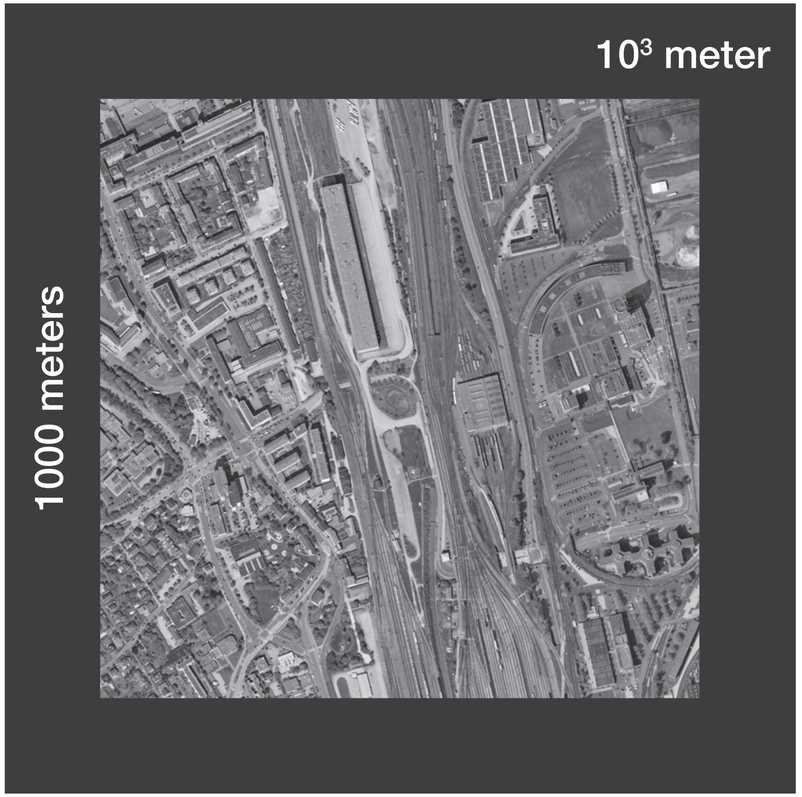


Understanding multiscalarity of transformations

The Power of Ten - Charles and Ray Eames 1977



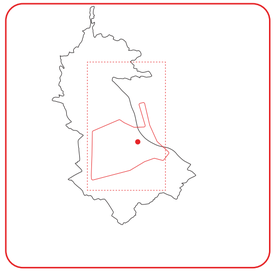
Steelscapes:
Making
Re-use
Flows
Living
Learning
Regeneration



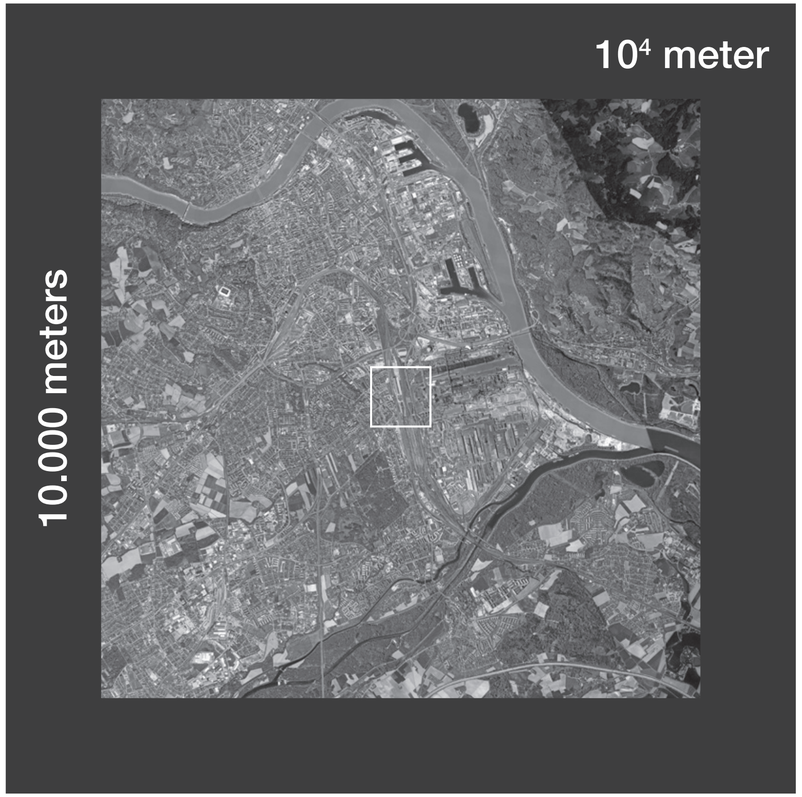
The distance a racing car can travel in 10 seconds

Neigbourhood
District

The Power of Ten - Charles and Ray Eames 1977



Steelscapes:
Making
Manufacturing
Re-use
Flows
Living
Lerarning
Regeneration



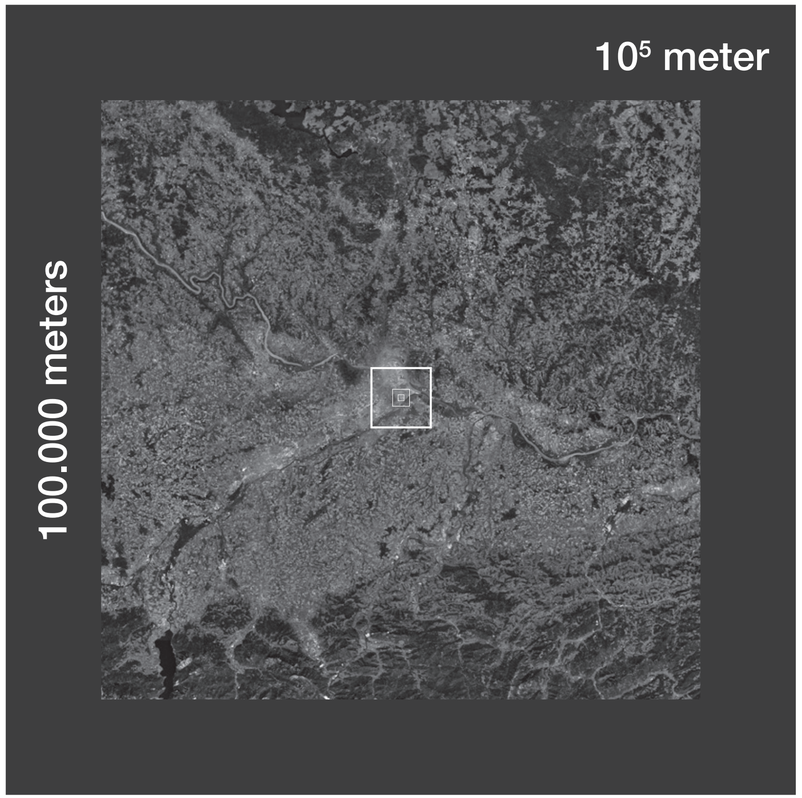
The distance a supersonic air-craft can travel in 10 seconds

City

The Power of Ten - Charles and Ray Eames 1977



Steelscapes:
Flows
Sourcing
Regeneration



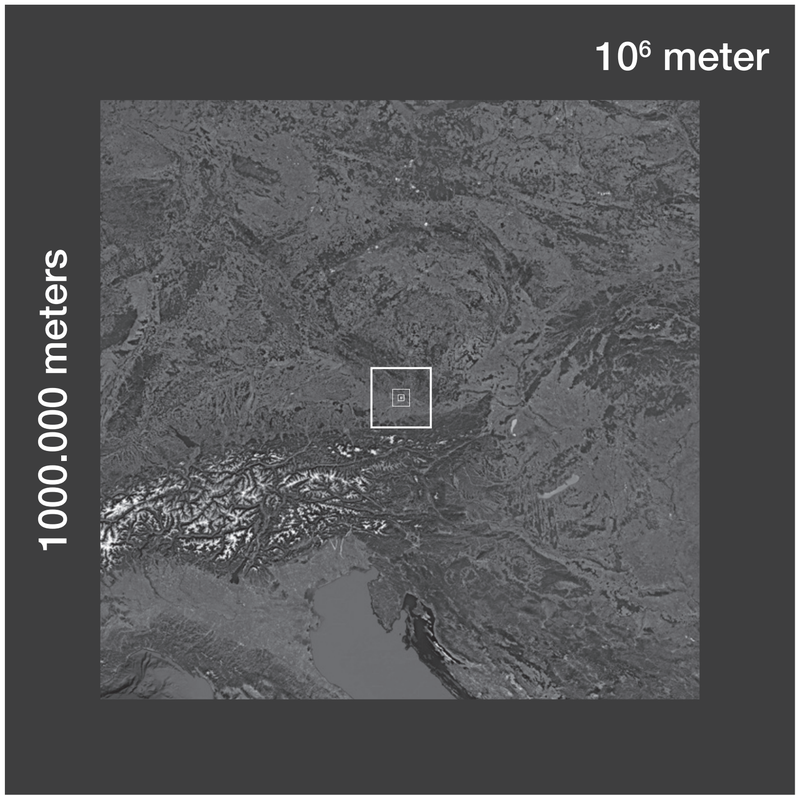
The distance a
orbiting satellite
covers in
10 seconds

Region
Territory

The Power of Ten - Charles and Ray Eames 1977



Steelscapes:
Flows
Sourcing
Regeneration



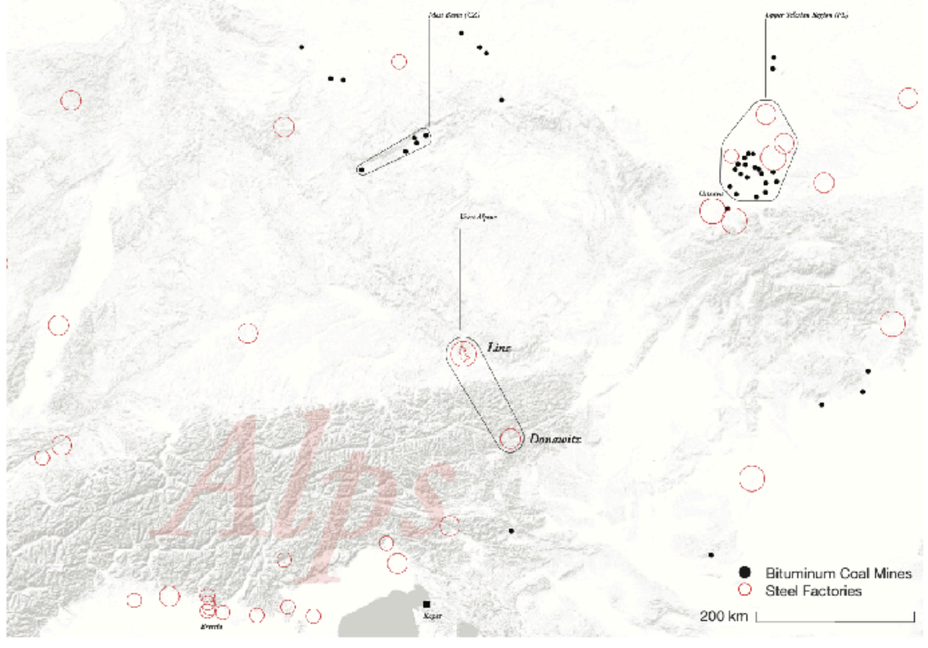
Soon the earth
will show us a
solid sphere

Nation
Continent

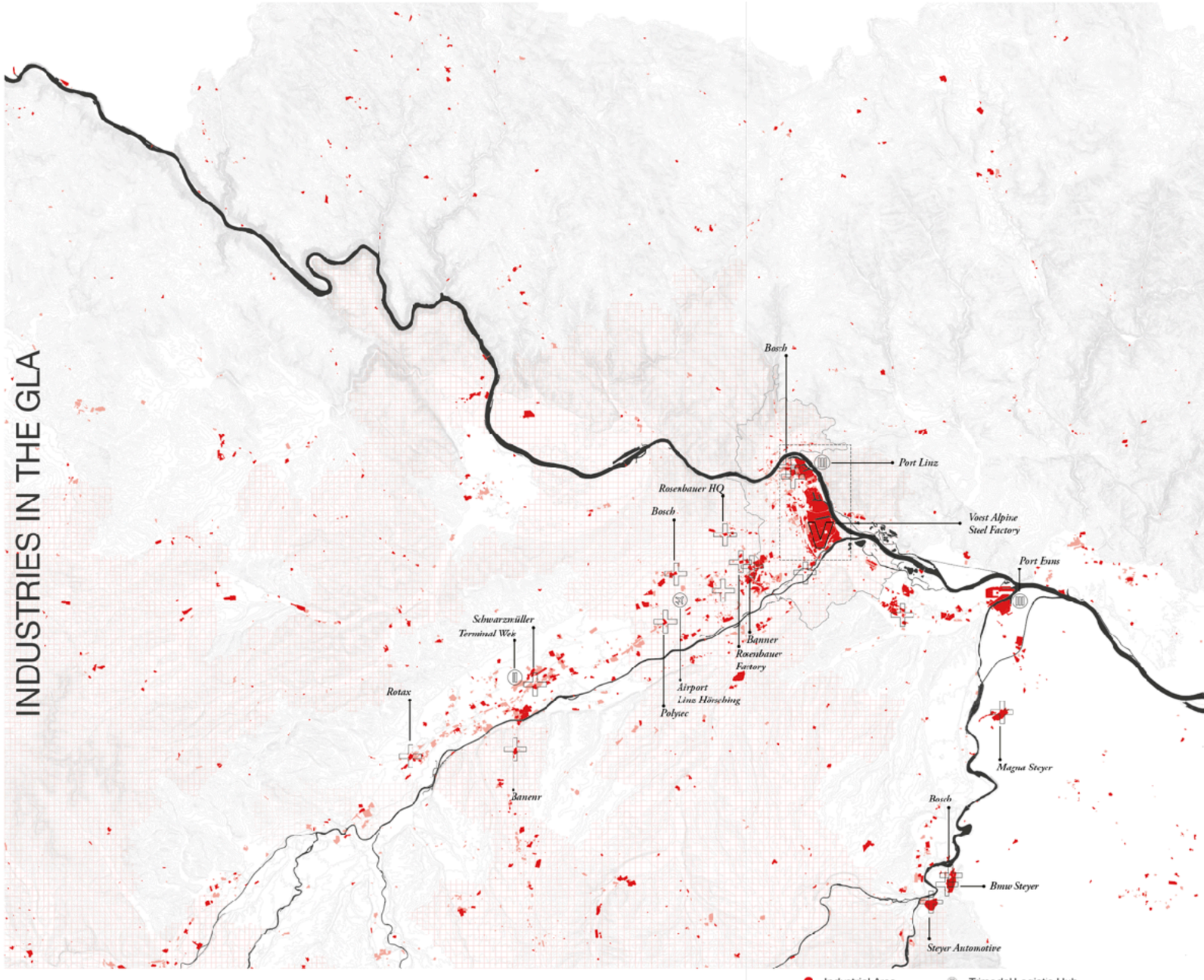
analysis

Make





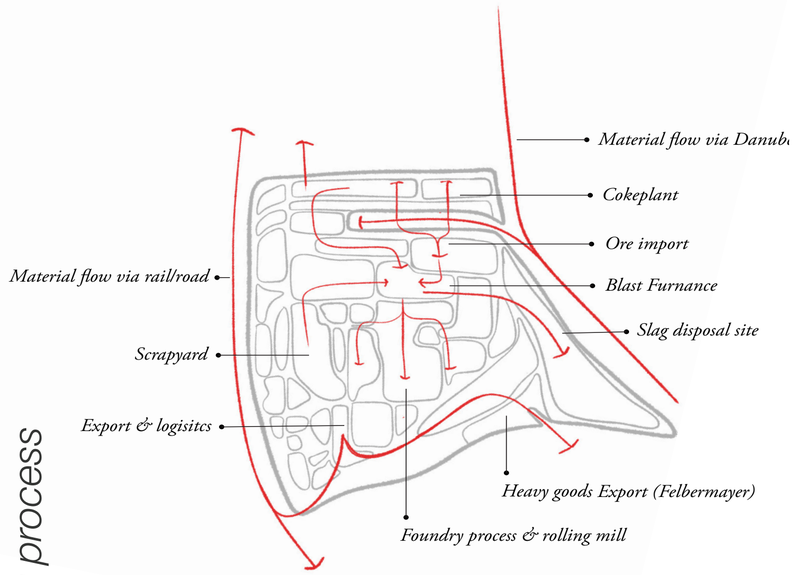
INDUSTRIES IN THE GLA



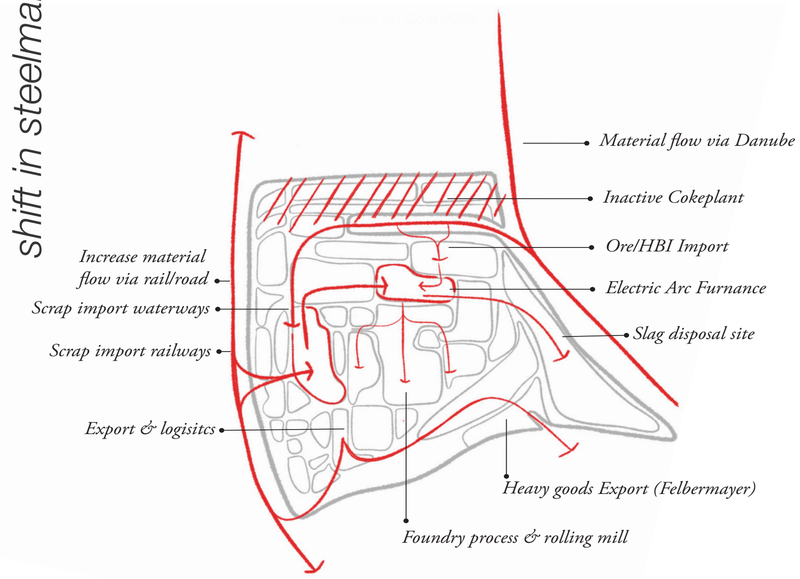
This map shows the industrial and commeercial areas in the GLA with a focuse on the biggest Automotive Industries in Austria by value in 2022 and the spatial realationship between the steelfactory, logisitc hubs and manufacturing enterprises.

- Industrial Area
- Commercial Area
- Bimodal Logistic Hub
- Trimodal Logistic Hub
- Autmotive Industry
- Waterways

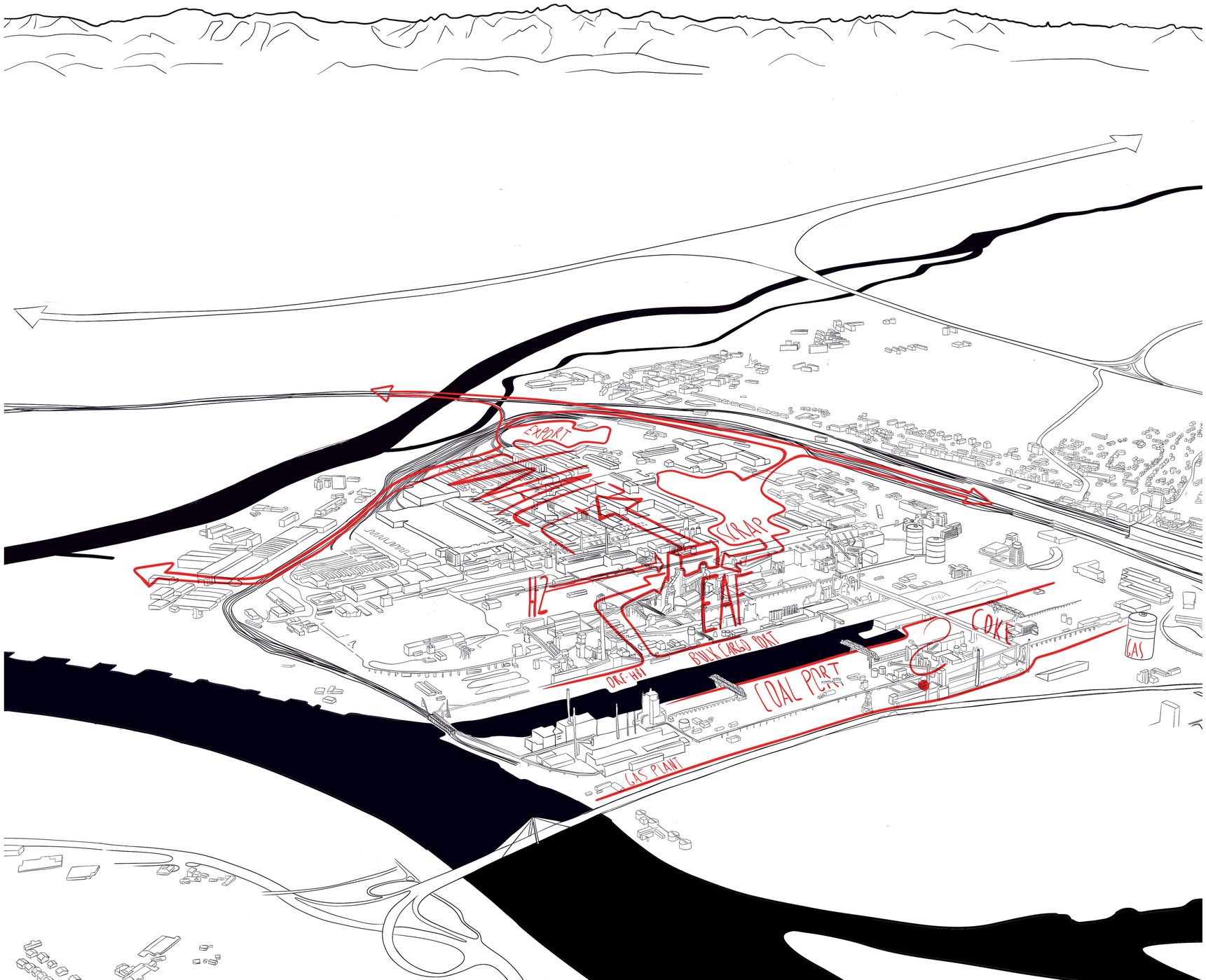
shift in steelmaking process



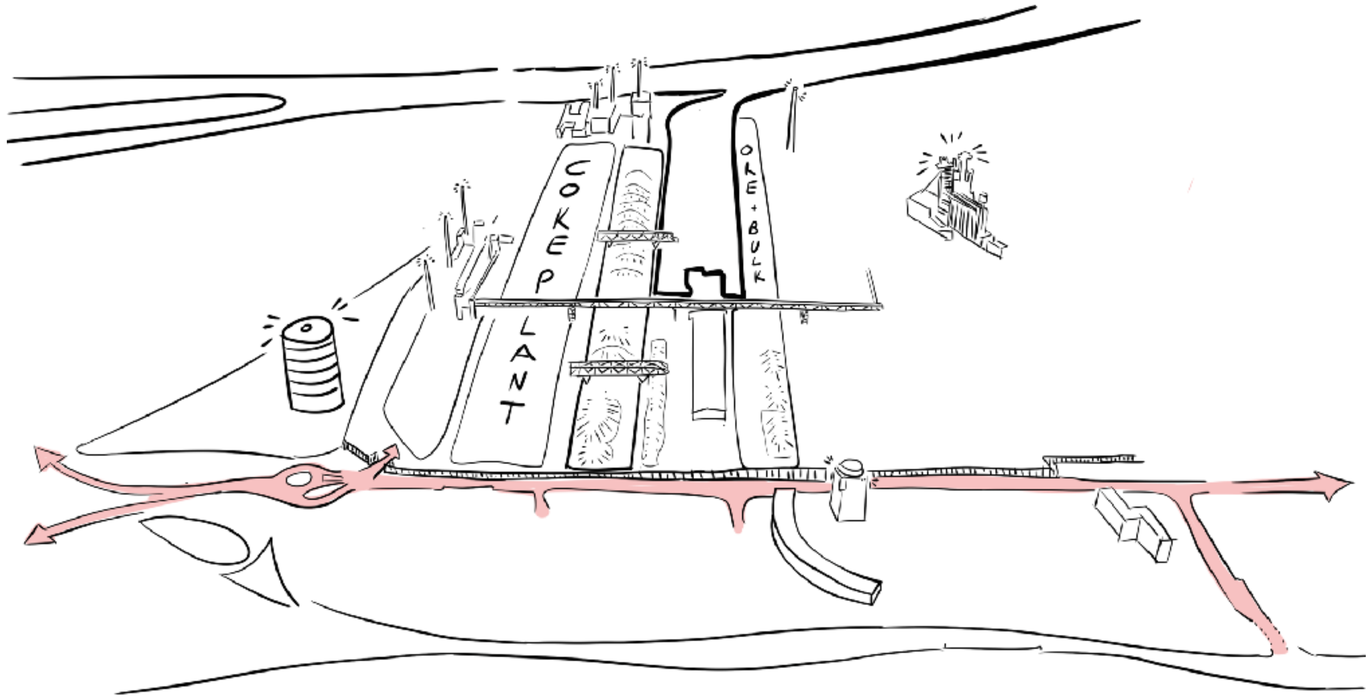
Voest on coal 2025

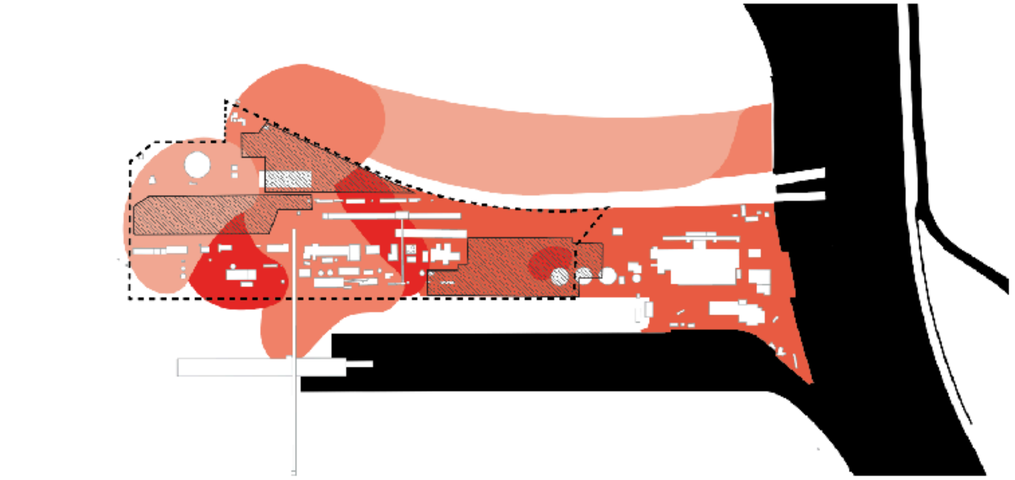


Voest on H2 2040

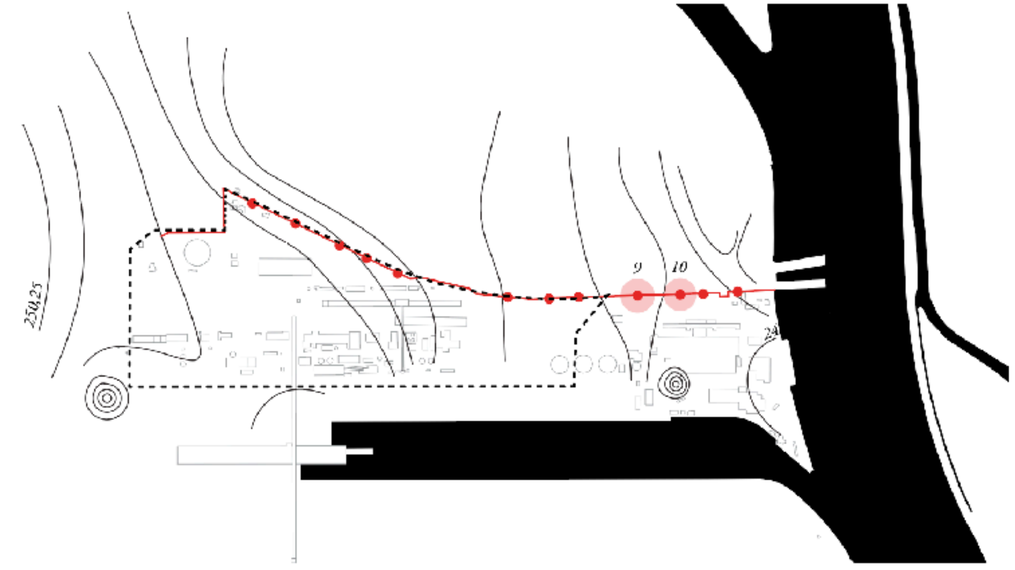


the cokeplant as wastescape





Summary of Groundwater Contamination Zones before decontamination



Groundwater level
Gates
Water

Gate and Funnel System

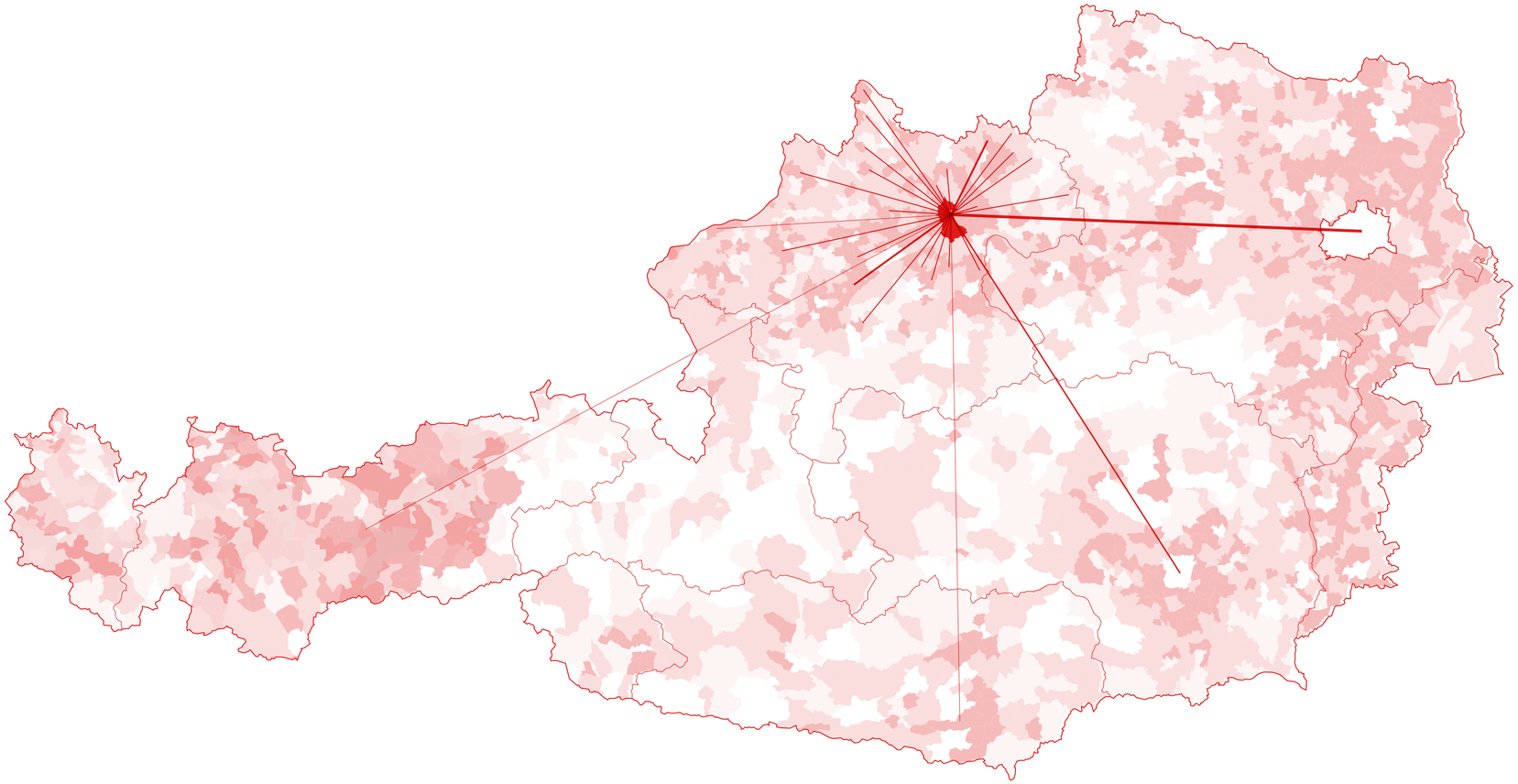
350m





Spatial consequences: Massive Infrastructures are required

Live



> 80 %
> 70 - 80 %
> 60 - 70 %

Share of out-commuters (in % of the employed population at place of residence)

