LANDSCAPES OF POWER

re-configuring the energy production landscape of western macedonia

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P5 Presentation
first mentor | Cecilia Furlan second mentor | Marcin Dabrowski
deligate | Mauro Overend

1 *The Problem*

Problem Field
Research Aim
Methodology

2 *Analysis:*

unravelling the energy Landscape

3 *Scenario Construction*

4 *Territorial Vision*

5 *Strategic Design*

6 *Conclusions*

The Problem

Current energy landscape

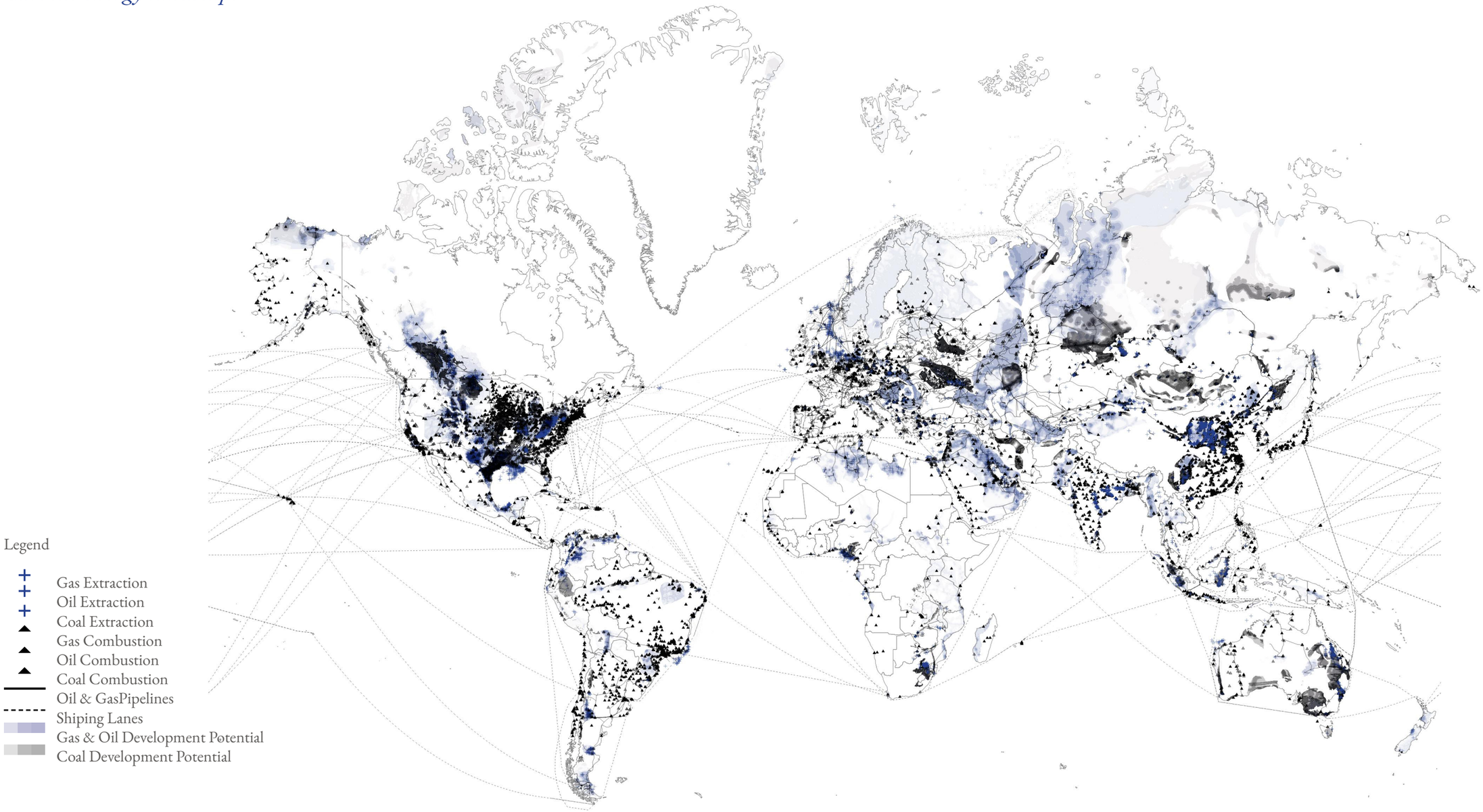


Figure | Fossil Fuel Energy Infrastructure
Sources | Global Energy Monitor (2022a), Global Energy Observatory et al. (2020), Oakleaf et al. (2019)

Current energy landscape



Extraction
Source: Modica (2014a)



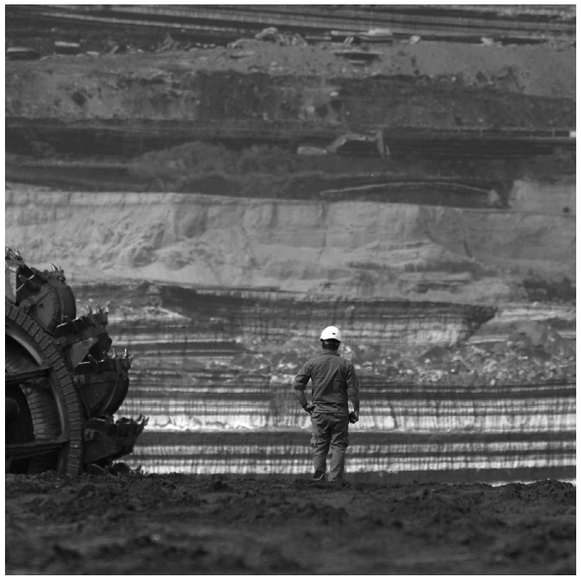
Conversion
Source: Modica (2014a)



Transportation
Source: Modica (2014a)



Storage
Source: Modica (2014a)



Expected shortage of fossil fuel resources

Source: Stavrakis (2022)



Geopolitical conflicts

Source: Modica (2014a)



Emerging climate crisis

Source: Konstantinos Tsakalidis



Demand the transition to renewables

Source: Alkis Konstantinidis

Renewable Energy Landscapes

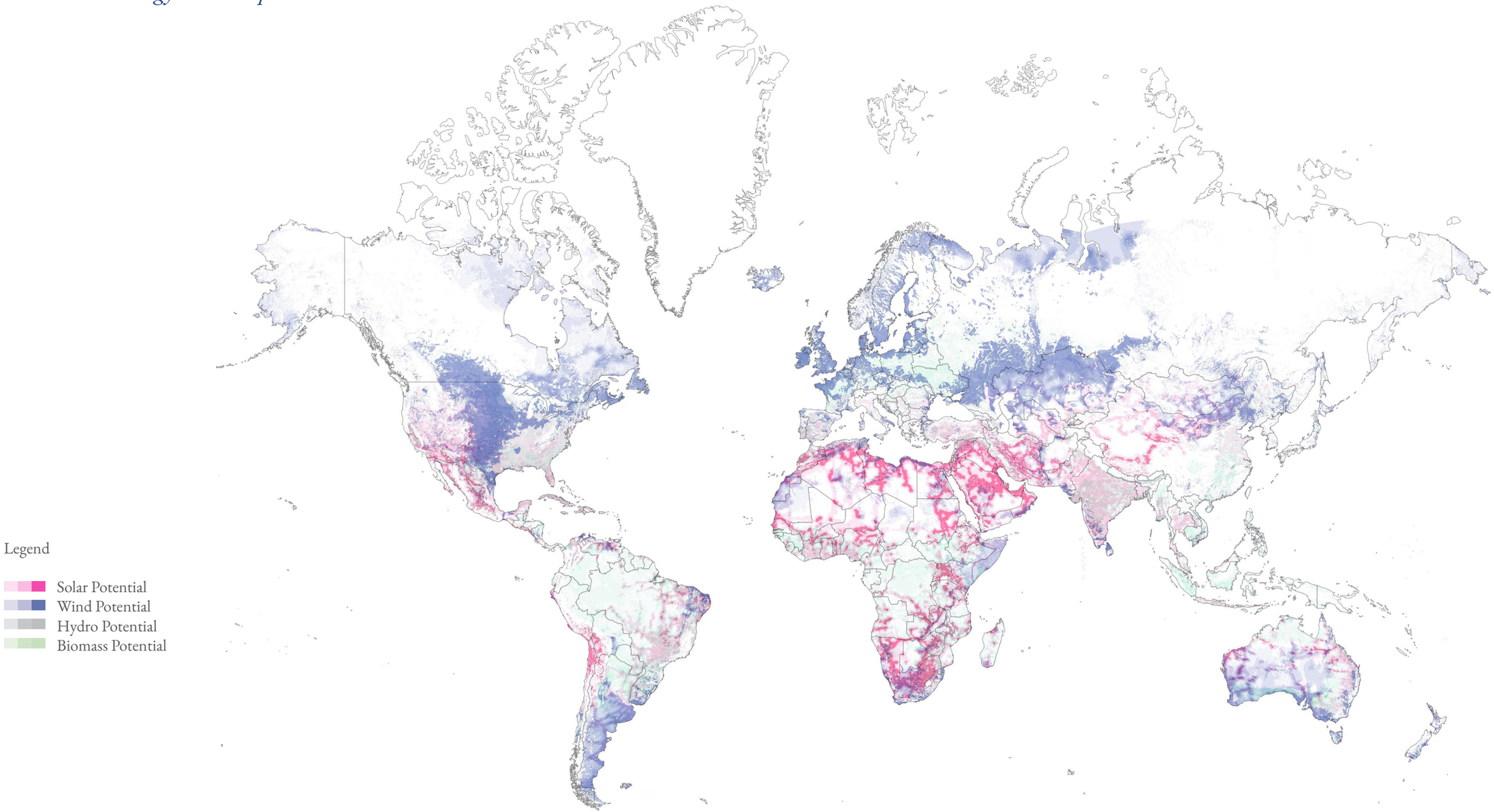


Figure | Renewable Energy Production Potential
Source | Global Energy Monitor (2022a),
Global Energy Observatory et al. (2020), Oakleaf et al. (2019)

Energy & Space | Fossils

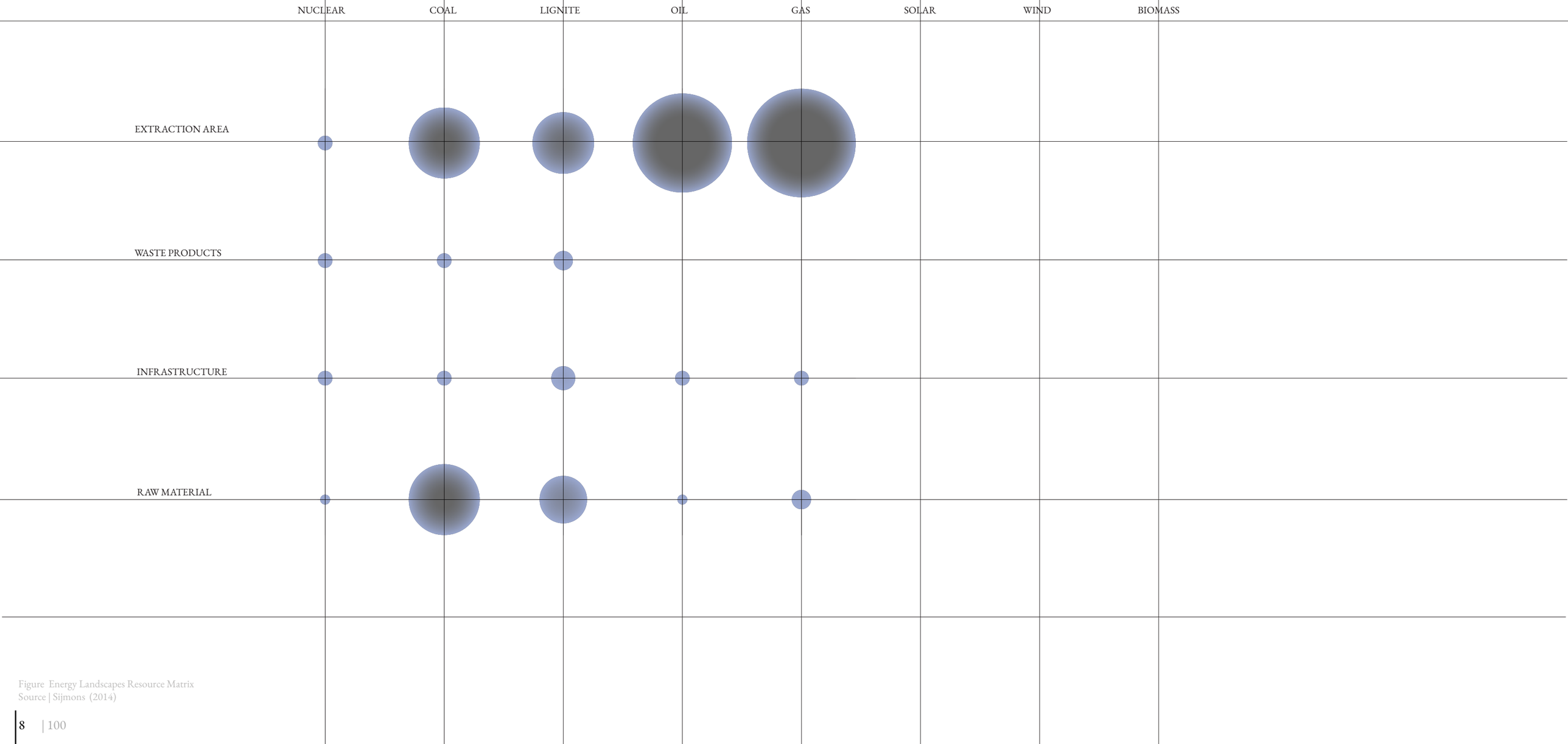


Figure Energy Landscapes Resource Matrix
Source | Sijmons (2014)

Energy & Space | Renewables

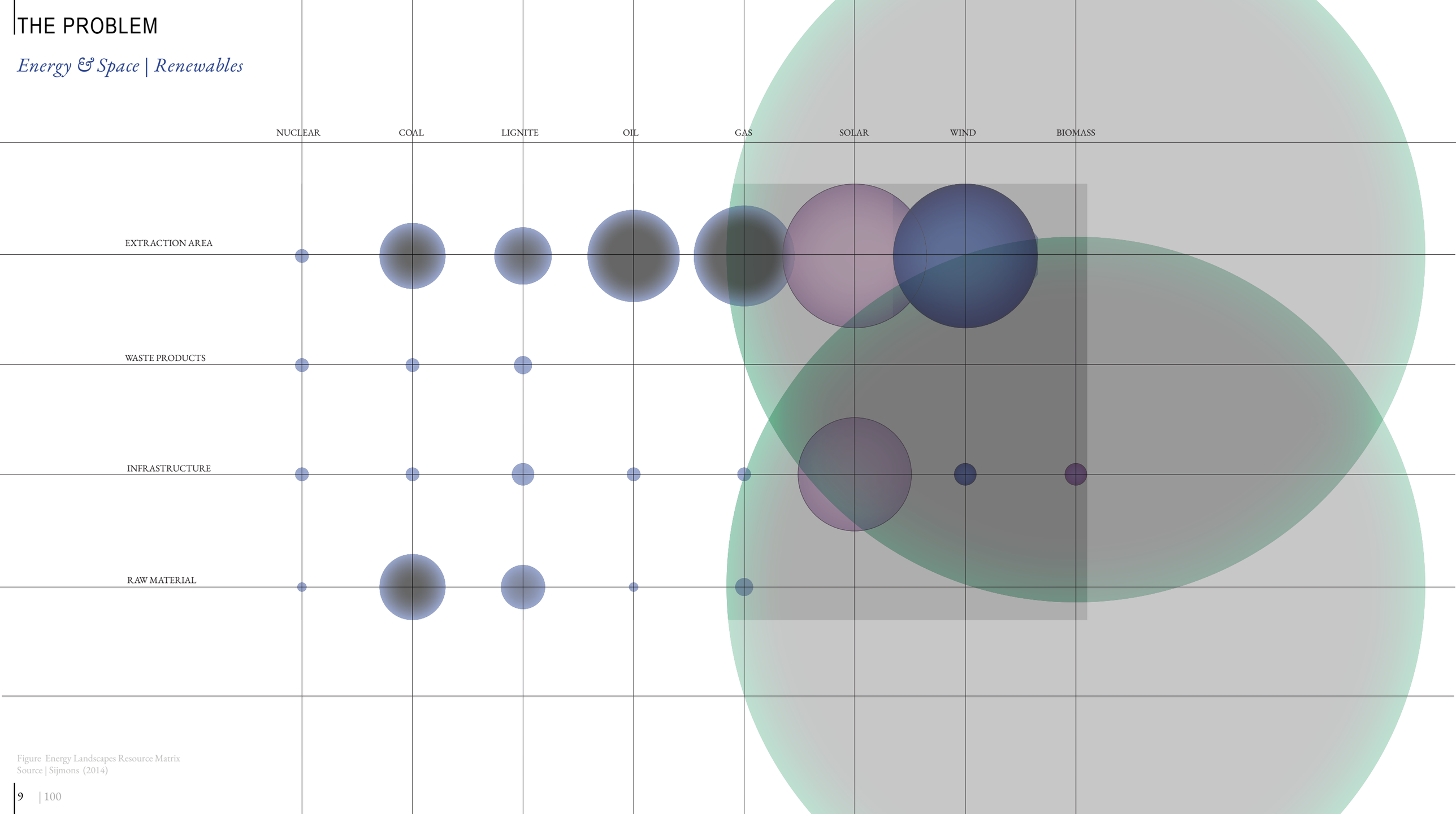


Figure Energy Landscapes Resource Matrix
Source | Sijmons (2014)

The context | European coal regions

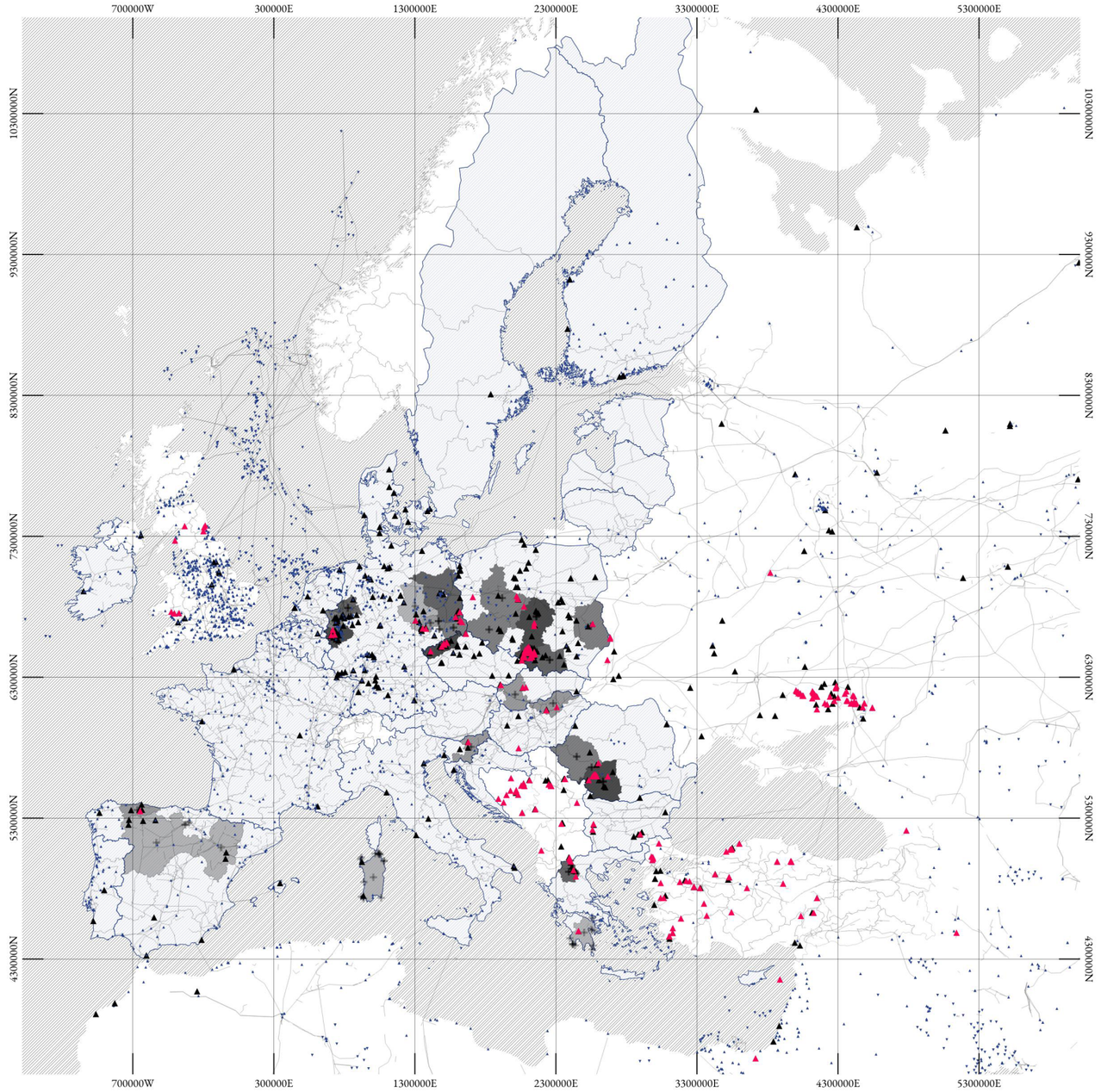
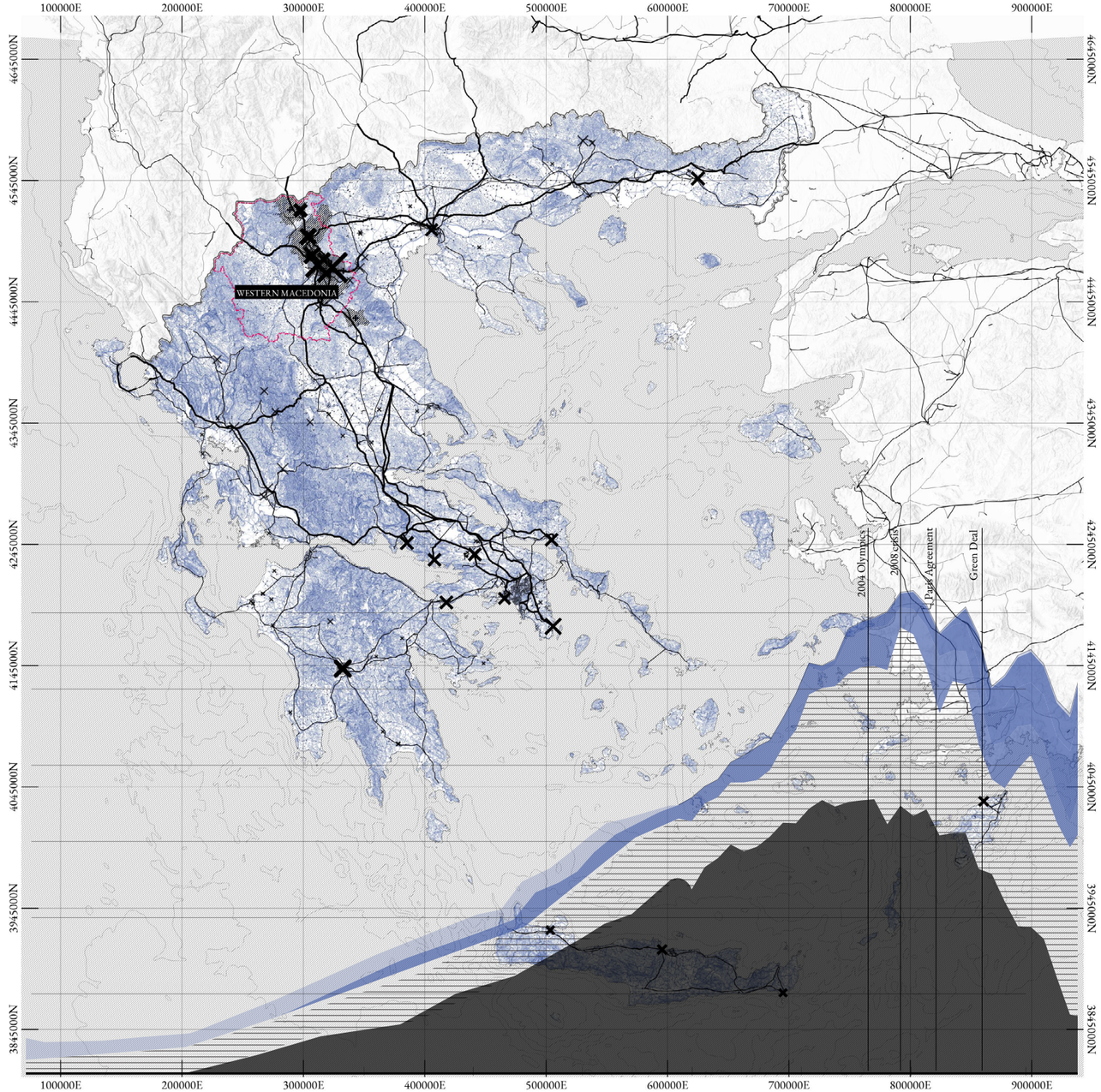


Figure | Coal Intensive Regions of Europe
Source: Geofabrik Download Server (2022) , Global Energy Monitor (2022a), Global Energy Observatory et al. (2020), European Environment Agency (2018),

The context | Greece



Legend

Energy Production

- Hydro, Oil Gas, Power plants
- Lignite based power plants

Energy Distribution

- Power lines 400V
- Power lines 150V
- Gas
- Administrative boundary WM
- Lignite Basins

Figure : Energy Production by source | Greece
Source: mber's Yearly Electricity Data et al. (2022)
Figure : Greece energy production system
Source: Geofabrik Download Server (2022) , Global Energy Monitor (2022a), Global Energy Observatory et al. (2020), EEA (2018), Patricia et al. (2018)

The case study \ Western Macedonia



Figure | Western Macedonia Energy Landscape
Source | author

The Context | Socio-economic Urgencies

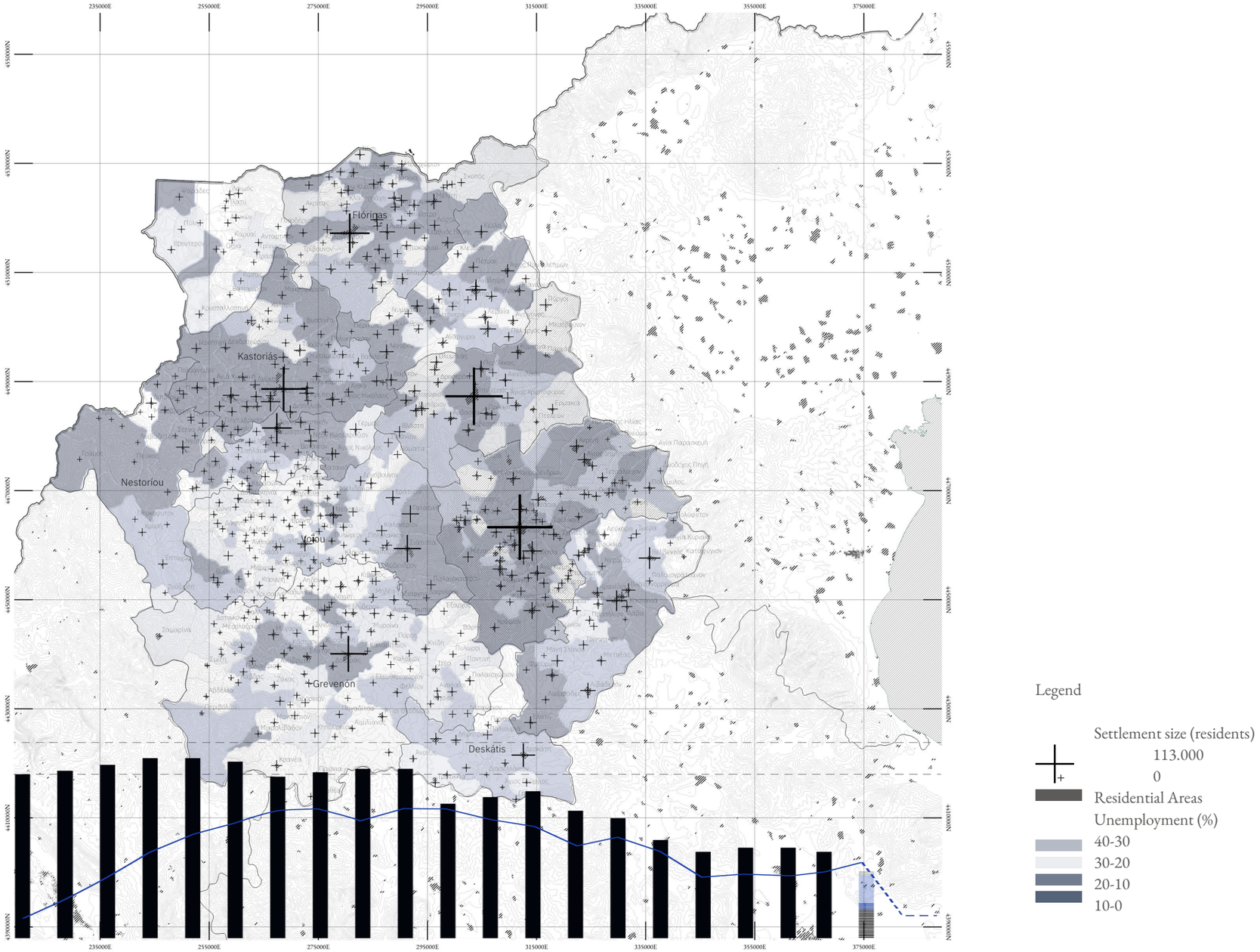


Figure | Population per Settlement and unemployment in Western Macedonia
Source | Geofabrik Download Server (2022) , ELSTAT, EEA (2018)

The context | environmental urgencies

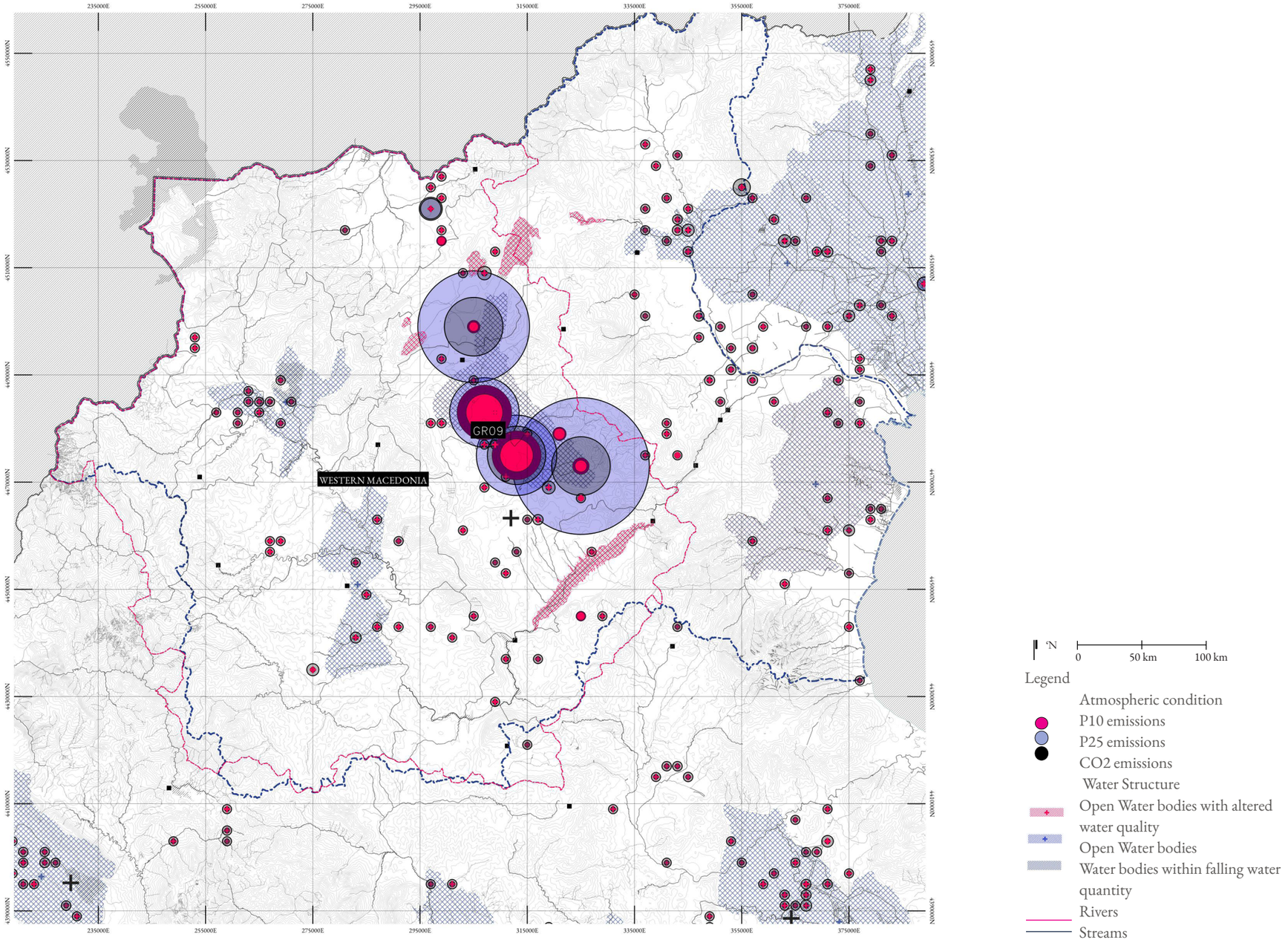


Figure | Environmental Conditions in Western Macedonia
Source | Geofabrik Download Server (2022) , ELSTAT, EEA (2018)

The context | spatial urgencies

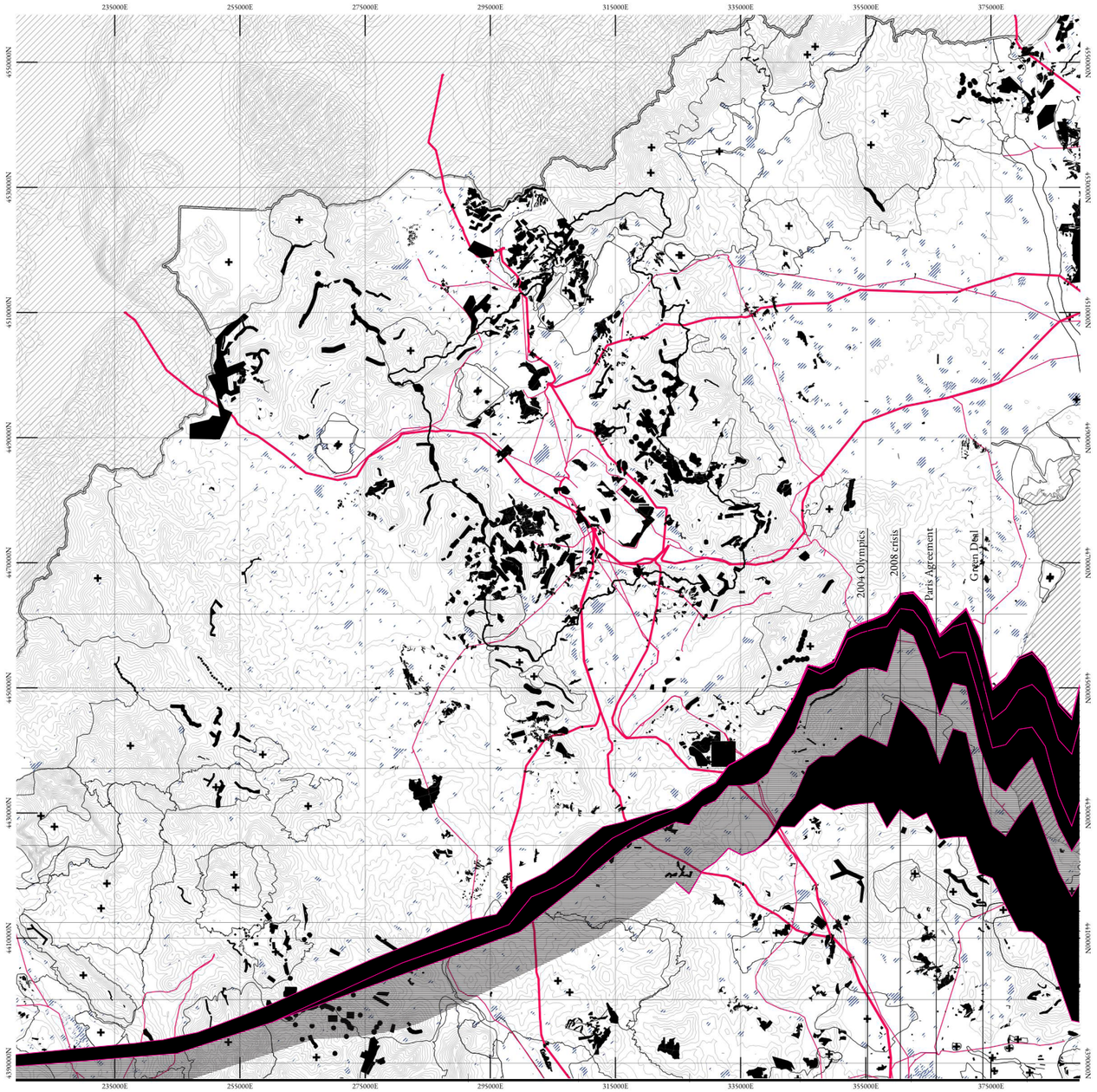


Figure | Renewable energy infrastructure expansion in Western Macedonia
Source | Geofabrik Download Server (2022) , ELSTAT, EEA (2018)

The context | the question of heritage

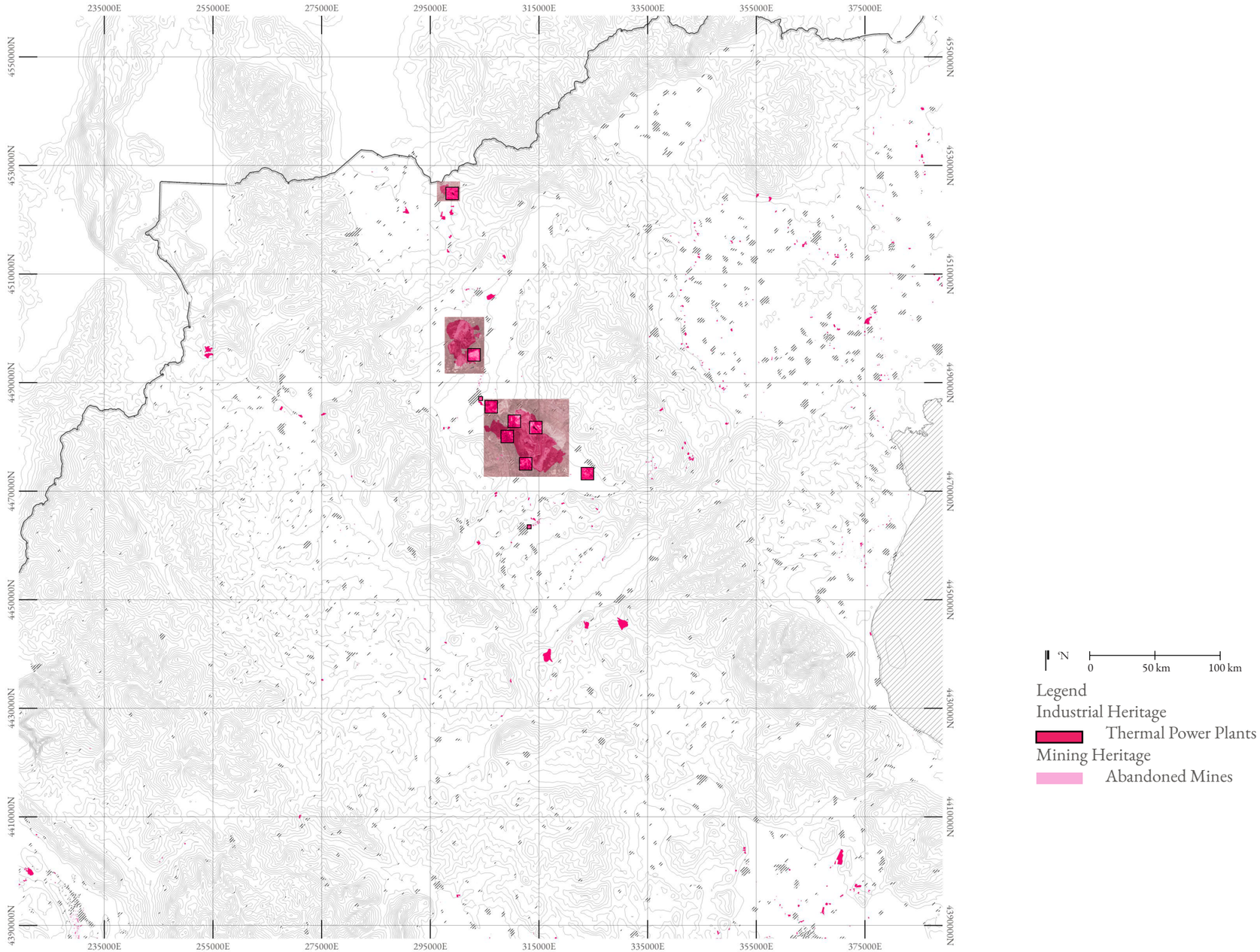


Figure : Mining and IndustrialHeritage
Source: Geofabrik Download Server (2022) , ELSTAT, EEA (2018)

The context | political urgencies

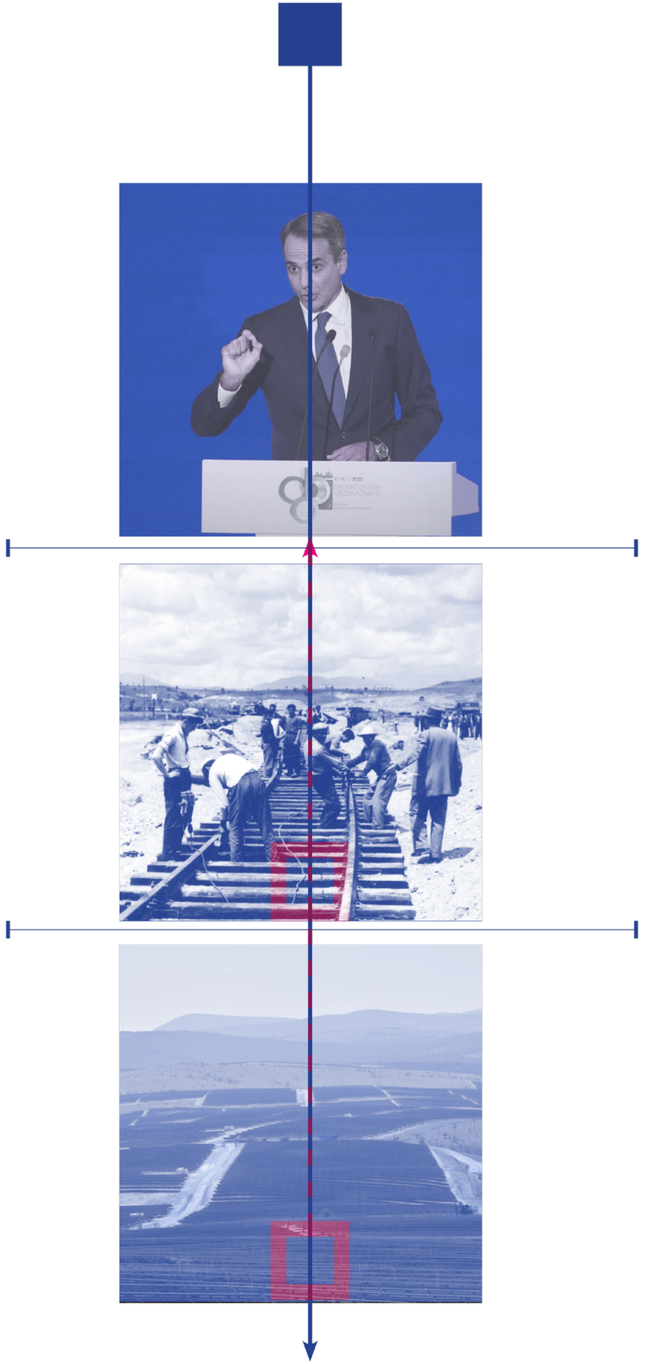


Figure: Understanding Justice
Source : author

THE PROBLEM

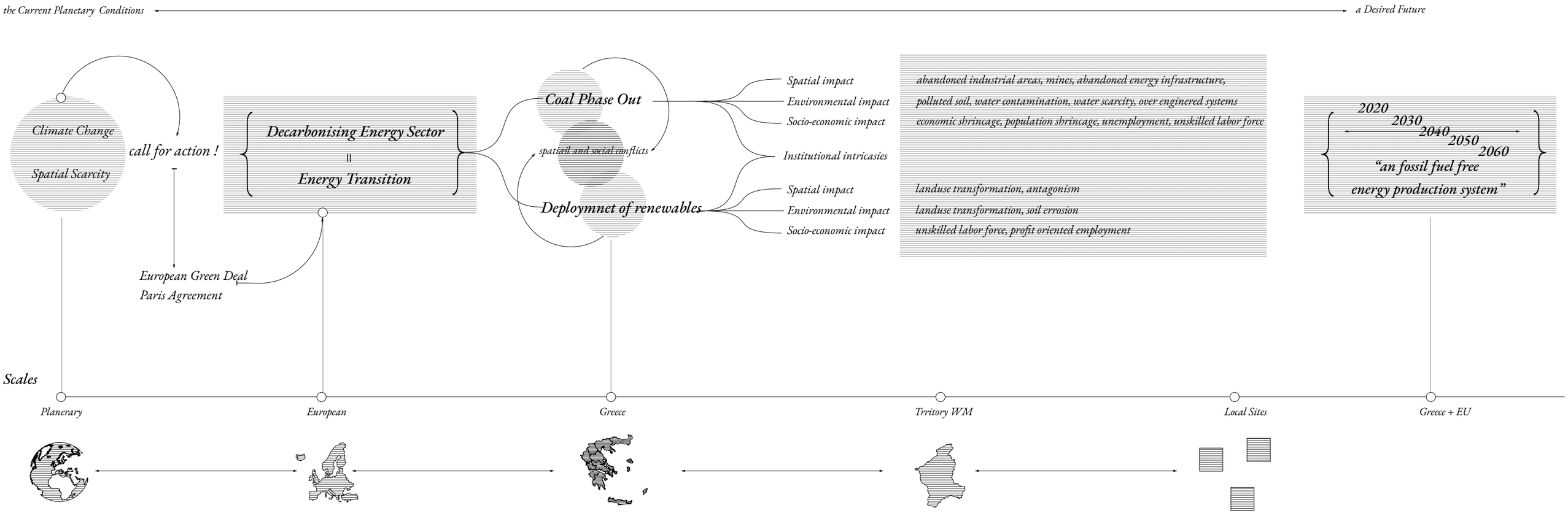


Figure: Problem Field Mind Map
Source : author

Problem Statement | Abstraction

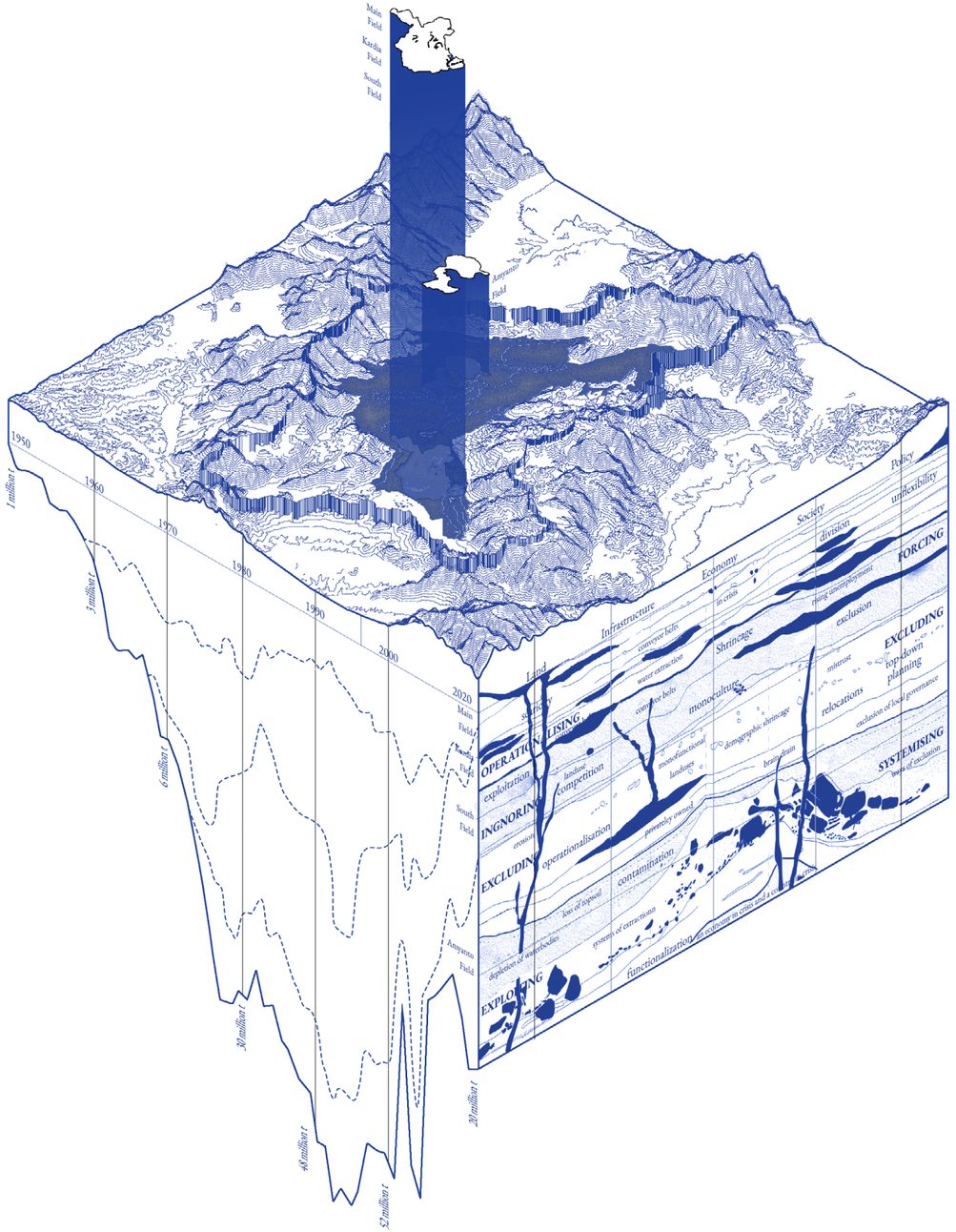


Figure | Problem Statement Abstraction
Source | author

Research Question

Main RQ

How can the re-configuration of the ***energy landscape*** of Western Macedonia establish a more ***environmentally*** and ***socially*** sustainable region while ensuring ***spatial , distributive and procedural*** Justice in an era of uncertainty?