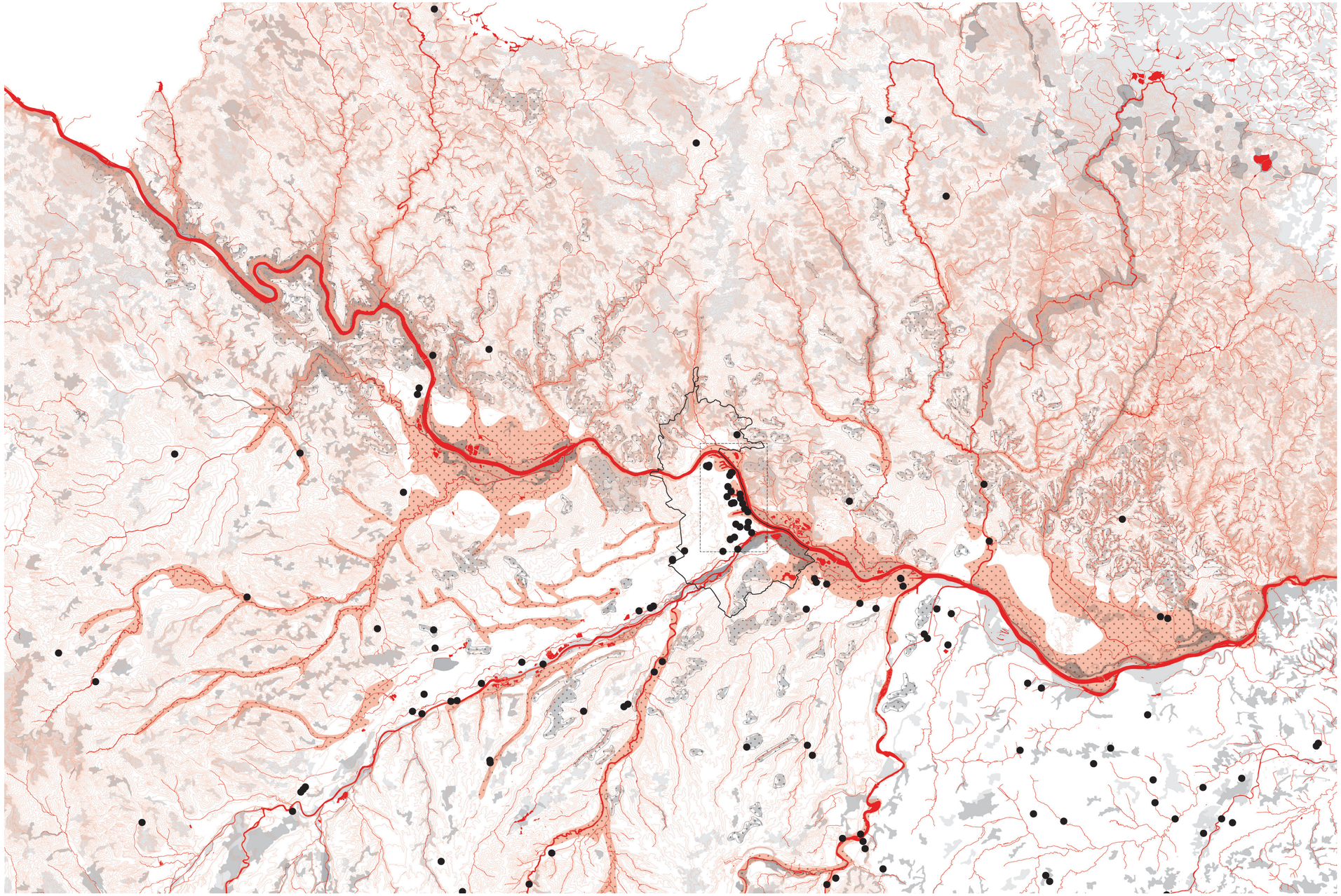
effected human environments





"We cannot understand the effects of high and low densities if we assume that the relationship between concentrations of people and production of diversity is a simple, straight mathematical affair." (Jacobs, 1961, p. 205)

effected ecosystems



The map shows the ecological territories and industrial polluters. The urban core of Linz disrupts the ecosystem of the Danube. The most pollutants are located in the industrial Area of Linz, directly attached to the shore of the Danube.

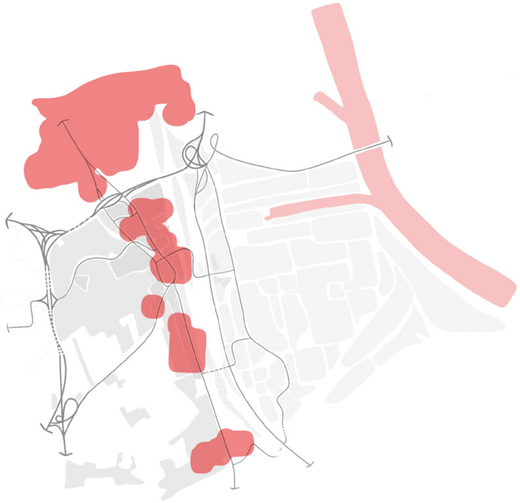
Waterbody
HQ 30+ Flood Area
Natura 2000

Coniferous Forest
Broad Leaf Forest
Mixed Forest

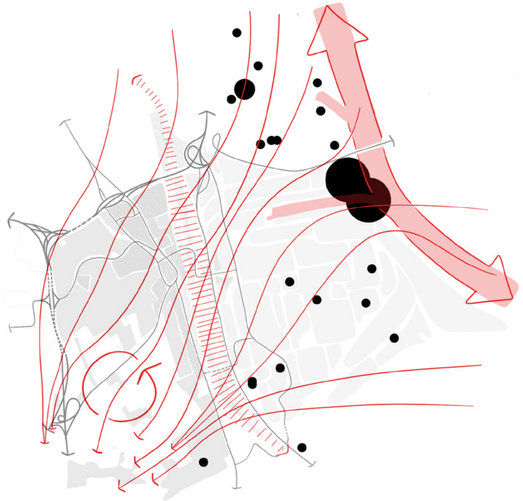
Polluters

10 km

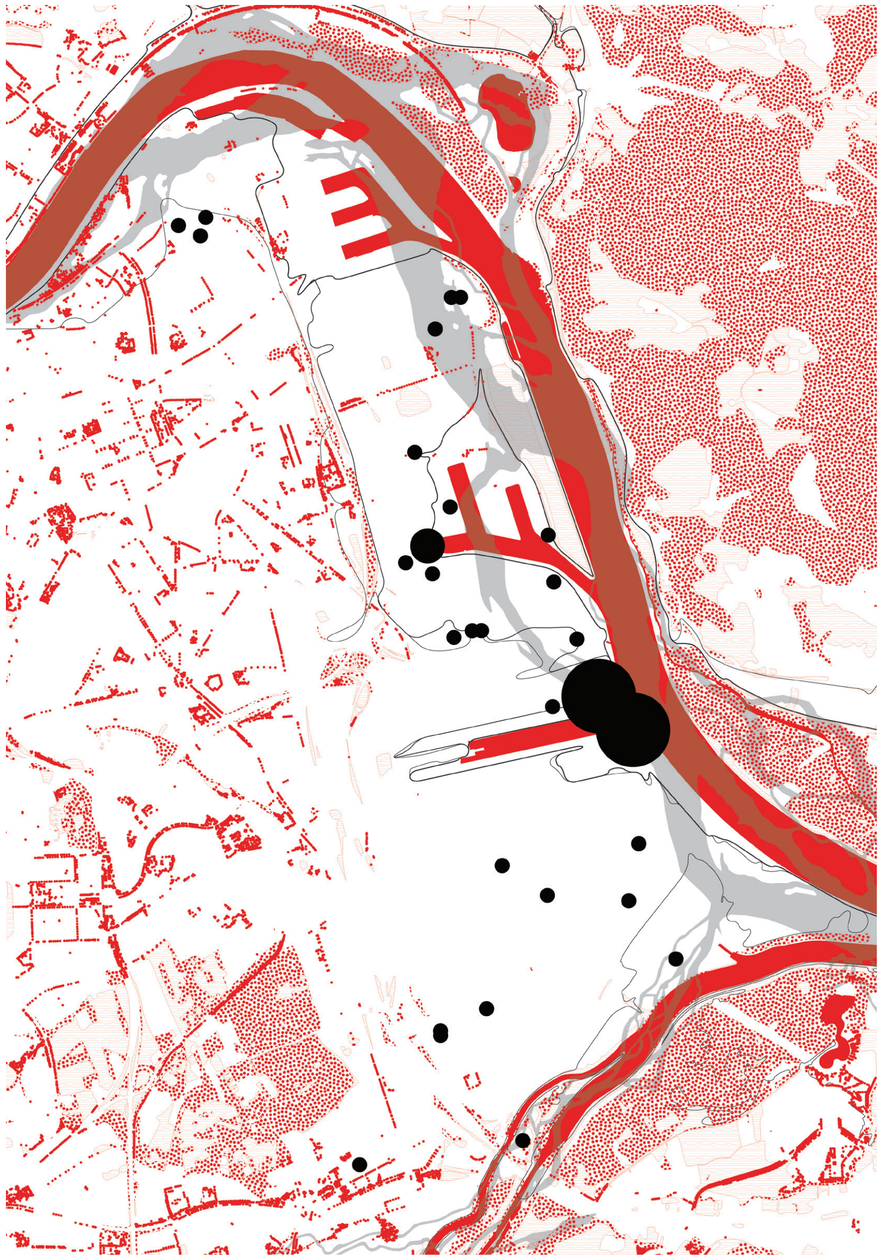
effected ecosystems



Critical Zones for
climate adaptation



Wind directions
Pollutors



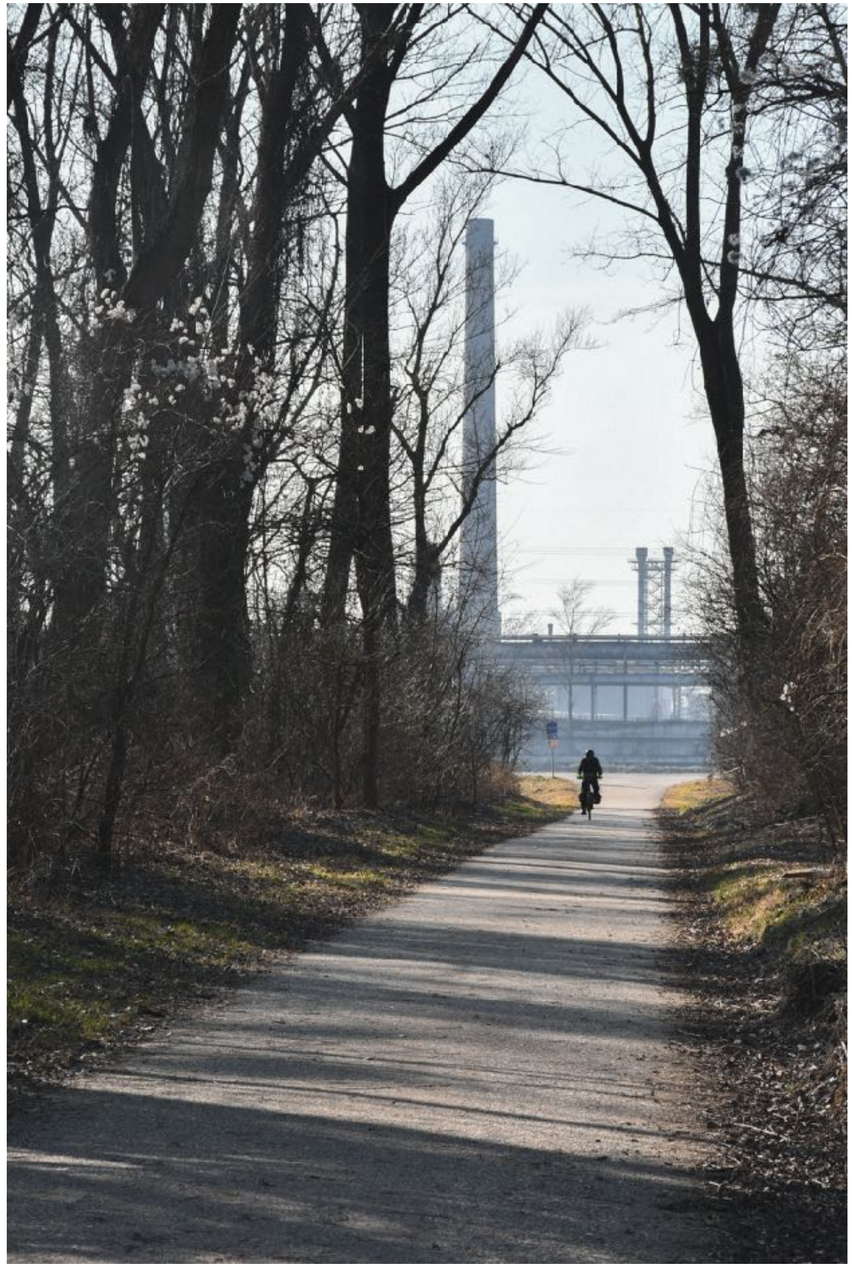
Forest
Trees

Water
Historical Waterflow

Floodrisk Area (300 - 1000 y)
Pollutors

1 km

consequences

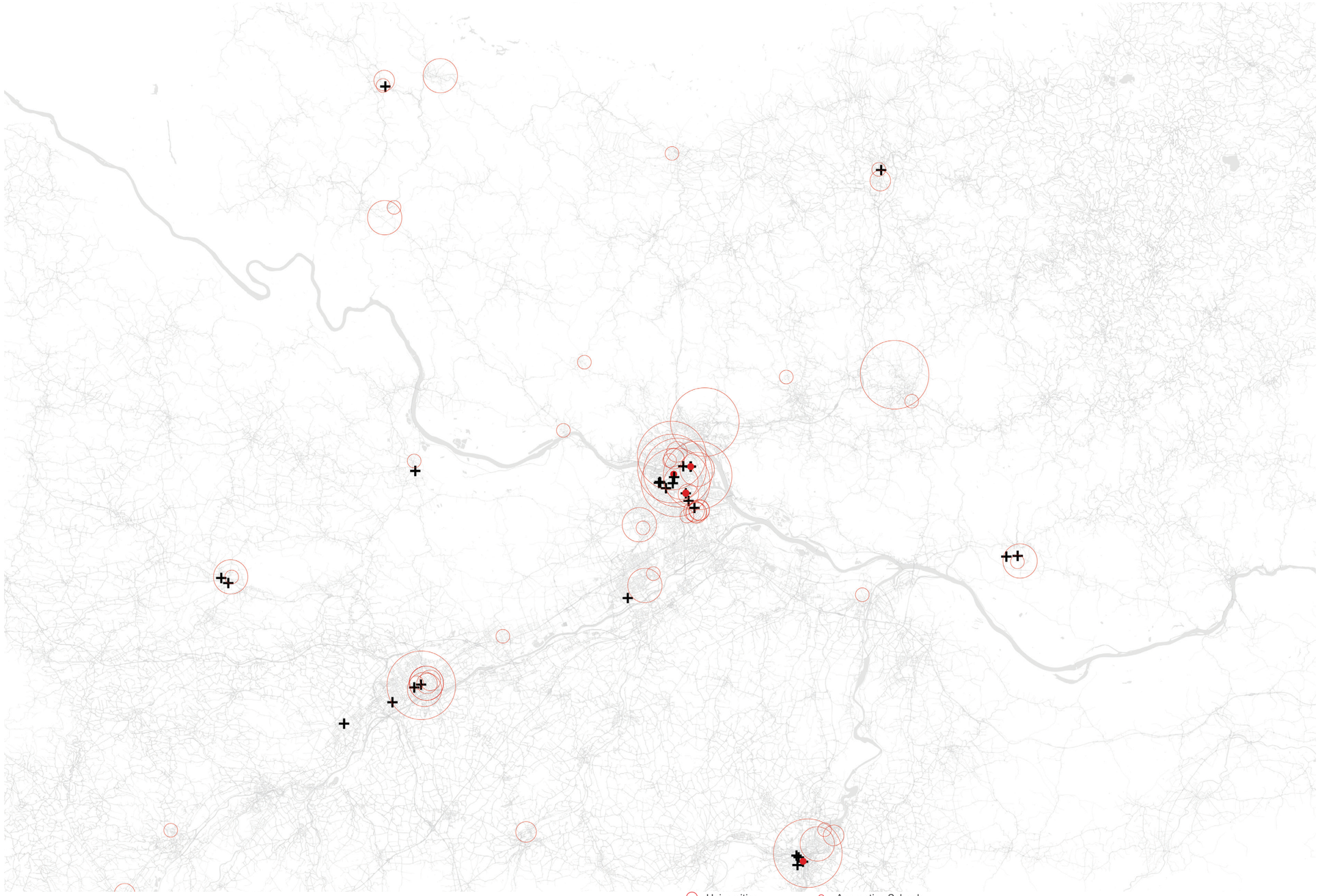


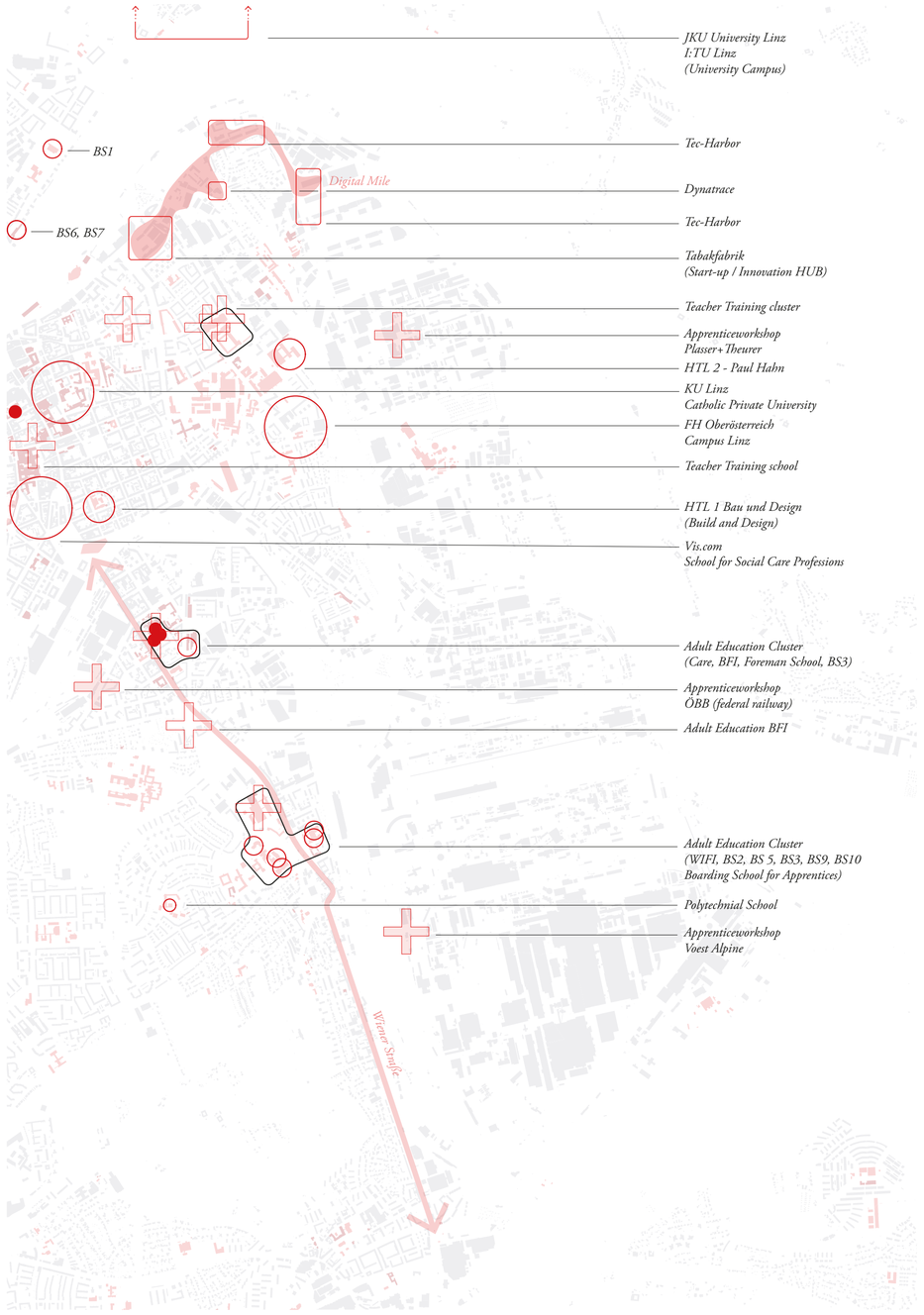


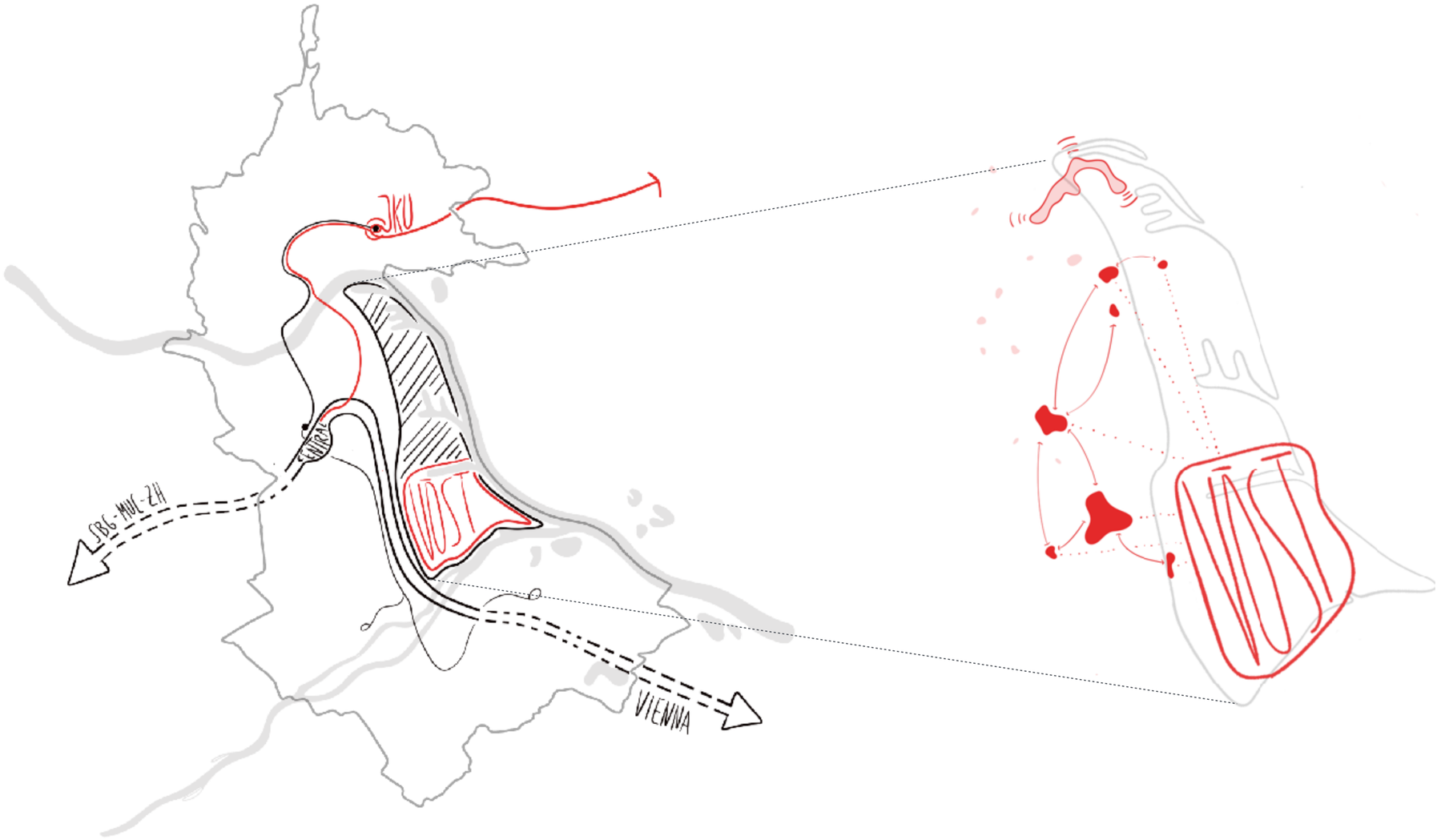
Spatial consequences: ecosystem degradation and effects on health for citizen close to industries and infrastructures

Learn

places of learning in the GLA




JKU University Linz
I:TU Linz
(University Campus)
BS1
Tec-Harbor
Digital Mile
Dynatrace
BS6, BS7
Tec-Harbor
Tabakfabrik
(Start-up / Innovation HUB)
Teacher Training cluster
Apprenticeworkshop
Plasser+Theurer
HTL 2 - Paul Hahn
KU Linz
Catholic Private University
FH Oberösterreich
Campus Linz
Teacher Training school
HTL 1 Bau und Design
(Build and Design)
Vis.com
School for Social Care Professions
Adult Education Cluster
(Care, BFI, Foreman School, BS3)
Apprenticeworkshop
ÖBB (federal railway)
Adult Education BFI
Adult Education Cluster
(WIFI, BS2, BS 5, BS3, BS9, BS10
Boarding School for Apprentices)
Polytechnial School
Apprenticeworkshop
Voest Alpine
Wiener Straße
Special Zoning
Other Use
Adult Education
Education Cluster
Apprentice School
Adult Education Steel related
500 m



New train line

Proximity of applied educational facilities closer to industries, but also digital mile shifting priorities in industrial area

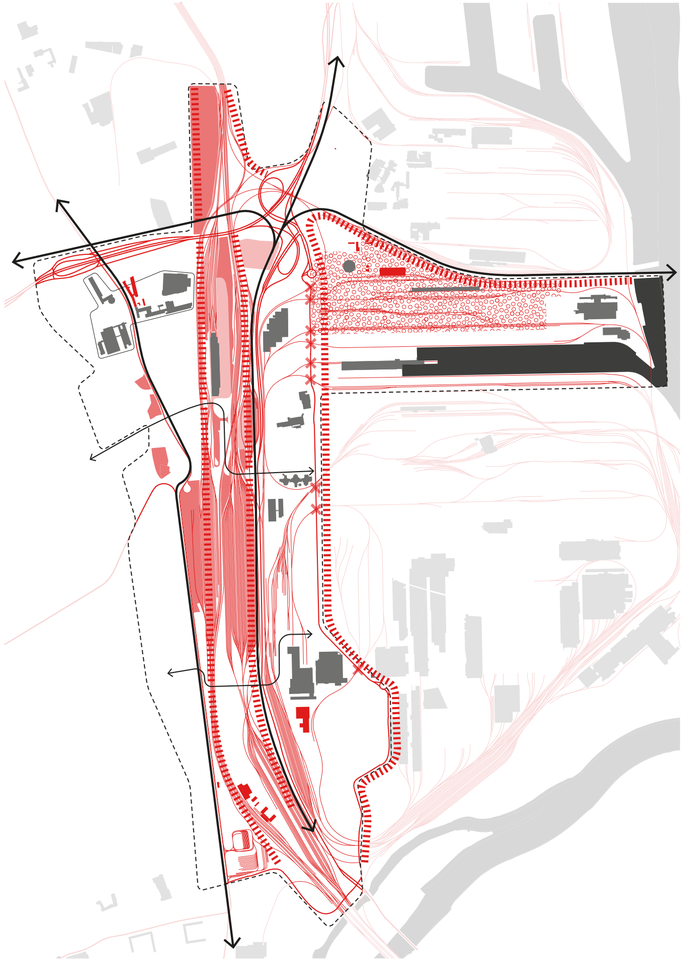
Education more related to heavy industries
Education more related to digital industries