Research Question + Sub Questions

Main RQ

How can the re-configuration of the ***energy landscape*** of Western Macedonia establish a more ***environmentally*** and ***socially*** sustainable region while ensuring ***spatial , distributive and procedural*** Justice in an era of uncertainty?

RQ1 |

How did the increasing demand for energy supply shape the ***energy landscape*** of Western Macedonia?
Methods: Literature review, Documentary review, Analytical Mapping, System Analysis

RQ2 |

How was the land operationalized to sustain the energy system? What were the ***negative impacts on the social and natural systems***?
Methods: Literature review, Documentary review, Analytical Mapping, Field trip, Micro Stories

RQ3 |

What is the structure of the current ***governance mechanism*** of the energy transition and what are the ***social and institutional challenges*** that arise?
Methods: Documentary Review, Stakeholder Analysis, Micro Story (Semi-structured Interview)

RQ4 |

How can a transition from an extractive energy system to a sustainable energy system be successfully realized in a period of uncertainty?
Which ***alternative scenarios*** could we be envisioning and designing for this territory?

Methods: Scenario Construction, Design Exploration

Methodological Framework

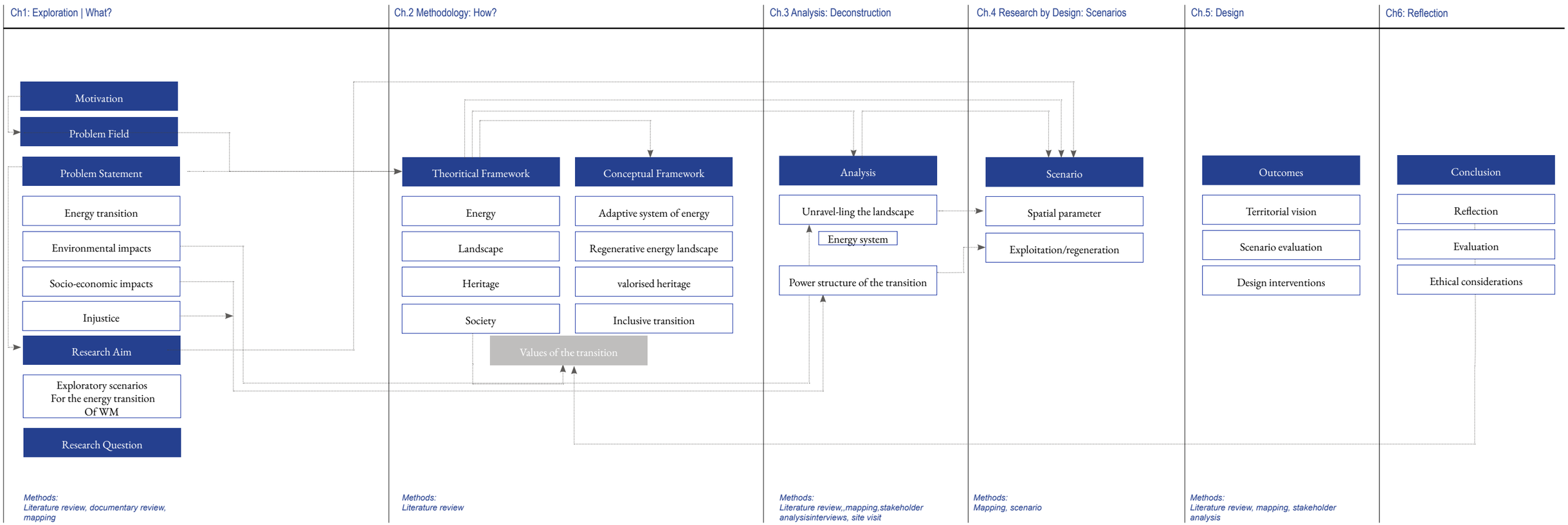


Figure | Methodological Framework
Source | author

Conceptual Framework

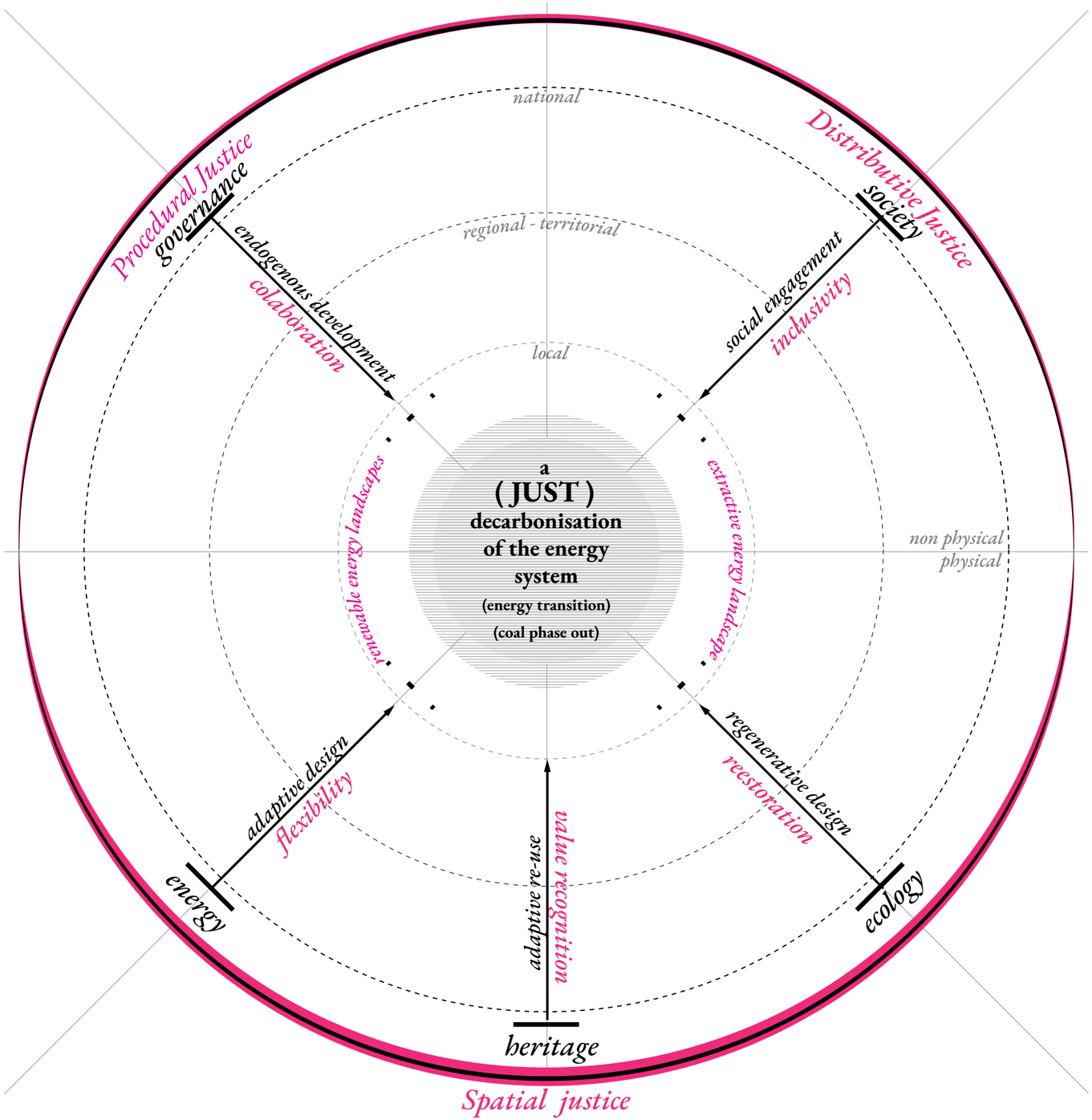


Figure | Conceptual Framework
Source | author

Unravelling

Unravelling

spatial analysis

stakeholder analysis

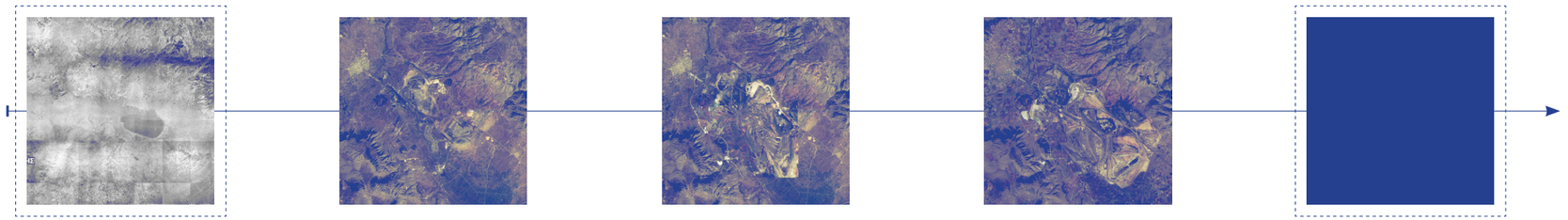
governance mechanism analysis

Overview



Figure | Western Maccedonia energy landscape
Source | author

Overview | Components | Actions



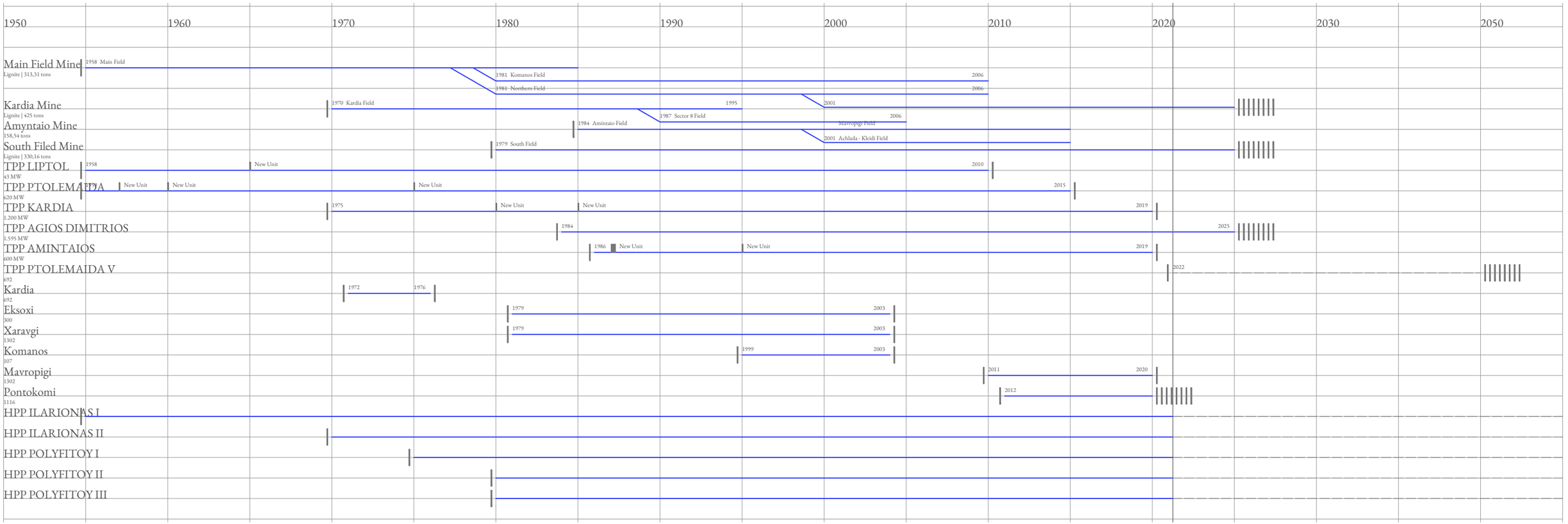


Figure | Timenline of actions
Source | author

Overview | Components | System

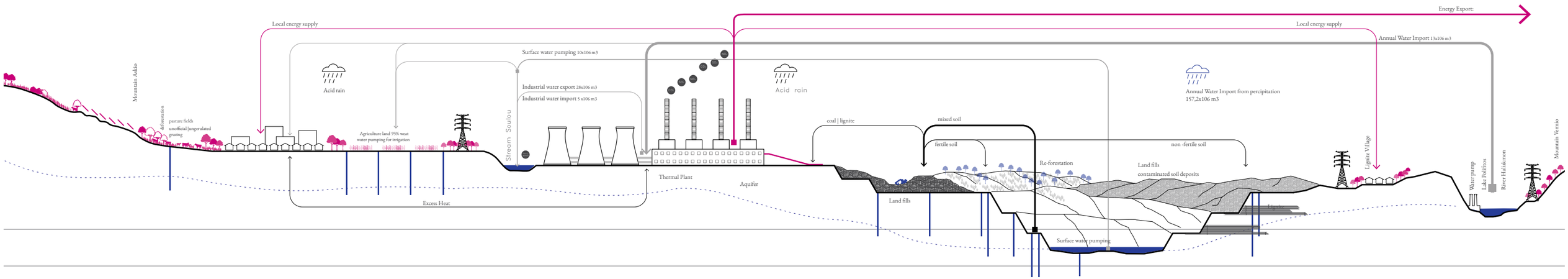


Figure | Systemic Section
Source | author

Analysis_ Grid and simplification

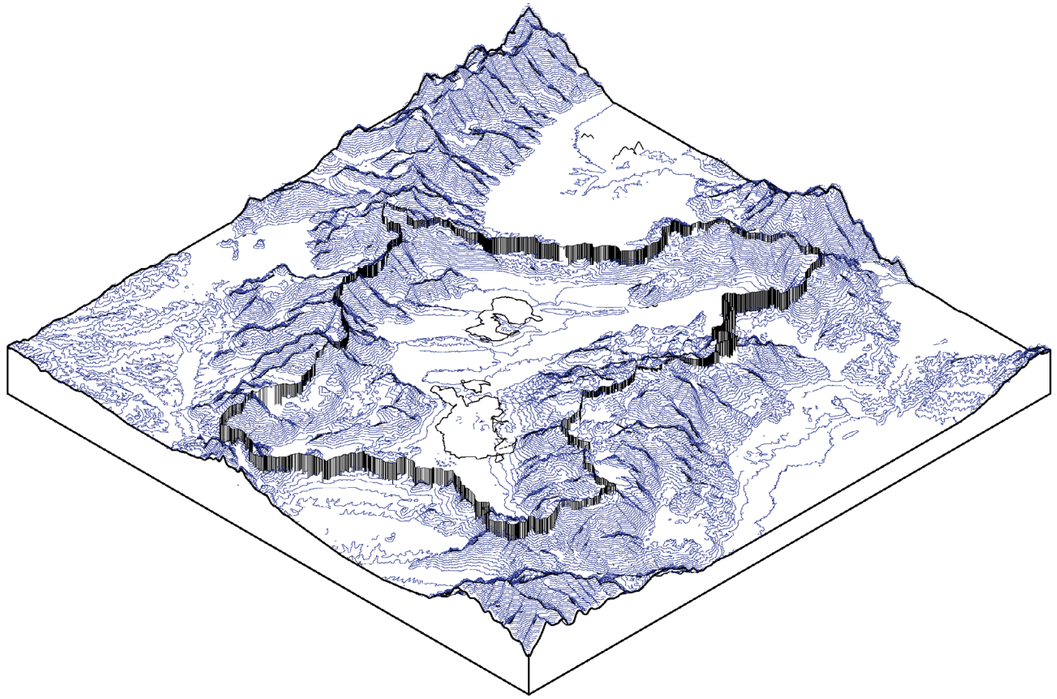


Figure | Mapping
Source | author

Analysis_ Grid and simplification

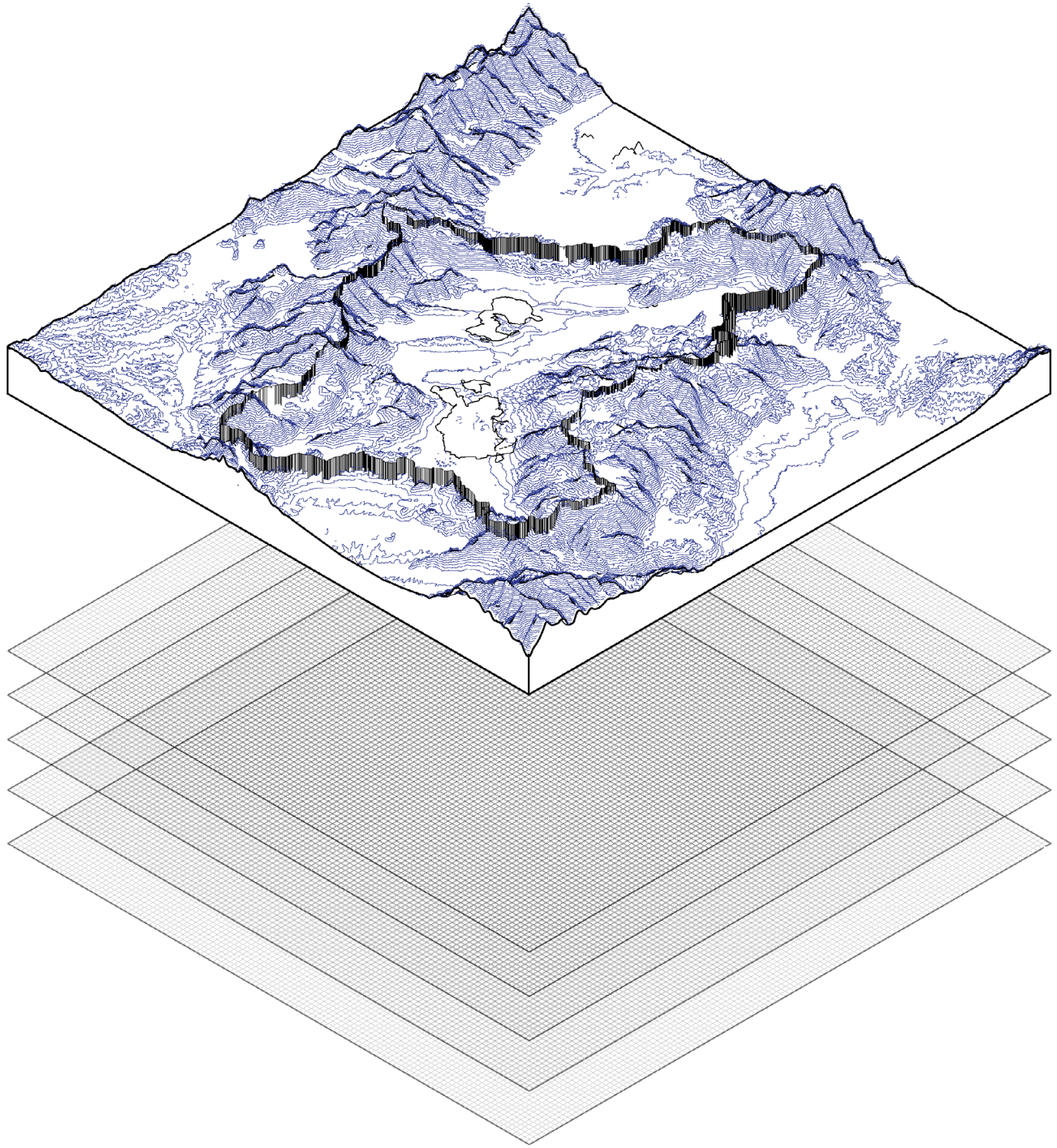


Figure | Mapping
Source | author

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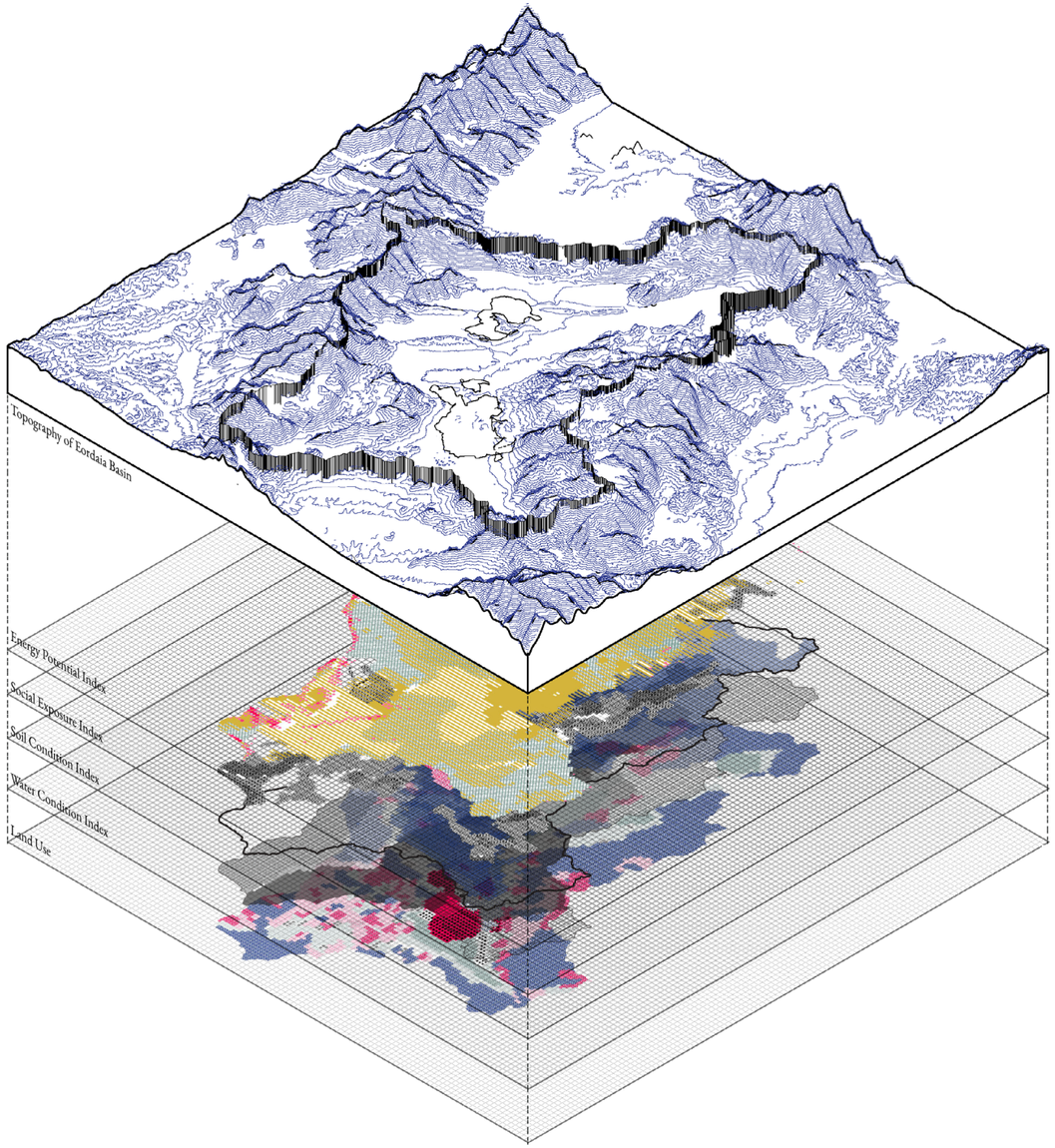


Figure | Mapping
Source | author

UNRAVELLING

Analysis | Spatial | Landuses

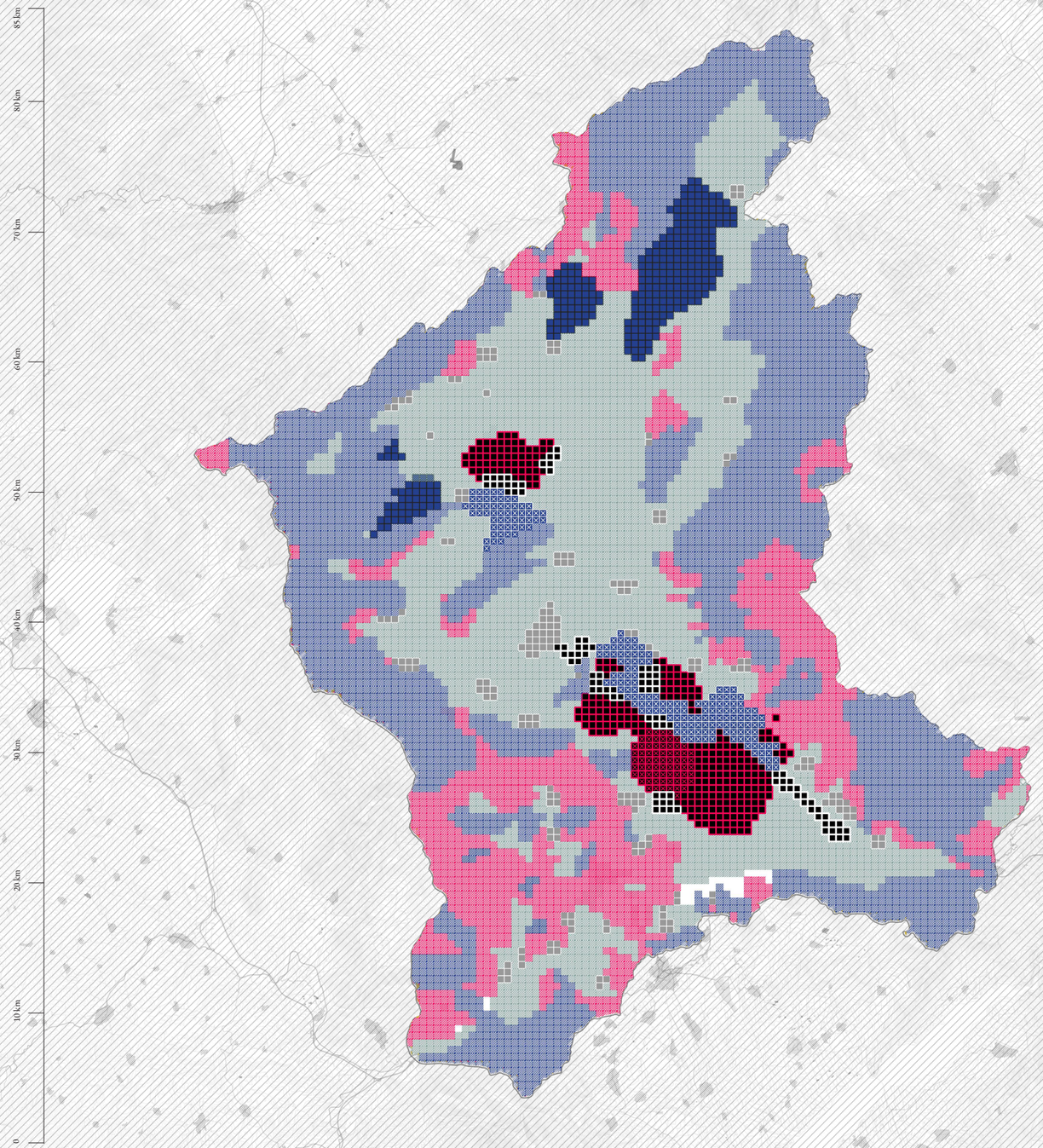




Figure | Landuse
Source | EEA (2018)

UNRAVELLING

Analysis | Spatial | Protection

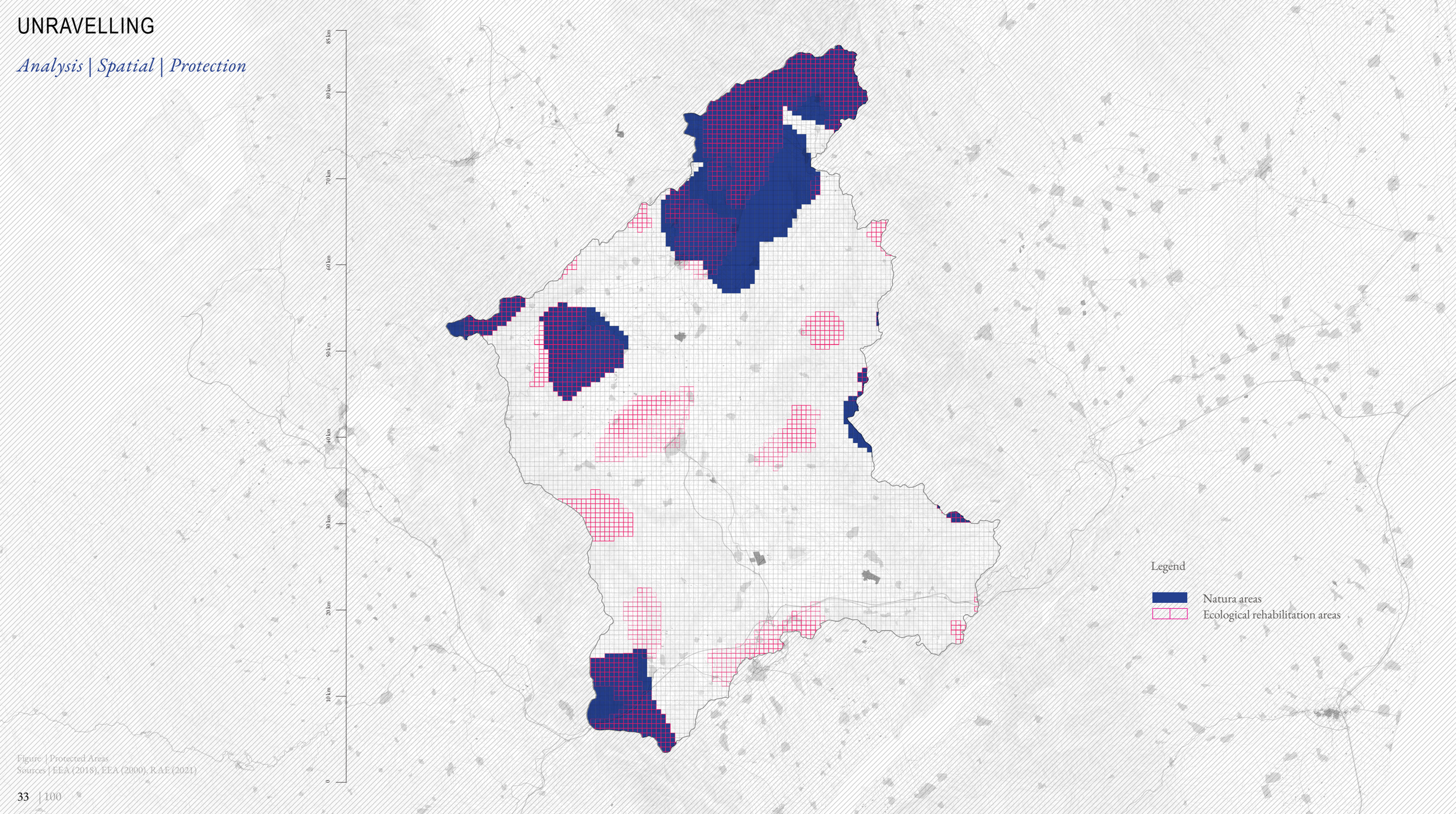


Figure | Protected Areas
Sources | EEA (2018), EEA (2000), RAE (2021)

Analysis | Environmental | Soil Conditions

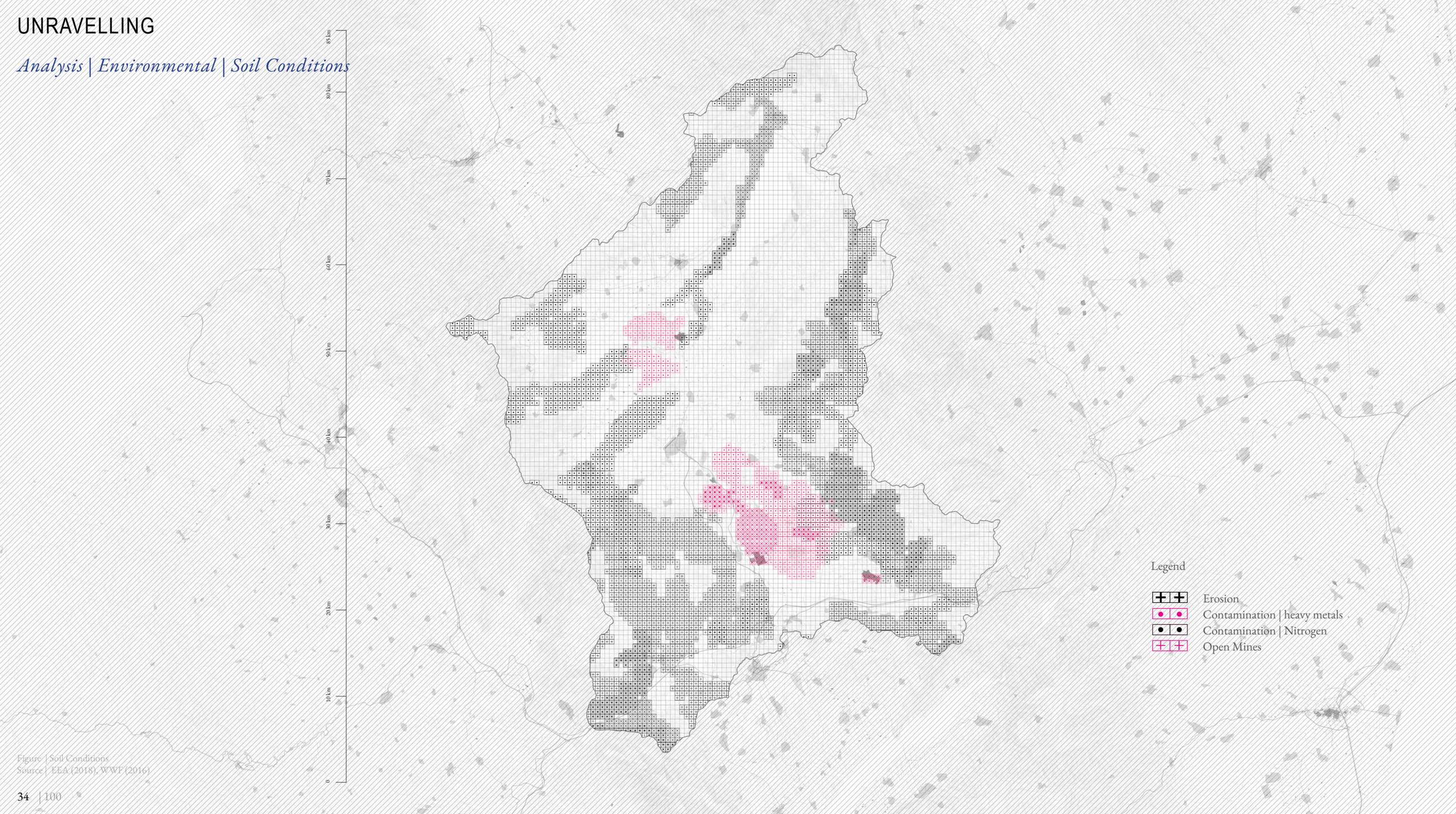
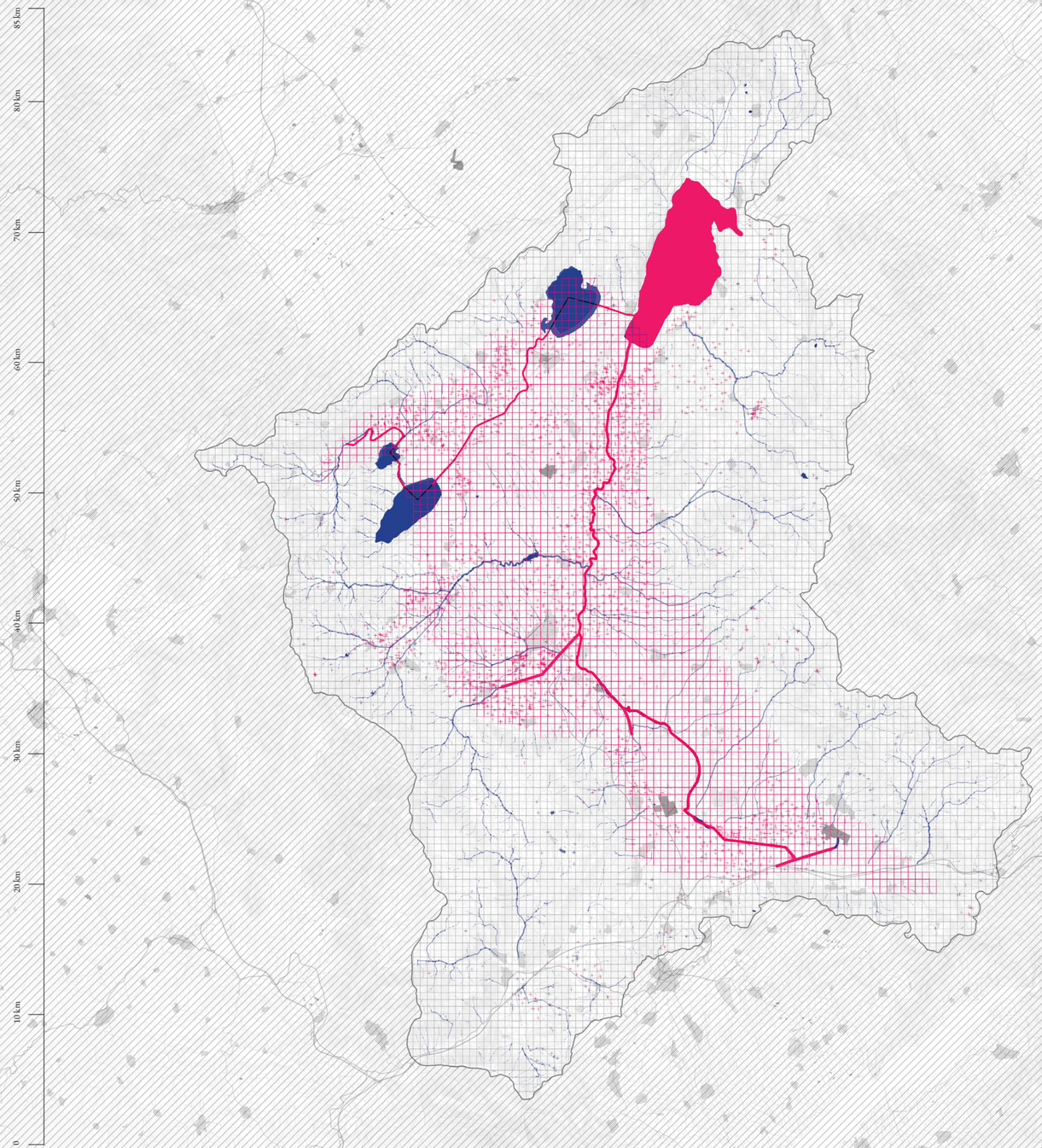


Figure | Soil Conditions
Source | EEA (2018), WWF (2016)

UNRAVELLING

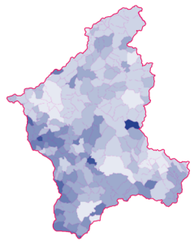
Analysis | Environmental | Water



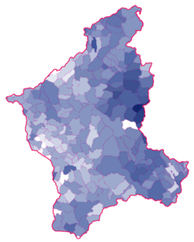
Legend

- Open water body | Poor chemical quality
- Open water body | Poor quantity
- Aquifer |poor chemical and lowering quantity
- Open Water body | good quantity
- Open Water body | good quantity
- Water Extraction points

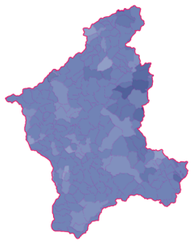
Figure |
Source |



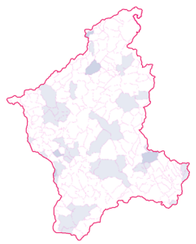
Age | over 65



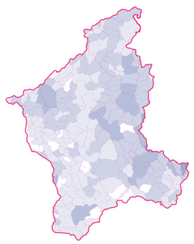
Job| no mobility



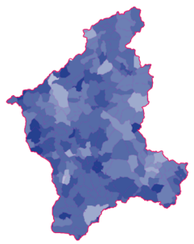
Job | Temporary Worker



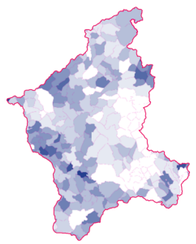
Education | Univercity



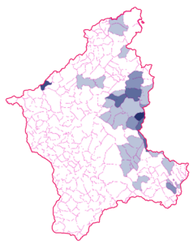
Education | high school



Education | technical school



Employment in primary sector



Employment in energy production



Employment in transportation



Figure | Socioeconomic condirions
Source | ELSTAT

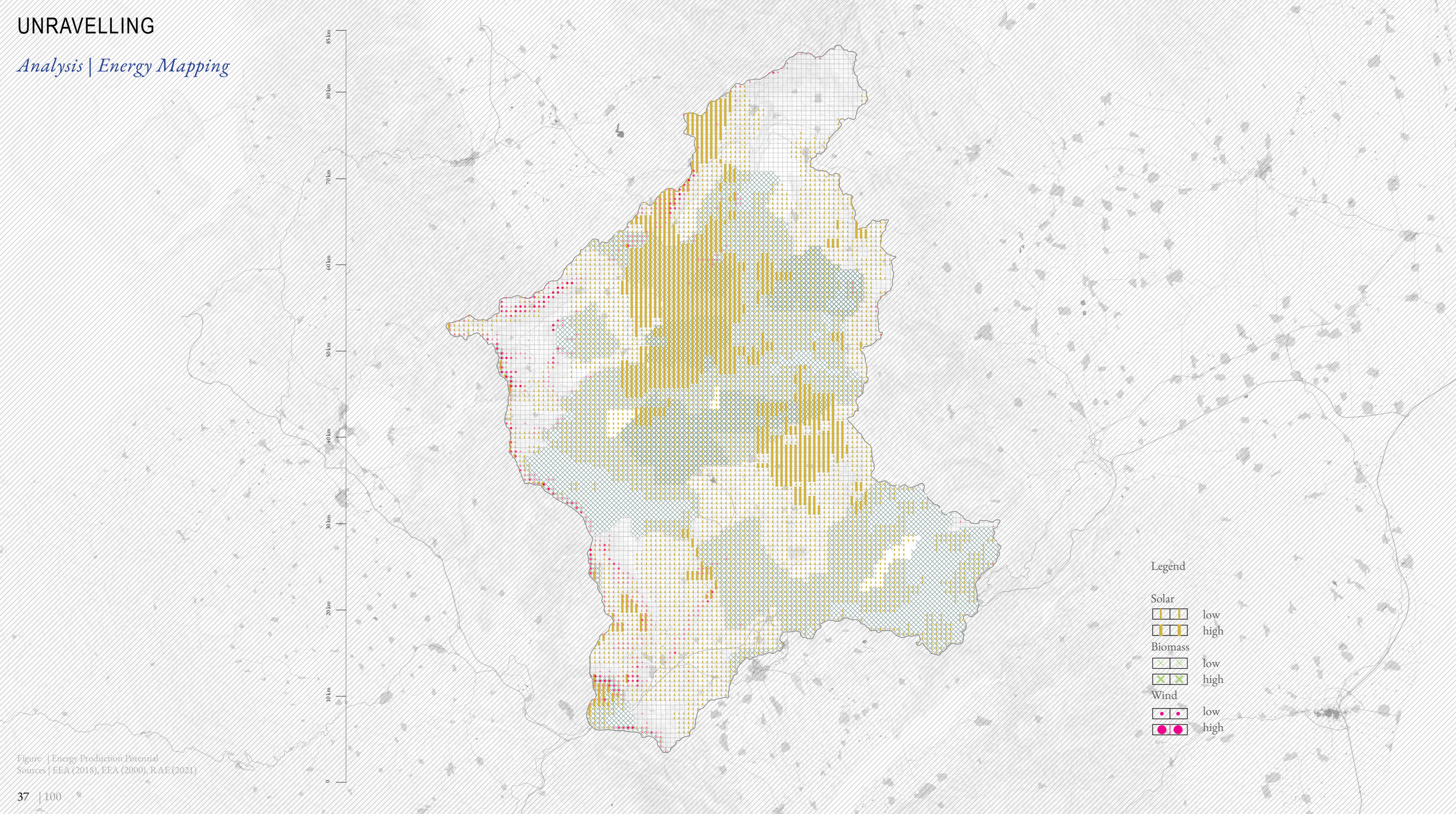


Figure | Energy Production Potential
Sources | EEA (2018), EEA (2000), RAE (2021)