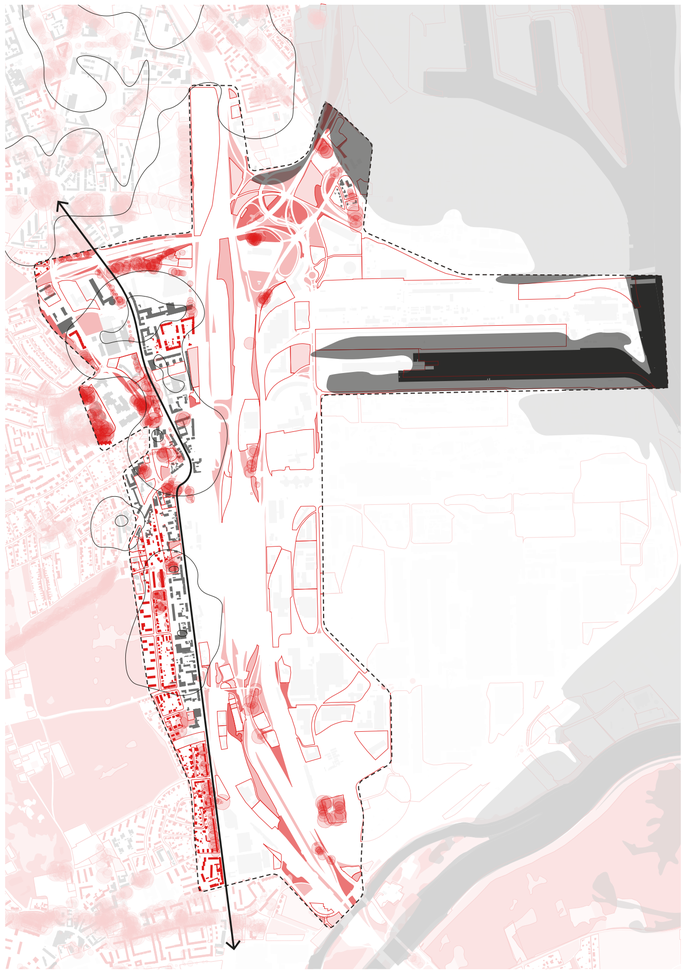


Spatial consequences: locations, programmation and facilities of places of learning are crucial

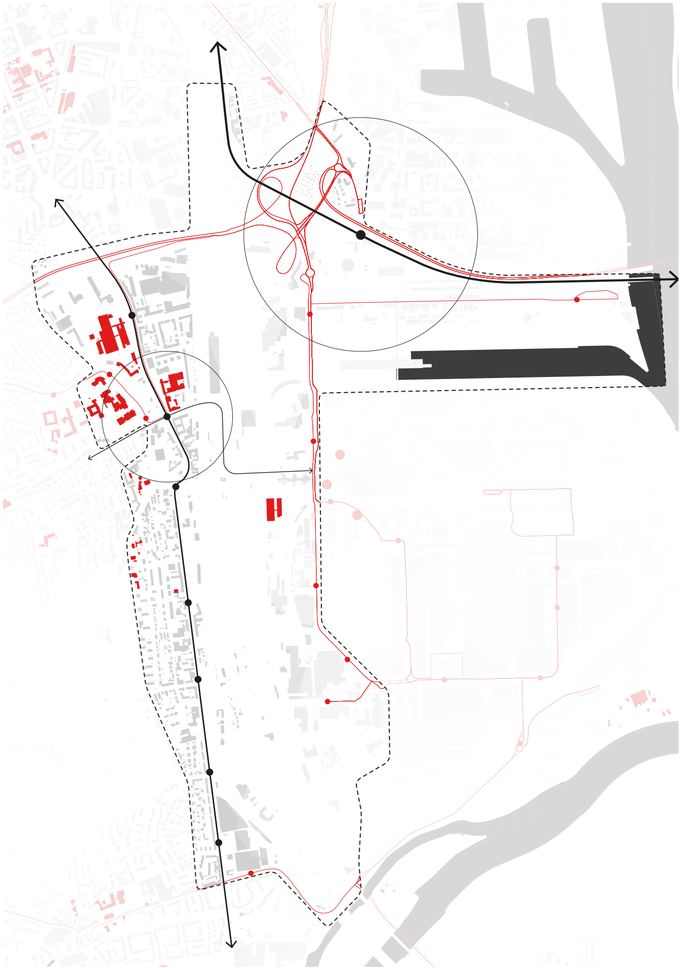
synthesis



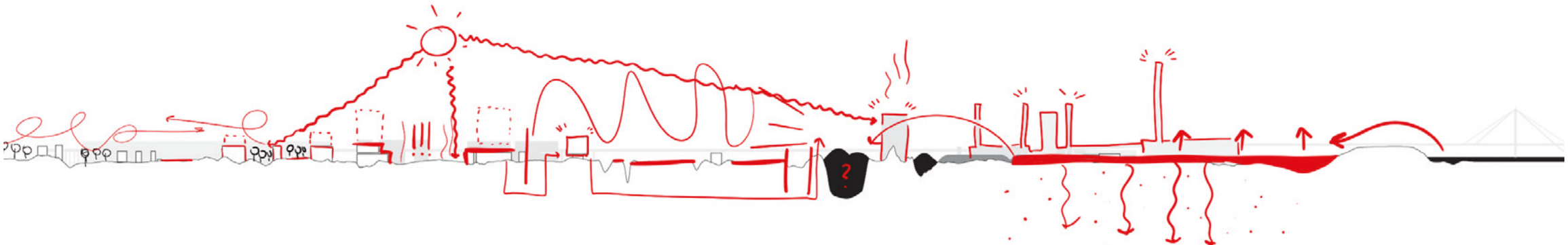
Make



Live



Learn





Wiener Straße x Turmstraße



In-Between

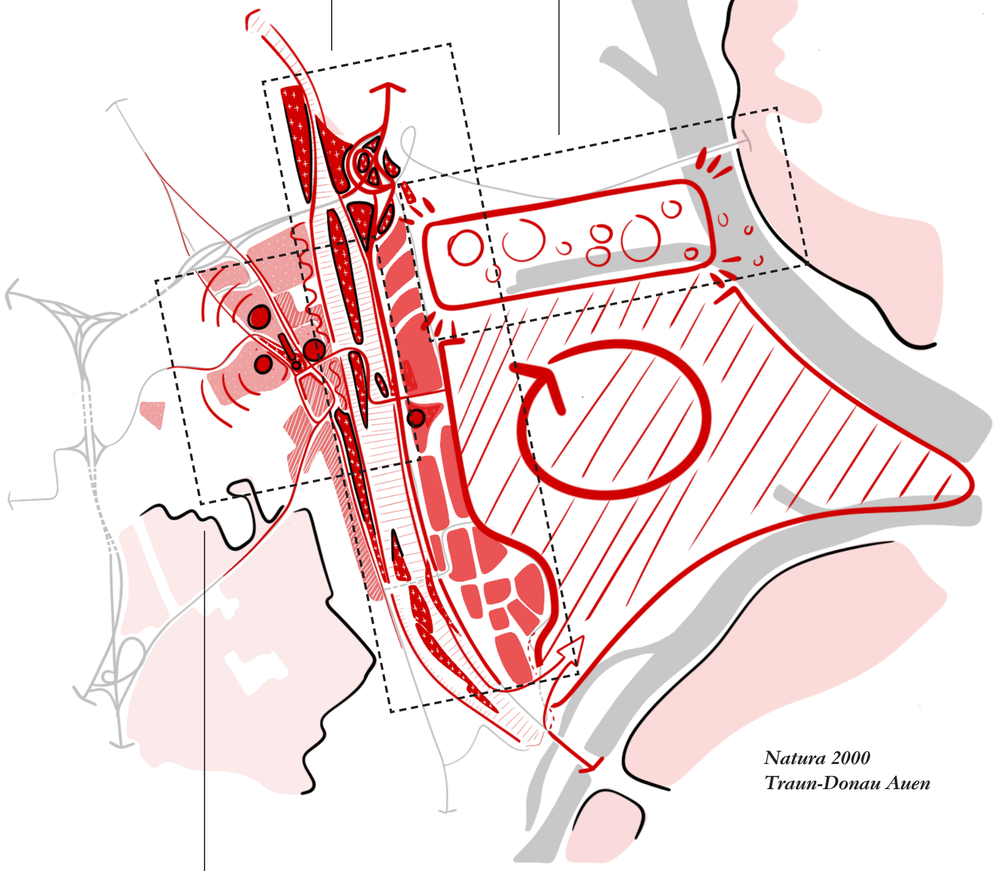


Coke plant



In-Between coddidor

Coke plant



Natura 2000
Traun-Donau Auen

Wiener Straße x Turmstraße

- Voest Alpine (public face)
- In-Between Areas
- Mix-Use Areas
- Special Use Areas (Schools)
- Resididential Areas
- Road Network
- Highly accessible road network
- Railyard
- Water
- Recreational Areas
- In-Between Corridor

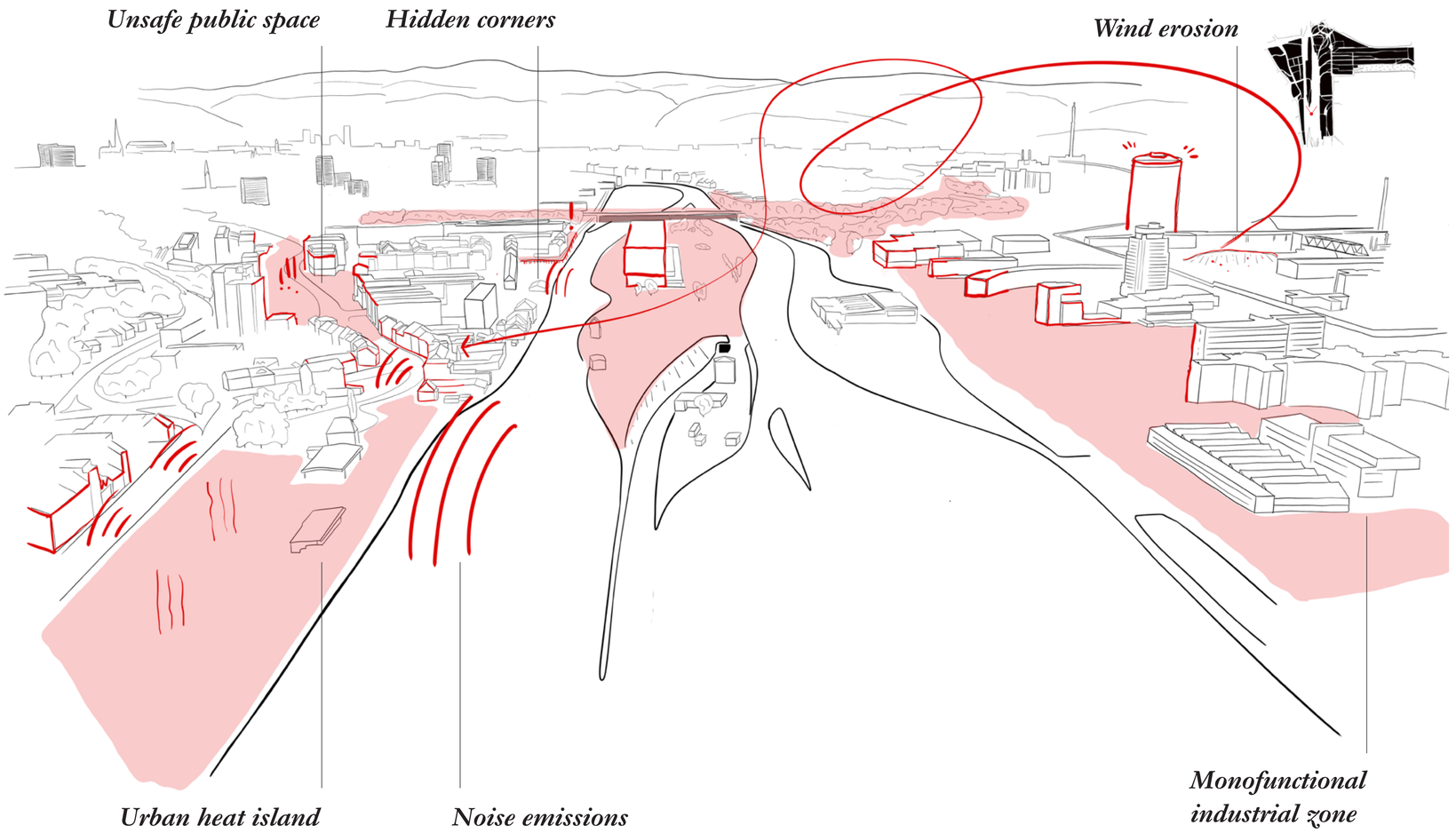
1 km

Morphology.
Connecting or blocking?

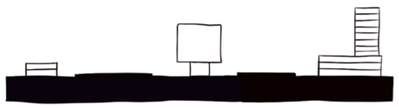
Circularity & Sustainability
But where?

Processes.
Flexible enough?

Governance & Cooperation
But how?

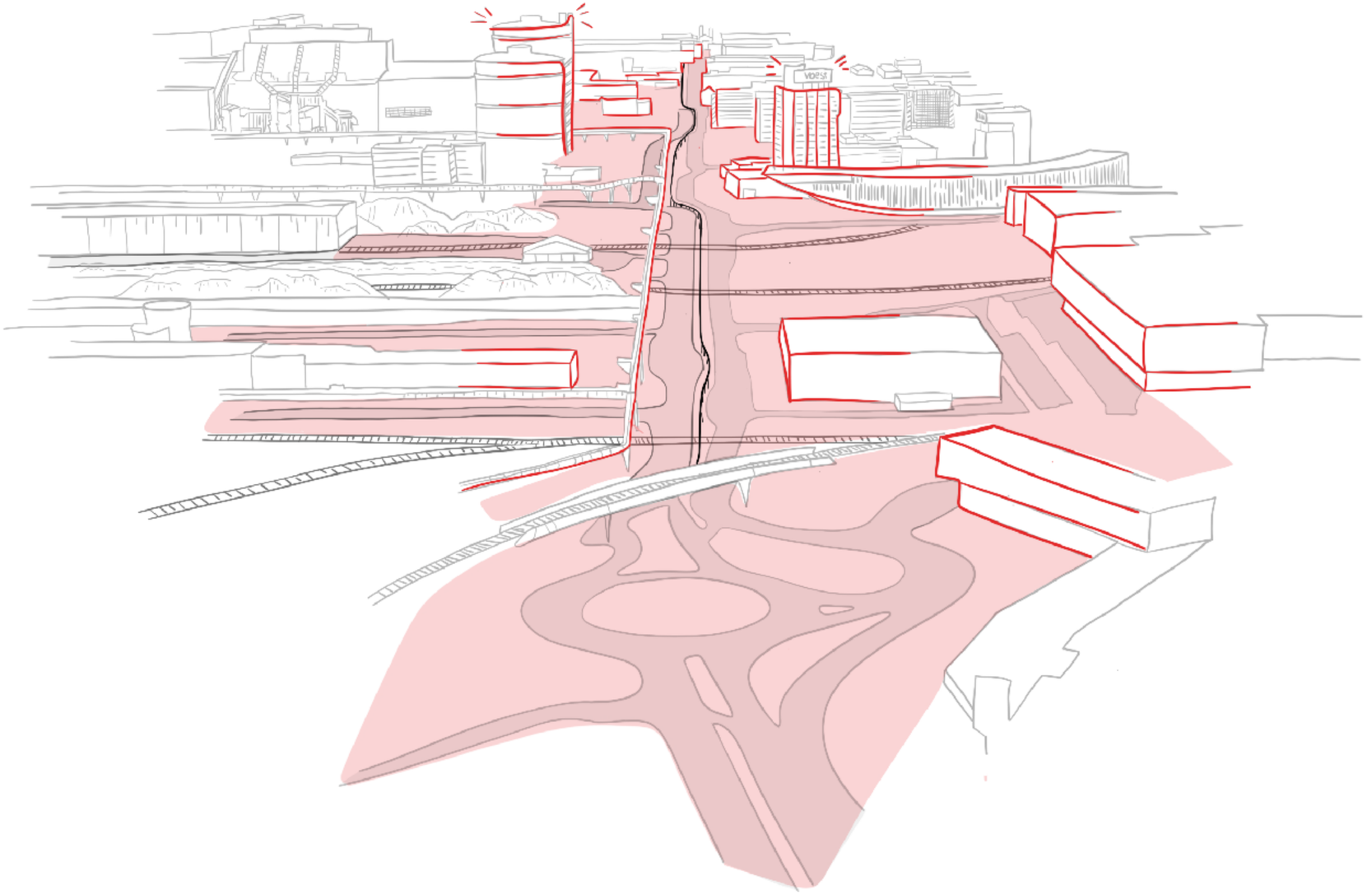



Wiener Straße x Turmstraße

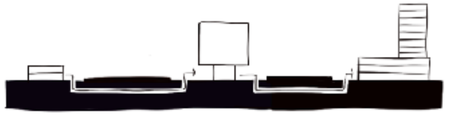

In-Between


Cokeplant

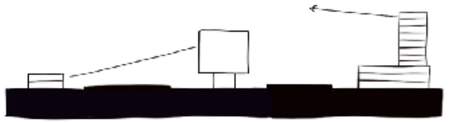
spatial qualities



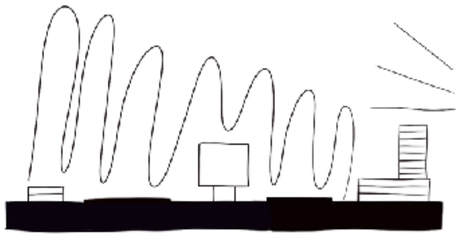
Connectivity



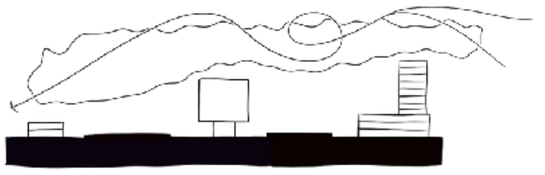
Orientation



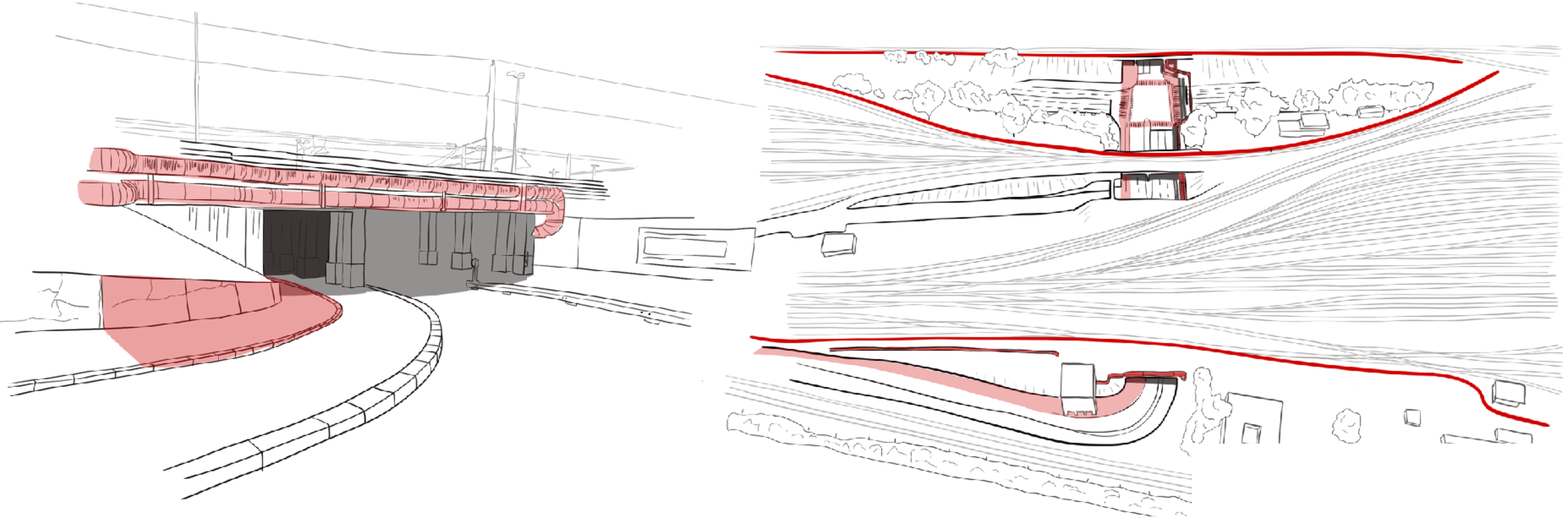
Noise pollution

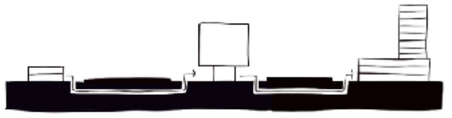


Air pollution



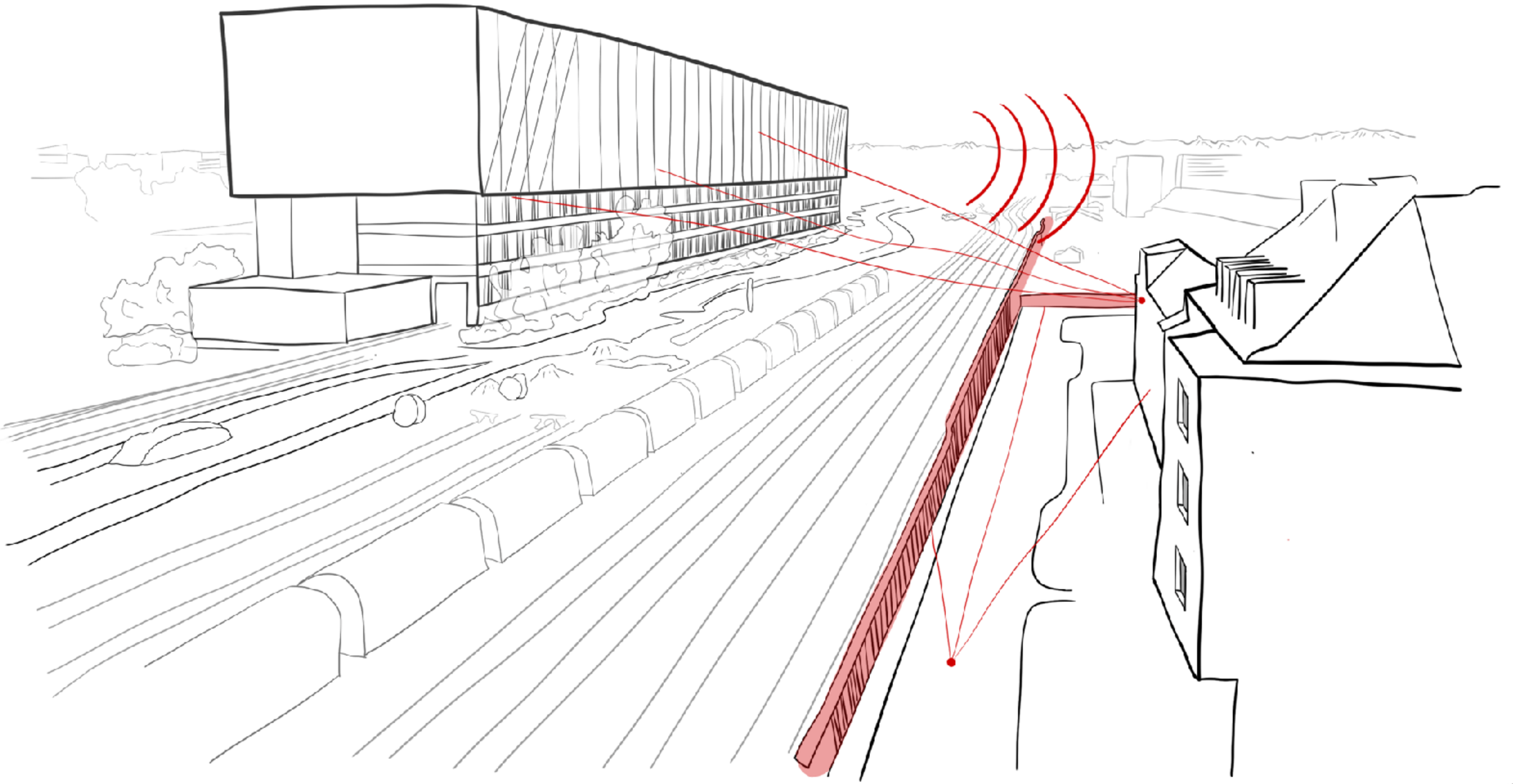
spatial qualities

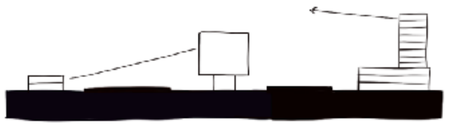




Connectivity

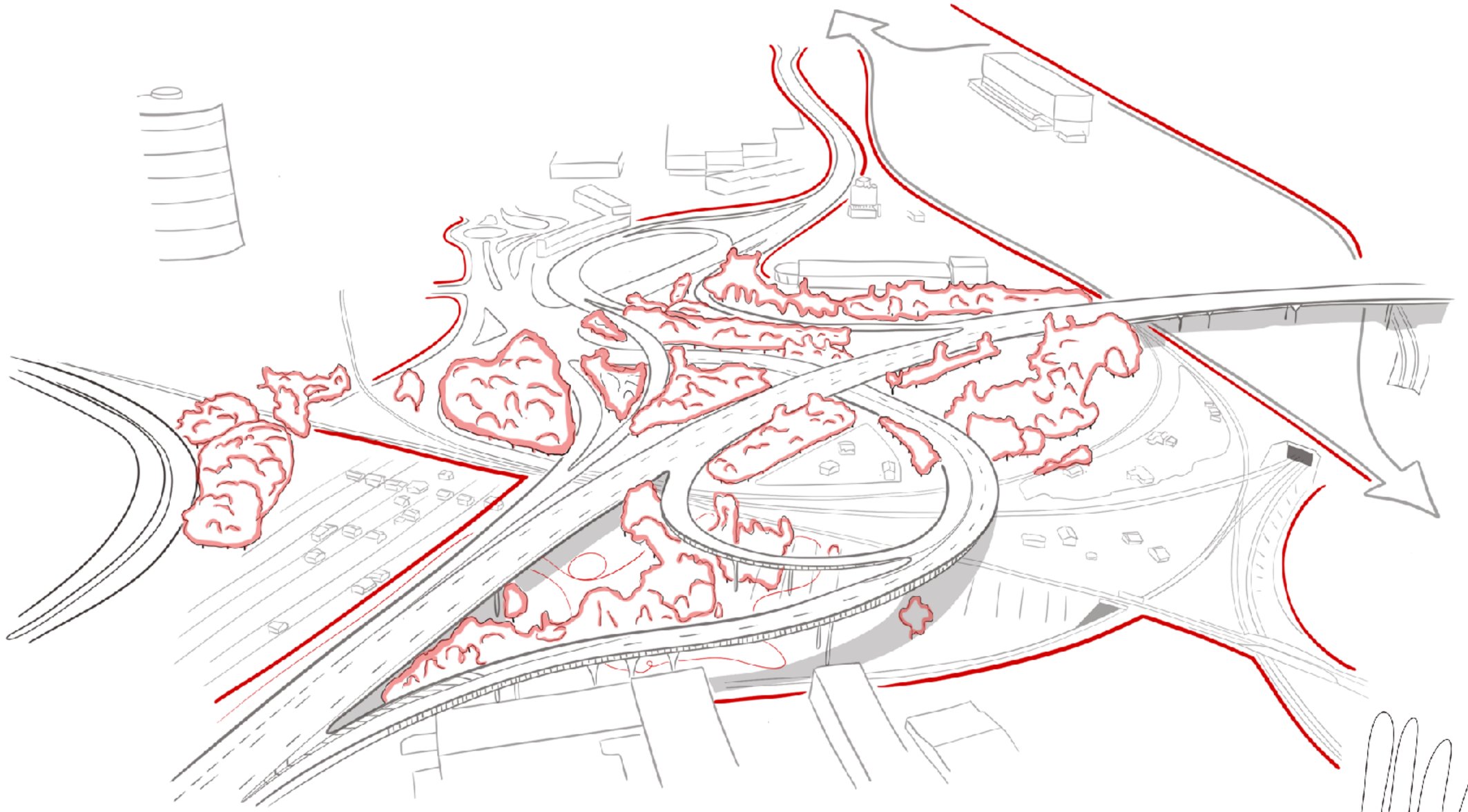
spatial qualities

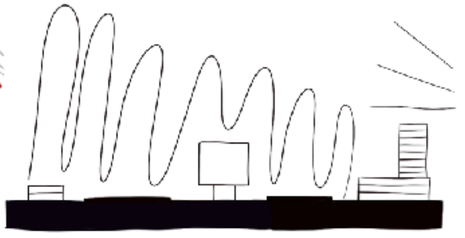




Orientation

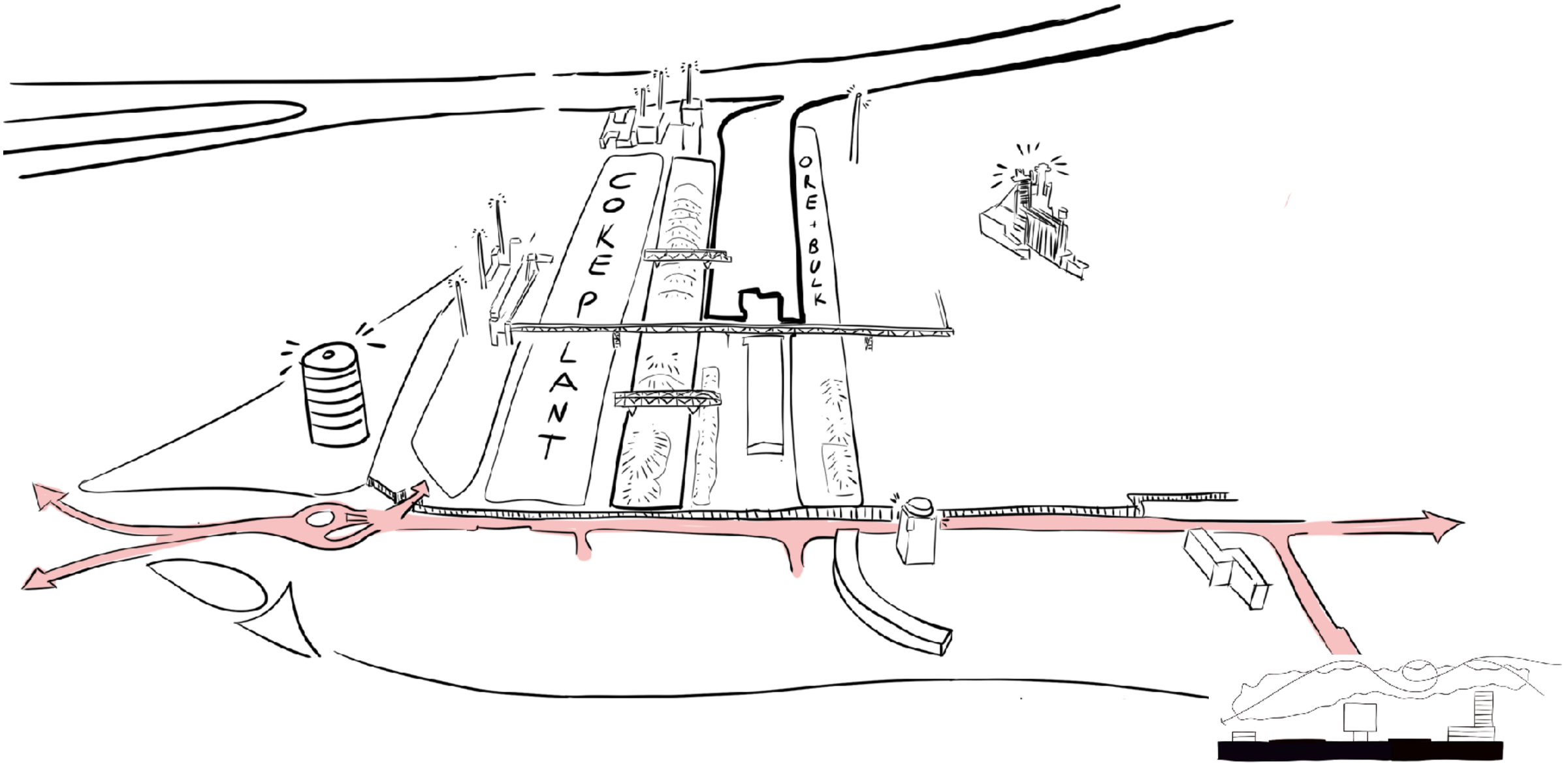
spatial qualities





Noise pollution + barrieres

spatial qualities



Air pollution

scenarios

Working with two diverging explorative design scenarios to envision future pathways



Resilient Roots is about **healing land, empowering people,** and growing **circular practices** that emerge from **bottom-up, community-driven** initiatives and **public investment.** This pathway **strengthens common values** but limits individual lifestyles.