Stakeholder Analysis | categorization

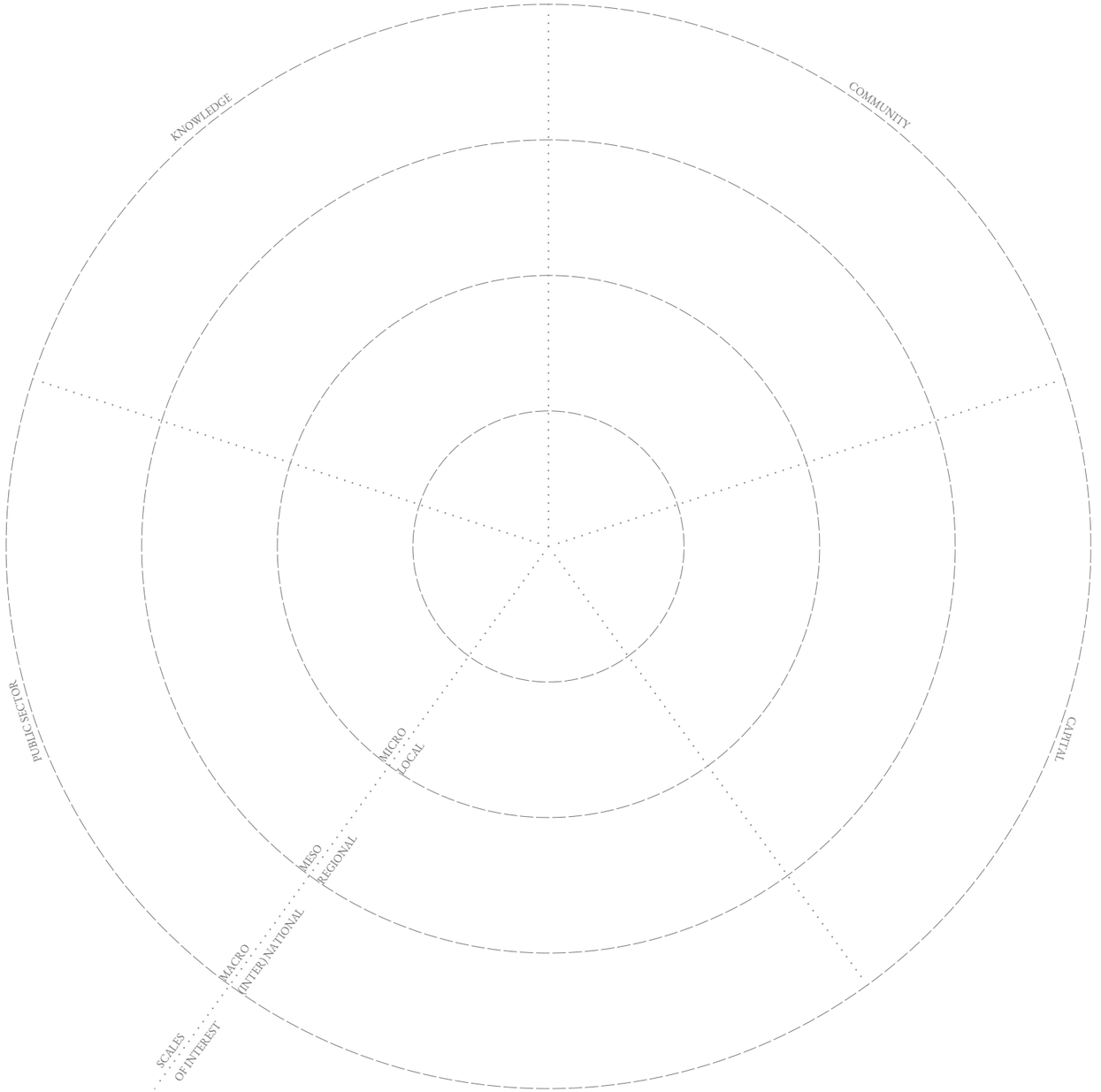


Figure | Stakeholder classification
Source | author

Stakeholder Analysis | categorization

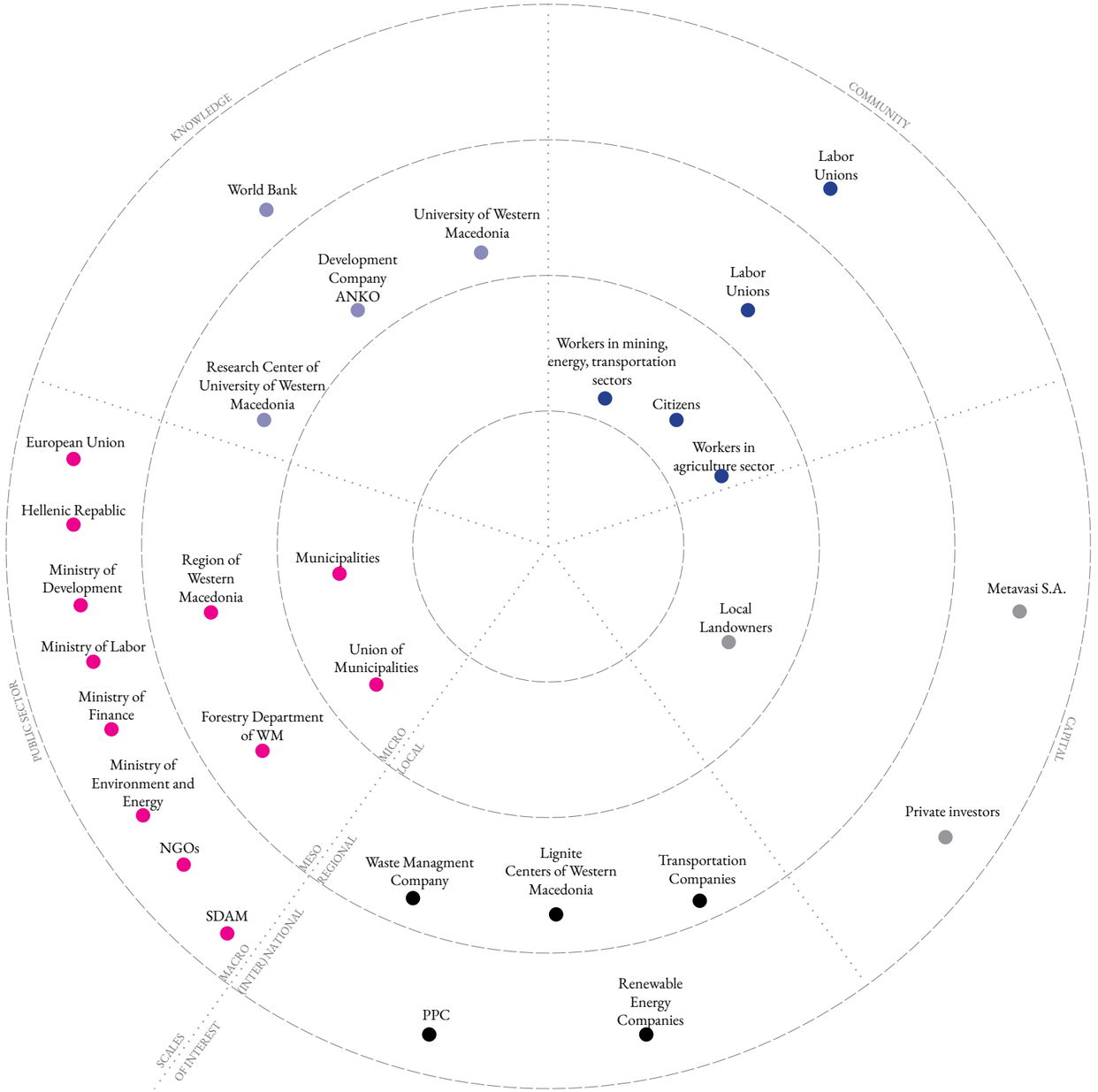


Figure | Stakeholder classification
Source | author

Stakeholder Analysis | power interest diagram

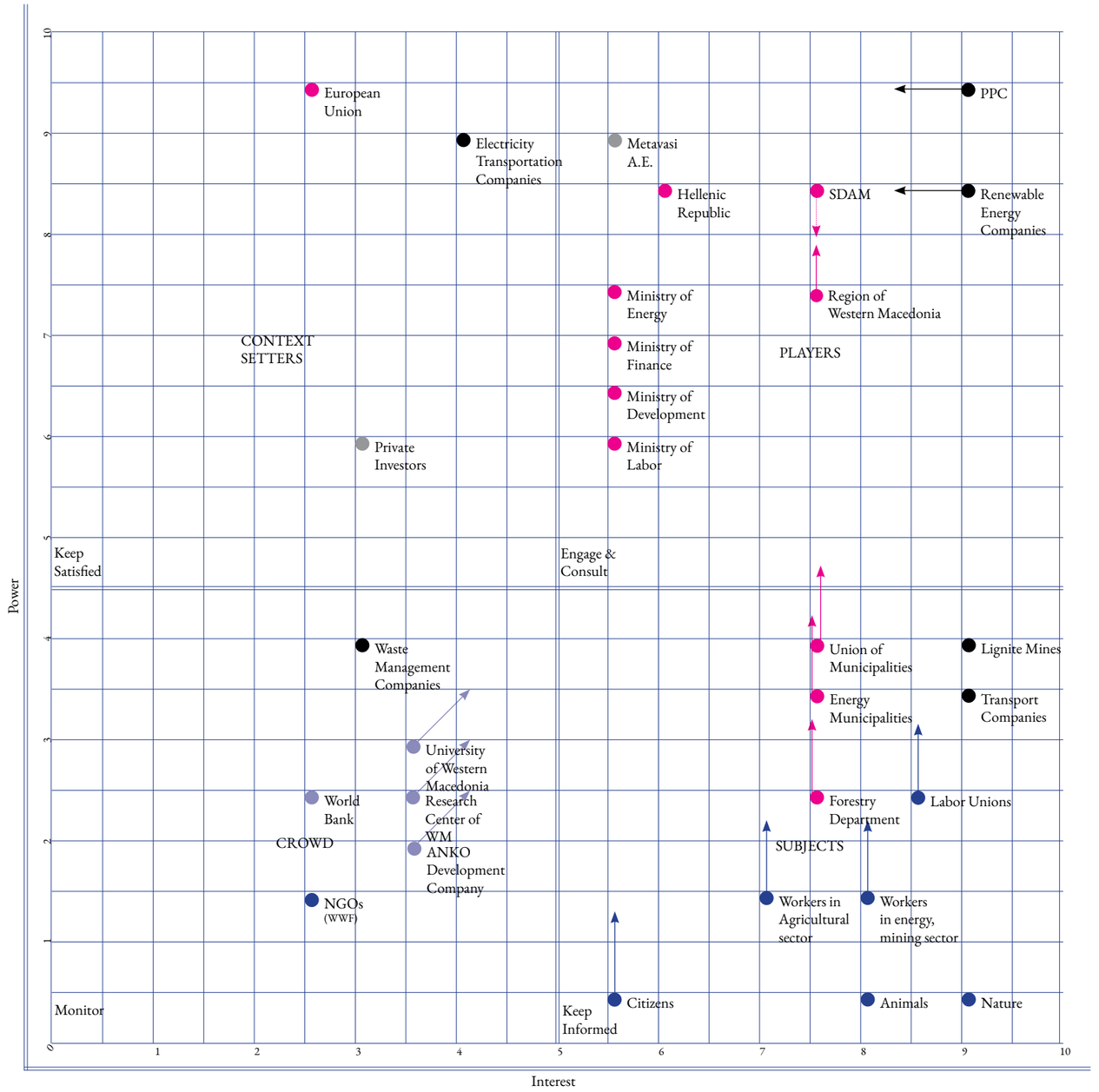


Figure | Stakeholder Power Interest Diagram
Source | author

Transition Governance Structure "SDAM"

Inner Structure

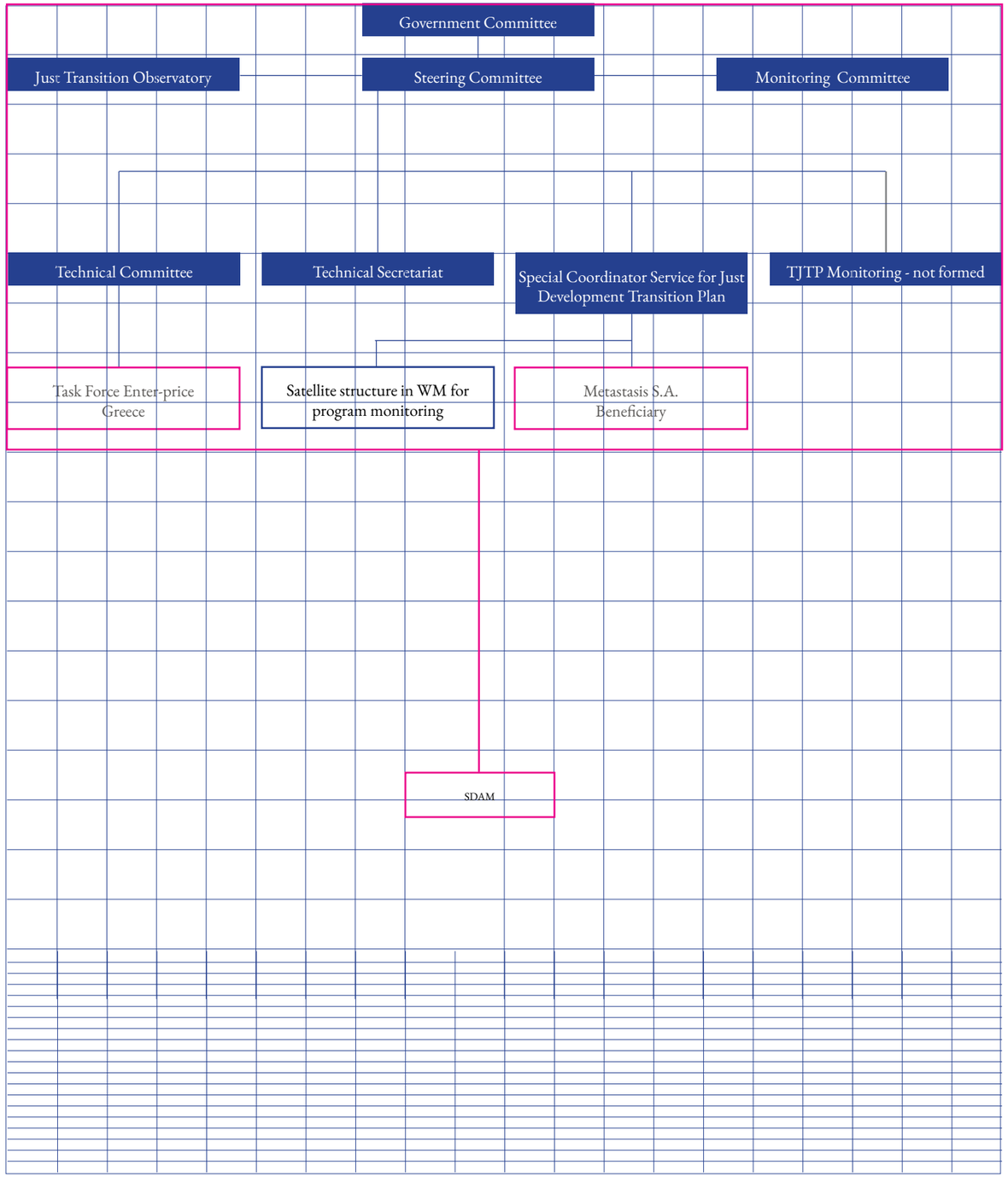


Figure | Structure of Transition Governance
Source | Topaloglou (2021), SDAM (2020)

Transition Governance Structure

Inner Structure

Position in policy making



Legend

- National scale
- Regional scale
- Beneficiary

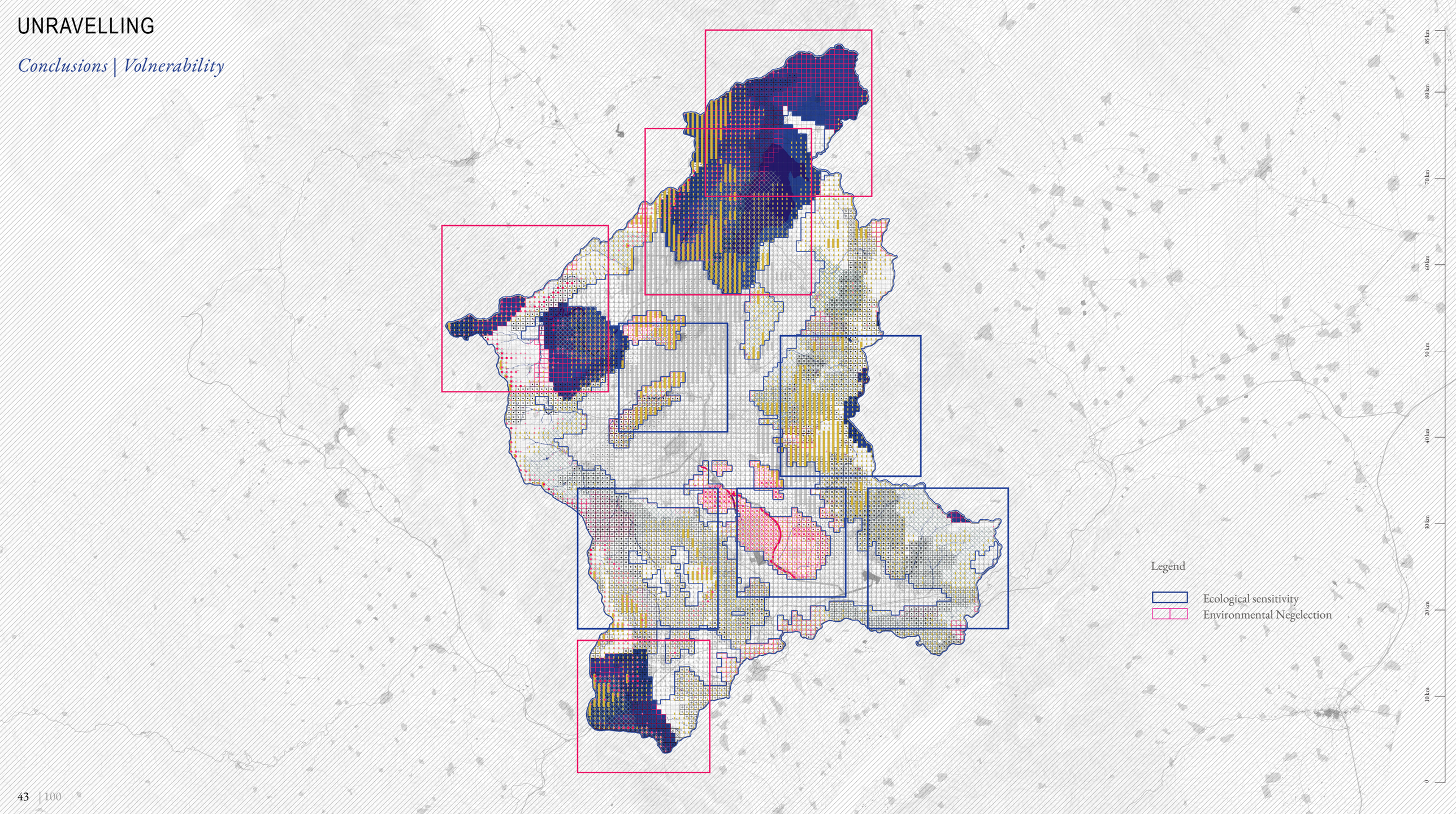
Legend

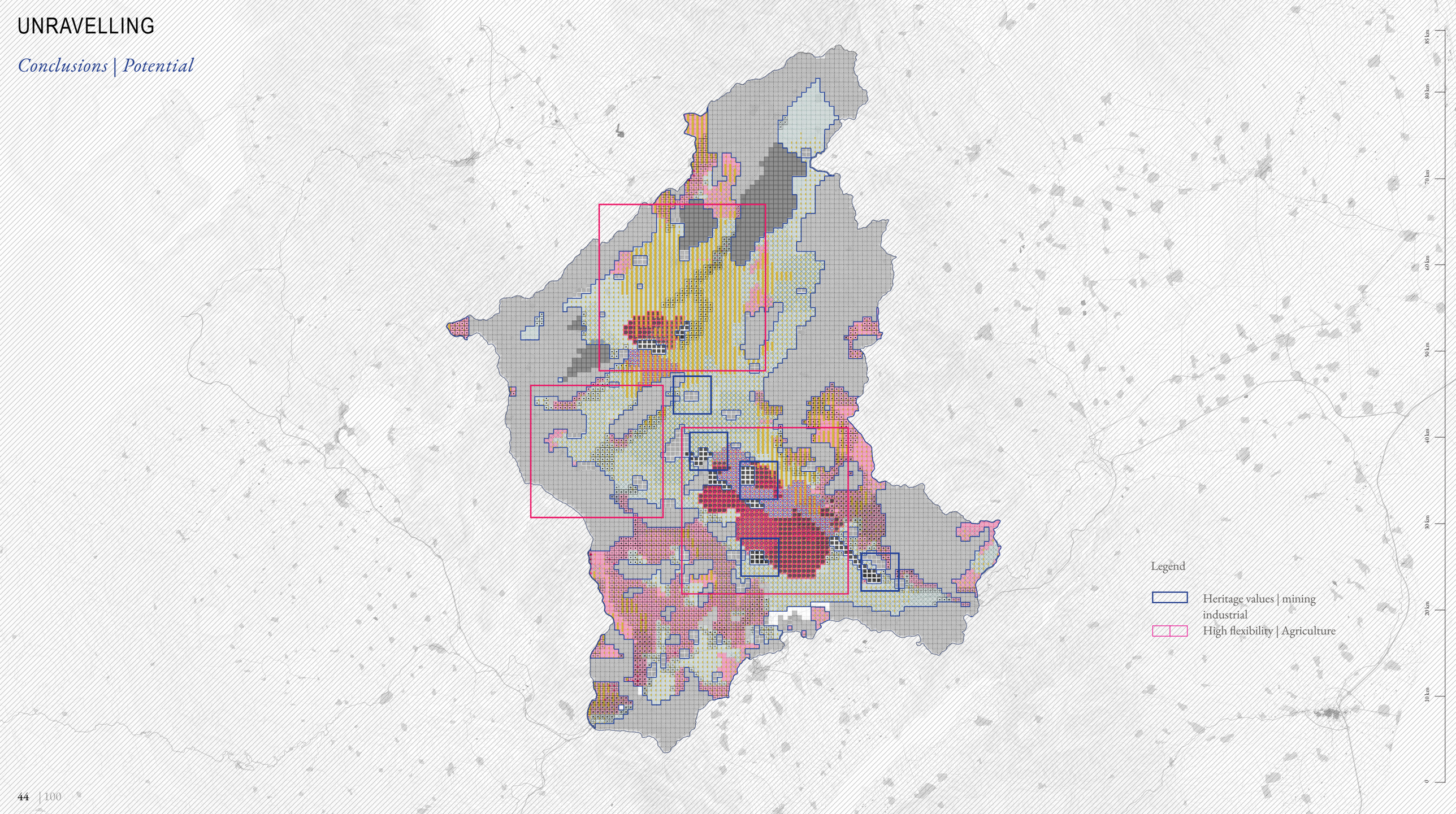
- Policy produced by SDAM
- Policy antagonized by SDAM
- Policy by national institution
- Implementation Law | ministry of development -labor-finance
- Implementation Law | ministry of environment and energy

Figure | Structure of Transition Governance and relations
Source | Topaloglou (2021), SDAM (2020)

UNRAVELLING

Conclusions | Volnerability




Legend
Heritage values | mining industrial
High flexibility | Agriculture
85 km
80 km
70 km
60 km
50 km
40 km
30 km
20 km
10 km
0