RR



Hyperlinked Horizons is about **upscaling, abundance** through **resource efficiency,** and growing **circular practices** that emerge from **top-down, private investment–driven** developments. It **enables individual lifestyles** but weakens common values.

HH

metabolism

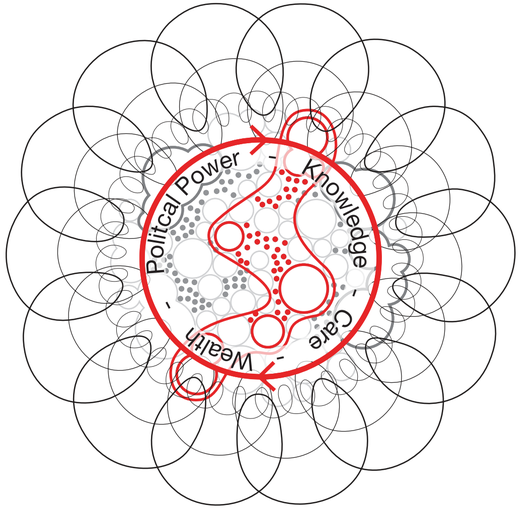


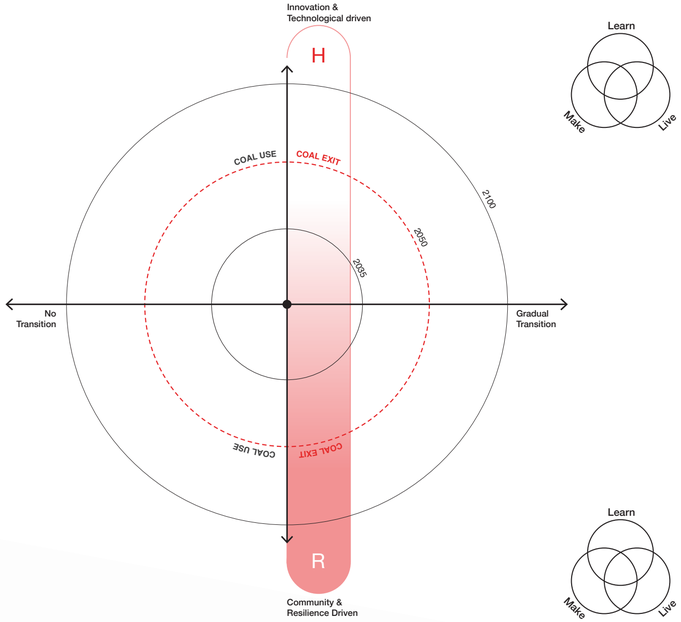
movement

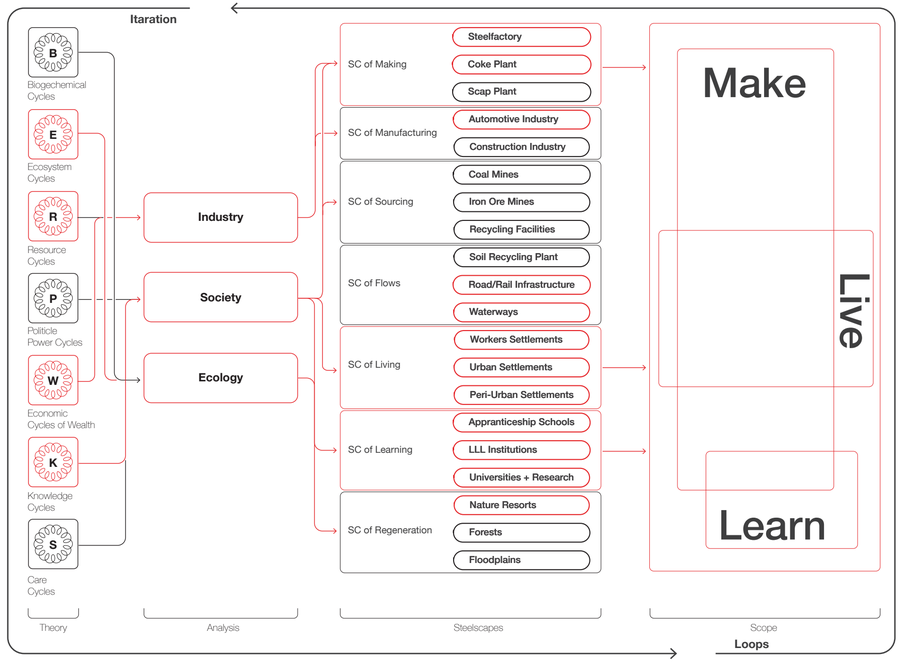
Steelscape Metabolism

Findings

Scenario test



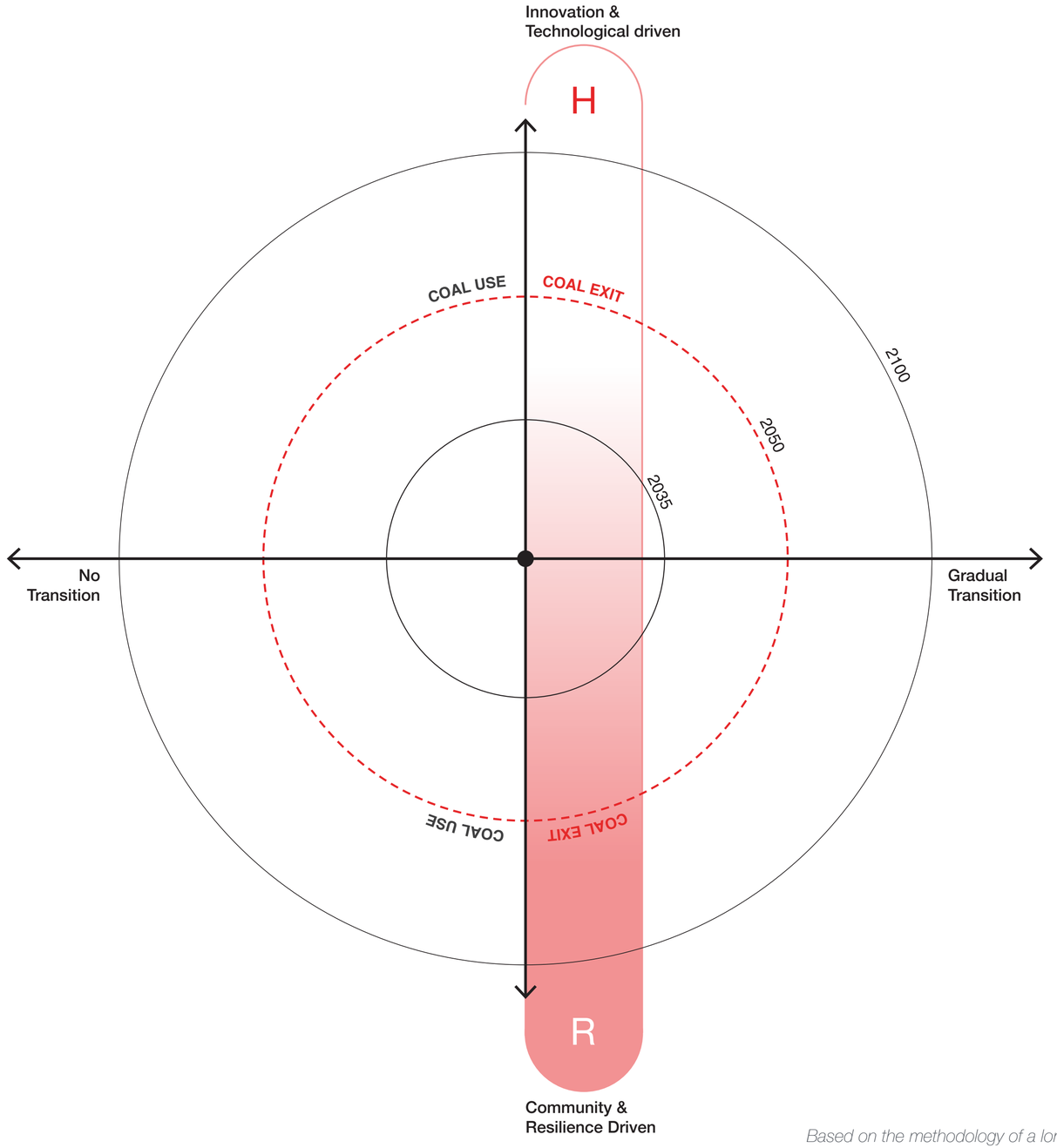


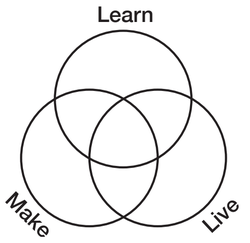


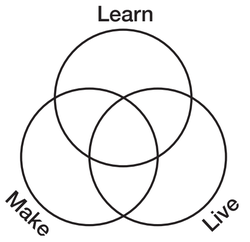
Operational Frame

Synthesis

scenario framework





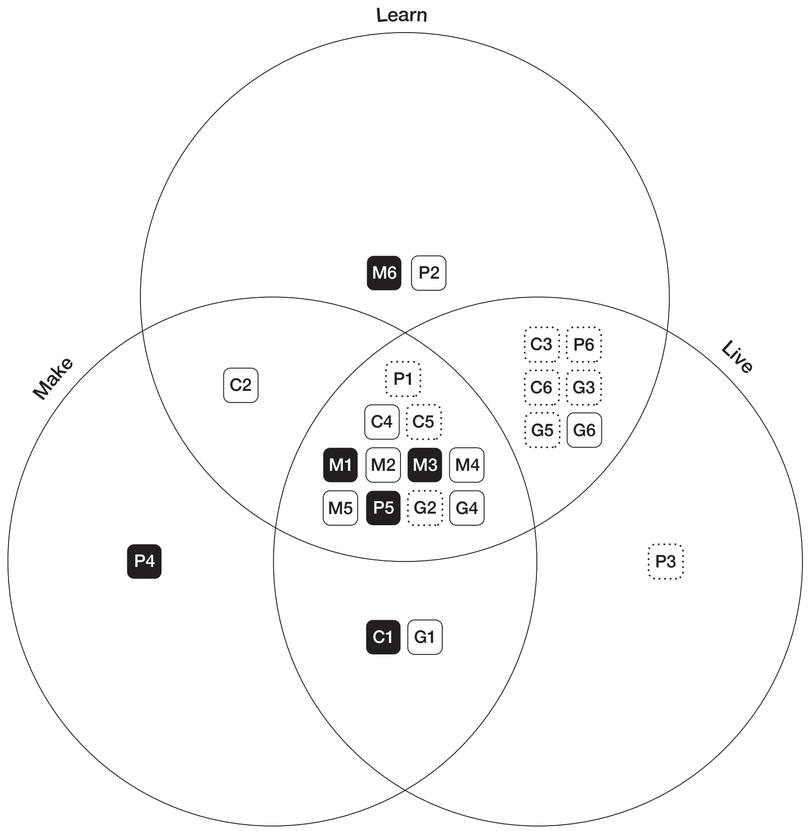


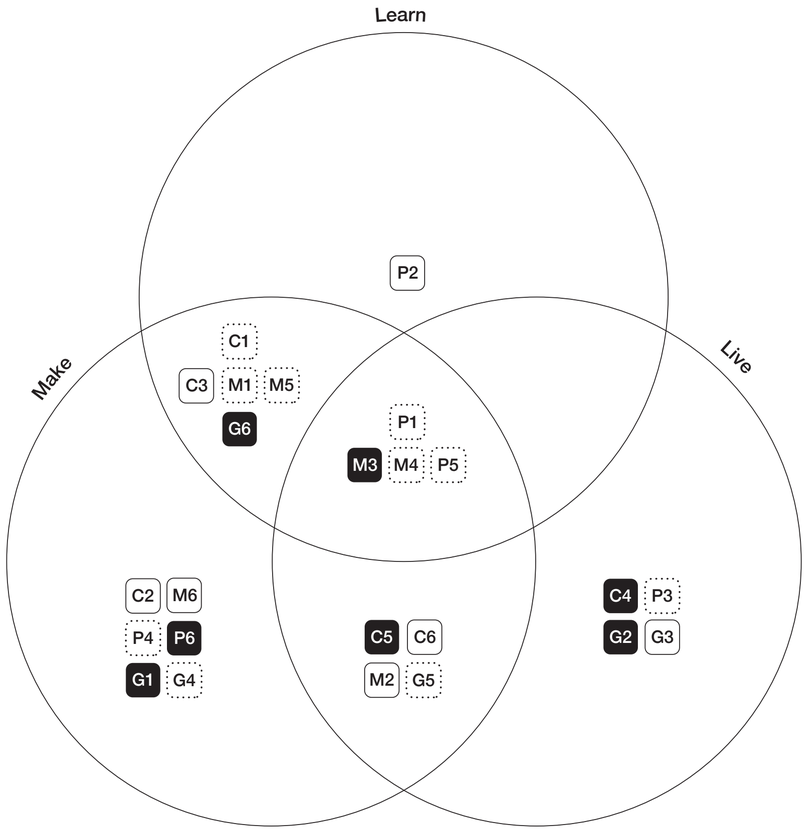
Based on the methodology of a long-term spatial strategy for the Dutch IJssel-Vechtdelta (HNS et al., 2012).

enablers

Enablers	Resilient Roots	Hyperlinked Horizons	M + L + L (RR)	Flexibility (RR)	M + L + L (HH)	Flexibility (HH)	Repair assesment
C1 Circular Infrastructure	Small scale, decentralised and local defined areas for re-use and sharing	Large + centralised areas for material storage and remanufacturing	Live + Make	●●●	Learn + Make	●○○	5.3 Functional (BE)
C2 Transformation of coke plant	Remidiation of Polluted Soil + Repurposing the site for regeneration	High-Tec HUB for recycling and distribution beyond regions	Learn + Make	●●○	Make	●●○	5.2 Physical (BE)
C3 Waste Flow Management	Focus on organic ways of making, compostable biosbased materials	AI, real time wasteflow management estimate flows beyond regions	Live + Learn	●○○	Learn + Make	●●○	3.1 Flows
C4 Construction Sector	Retrofit buildings, new programms, repurpose + adaptable buildings	Demolish buildings, recycle materials in proximity, new buildings	Live + Learn + Make	●●○	Live	●●●	3.2 Stocks
C5 Societal Behavior Patterns	Scarcity. people have to re-use and adapt what they have. Communal	Abundance. Everythig is available at all time. Outsourced supply	Live + Learn + Make	●○○	Live + Make	●●●	2.3 Ordinary Life Practices
C6 Circular Learning Patterns	Relearning practices from indigenous - living with nature	Adapting to new ways of digital learning. Tech driven	Live + Learn	●○○	Live + Make	●●○	2.3 Ordinary Life Practices
M1 Beyond Wastescapes	Adaptive landuse zones make space for circular practices (food, energy,...)	Space for new devlopment, economic driven learning and making	Live + Learn + Make	●●●	Learn + Make	●○○	5.1 Wastescapes
M2 Places for living	Repurpose + redensified exisiting built environment in mixed use areas	New development with re-used materials, high rise in central locations	Live + Learn + Make	●●○	Live +Learn + Make	●●○	5.3 Functional (BE)
M3 Remote outposts	Mobile + nature related outposts for food production + self sufficiency	Mobile + digital nomadic connection to information infrastructure	Live + Learn + Make	●●●	Live + Learn + Make	●●●	5.2 Physical (BE)
M4 New Trainstation	New trainstation connects the area with the mainstation.	New international highspeed HUB connects european destinations	Live + Learn + Make	●●○	Live + Learn + Make	●○○	5.2 Physical (BE)
M5 New connecting bridge	Bridge overcomes barriers for pedestrians and connects green spaces	Trainstation connects the west/east campus districts	Live + Learn + Make	●●○	Learn + Make	●○○	5.2 Physical (BE)
M6 Focus on Green space	Nature defines design. Reservoirs connect city within a green network.	Design defines nature. Green spaces function as technological solutions	Learn	●●●	Make	●●○	1.3 Experiments/Eco-Innovative Solutions
P1 Defining a new Campus	New Eco-Campus of life sciences Curricula with environmental focus	New Digital IT-Campus Curricula with AI + IT focus	Live + Learn + Make	●○○	Live + Learn + Make	●○○	1.2 Agendas
P2 Future ways of Learning	Schools focus on environmental education to prepare for climate crisis	Schools focus on digital technologies to prepare for shift in jobmarket	Learn	●●○	Learn	●●○	1.1 Arenas (long-term strategies)
P3 Future ways of Living	Community based and supported by strong state run organisations.	Individual oriented with focus on and private investment.	Live	●●○	Live	●○○	1.1 Arenas (long-term strategies)
P4 Future ways of Making	Localy produced goods with re-sourced materials (degrowth)	Globally produced goods with re-sourced materials (abundance)	Make	●●●	Make	●○○	1.1 Arenas (long-term strategies)
P5 Future ways of Planning	Framework thinking + public driven investment in existing structures	Masterplan thinking + private driven investments in new developments	Live + Learn + Make	●●●	Live + Learn + Make	●○○	5.3 Functional (BE)
P6 Perspectives on change	Open minded and local based perspective on common practices	Open minded global based perspectives on individual lifestyles	Live + Learn	●○○	Make	●●●	1.2 Agendas
G1 New Zoning methods	Flexible + adaptive landscapes as experimental zones	AI zoning on demand for smart solutions	Live + Make	●●○	Make	●●●	1.3 Experiments/Eco-Innovative Solutions
G2 Bottom Up practices	Initiatives foster collectiv decision making + grassroot movements	Top down accepts bottom up approaches for informative issues	Live + Learn + Make	●○○	Live	●●●	3.3 Co-creation
G3 Emergency prevention strategies	Awareness building with strategies to overcome environmental shocks	Awareness building to overcome economic shocks with analog tools	Live + Learn	●○○	Live	●●○	3.3 Co-creation
G4 Intercommunal cooperations	Strong interaction with communities in the hinterland sharing ressources.	Strong interaction with municipalities based on economic development	Live + Learn + Make	●●○	Make	●○○	3.3 Co-creation
G5 Investment in Infrastrucutres	Public driven with focus on public-transport and slow traffic	Public Private driven with focus on material flow optimisation	Live + Learn	●○○	Live + Make	●○○	2.2 Policy Implementation
G6 Politics of Change	Citizen voices are represented in local governments - co-design	Industry and Economy voices define pathways to increase competitiveness	Live + Learn	●●○	Learn + Make	●●○	1.1 Arenas (long-term strategies)

identifying the integration of enablers in a triple helix

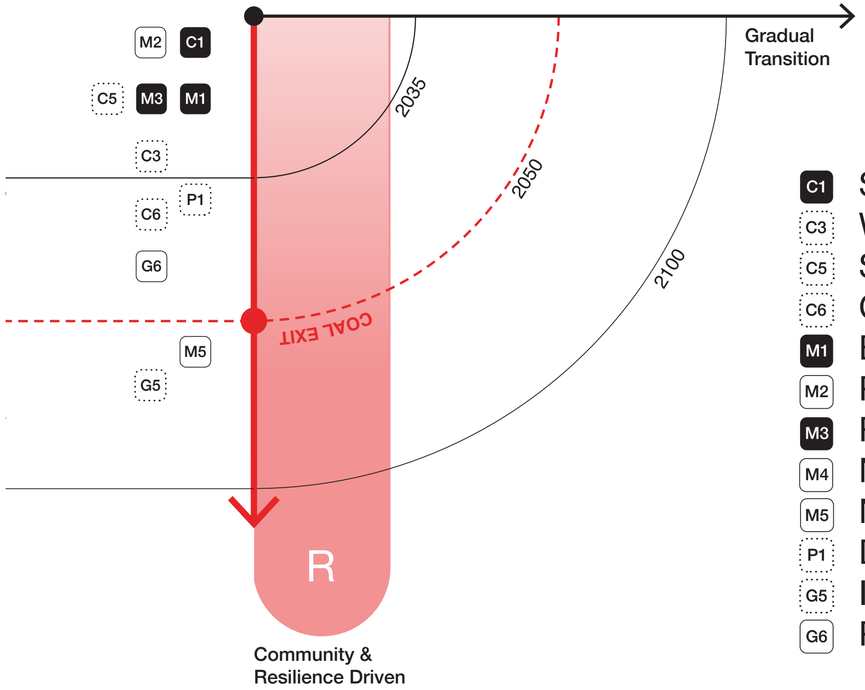




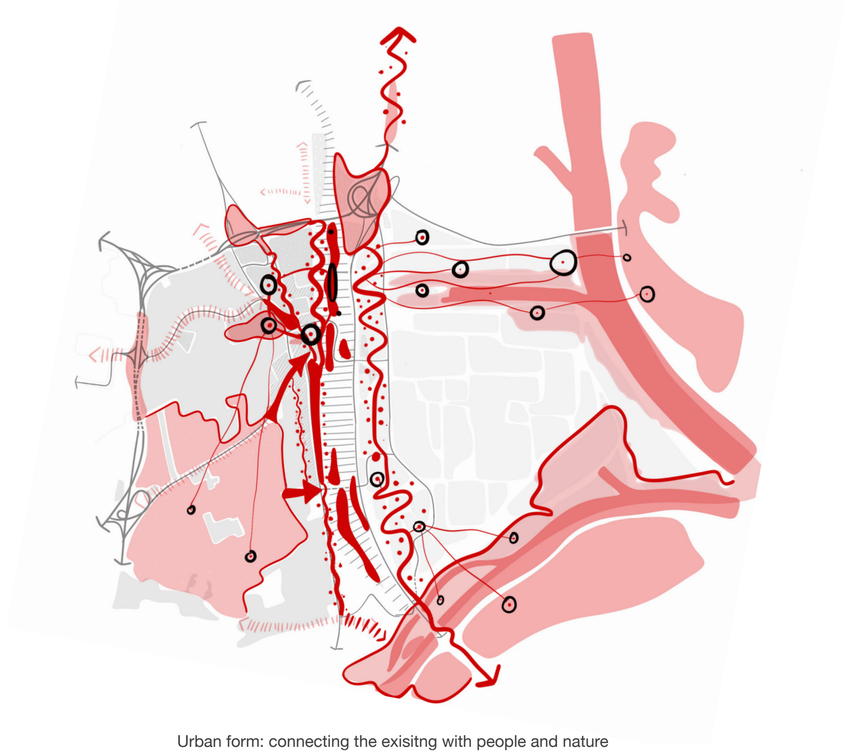
RR

HH

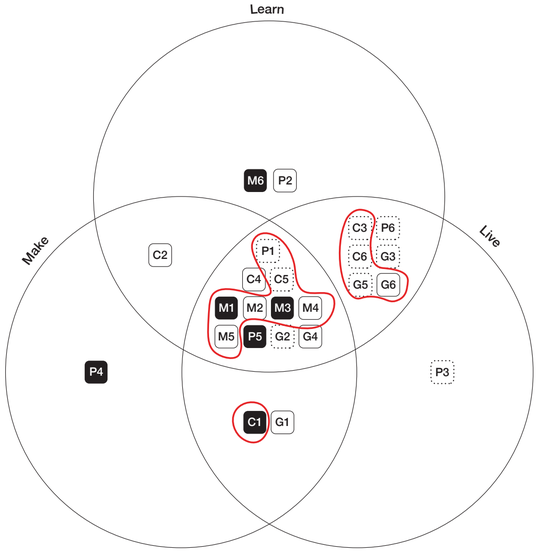
Resilient Roots



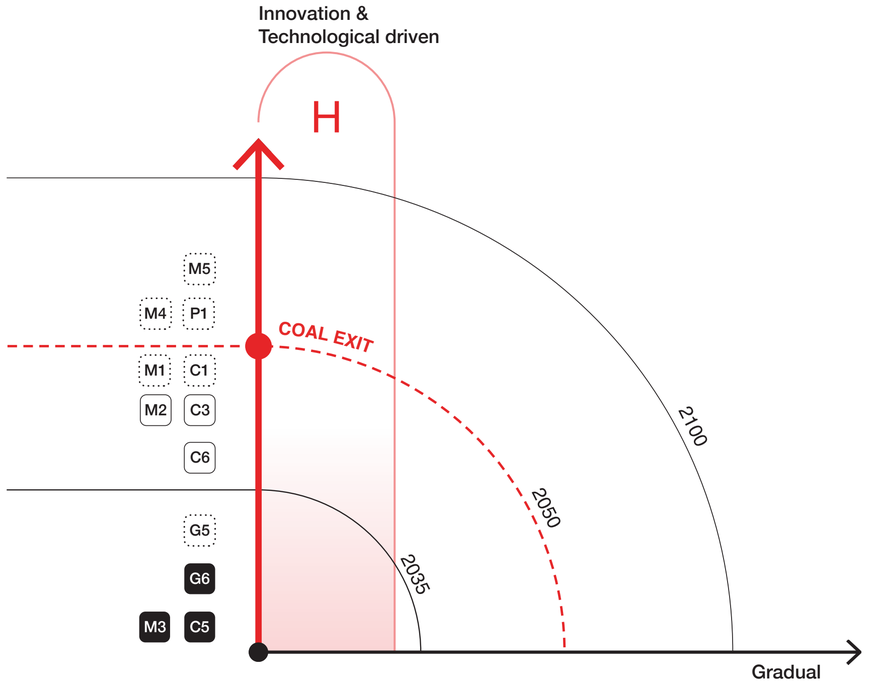
- C1 Space for circular infrastructure
- C3 Wasteflow management
- C5 Societal behavior patterns
- C6 Circular learning patterns
- M1 Beyond Wastescapes
- M2 Places for living
- M3 Remote outsposts
- M4 New trainstration
- M5 New bridge
- P1 Defining a Campus
- G5 Investment in Infrastruture
- G6 Politics of change



Urban form: connecting the exisitng with people and nature



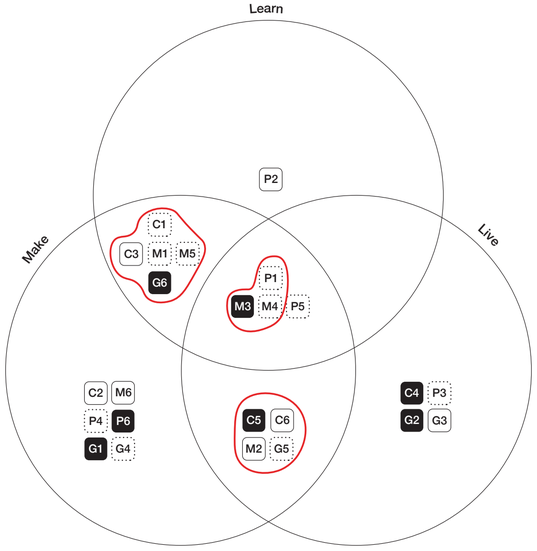
Hyperlinked Horizons





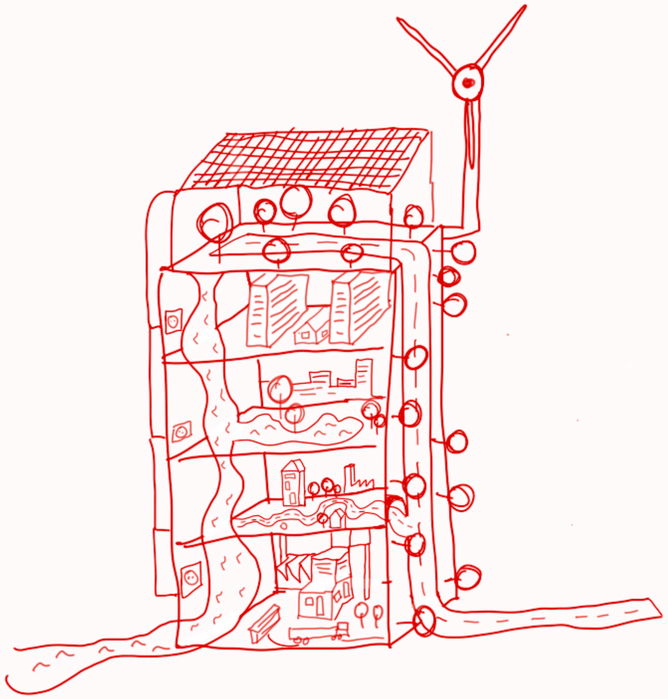
Urban form: connecting the new with innovation and businesses

- C1 Space for circular infrastructure
- C3 Wasteflow management
- C5 Societal behavior patterns
- C6 Circular learning patterns
- M1 Beyond Wastescapes
- M2 Places for living
- M3 Remote outsposts
- M4 New trainstration
- M5 New bridge
- P1 Defining a Campus
- G5 Investment in Infrastruture
- G6 Politics of change



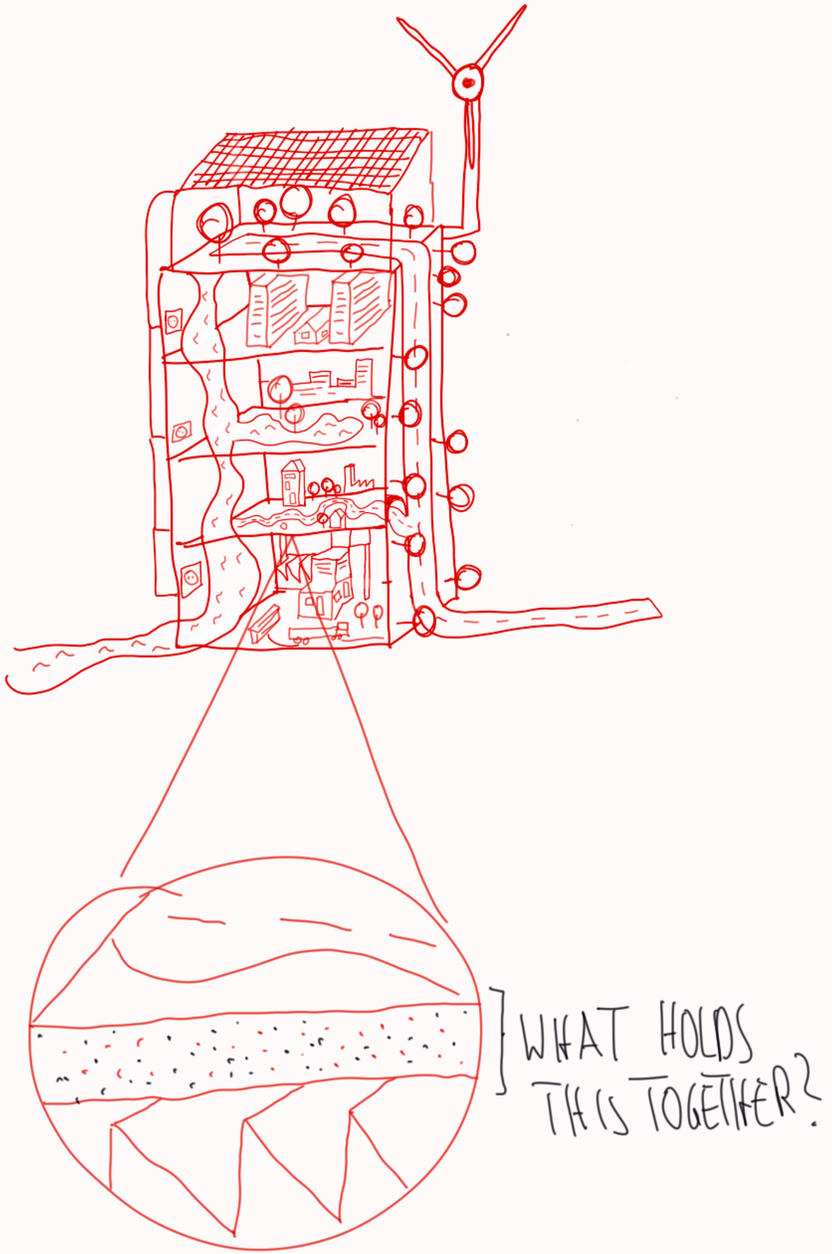
How can this be translated to a tangible context?

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK



Re-imagening Erich Raith's explanation in *Stadtmorphologien* (1998) describing cities as bookshelves.
They are structurally resilient to evolving demands but are capable of being filled in many different ways.

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

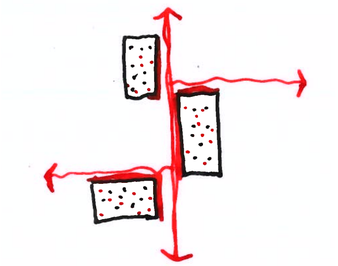


enablers

Enablers	Resilient Roots	Hyperlinked Horizons	M + L + L (RR)	Flexibility (RR)	M + L + L (HH)	Flexibility (HH)	Repair assesment	
C1 Circular Infrastructure	Small scale, decentralised and local defined areas for re-use and sharing	Large + centralised areas for material storage and remanufacturing	Live + Make	●●●	Learn + Make	●○○	5.3 Functional (BE)	●
C2 Transformation of coke plant	Remidiation of Polluted Soil + Repurposing the site for regeneration	High-Tec HUB for recycling and distribution beyond regions	Learn + Make	●●○	Make	●●○	5.2 Physical (BE)	
C3 Waste Flow Management	Focus on organic ways of making, compostable biosbased materials	AI, real time wasteflow management estimate flows beyond regions	Live + Learn	●○○	Learn + Make	●●○	3.1 Flows	
C4 Construction Sector	Retrofit buildings, new programms, repurpose + adaptable buildings	Demolish buildings, recycle materials in proximity, new buildings	Live + Learn + Make	●●○	Live	●●●	3.2 Stocks	
C5 Societal Behavior Patterns	Scarcity. people have to re-use and adapt what they have. Communal	Abundance. Everythig is available at all time. Outsourced supply	Live + Learn + Make	●○○	Live + Make	●●●	2.3 Ordinary Life Practices	
C6 Circular Learning Patterns	Relearning practices from indigenous - living with nature	Adapting to new ways of digital learning. Tech driven	Live + Learn	●○○	Live + Make	●●○	2.3 Ordinary Life Practices	
M1 Beyond Wastescapes	Adaptive landuse zones make space for circular practices (food, energy,...)	Space for new devlopment, economic driven learning and making	Live + Learn + Make	●●●	Learn + Make	●○○	5.1 Wastescapes	●
M2 Places for living	Repurpose + redensified exisiting built environment in mixed use areas	New development with re-used materials, high rise in central locations	Live + Learn + Make	●●○	Live +Learn + Make	●●○	5.3 Functional (BE)	
M3 Remote outposts	Mobile + nature related outposts for food production + self sufficiency	Mobile + digital nomadic connection to information infrastructure	Live + Learn + Make	●●●	Live + Learn + Make	●●●	5.2 Physical (BE)	
M4 New Trainstation	New trainstation connects the area with the mainstation.	New international highspeed HUB connects european destinations	Live + Learn + Make	●●○	Live + Learn + Make	●○○	5.2 Physical (BE)	
M5 New connecting bridge	Bridge overcomes barriers for pedestrians and connects green spaces	Trainstation connects the west/east campus districts	Live + Learn + Make	●●○	Learn + Make	●○○	5.2 Physical (BE)	
M6 Focus on Green space	Nature defines design. Reservoirs connect city within a green network.	Design defines nature. Green spaces function as technological solutions	Learn	●●●	Make	●●○	1.3 Experiments/Eco-Innovative Solutions	
P1 Defining a new Campus	New Eco-Campus of life sciences Curricula with environmental focus	New Digital IT-Campus Curricula with AI + IT focus	Live + Learn + Make	●○○	Live + Learn + Make	●○○	1.2 Agendas	
P2 Future ways of Learning	Schools focus on environmental education to prepare for climate crisis	Schools focus on digital technologies to prepare for shift in jobmarket	Learn	●●○	Learn	●●○	1.1 Arenas (long-term strategies)	
P3 Future ways of Living	Community based and supported by strong state run organisations.	Individual oriented with focus on and private investment.	Live	●●○	Live	●○○	1.1 Arenas (long-term strategies)	
P4 Future ways of Making	Localy produced goods with re-sourced materials (degrowth)	Globally produced goods with re-sourced materials (abundance)	Make	●●●	Make	●○○	1.1 Arenas (long-term strategies)	
P5 Future ways of Planning	Framework thinking + public driven investment in existing structures	Masterplan thinking + private driven investments in new developments	Live + Learn + Make	●●●	Live + Learn + Make	●○○	5.3 Functional (BE)	
P6 Perspectives on change	Open minded and local based perspective on common practices	Open minded global based perspectives on individual lifestyles	Live + Learn	●○○	Make	●●●	1.2 Agendas	
G1 New Zoning methods	Flexible + adaptive landscapes as experimental zones	AI zoning on demand for smart solutions	Live + Make	●●○	Make	●●●	1.3 Experiments/Eco-Innovative Solutions	
G2 Bottom Up practices	Initiatives foster collectiv decision making + grassroot movements	Top down accepts bottom up approaches for informative issues	Live + Learn + Make	●○○	Live	●●●	3.3 Co-creation	
G3 Emergency prevention strategies	Awareness building with strategies to overcome environmental shocks	Awareness building to overcome economic shocks with analog tools	Live + Learn	●○○	Live	●●○	3.3 Co-creation	
G4 Intercommunal cooperations	Strong interaction with communities in the hinterland sharing ressources.	Strong interaction with municipalities based on economic development	Live + Learn + Make	●●○	Make	●○○	3.3 Co-creation	
G5 Investment in Infrastrucutres	Public driven with focus on public-transport and slow traffic	Public Private driven with focus on material flow optimisation	Live + Learn	●○○	Live + Make	●○○	2.2 Policy Implementation	
G6 Politics of Change	Citizen voices are represented in local governments - co-design	Industry and Economy voices define pathways to increase competitiveness	Live + Learn	●●○	Learn + Make	●●○	1.1 Arenas (long-term strategies)	

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

circular spaces



C1: Circular infrastructure



M1: Wastescapes as circular spaces

wastescapes

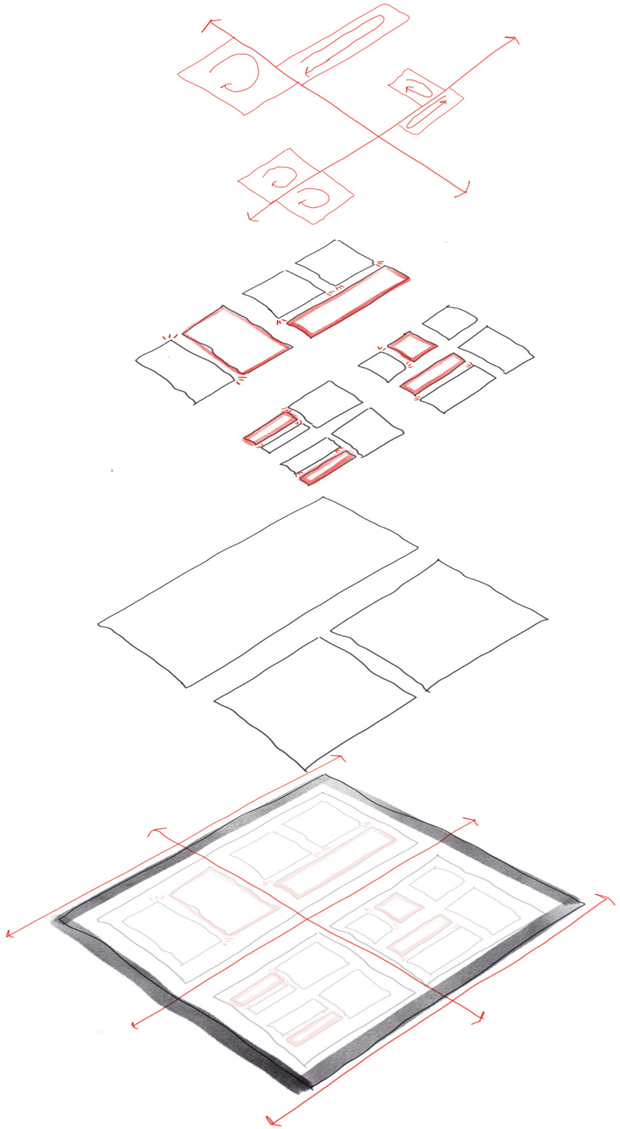




“Areas that emerge as a consequence of unsustainable, linear growth patterns and their spatial impacts within the framework of urban metabolic flows and related infrastructure” (Amenta & Van Timmeren, 2018, p. 1).

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

spatial logic



Circular space logic

An inner logic connecting these circular spaces generates a network for its users to navagiate trough the space. Flexible circular spaces can change be switched on and of on demand.

Block

Blocks function as an ongoing changing entety, with a focuse on circular spaces with a maximal grade on flexibility.

Maxi Block

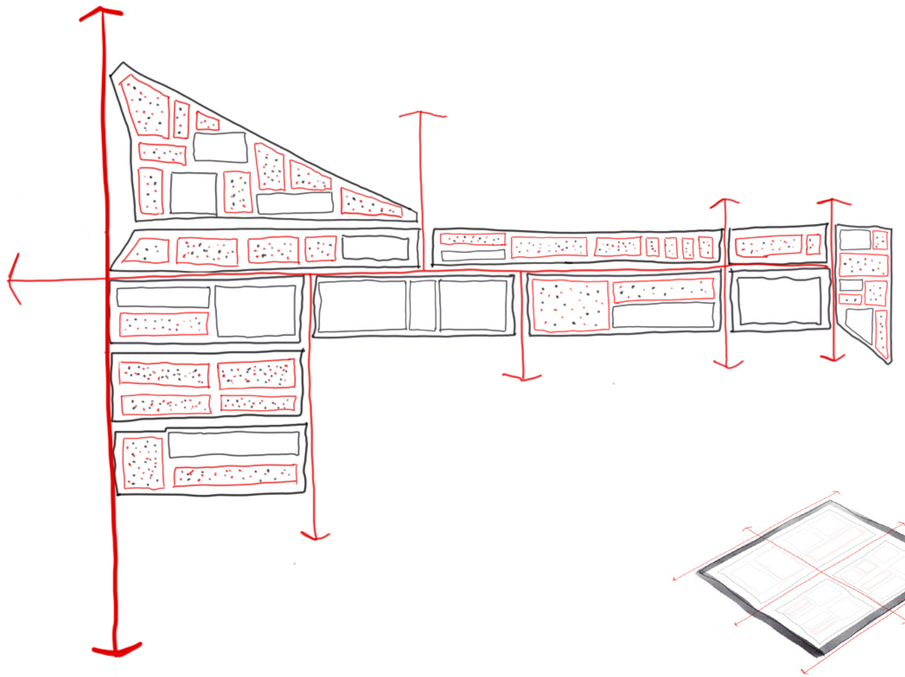
Maxi Blocks keep the flexibility within the quarter structure to adapt to continues changes.

Quarter

Characterised quartes enable a definition of core strenghts of the area as more robust structure.

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

spatial organisation



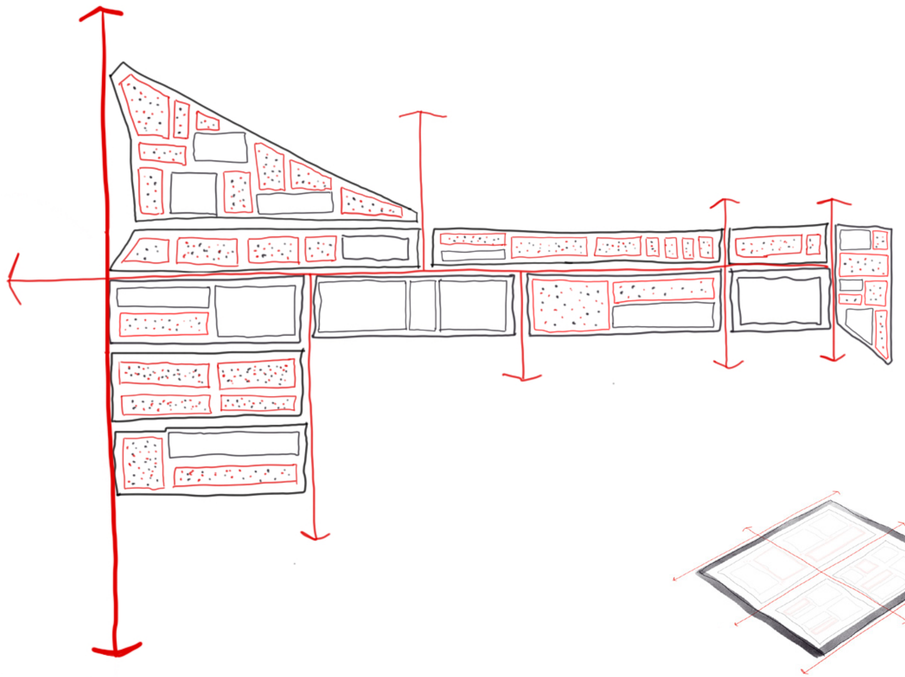
Circular spaces
Blocks
Quarters
Main Connections

- Heterogenous order
- Inner logic for shared spaces
- Ecosystems define logic

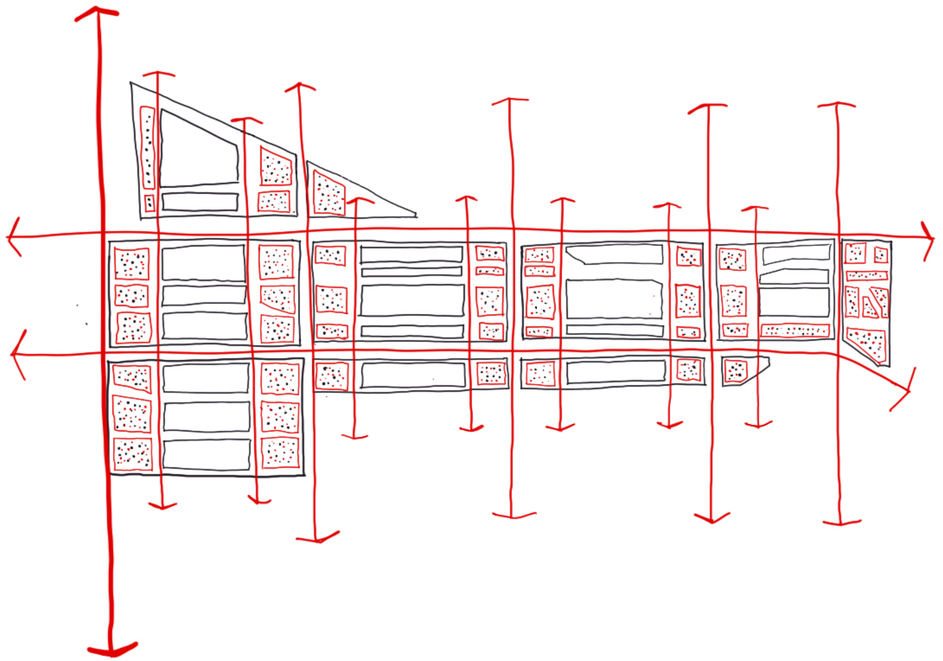
RR

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

spatial organisation



Circular spaces
Blocks
Quarters
Main Connections



- Heterogenous order
- Inner logic for shared spaces
- Ecosystems define logic

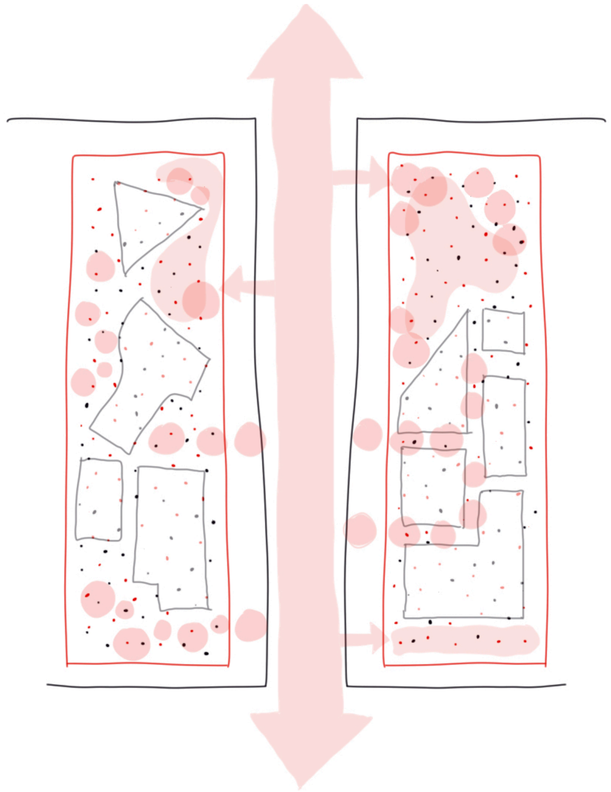
- Homogenous order
- Allows flow optimised processes
- Existing infrastructure defines logic

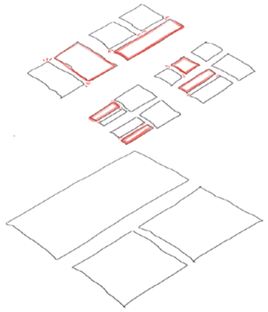
RR

HH

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

spatial organisation





Circular spaces
Blocks
Quarters
Main Connections

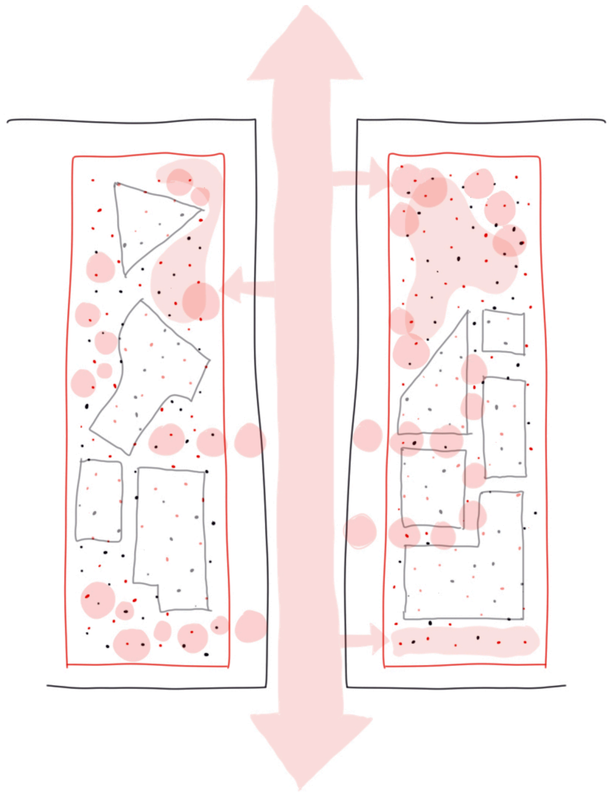
- Important ecological role
- Messy order within block structure possible

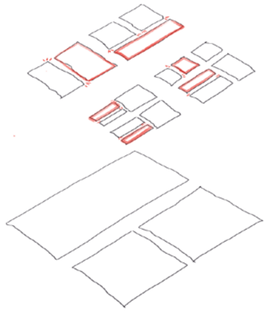
RR

HH

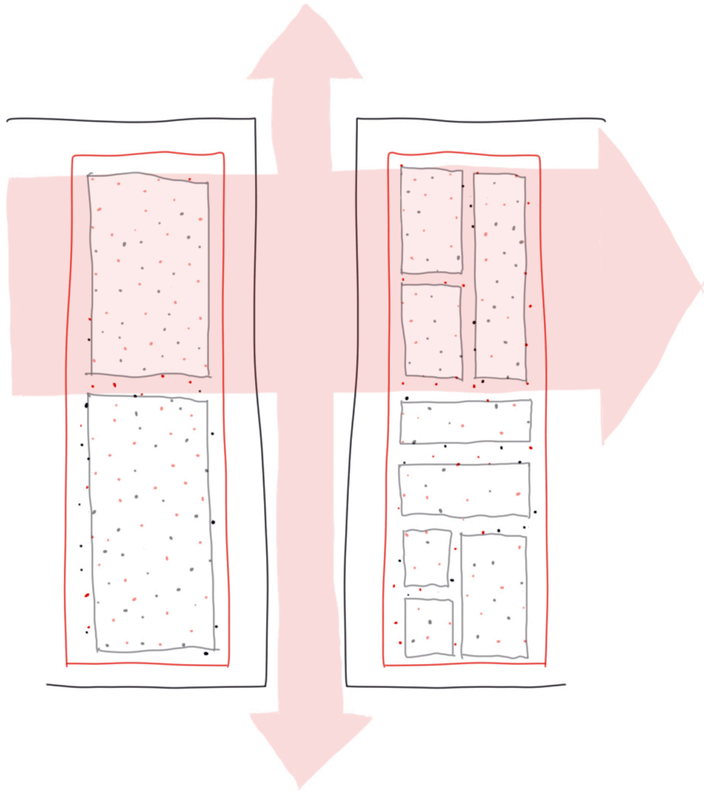
~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

spatial organisation





Circular spaces
Blocks
Quarters
Main Connections



- Important ecological role
- Messy order within block structure possible

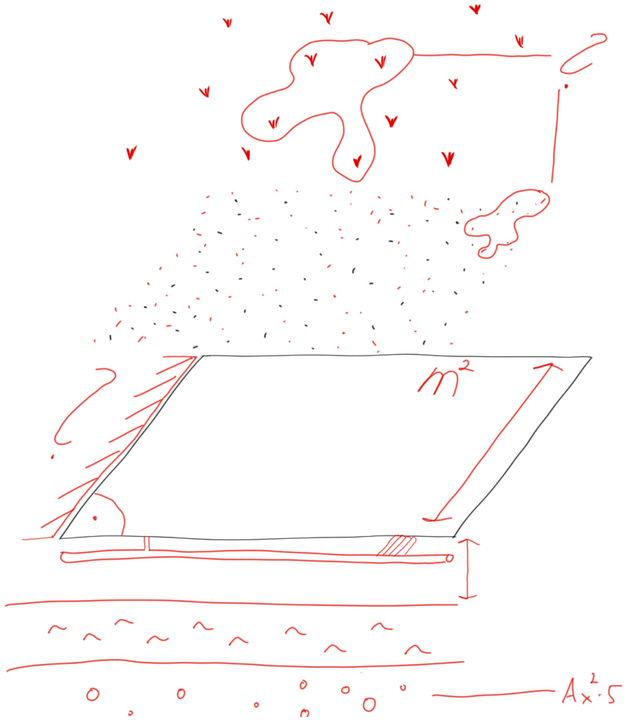
- Cross-block plug ins possible
- Clear order within block structure required

RR

HH

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

programmatic organisation: hardware



- Tree cover
- Species
- Groundwater level
- Pollutants
- Soil condition

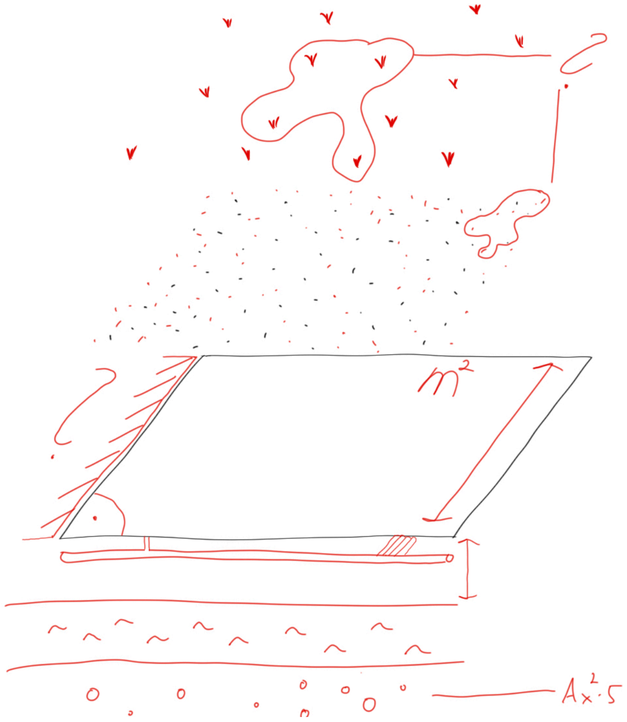
  Size/Dimensions
- Neigbour Block
- Technical Infrastructure

RR

HH

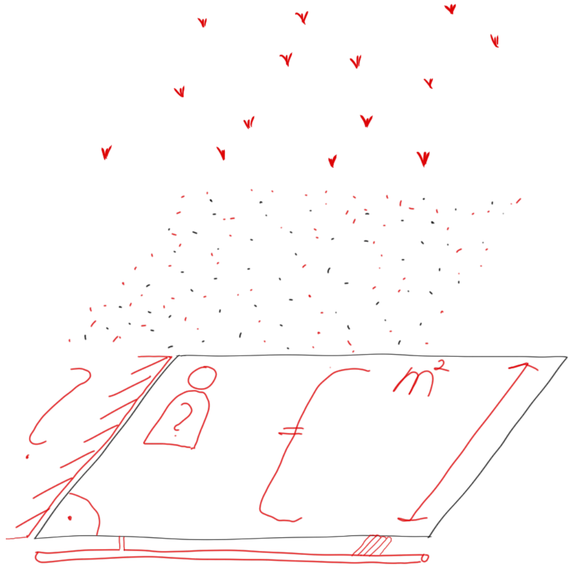
~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

programmatic organisation: hardware



- Tree cover
- Species
- Groundwater level
- Pollutants
- Soil condition
  Size/Dimensions
- Neigbour Block
- Technical Infrastructure

RR

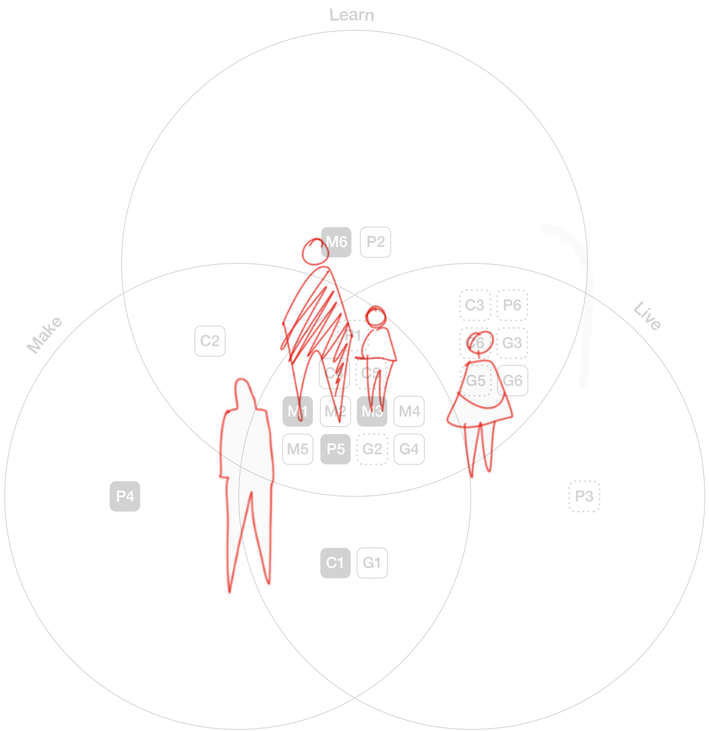


- Ownership
- Size/Dimensions
- Price per square meter
- Neigbour Block
- Rail access
- Road access
- Technical Infrastructure
- Soil (Load-bearing capacity)