Scenario Construction

Logic of construction

Logic of Intervention

Landscape Abstraction

Simplifica3tion

Land Use

Simplification

Proposed Strategies

Spatial

New Productive Landscape

Spatial

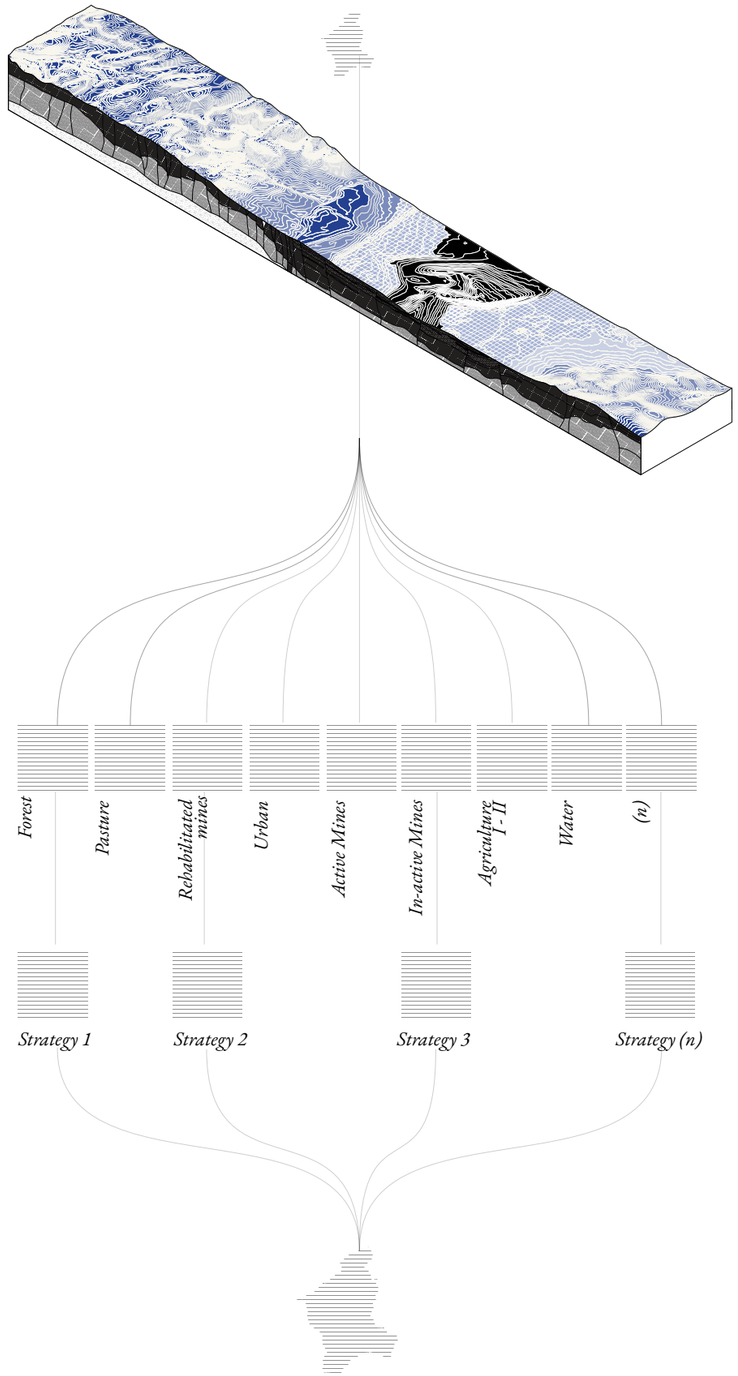


Figure | Scenario Construction diagrams
Source | author

The four scenarios

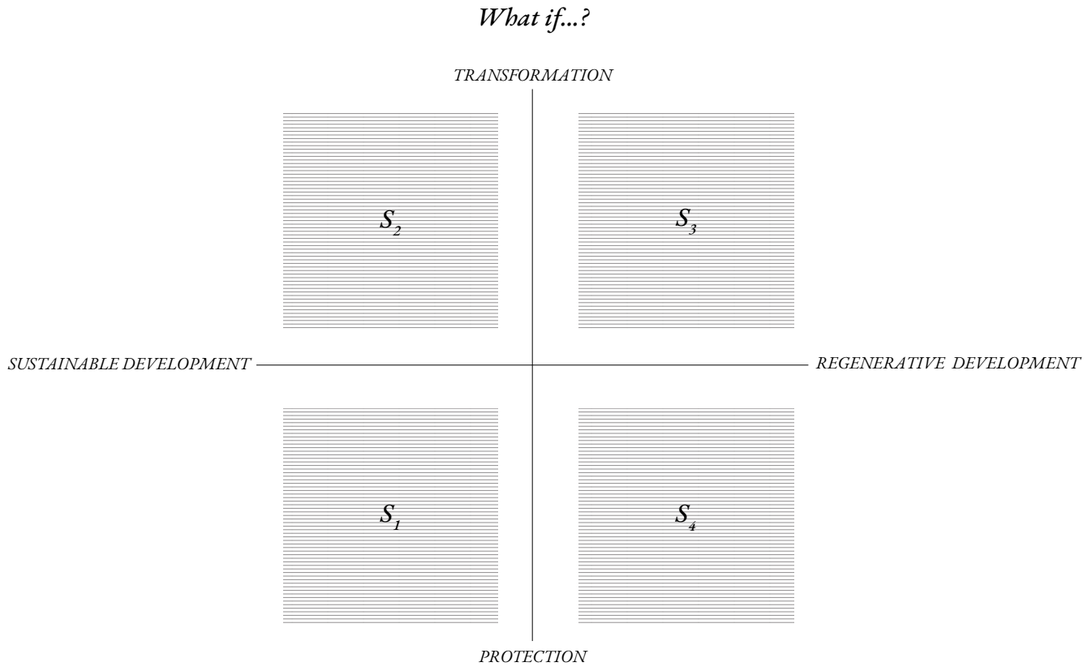
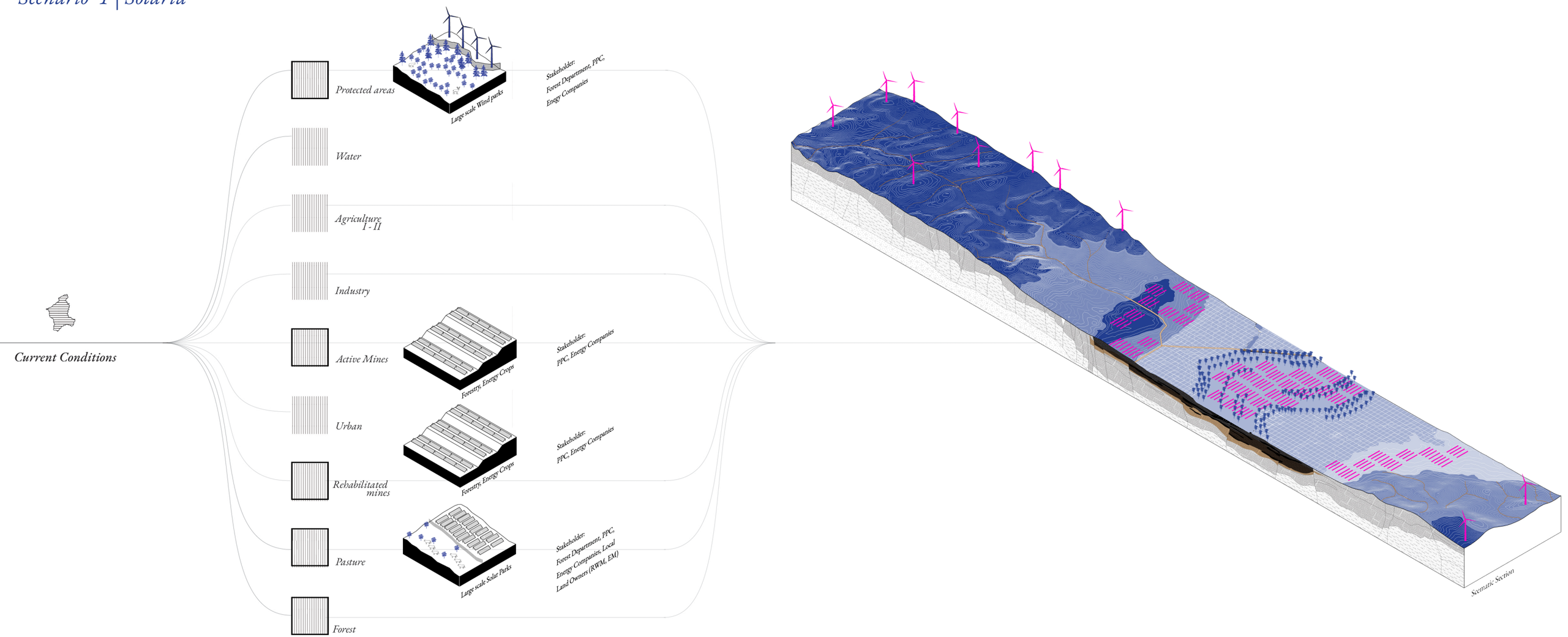


Figure | Scenario Matrix
Source | author

SCENARIO

Scenario 1 | Solaria



Landscape Abstraction
Simplification

Land Use
Simplification

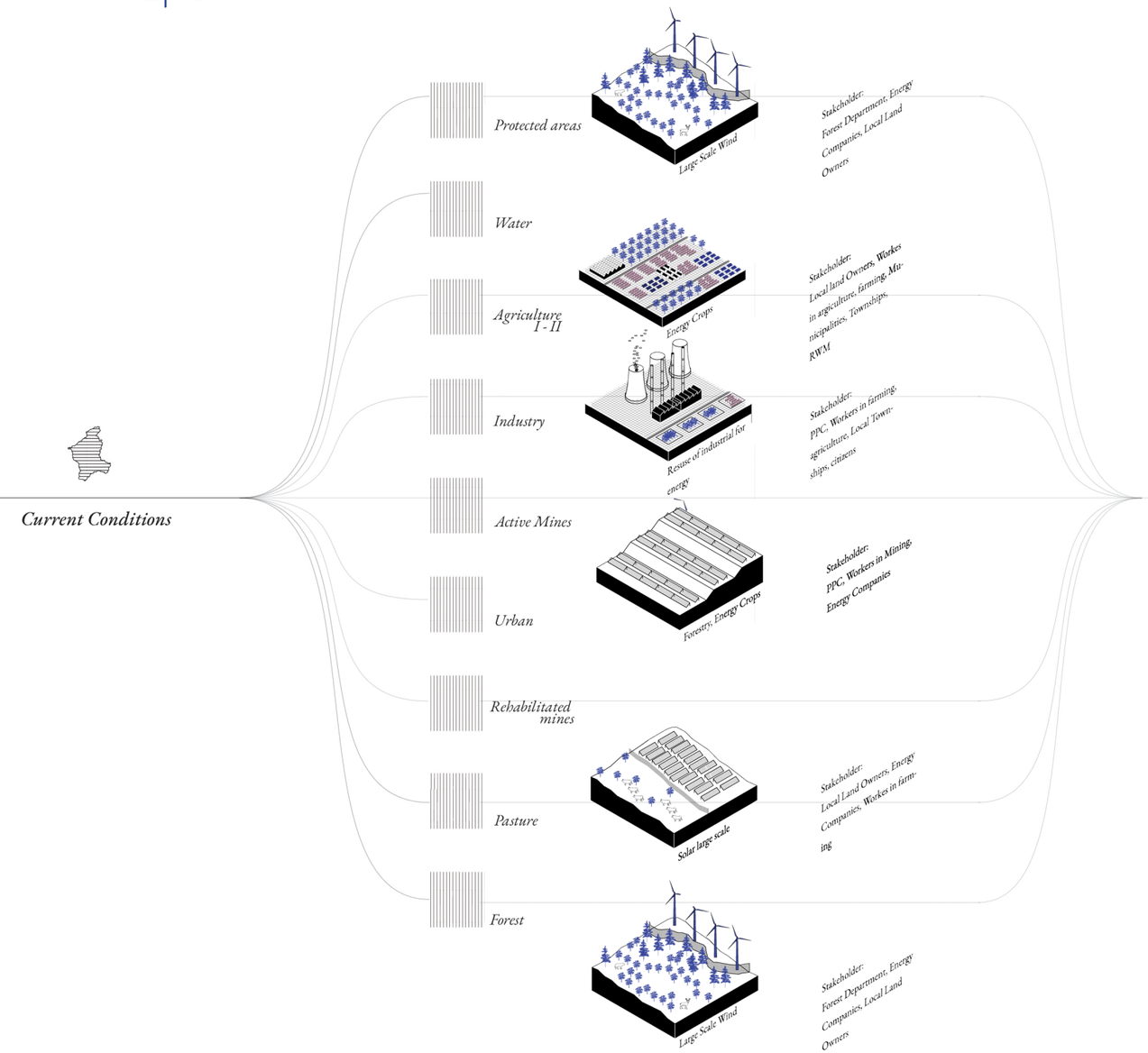
Proposed Strategies
Spatial

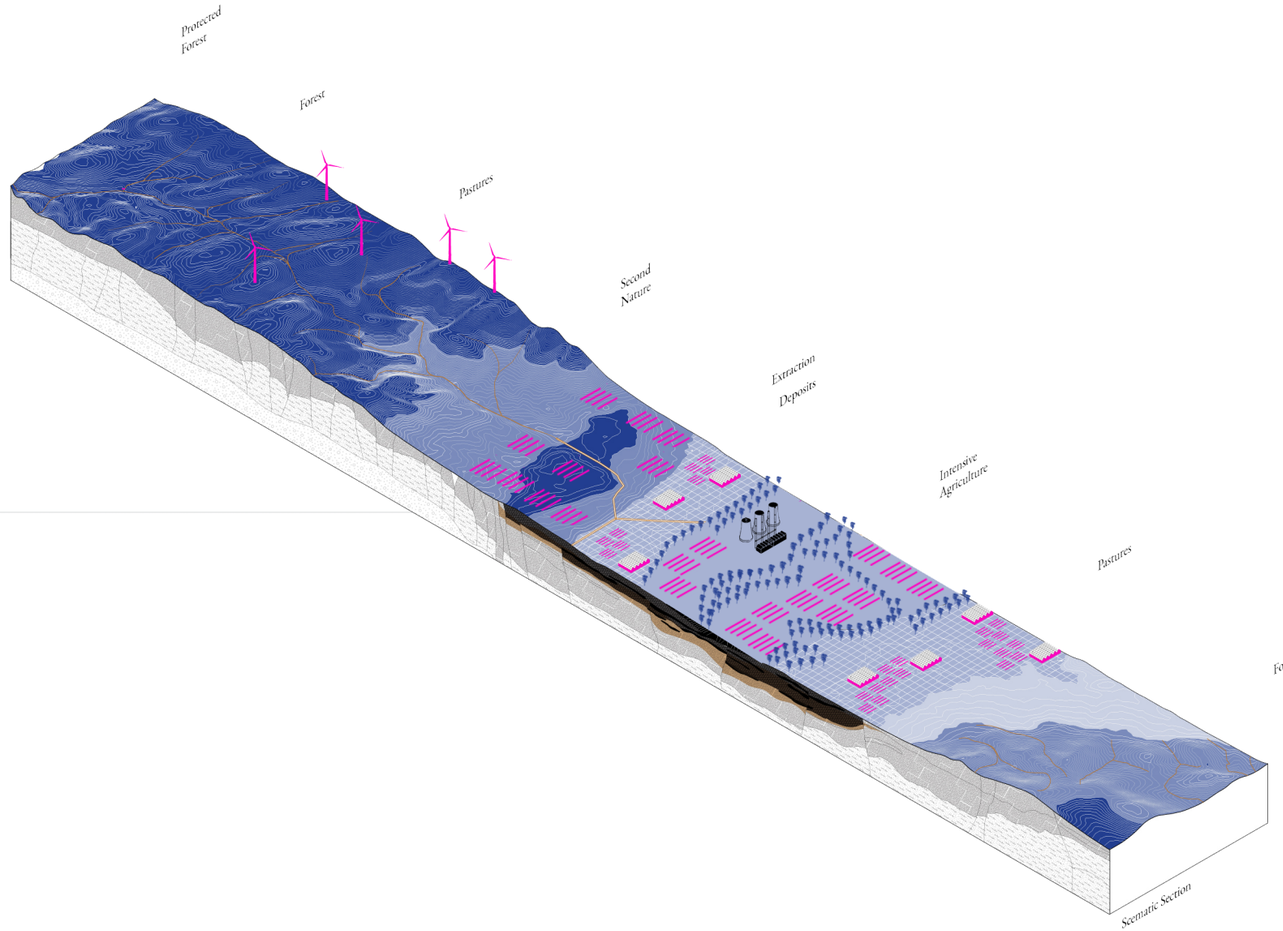
New Productive Landscape
Spatial

Source | Author

SCENARIO

Scenario 2| Modernisation





Landscape Abstraction
Simplification

Land Use
Simplification

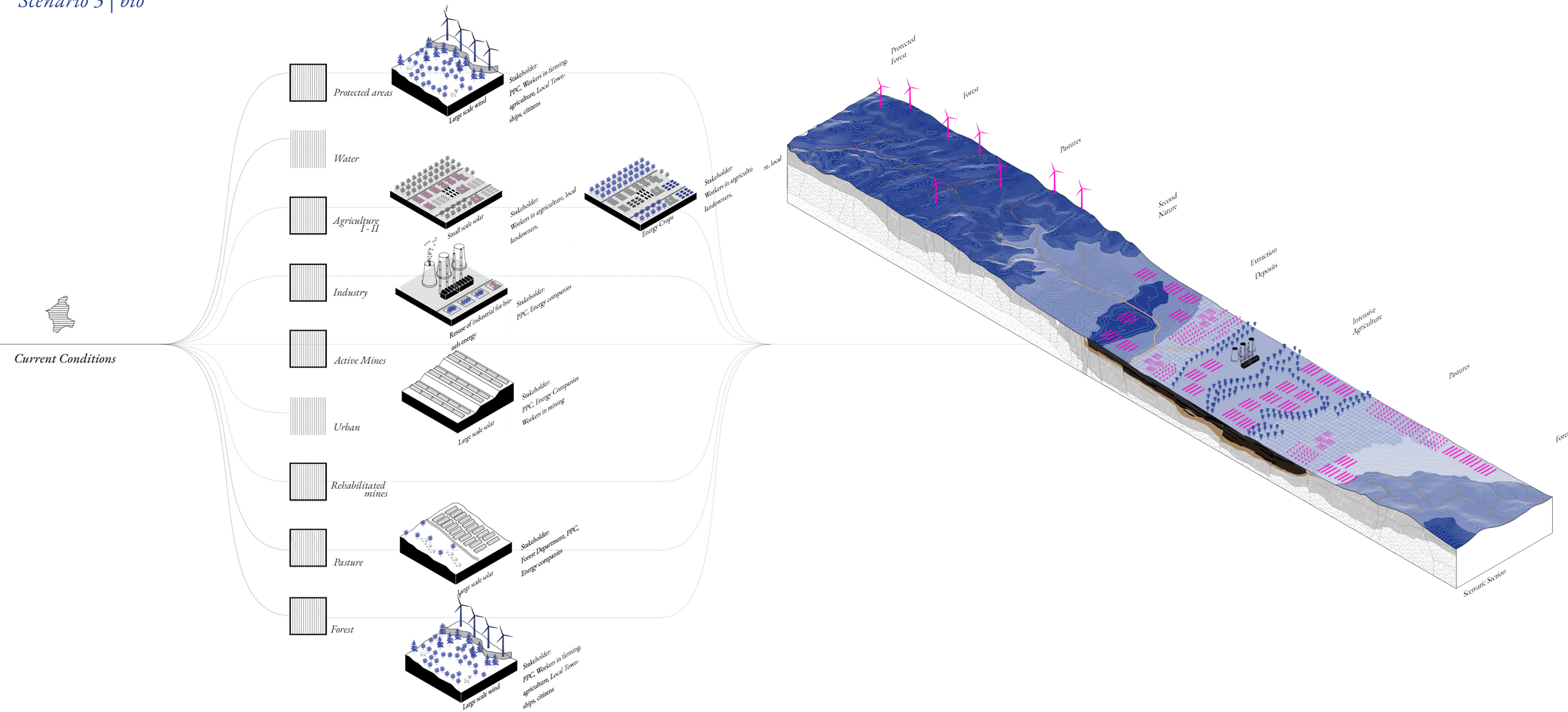
Proposed Strategies
Spatial

New Productive Landscape
Spatial

Source | Author

SCENARIO

Scenario 3 | bio



Source | Author

SCENARIO

Scenario 4 | De-growth

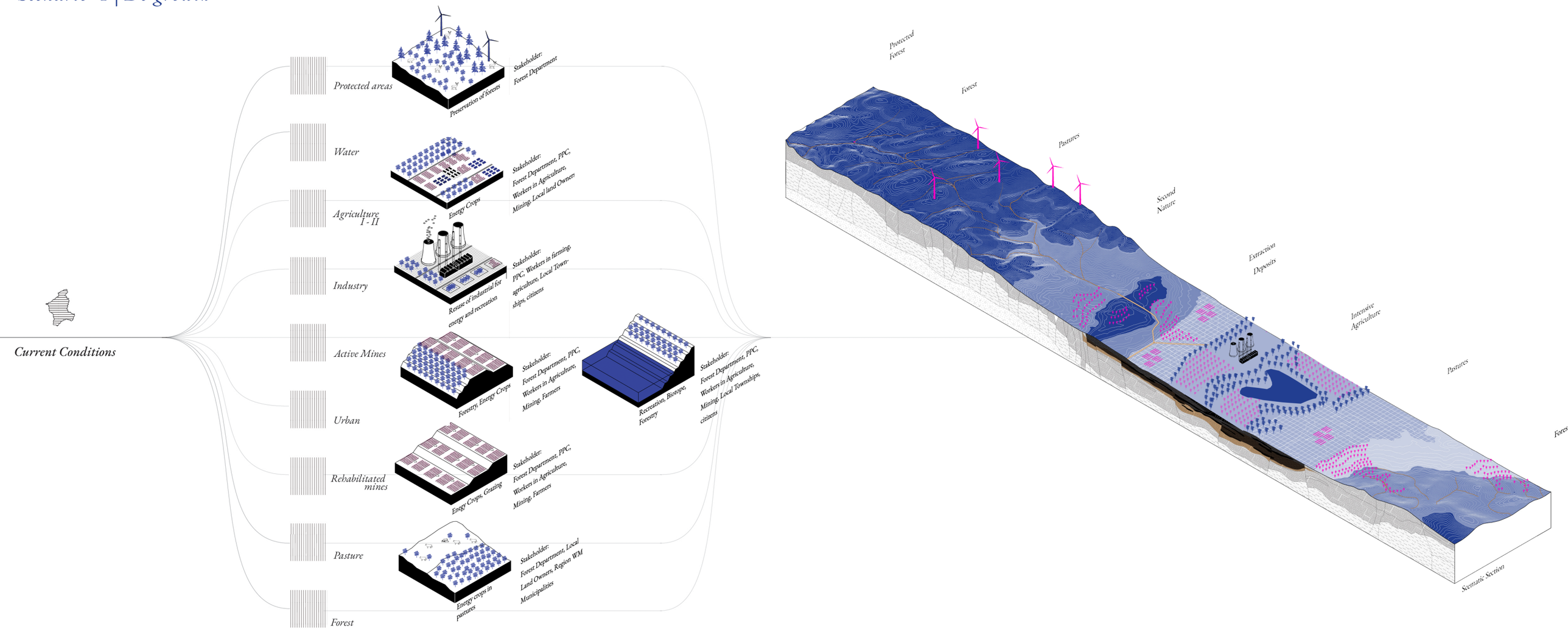


Figure | Applied Research
Source | author

Landscape Abstraction
Simplification

Land Use
Simplification

Proposed Strategies
Spatial

New Productive Landscape
Spatial

Evaluation | Energy Impact

Environmental Impact

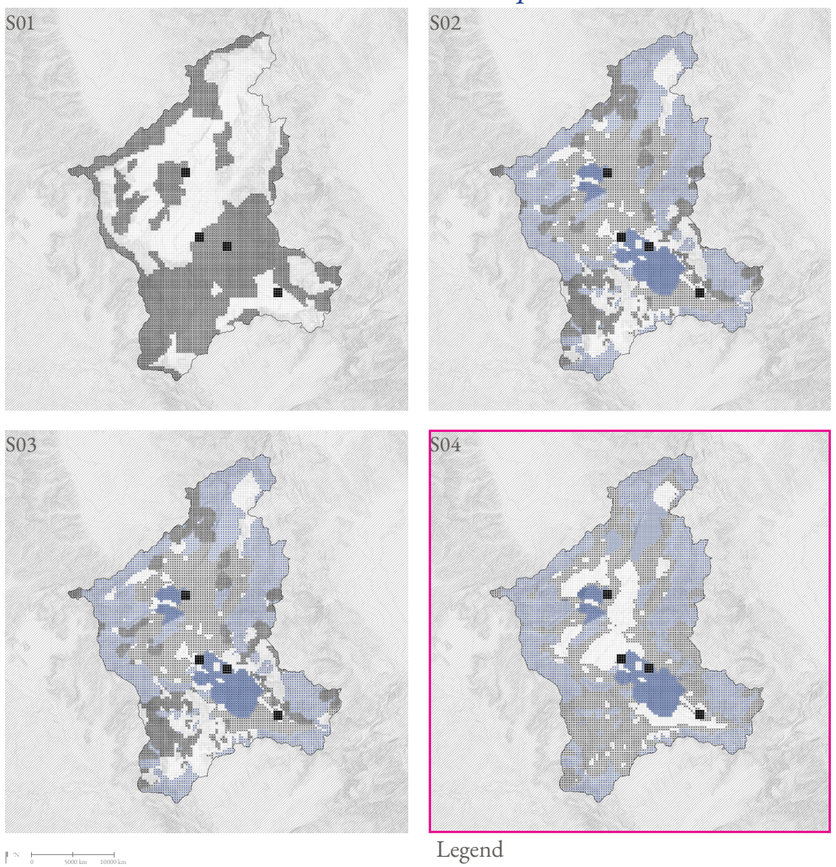


Figure | Evaluation | Environmental Impact Diagrams
Source: author

Socio-economic Impact

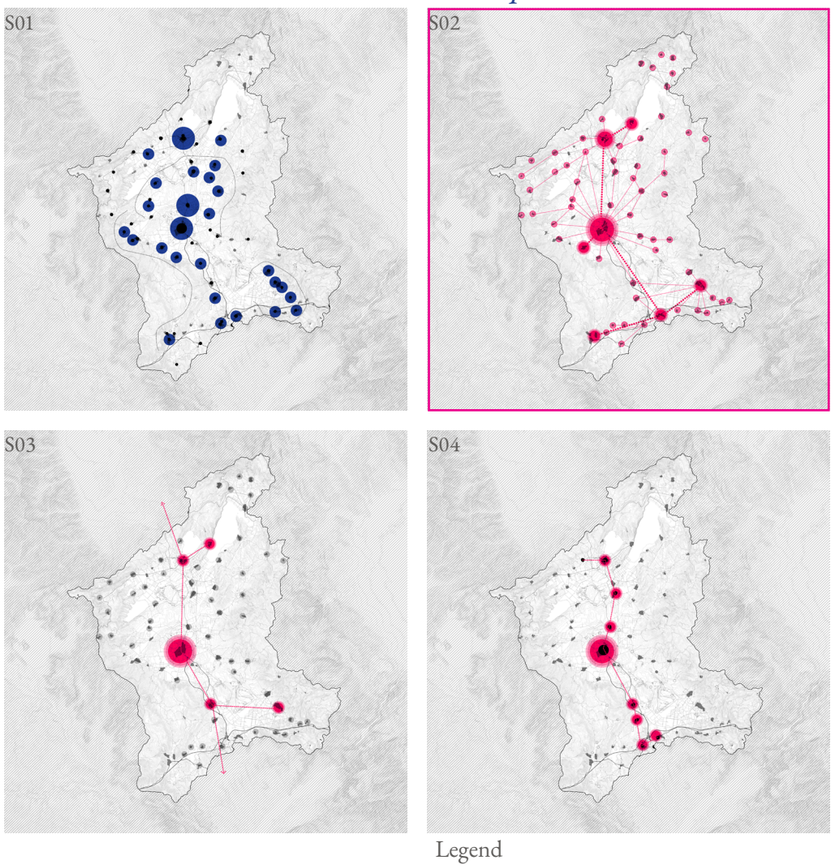
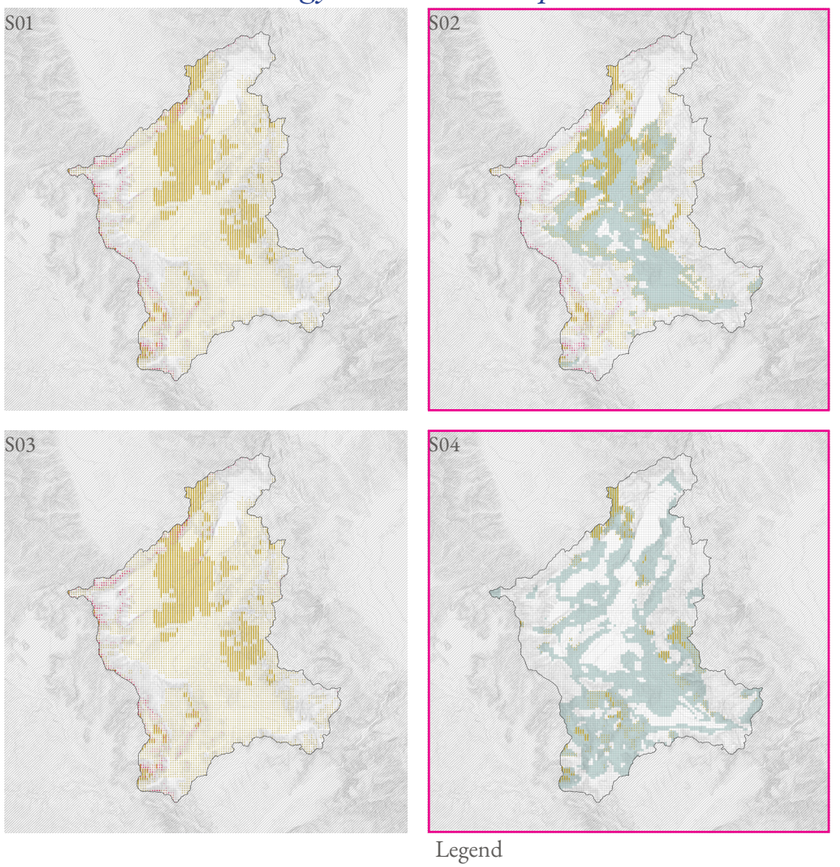