HH

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

programmatic organisation: software



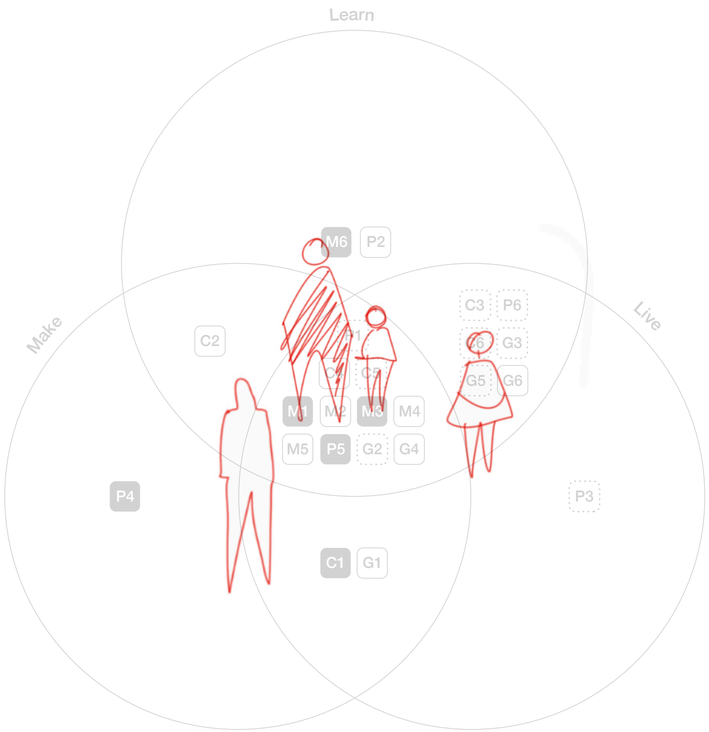
Human focused

RR

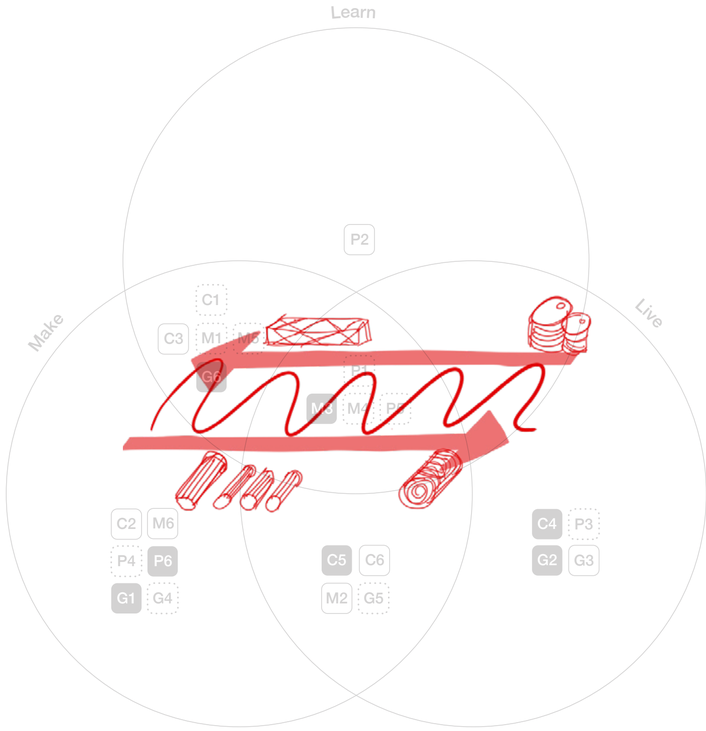
HH

~~MASTERPLAN~~ FLEXIBLE FRAMEWORK

programmatic organisation: software



Human focused



Industry focused

RR

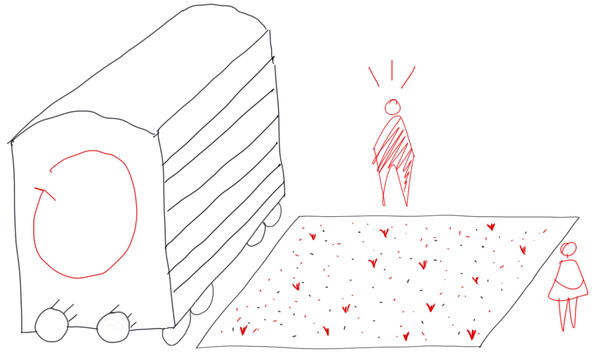
HH

Testing them next to each other

MAKE RE-USE WORK

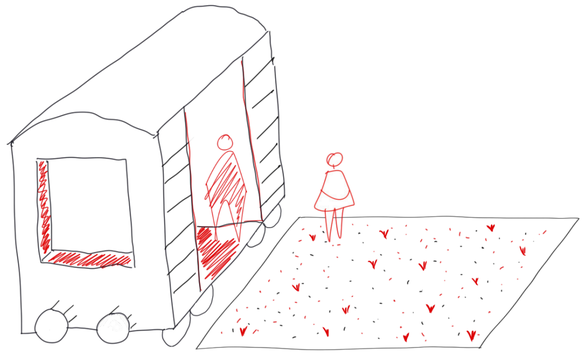
1. Find opportunities

In the energy transtition, many infrastructures and objects may change value or purpuse. Knowing where they are can be a potential for re-purposing the existing.



2. Use the exisiting

Activating vacant buildings or mobile infrastructures can function as a base for community driven places for repair.



3.Claiming space together

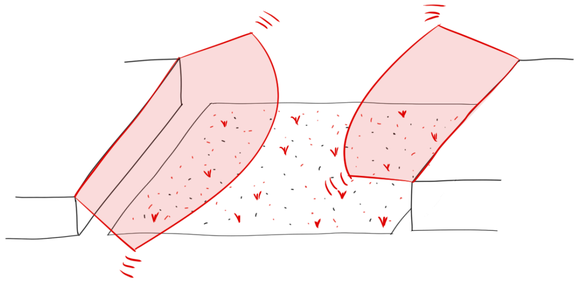
More hands - more possibilities. Common practices enable with low cost interventions a resource efficient and sustainable way of making.



RR

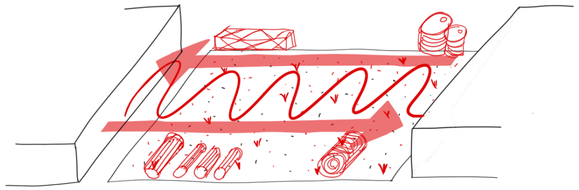
1. Find partners to share

New technologies mean also new ways of making and new possibilities to do it together. Knowing who is doing what and where helps to understand future purposes of circular spaces.



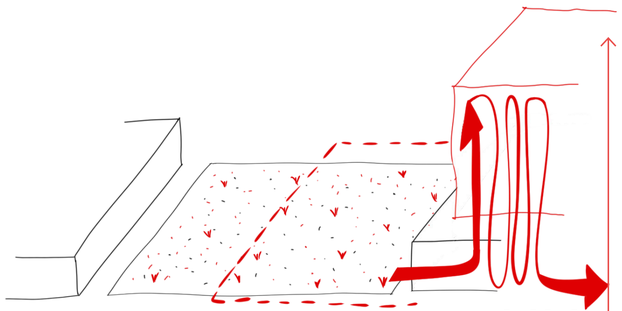
2. Benefit from the other

To optimise work flows, proximity plays a crucial role in material flows. Local exchange is more cost efficient and allows fast and independent exchange between partners.



3. Changing demands

Changing technologies mean changing demands of space and built environments. Therefore, flexibility is crucial to give those who need the space at the moment the right amount. Development is only happening vertically, which shifts again the surrounding conditions for circular spaces.

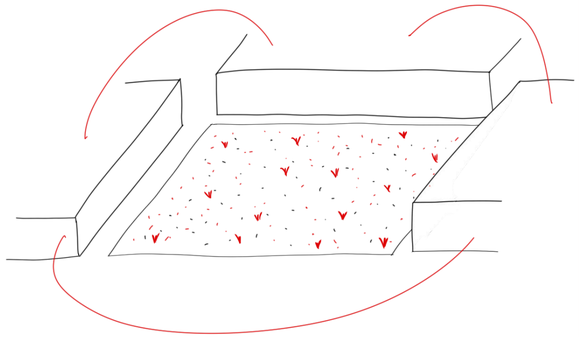


HH

LIVE LAUGH LOVE

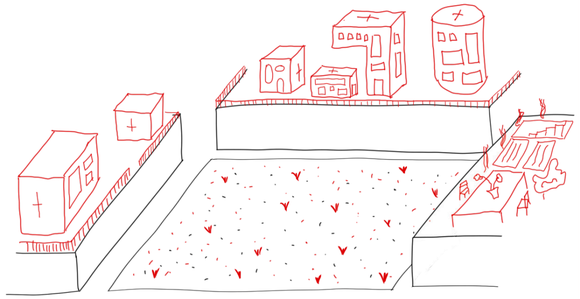
1. Get to know the others

Often neighbours across the courtyard don't know each other for a whole life. In a future where helping each other gets more crucial, having a support network around can help.



2. Share future plans

Changing demand on living require a more flexible and adaptable built environment. Sharing common plans for changing situations can help to understand the others better and generates common space for negotiation.



3. Celebrate togetherness

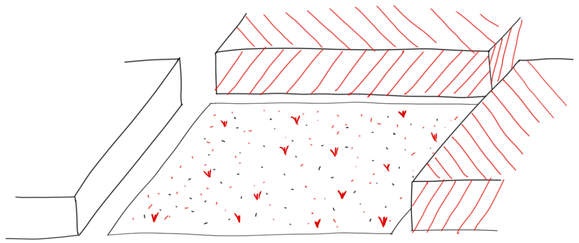
This common negotiation space can be today the garden party, tomorrow the outdoor pilates studio and in 5 years the playground for the next generation.



RR

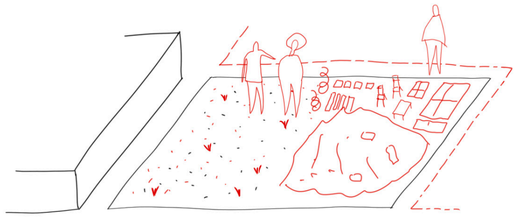
1. Identify potentials

Some buildings don't meet today's standards for renovation and have to be demolished to meet future needs of living.



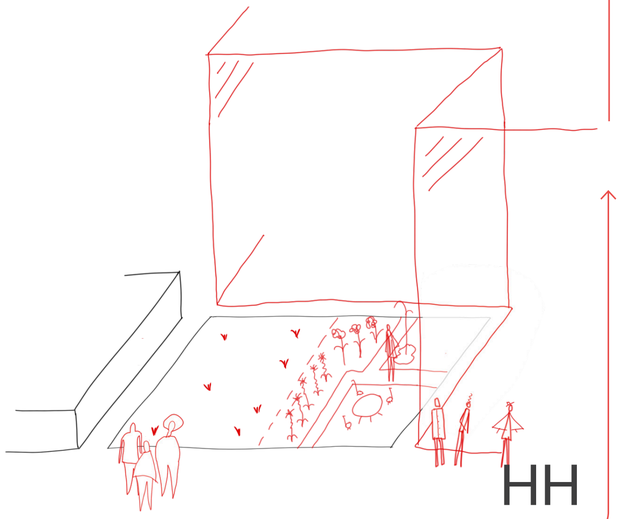
2. Demolish but re-use

To avoid an increase in CO^2 emissions, it is crucial to re-use as much as possible of the deconstructed built environment. Therefore, a material bank can help to seperate usable from non-usable materials to keep usable material in the loop.



3. Aim for density

When it comes to new developments, it is crucial to avoid greenfield developments at all costs. Furthermore, new developments have to be align with future needs in terms of material re-use. The space in between the existing and the new can be re-interpreted on demand for commercial or private use.

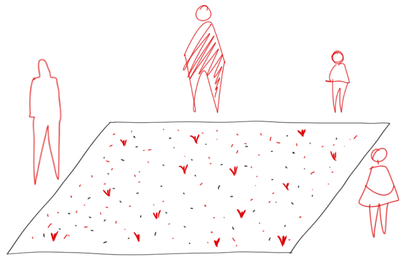


HH

LEARN TO RE-LEARN

1. Find an interest group

Resilient futures require local methods. Not all people have the knowledge for those, often forgotten and unlearned practices. Therefore, finding a peer-group to learn together helps to navigate trough uncertain futures.



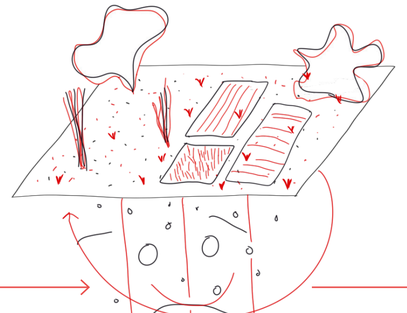
2. Learn new-old things

Making food is nothing new. But interdependencies from food markets in a more self sufficient future requires knowledge in terms of how, where, when and what. Exchange between educational facilities, indigenous, old and young people is crucial to learn healthy ways of doing.



3. Regenerate

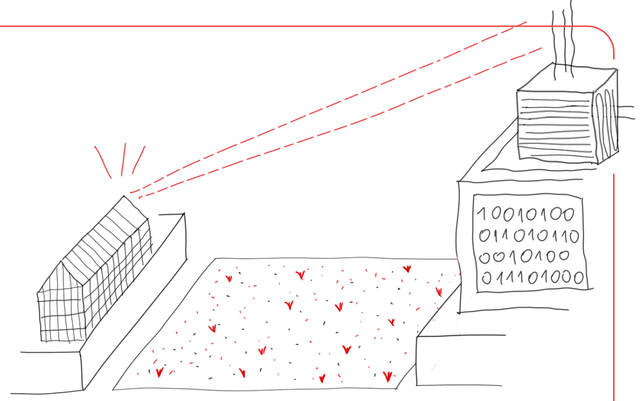
After a period of human interaction with ecosystems, the soil can regenerate because of the previous restoration and preparation. This allows flora and fauna to claim back the space needed.



RR

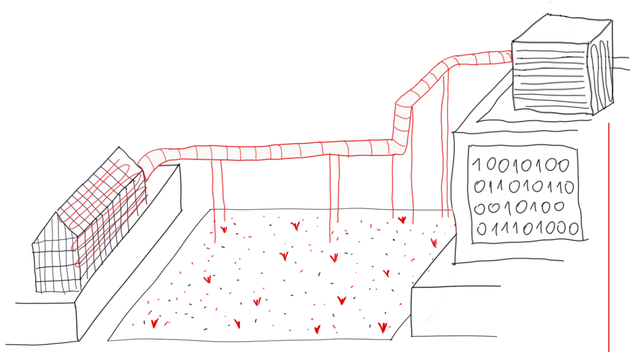
1. See the unseen

Often innovate and ground breaking solutions are just developed around the corner without any notice. Knowing who is doing what where helps to learn from each other.



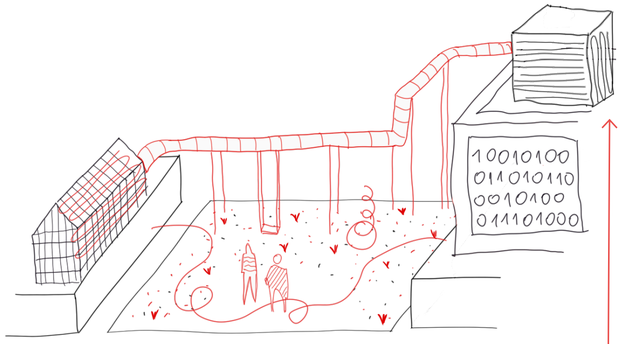
2. Learn how to use it

To join forces, a certain infrastructure is required to make things work. Circular spaces can host adaptable technologies.



3. Learn togetherness

Working with the knowledge and infrastructure from other disciplines can help to join forces for new findings and smarter ways of making.

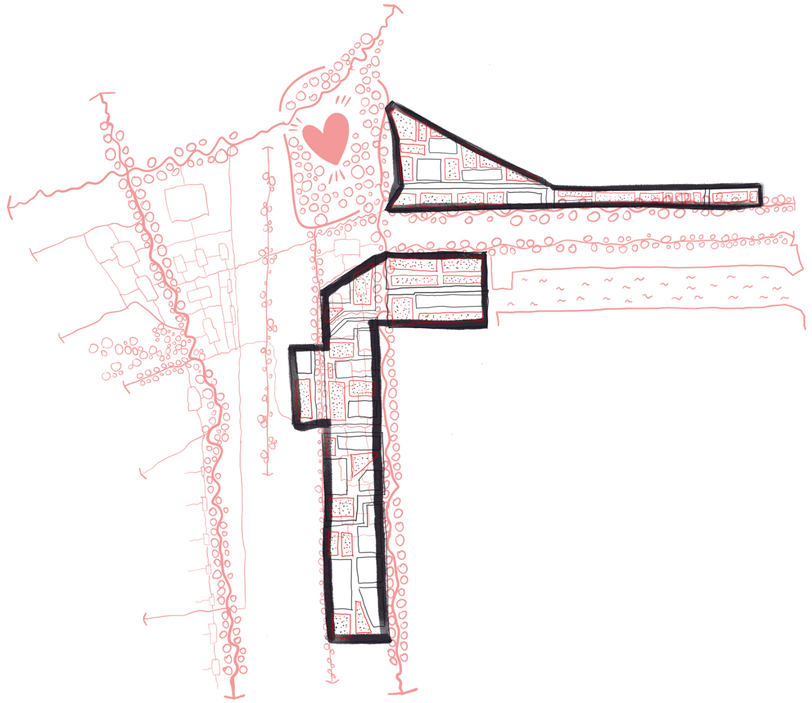


HH

How does it land in space?



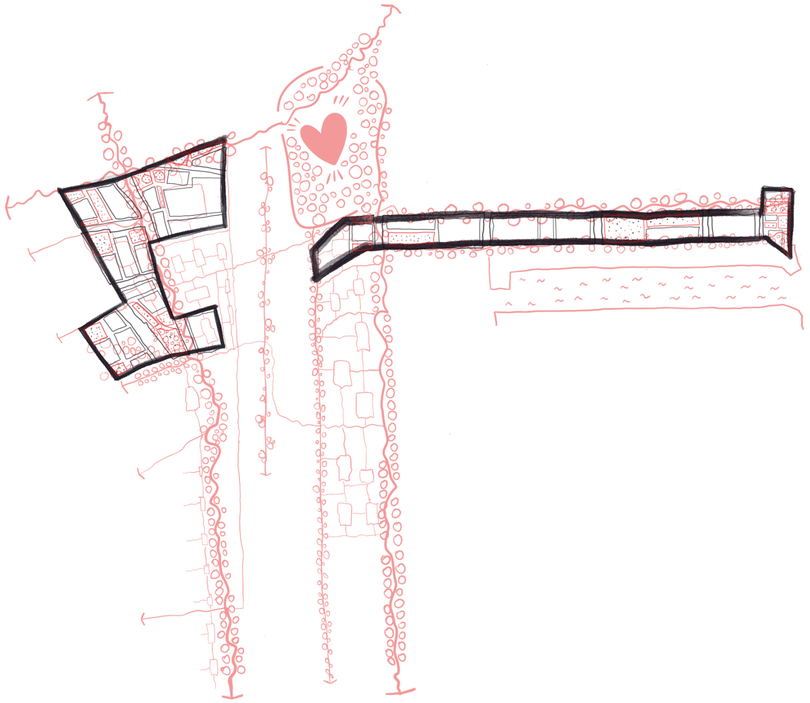
Resilient Framework



Making along learning



Living In-Between



Eco-Campus as connector

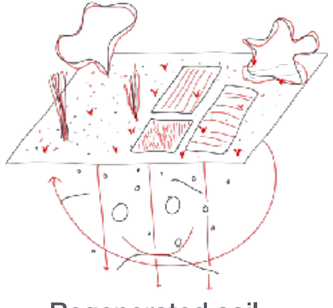




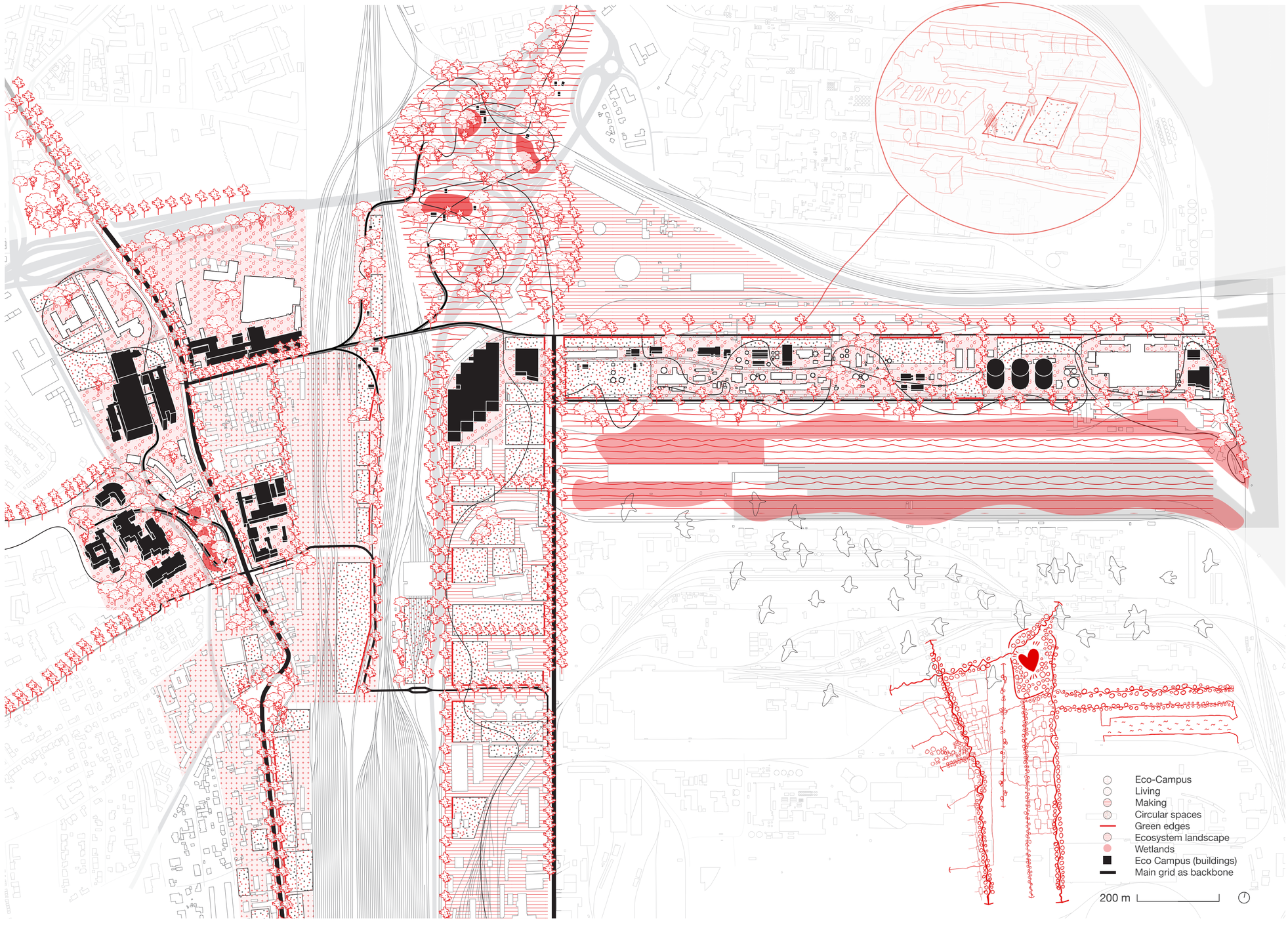
Repair-cafes are mainstream



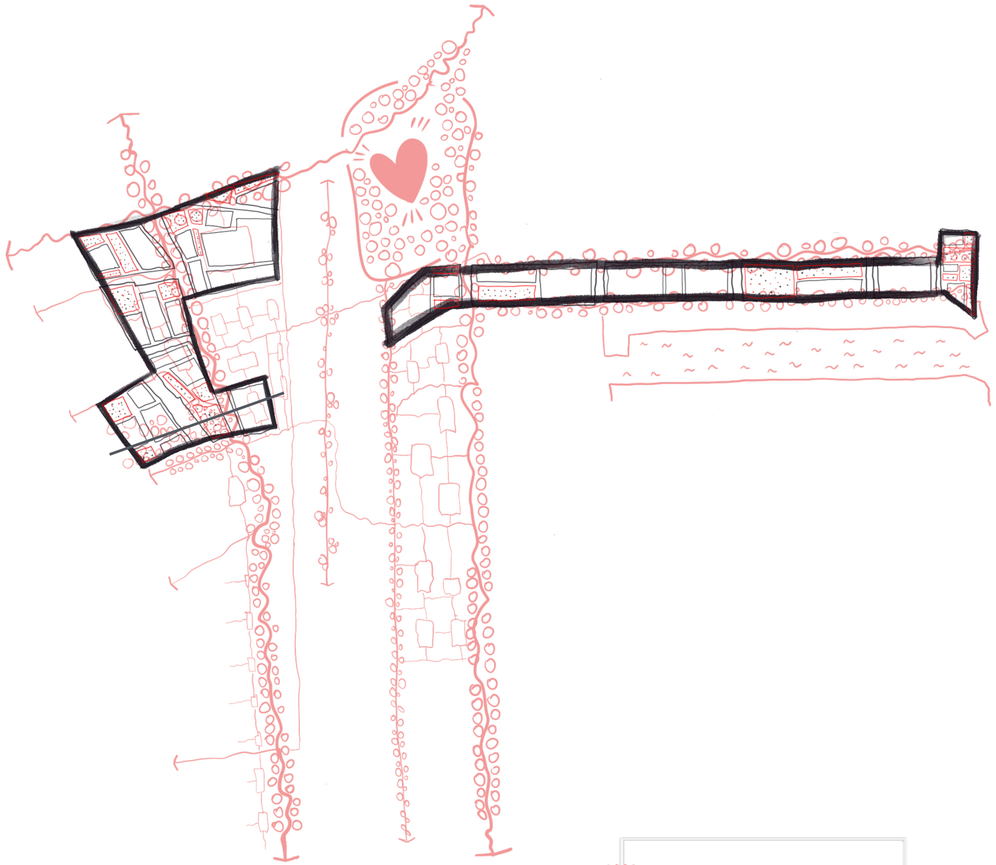
Neighbourhood meet-up spots

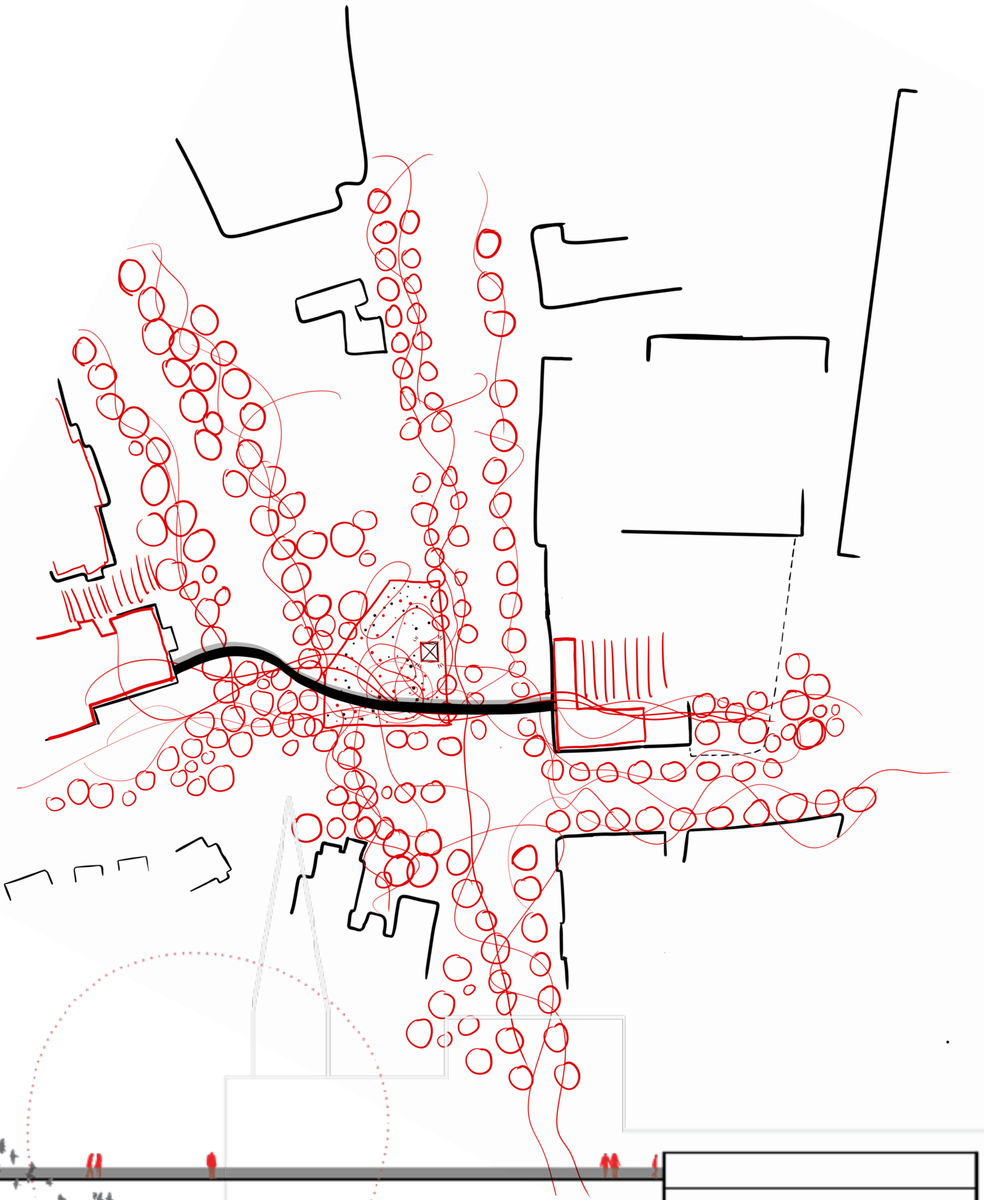


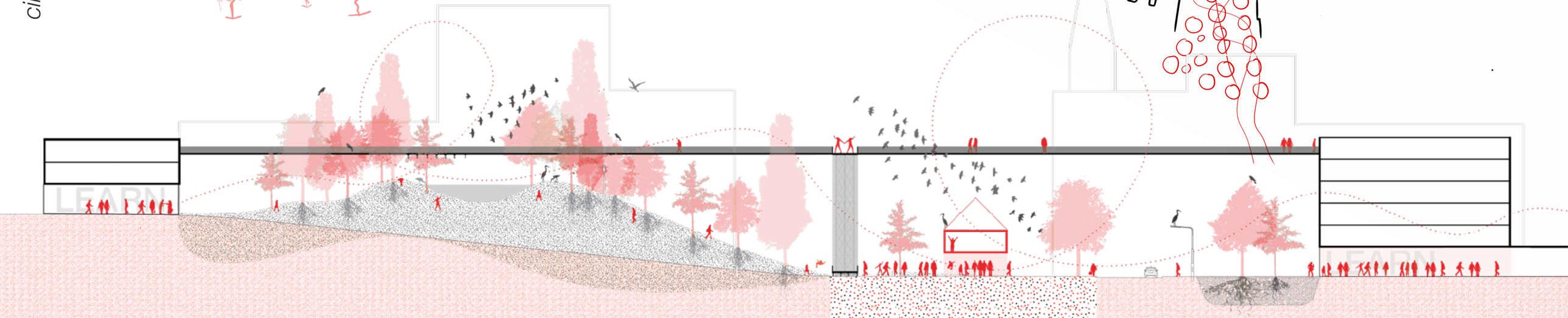
Regenerated soil

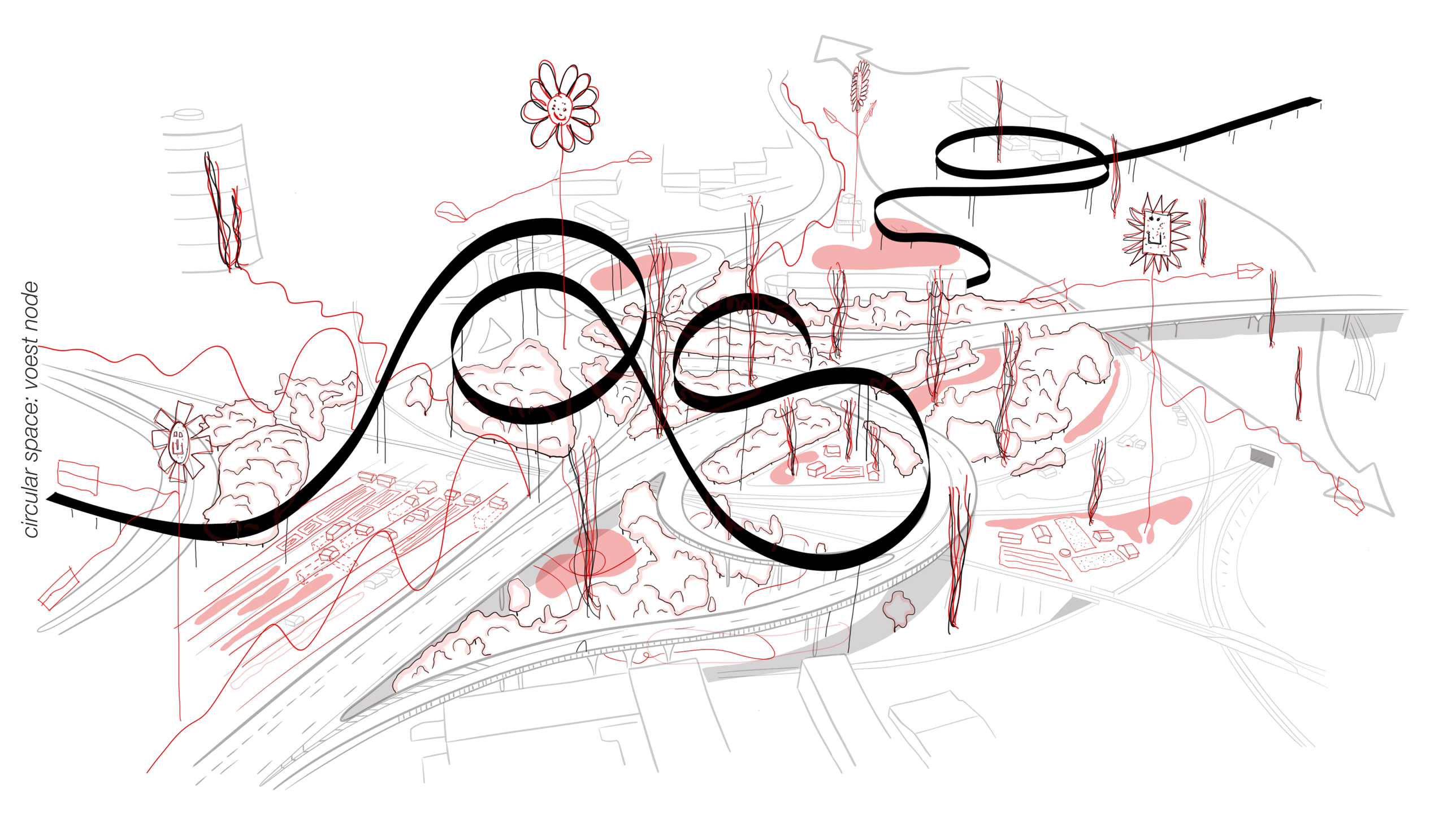


circular space: campus link

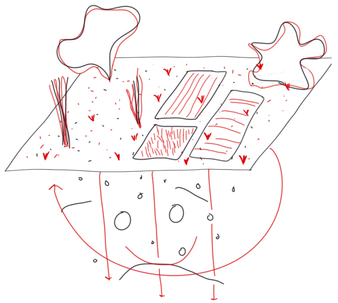


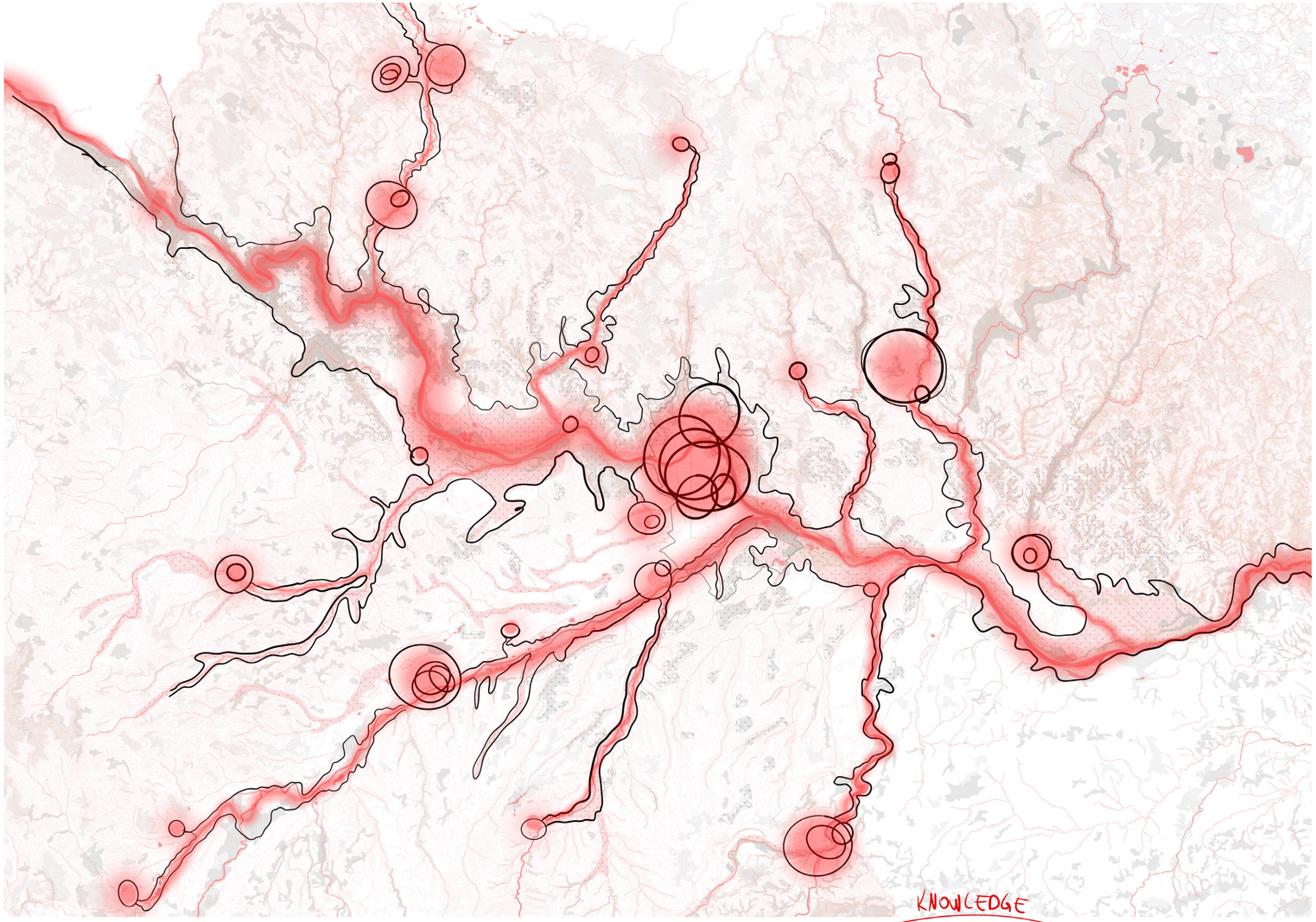




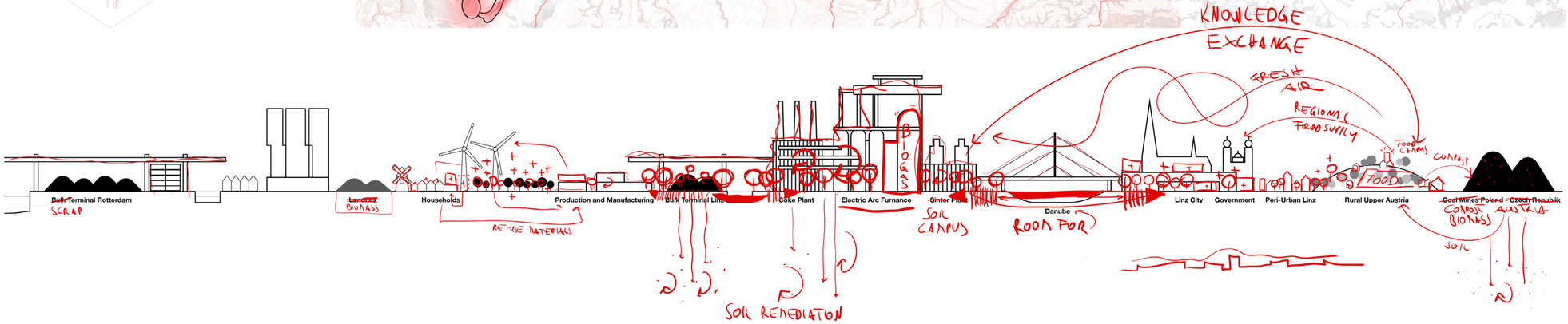

circular space: voest node

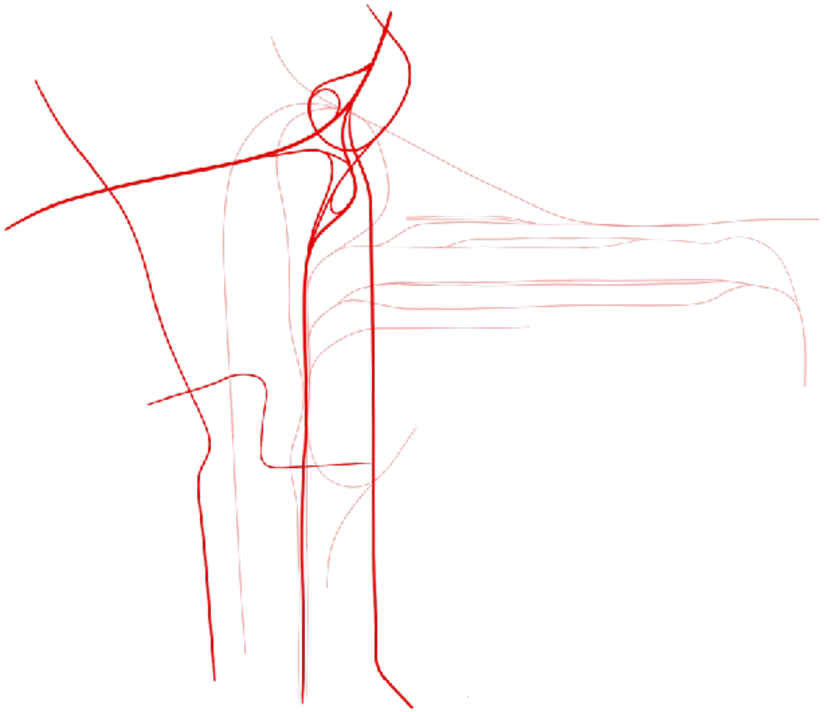
territorial dimension. a matter of scale.





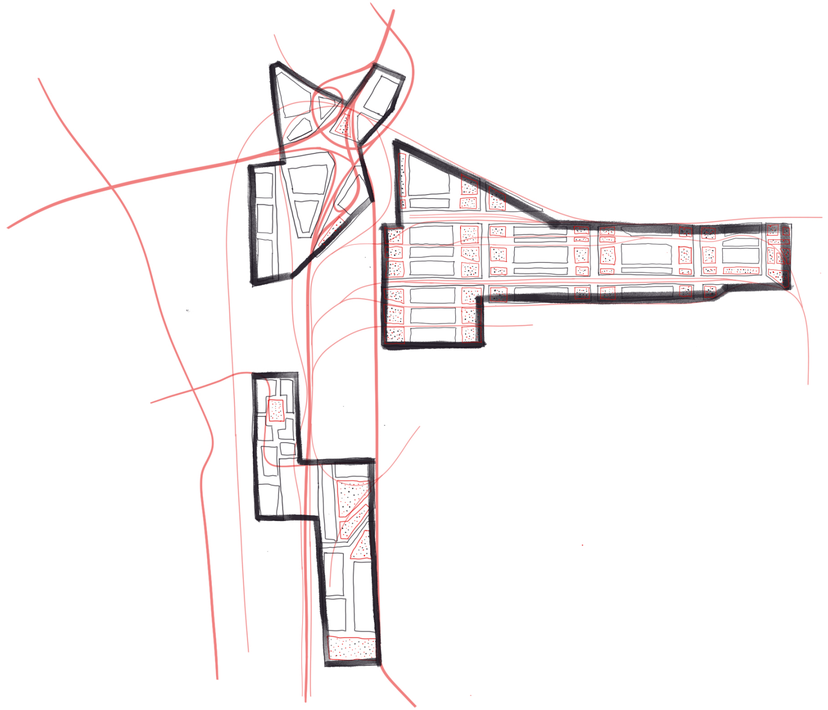




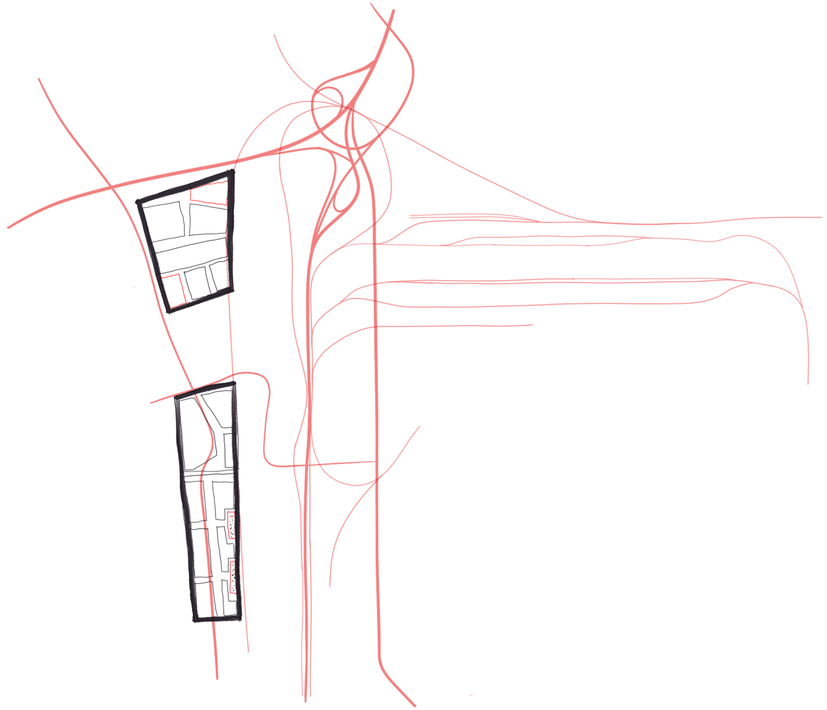


Hyperlinked Framework

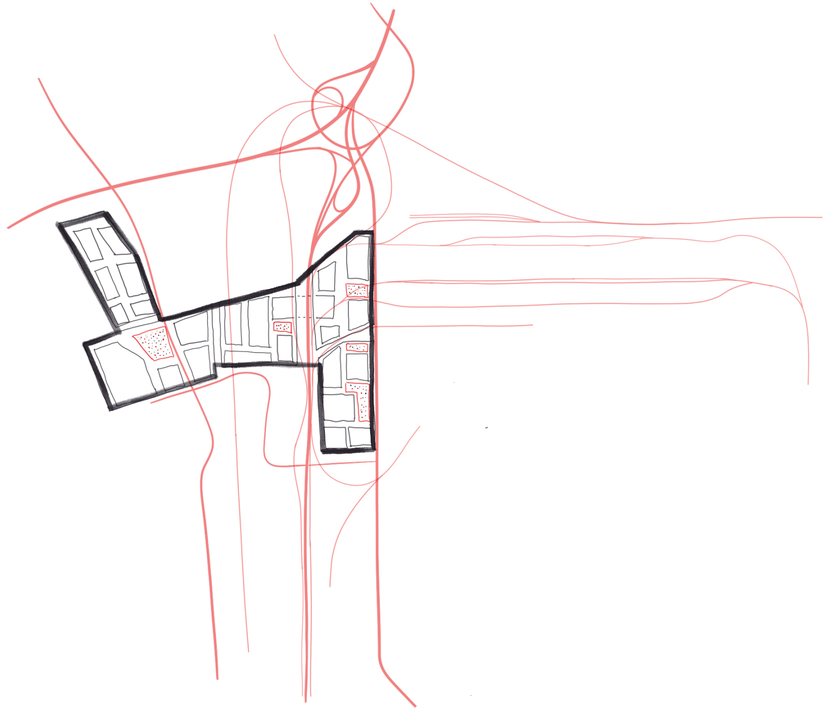




Making a lot

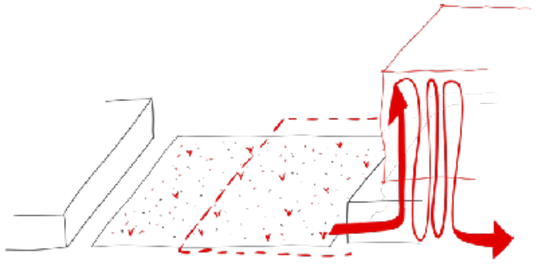


Living along Wiener

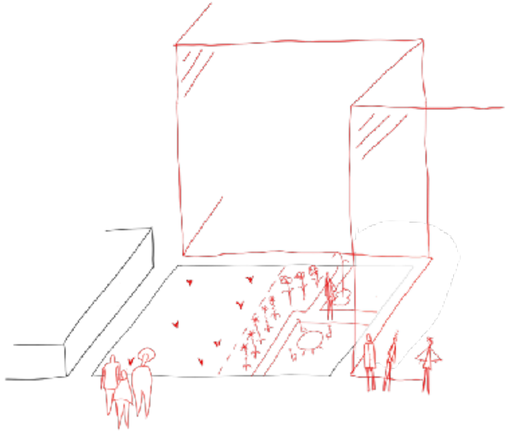


Tech-Campus as connector





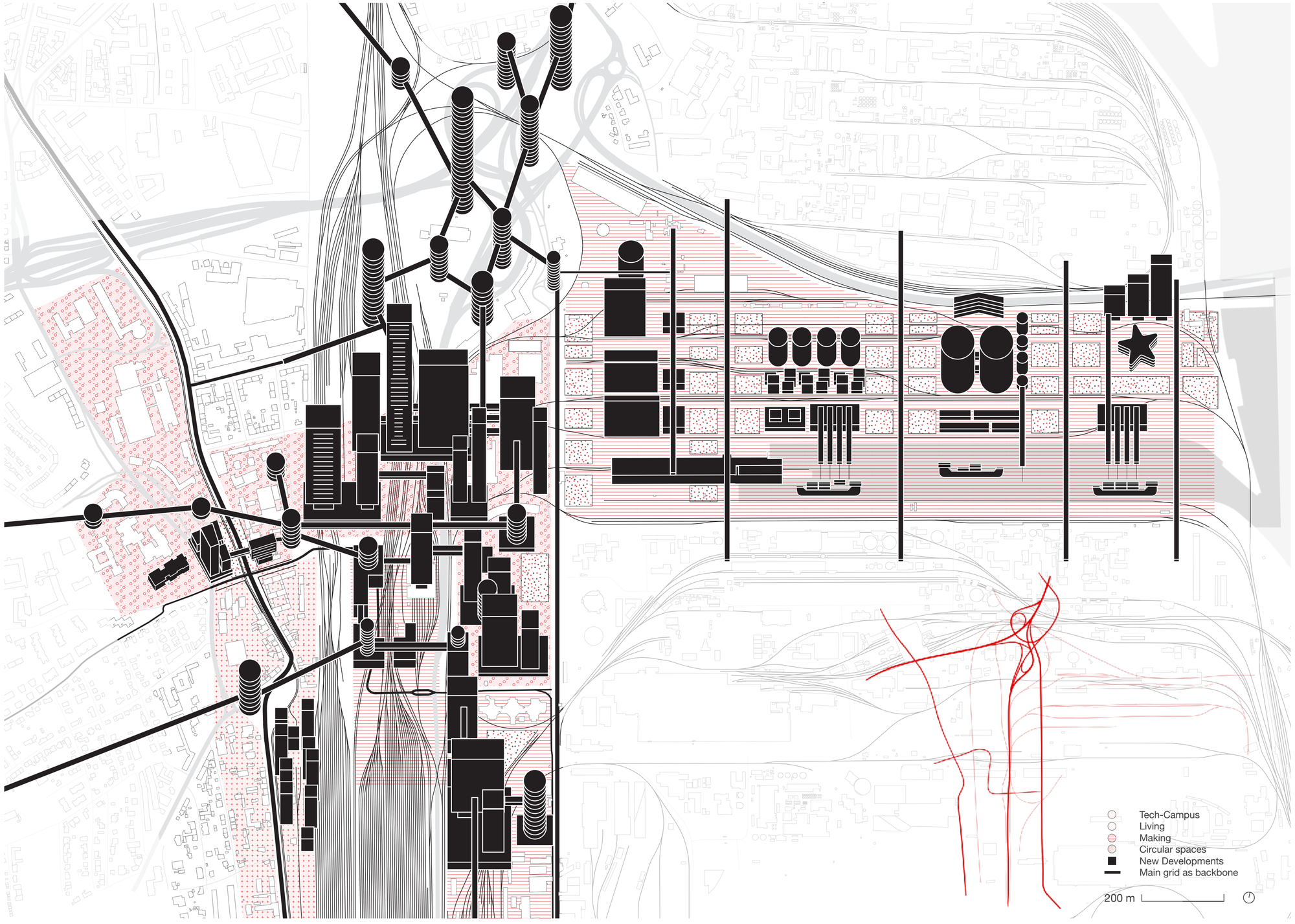
Vertical making is mainstream

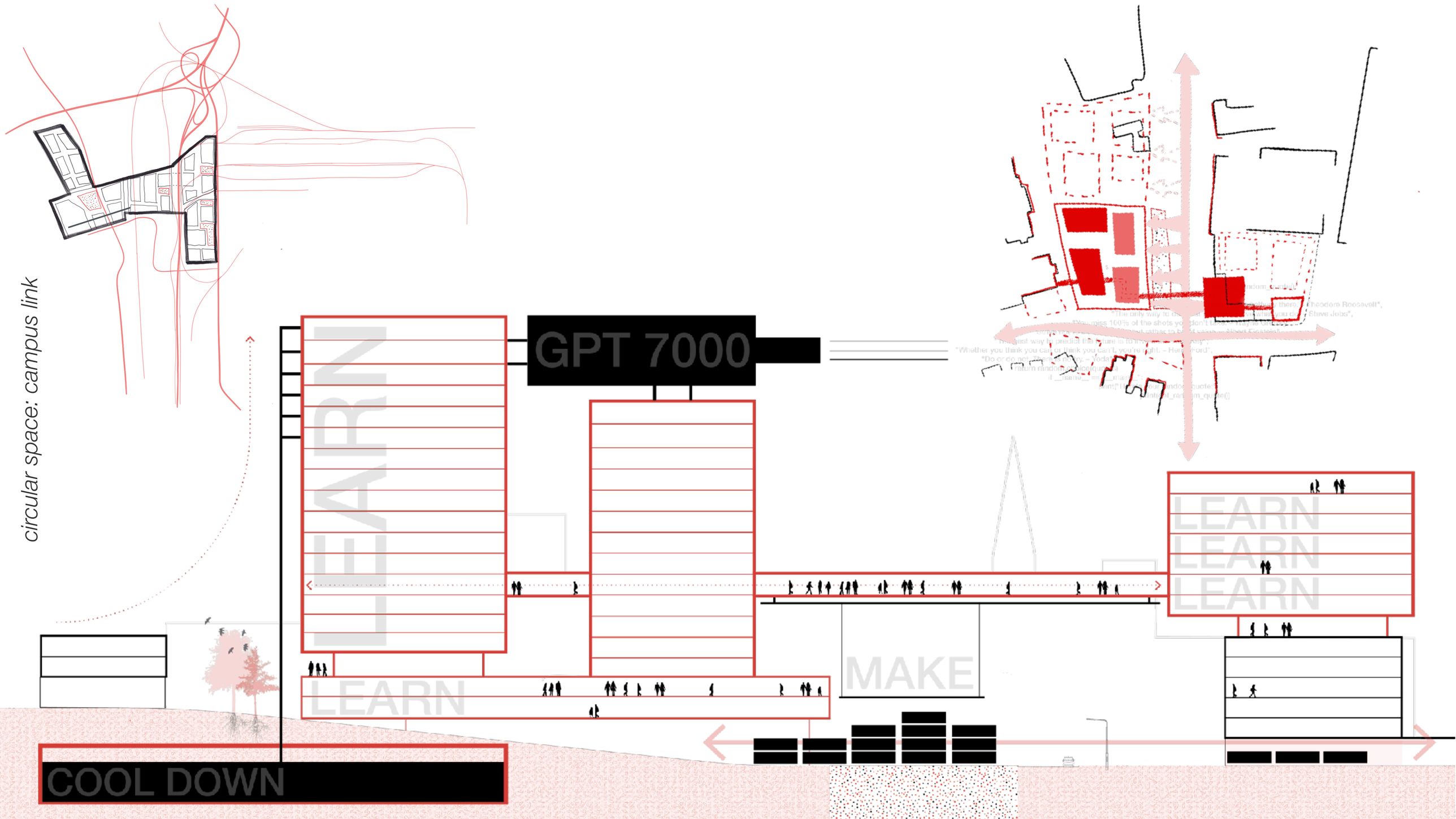


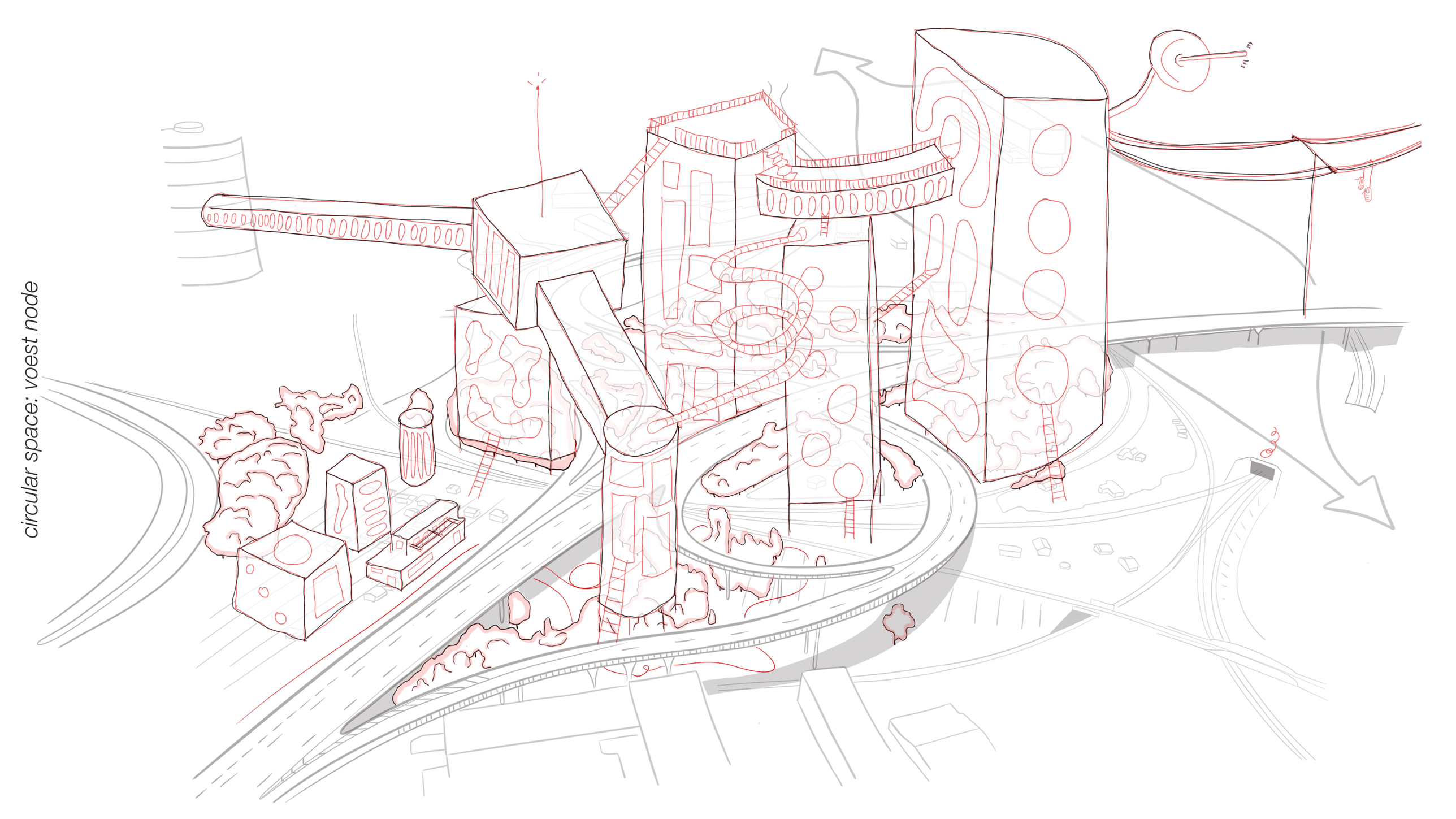
New public space design



Innovation hubs emerge

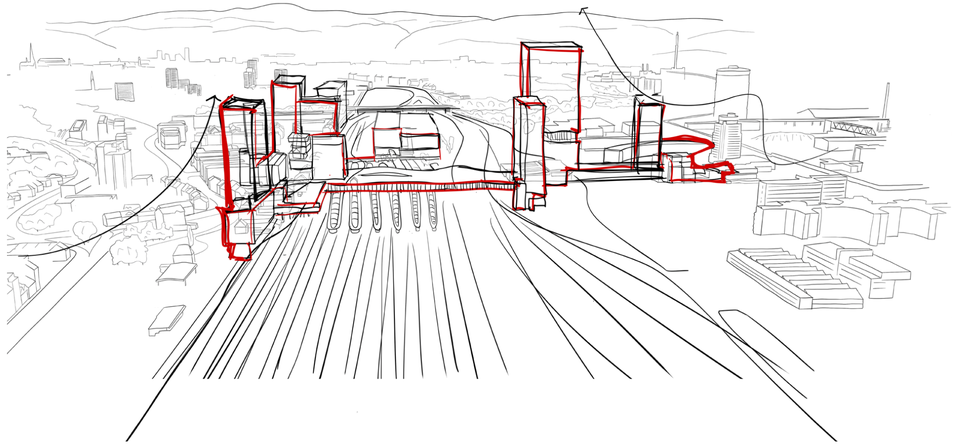


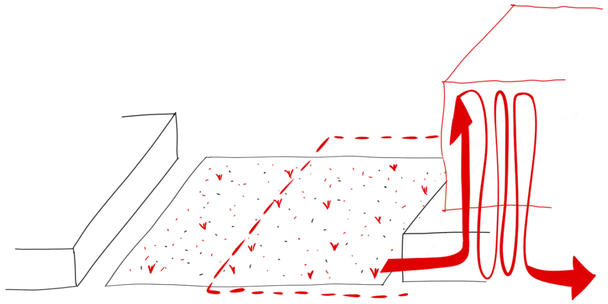

circular space: campus link
GPT 7000
LEARN
LEARN
LEARN
LEARN
LEARN
LEARN
MAKE
COOL DOWN

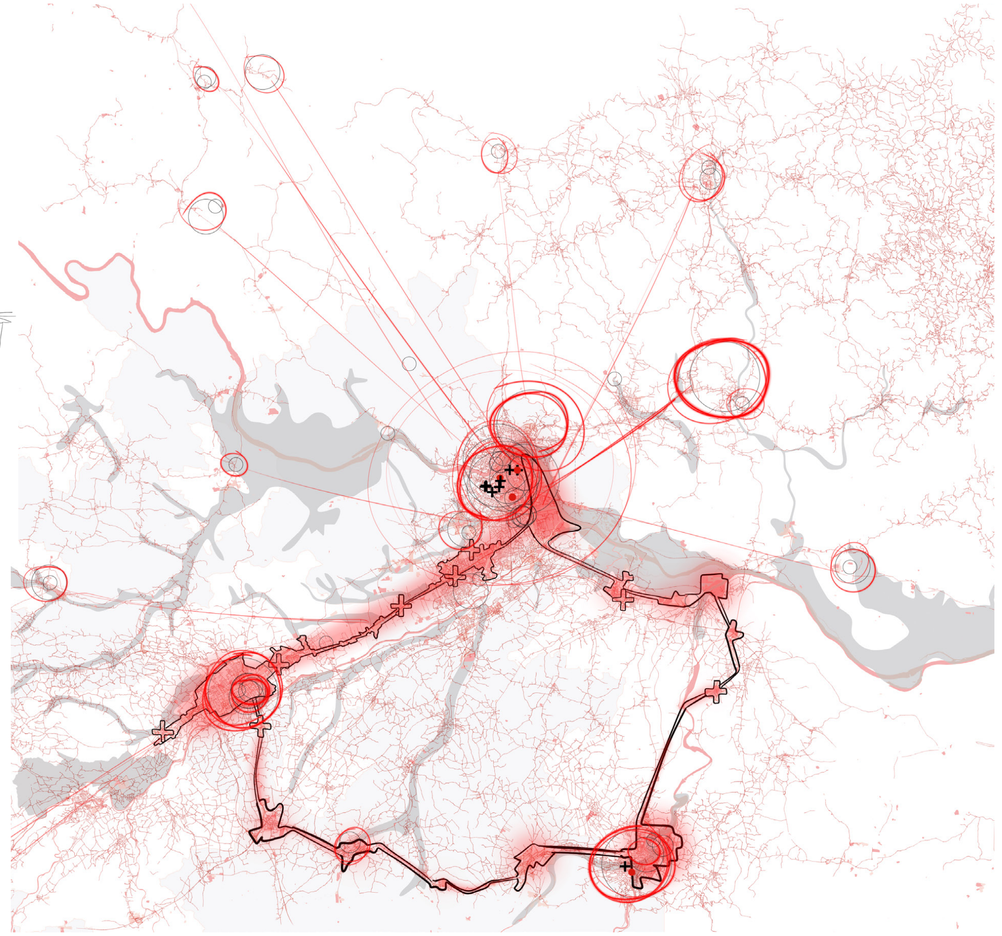


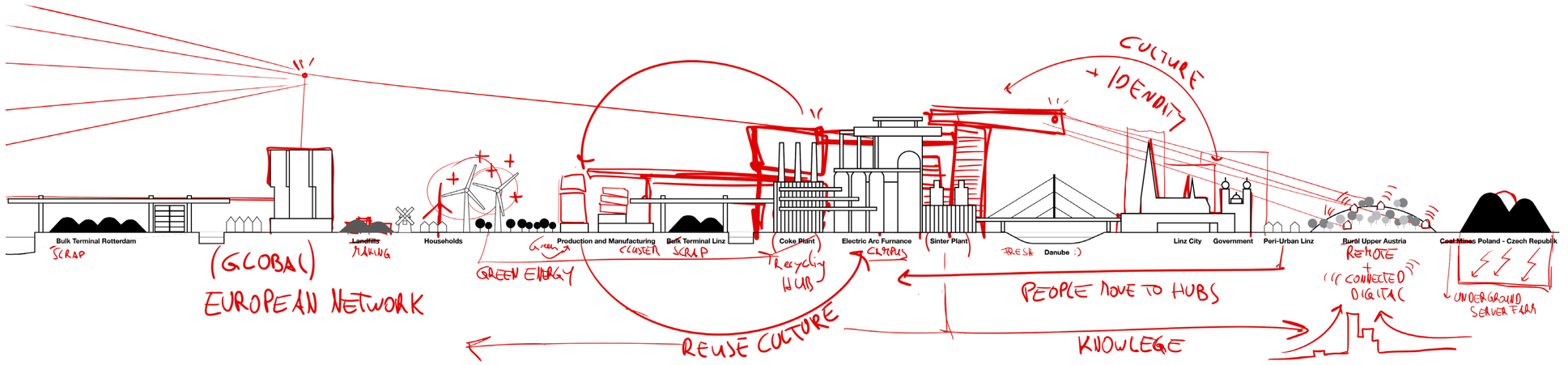
circular space: voest node

territorial dimension. a matter of scale.





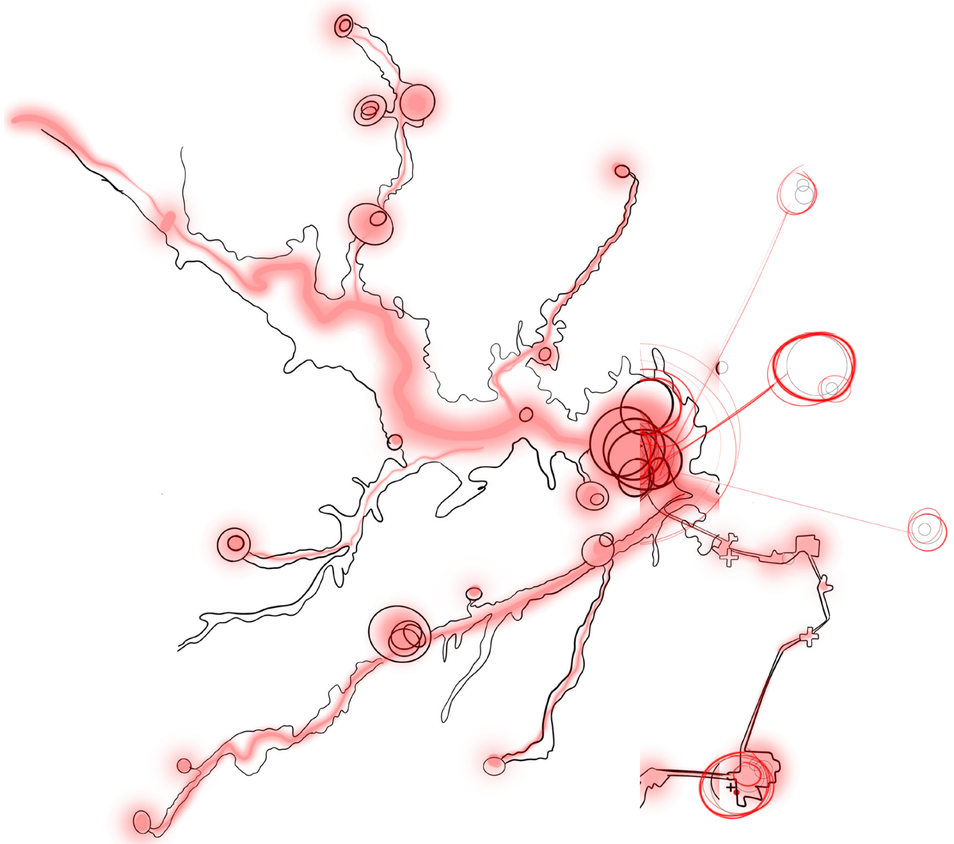


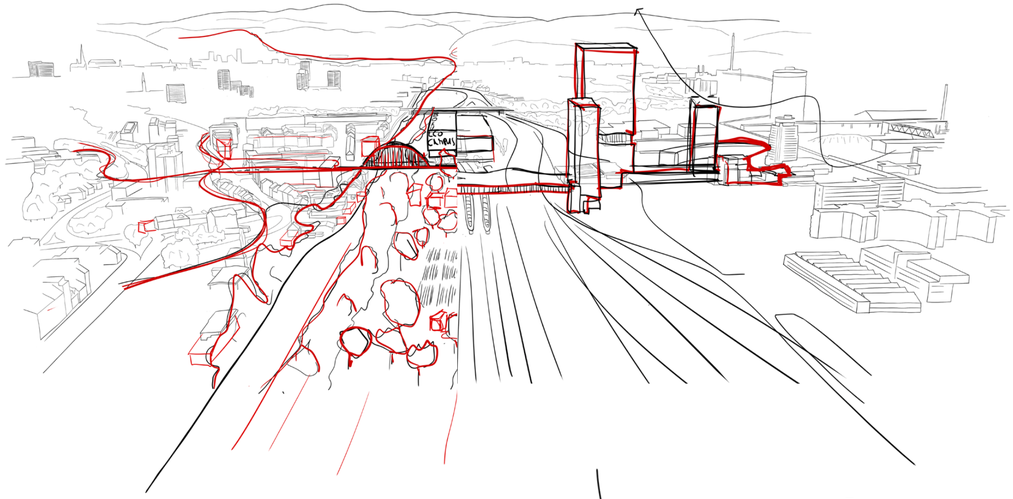


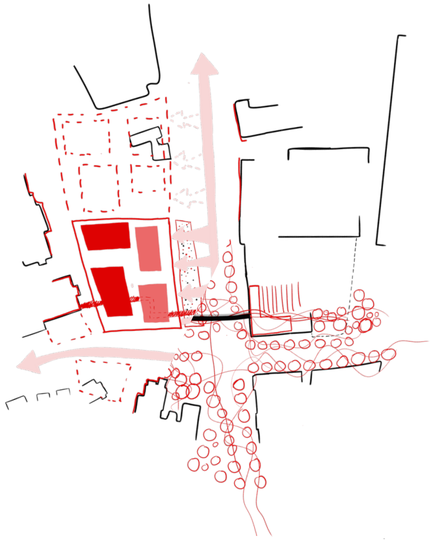
learnings & conclusion

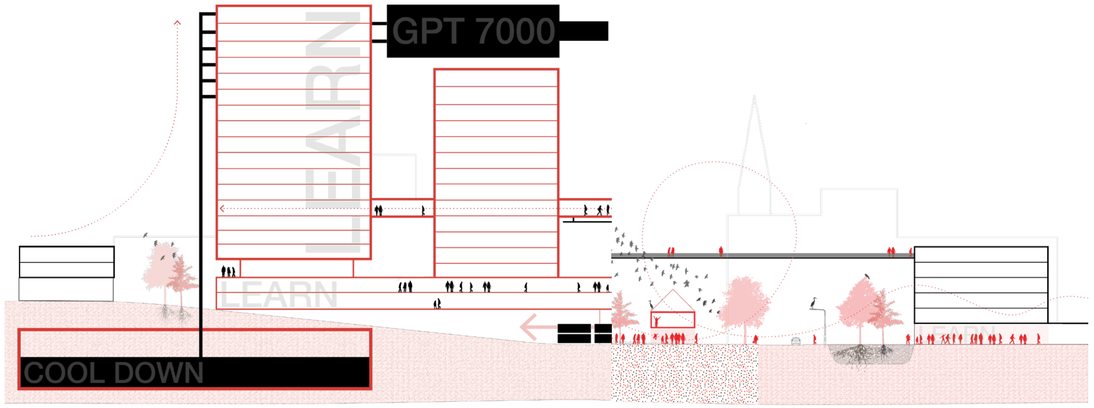

R
H

testing hybrids



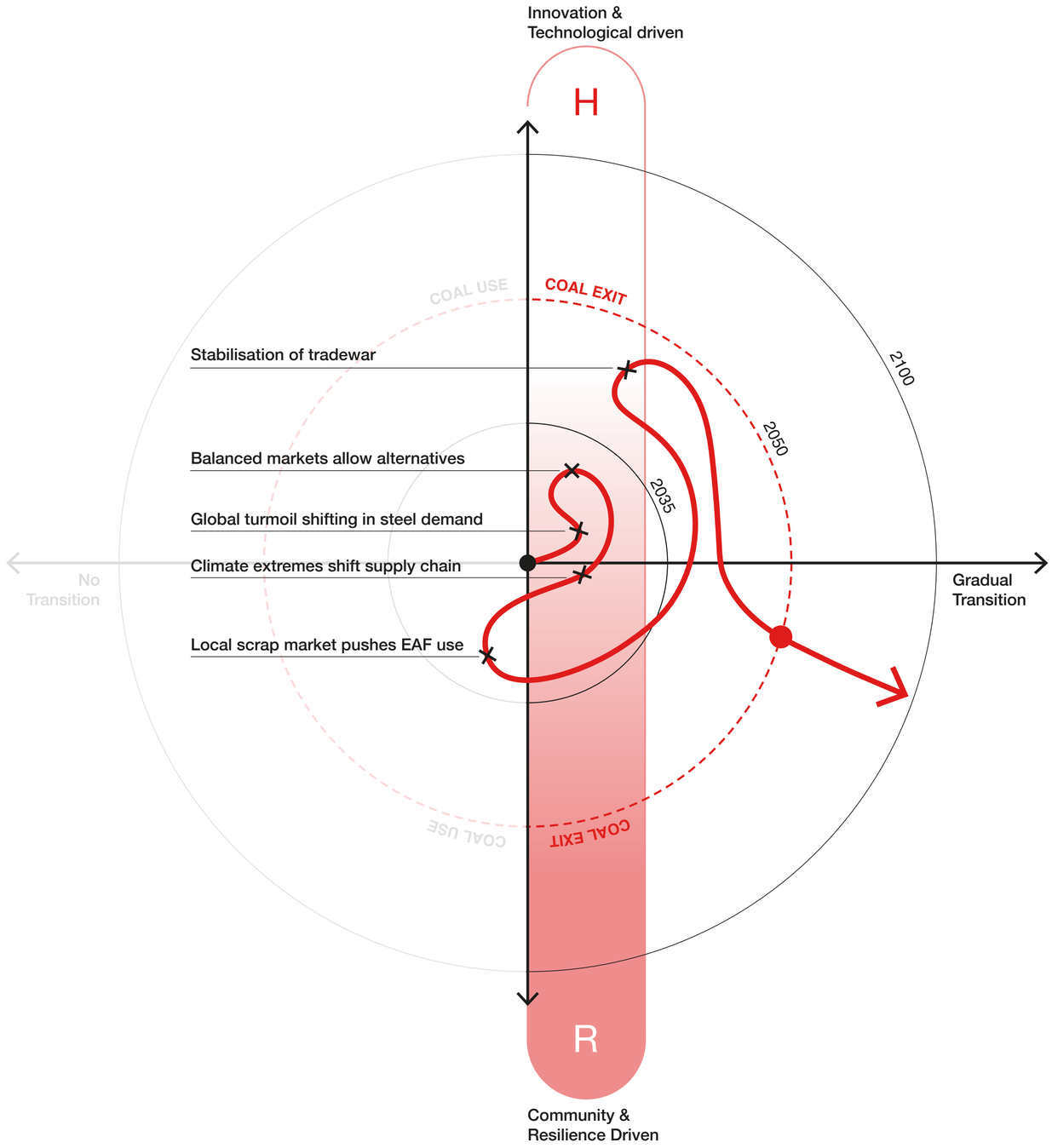








understanding the reality



answering the research question

How can transformations in the steel industry of Linz act as a catalyst for the **spatial and programmatic organisation of urban and peri-urban settlements** and **industrial districts,** fostering the integration of **industrial innovation** and **societal shifts** towards a **Circular Society.**

industrial innovation and societal shifts

Make

Steel production in Linz relies on heavy infrastructure, embedding the industry into the city’s spatial system.
This creates both challenges and opportunities for reuse of underutilised land and circular economy strategies.
Geopolitical situations can shift priorities and may have effects on the spatial development.

Live

The factory draws large commuter flows, making Linz a “drive-in city” and stressing local infrastructure.
Innovation and modernisation can effect shifting employment rates.
Nearby communities face environmental and social burdens, revealing inequalities tied to industrial presence.
Cleaner production can shift proximities.

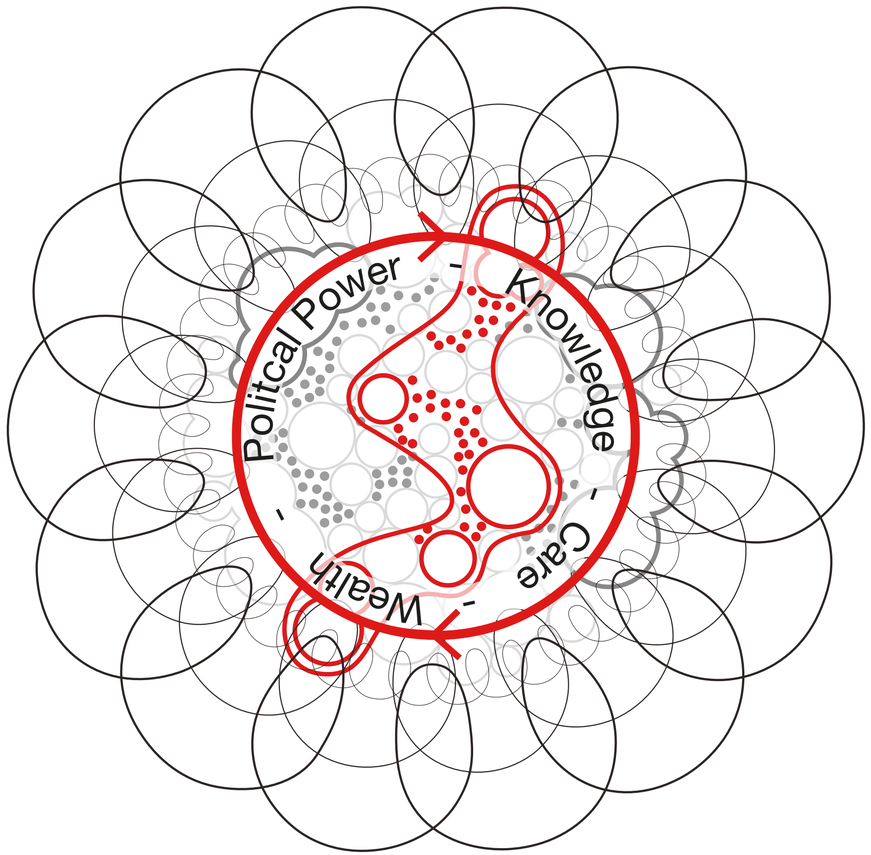
Learn

Linz’s shift toward digital industry depends on education.
Close ties between industry and institutions offer chances for re-skilling, but structural barriers still exclude many from this transition.
It is crucial to focus on weaker groups in society which will be more effected by this transition than others.

Going beyond Make, Live and learn

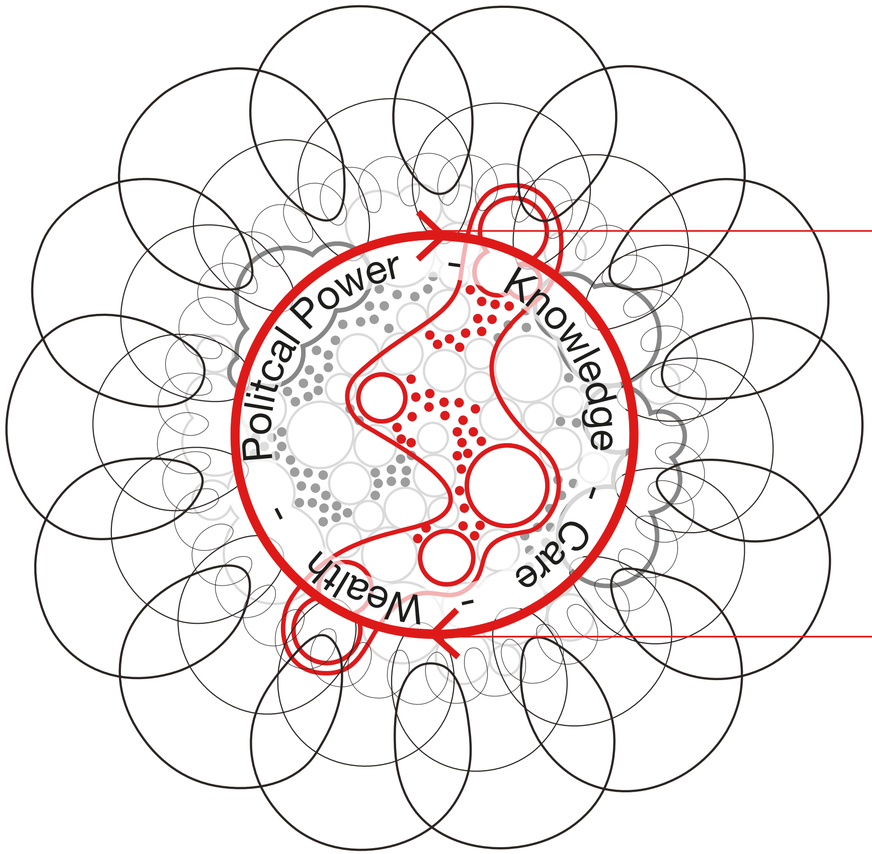
Working intersectional, to open up more topics which are relevant in a ongoing complex and unequal world.

spatial and programmatic organisation

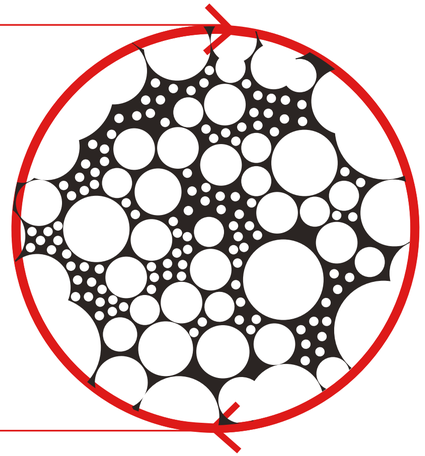


Steelscape
Metabolism

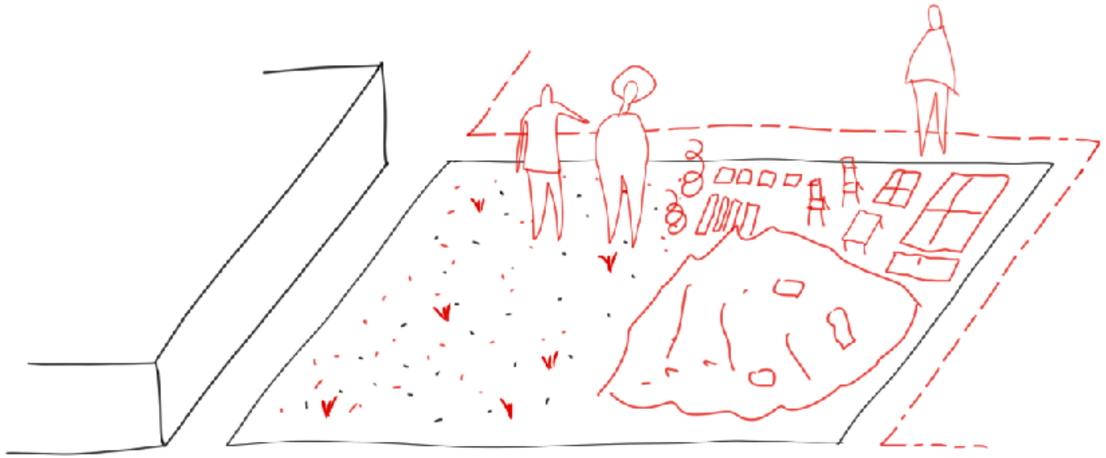
spatial and programmatic organisation



Steelscape
Metabolism

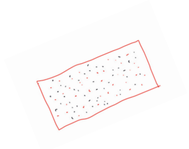


In-between spaces as circular resource



Because cities are never finished…



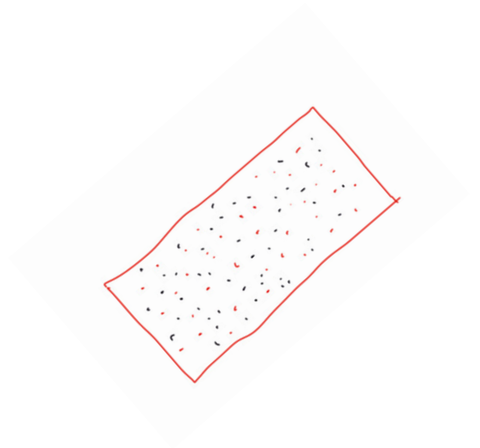




Der Sinn des Lebens ist das Unvollendete.
The meaning of life is the unfinished.







Bruno Kreisky

thank you



sources

Literature

Amenta, L., & Van Timmeren, A. (2018). Beyond wastescapes: Towards circular landscapes. Addressing the spatial dimension of circularity through the regeneration of wastescapes. Sustainability, 10(12), Article 12. https://doi.org/10.3390/su10124740

Calisto Friant, M., Vermeulen, W. J. V., & Salomone, R. (2023). Transition to a sustainable circular society: More than just resource efficiency. Circular Economy and Sustainability, 4(1), 23–42. https://doi.org/10.1007/s43615-023-00272-3

HNS, Office Outside, The Beuk Organizational Advice, & Atelier 2T. (2012). Lange termijn perspectief IJssel-Vechtdelta. HNS. http://www.hnsland.nl/projecten/lange-termijn-perspectieven-ijssel-vechtdelta/

Ito, A., Langefeld, B., & Götz, N. (2020). The future of steelmaking: How the European steel industry can achieve carbon neutrality. Roland Berger.

Oswald, F., & Baccini, P. (1998). Netzstadt. Hochschulverlag AG an der ETH Zürich.

Raith, E. (1998). Stadtmorphologie: Annäherungen, Umsetzungen, Aussichten [Habilitation, Technische Universität Wien].

Web & Media

Global Energy Monitor. (2023–2024). Global steel plant tracker (April 2024) and Global coal terminals tracker (2023). https://globalenergymonitor.org

Google Maps. (n.d.). Satellite images [Digital images]. Retrieved June 2025, from https://www.google.com/maps

Industriemagazin. (2025, April 14). Das sind Österreichs größte Automobilzulieferer. Retrieved June 17, 2025, from https://industriemagazin.at/fuehren/das-sind-oesterreichs-groesste-automobilzulieferer/#blockid-4246003

The Geography of Transport Systems. (n.d.). Main material components of a car. Retrieved June 17, 2025, from https://transportgeography.org/contents/chapter4/transportation-sustainability-decarbonization/material-components-car/

Kreisky Forum. (n.d.). Quote Bruno Kreisky. Retrieved from https://www.kreisky-forum.org/de/bruno-kreisky/

Images & Visuals

Edi, L. [@lisaedi]. (2025). Schifoan is des Leiwandste [Instagram photo]. Instagram. https://www.instagram.com/p/DKHeT3yN7gh/?img_index=10&igsh=MXV4dDZ5MTJjeXB4dw==

Yanul, M. (2023, August). Kiyev Ukraine Kyiv, Ukraine [Black and white photo of scrap pile]. Unsplash. https://unsplash.com/de/fotos/ein-schwarz-weiss-foto-von-einem-haufen-schrott-_RUhSeXpzDQ

Zhang, Q. C. (2021, September). 桐梓县, 遵义市, 中国 [Photo of a red-and-white pipe emitting smoke]. Unsplash. https://unsplash.com/de/fotos/eine-rot-weisse-pfeife-schiesst-rauch-in-den-himmel-mrjldq0h0vc

All maps, simulated space syntax models, density studies, drawings, and pictures presented in this thesis, unless explicitly credited within the figures, were developed and created by the author.