Figure | Evaluation | Socioeconomic Structure Diagrams
Source: author

Energy Production Impact



Evaluation | Energy Production Impact Diagrams
Source: author

Evaluation | Matrix

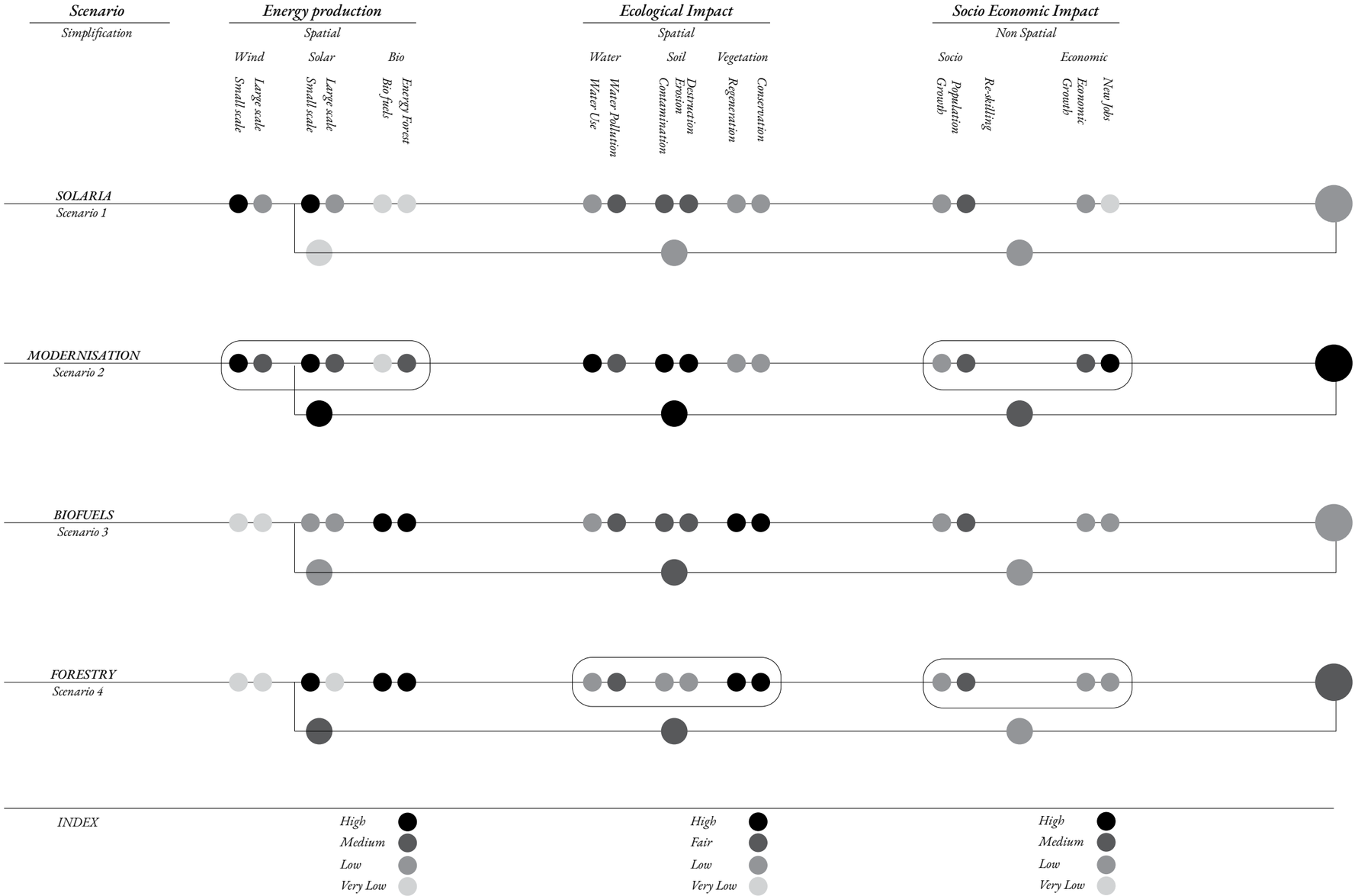


Figure | Scenario Evaluation
Source | author

A pause | re-visiting the foundations

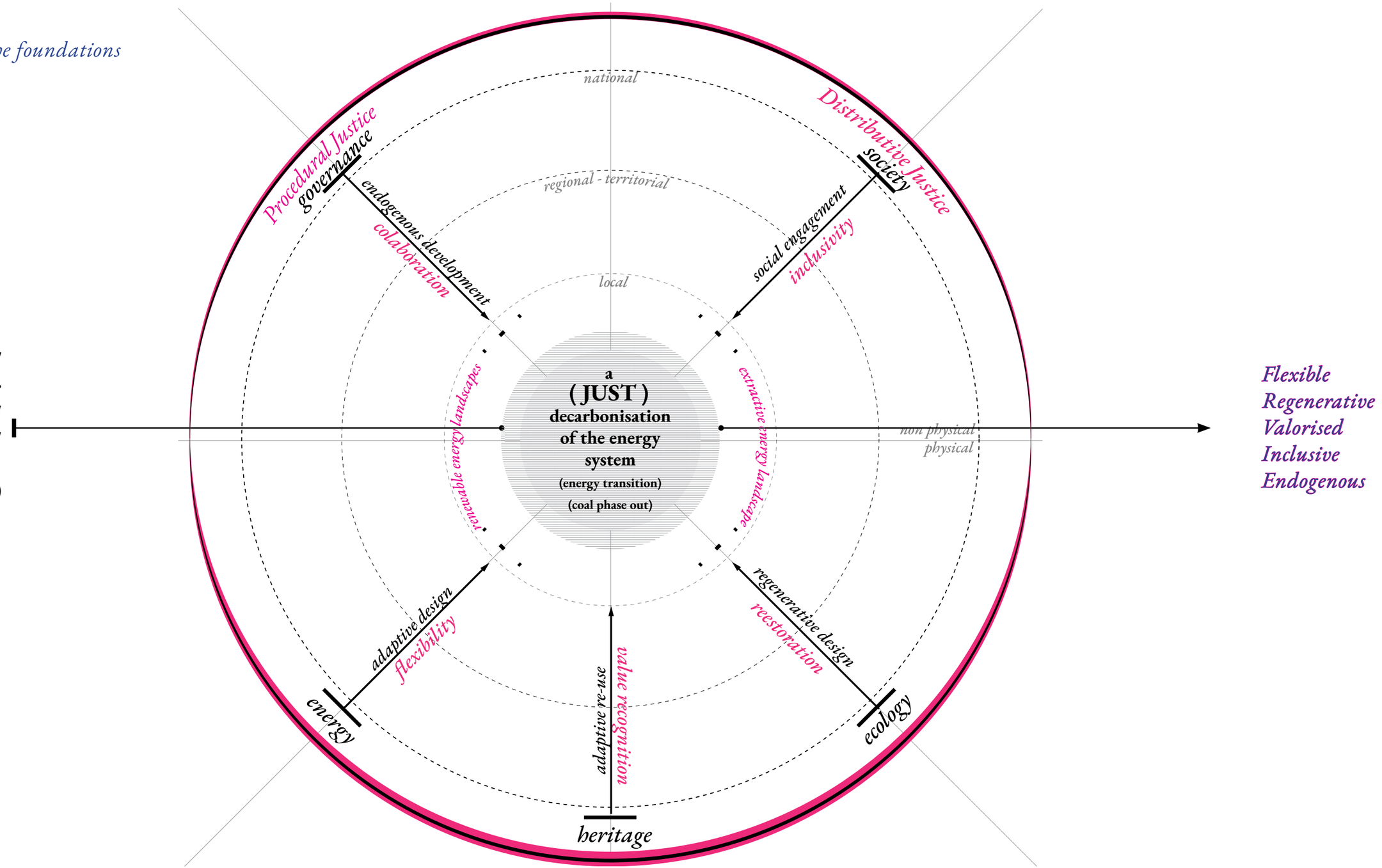


Figure | Conceptual Framework
Source | author

Territorial Vision

VISION

Goals

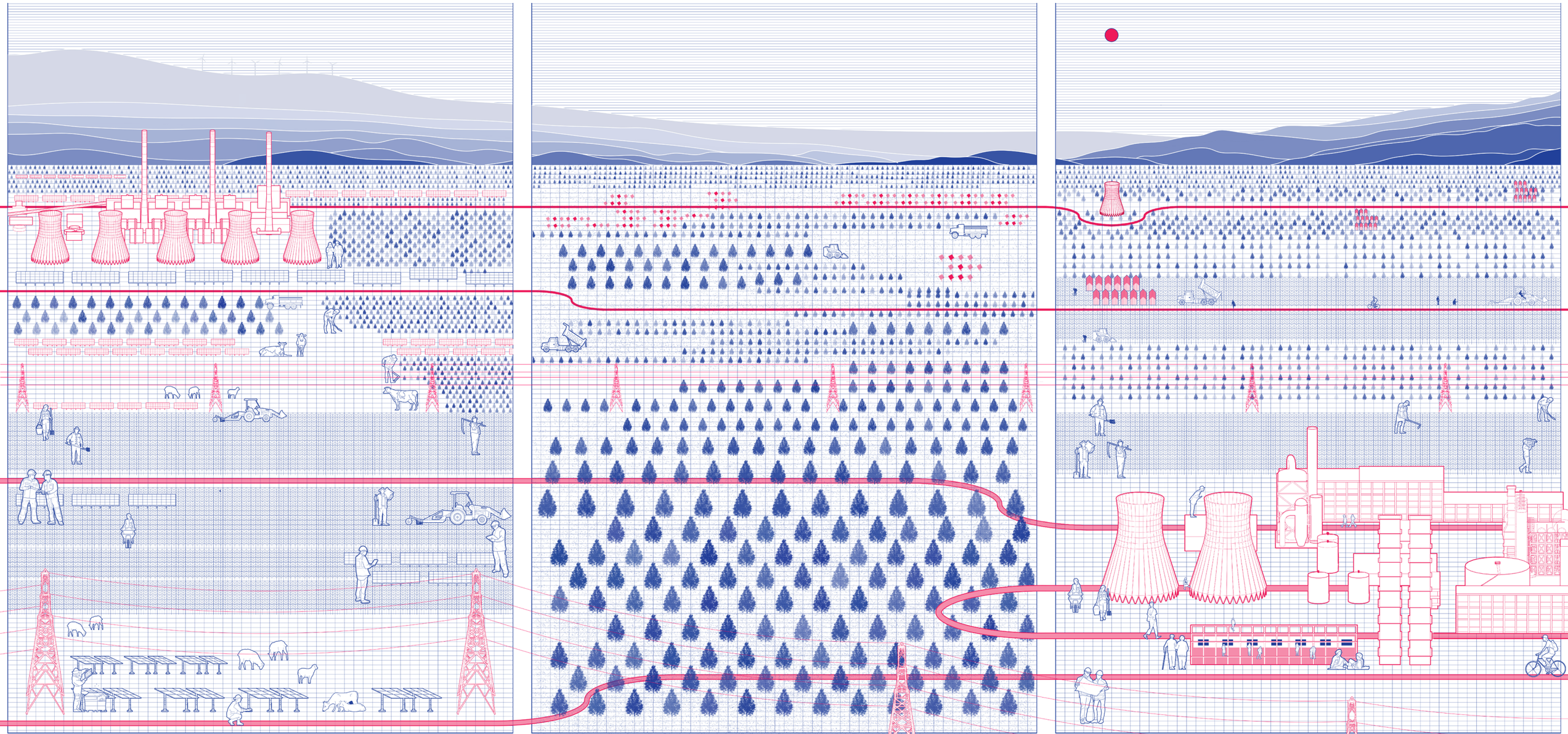
Flexible
energy
energy landscapes

Regenerative
ecology
energy landscapes

Valorised
heritage
heritage spaces

Inclusive
society
(energy) transition

Endogenous
governance
(transition) governance


flexible
endogenous
regenerative
inclusive
re-valorised

Strategies

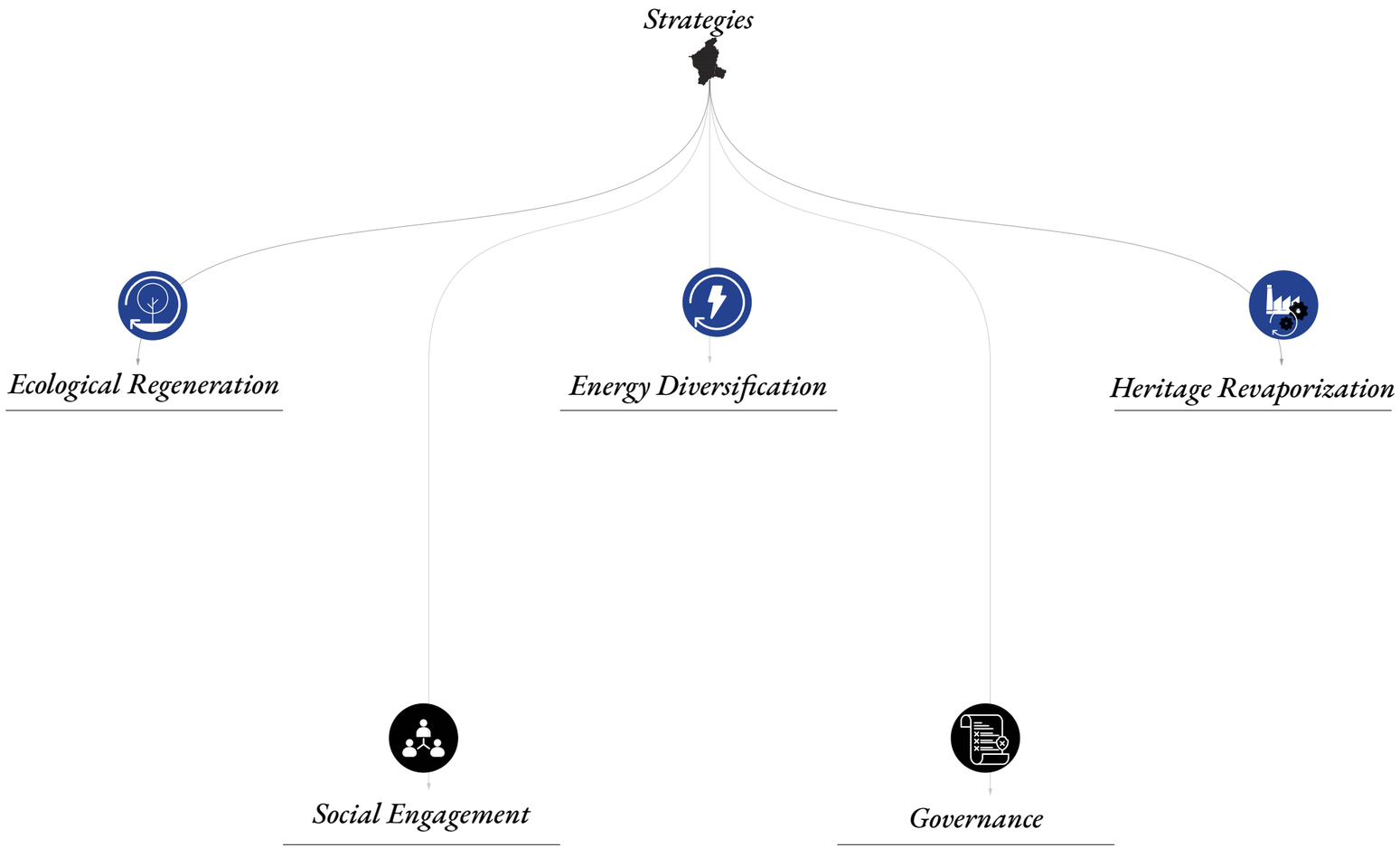


Figure | Principles for a just transition
Source | author

Strategies

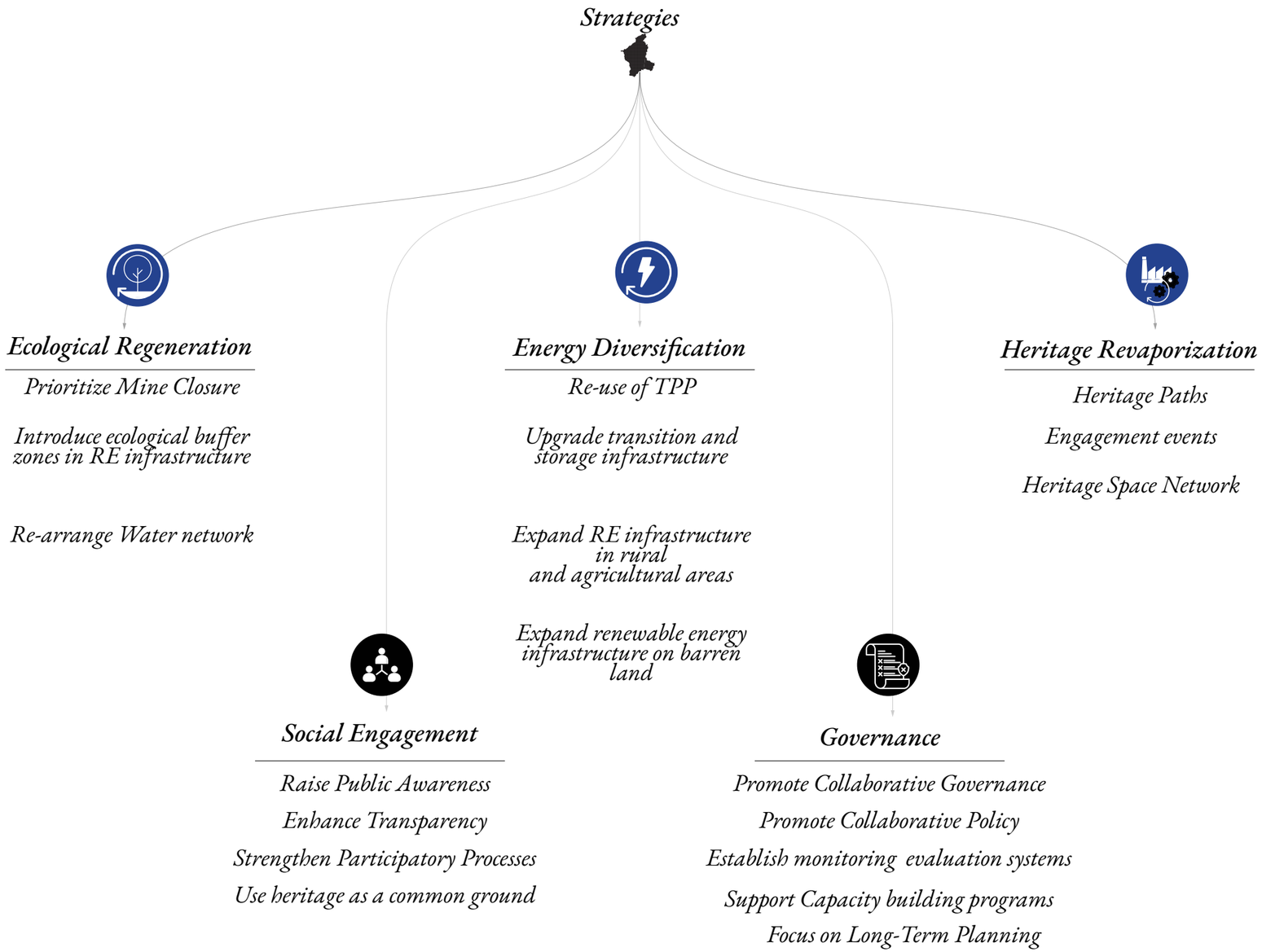


Figure | Expansion of Strategies
Source | author

Strategies

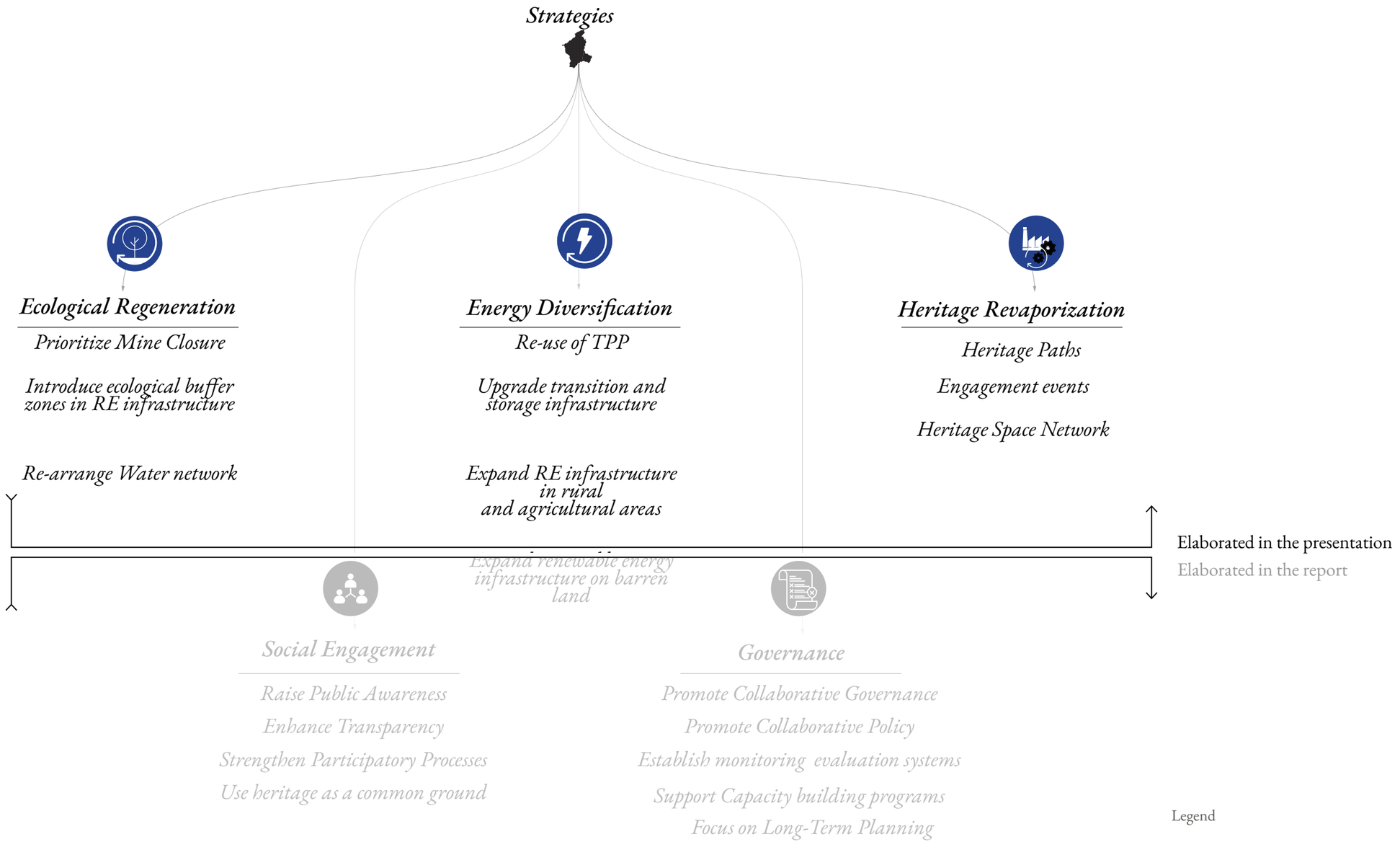


Figure | Expansion of Strategies
Source | author

VISION 2060
Strategy 1 | Ecological Regeneration

Legend

Ecology
- Mine Restoration
- Riparian Zones
- Restoration of Barren Land

Energy
- Biomass plant | Hydro Hub
- Transmission network | 400v
- Transmission network | 100v
- Transmission | 100v extension
- Storage
- Small scale agriculture solar
- Large scale solar
- Small scale bio-fuels
- Energy Forestry

Heritage
- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use

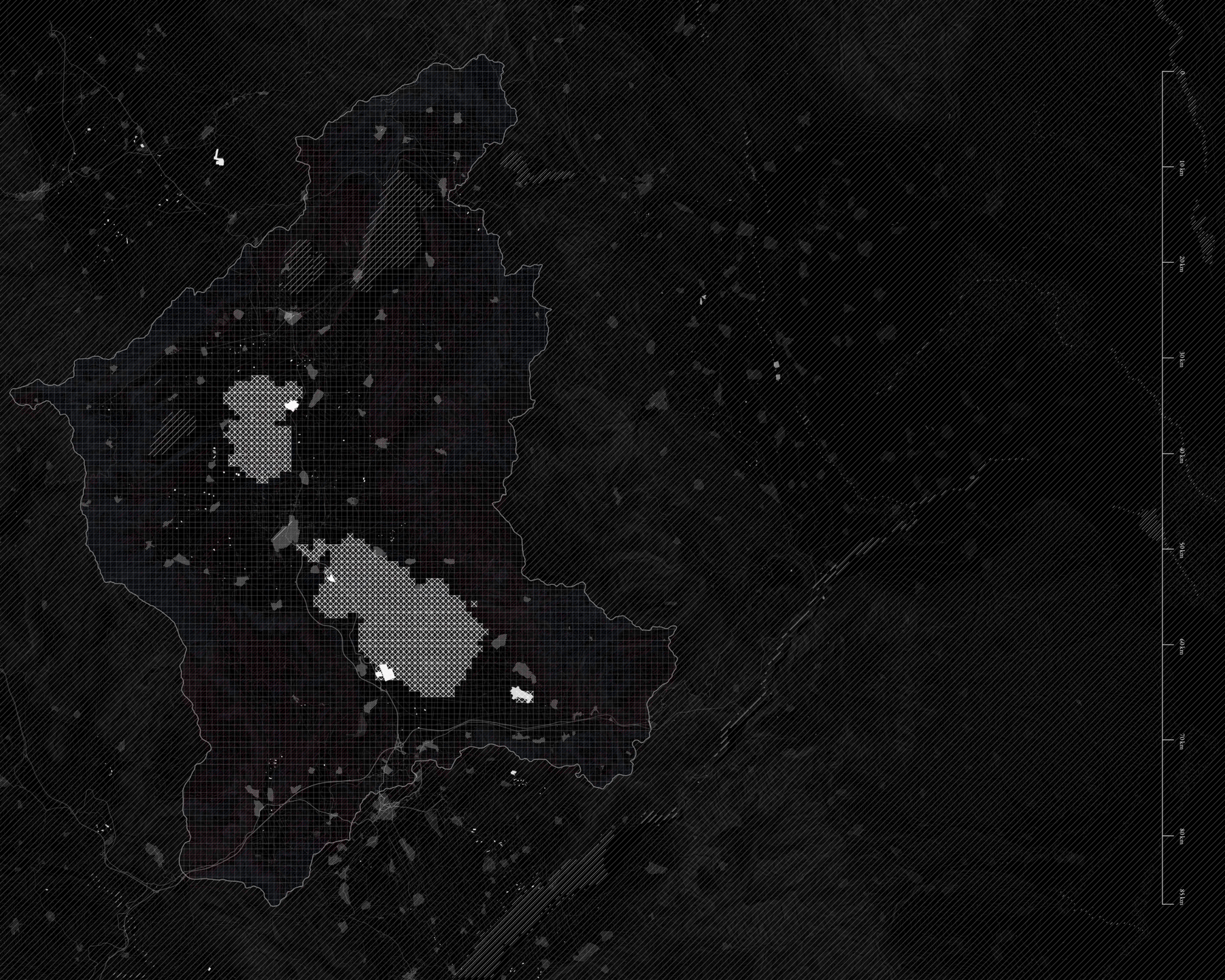


Figure | Ecological Rehabilitation Strategy
Source | author

VISION 2060
Strategy 1 | Ecological Regeneration

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Figure | Ecological Rehabilitation Strategy
Source | author

VISION 2060
Strategy 1 | Ecological Regeneration

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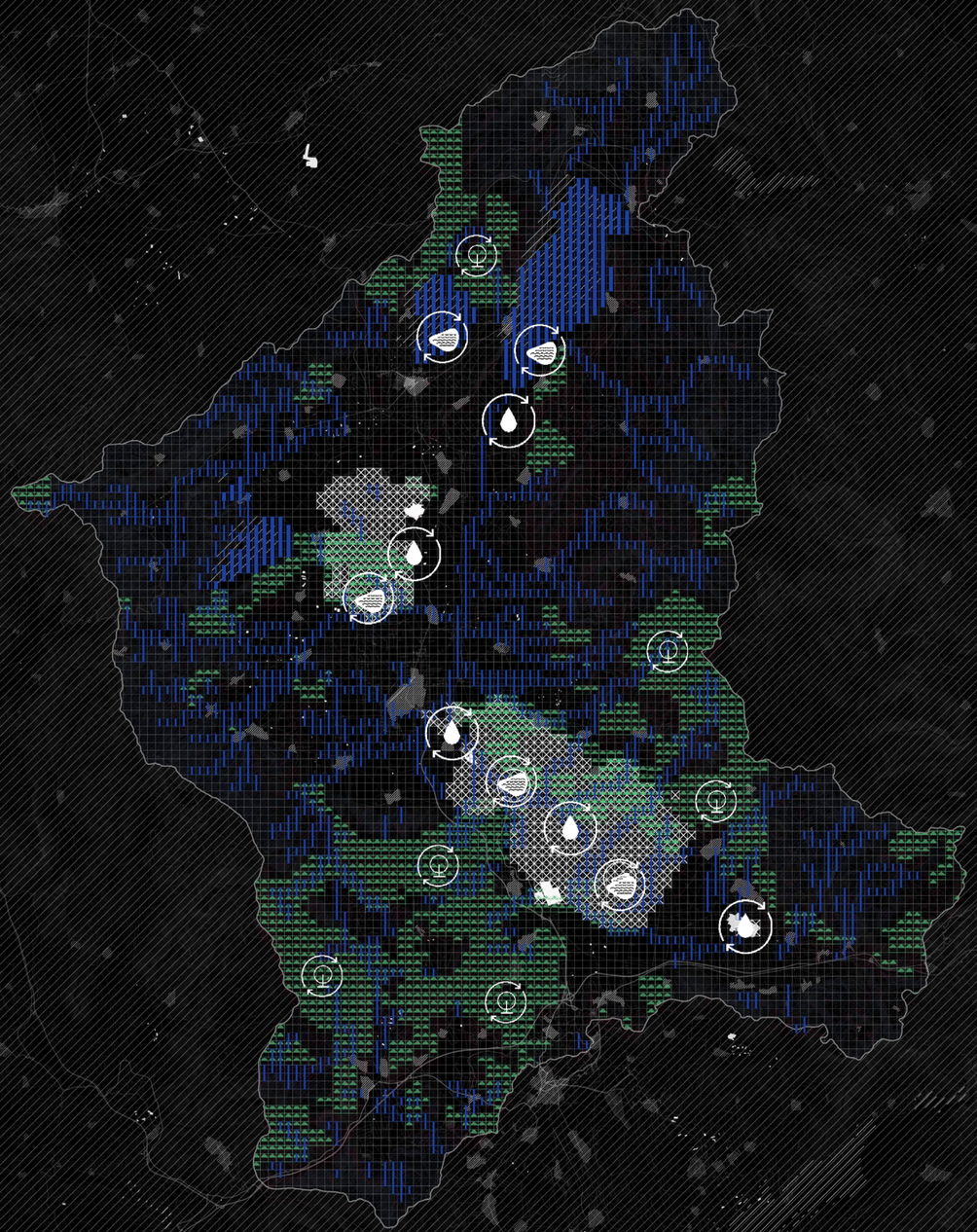



Figure | Ecological Rehabilitation Strategy
Source | author

VISION 2060
Strategy 2 | Energy Diversification

Legend

Ecology
- Mine Restoration
- Riparian Zones
- Restoration of Barren Land

Energy
- Biomass plant | Hydro Hub
- Transmission network | 400v
- Transmission network | 100v
- Transmission | 100v extension
- Storage
- Small scale agriculture solar
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- Small scale bio-fuels
- Energy Forestry

Heritage
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- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use

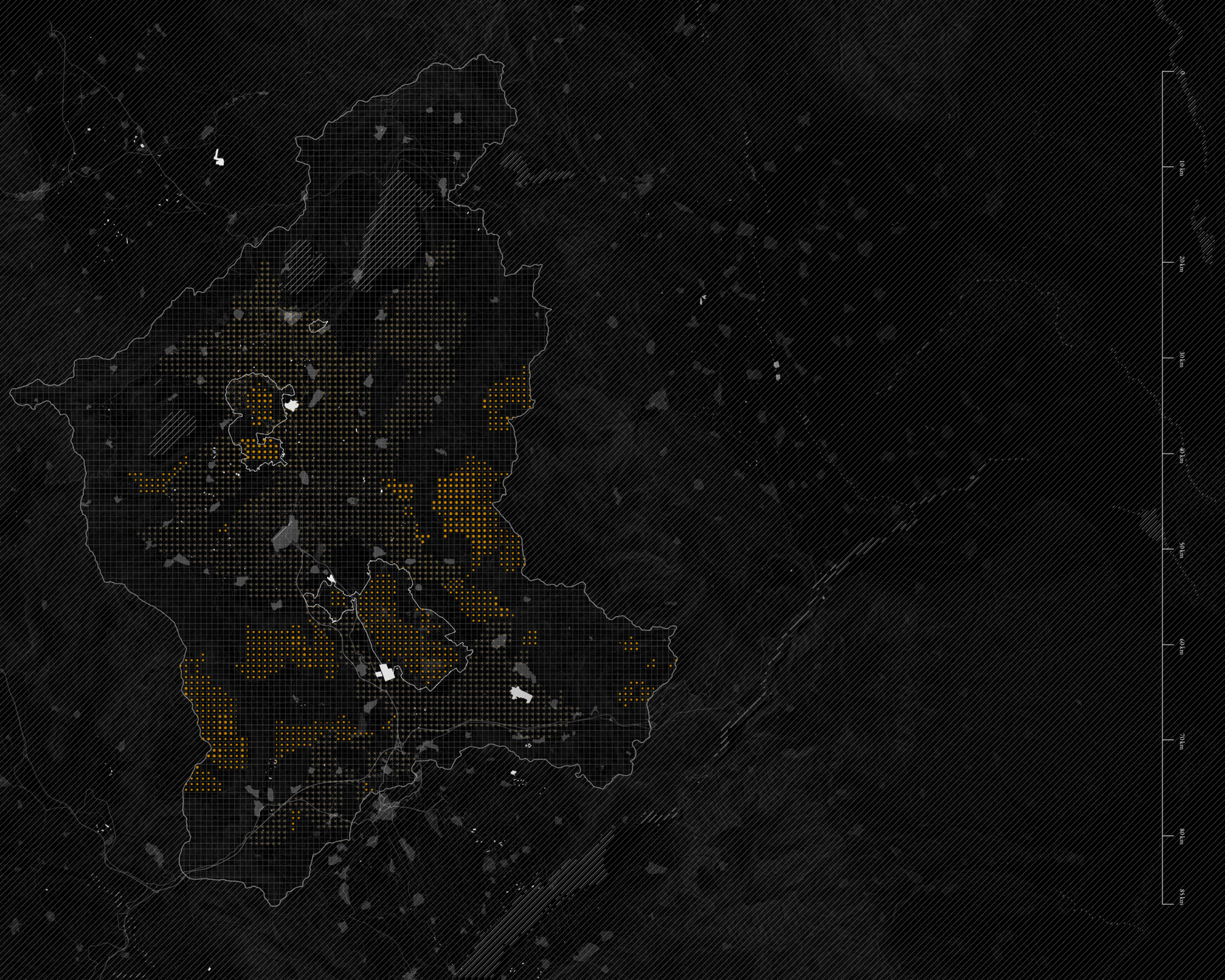

Figure | Strategy Energy Diversification Strategy
Source | author

VISION 2060
Strategy 2 | Energy Diversification

Legend

Ecology
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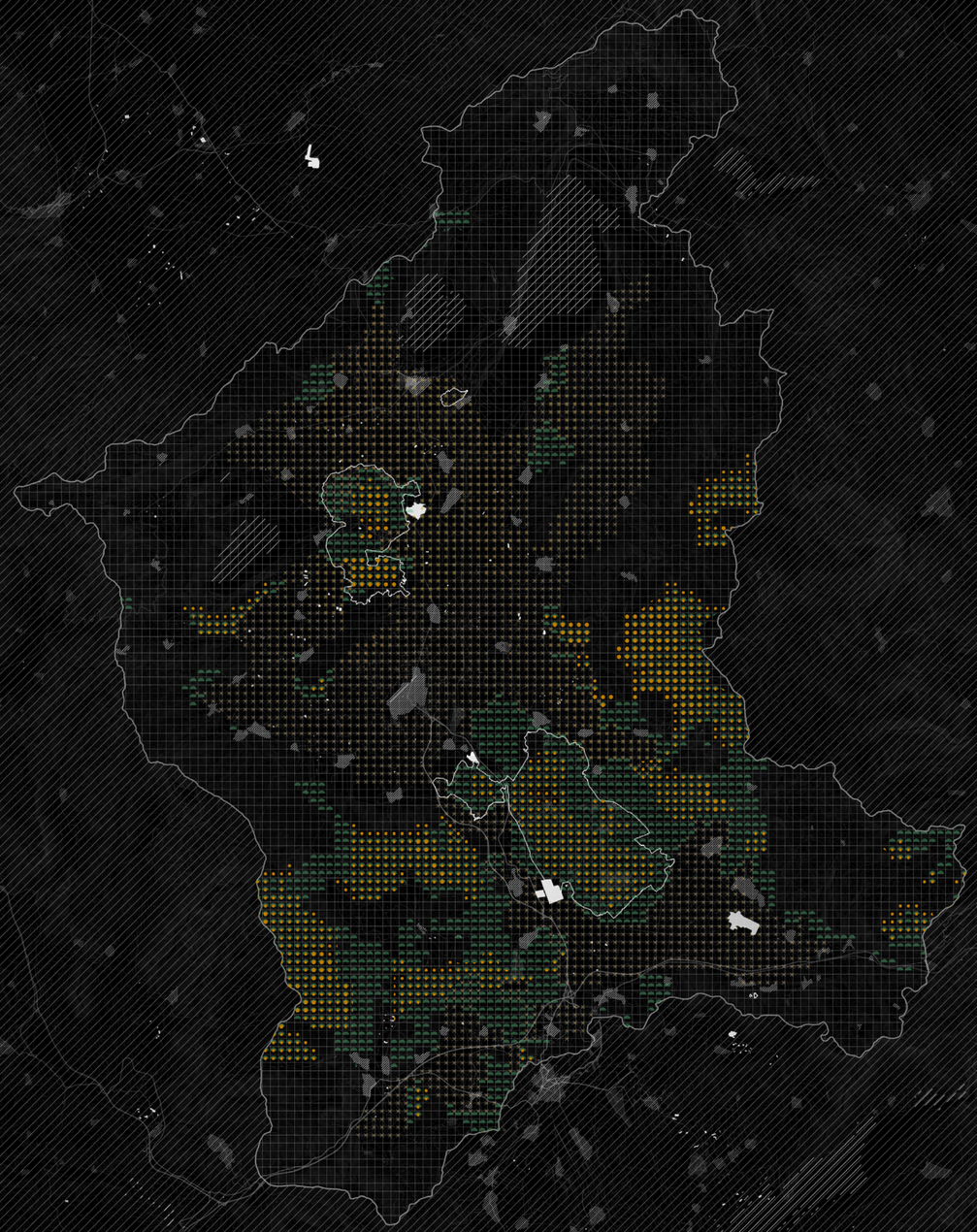



Figure | Strategy Energy Diversification Strategy
Source | author

VISION 2060
Strategy 2 | Energy Diversification

Legend

Ecology
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- Railway
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Figure | Strategy Energy Diversification Strategy
Source | author

VISION 2060
Strategy 2 | Energy Diversification

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- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use

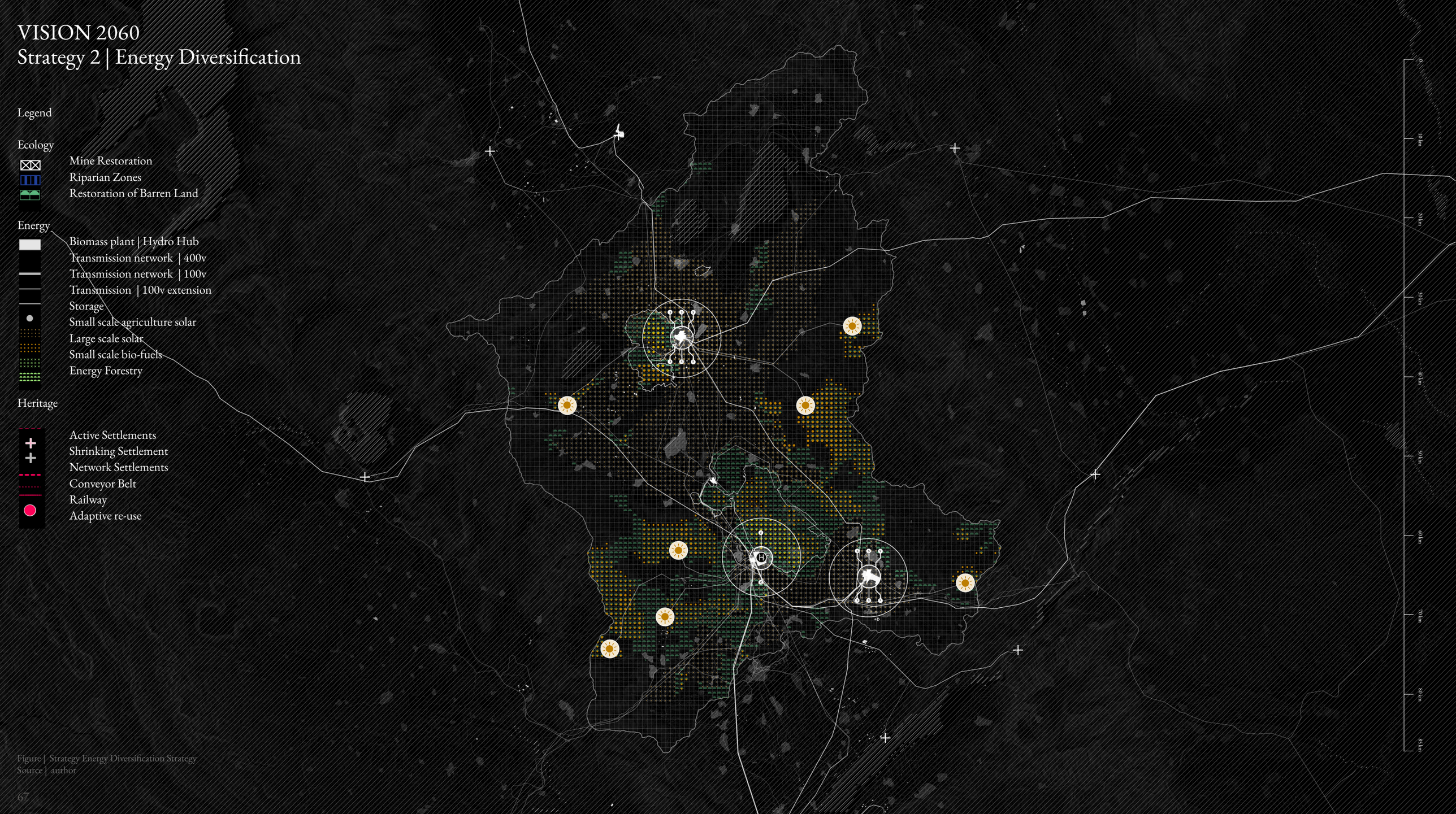

Figure | Strategy Energy Diversification Strategy
Source | author

VISION 2060
Strategy 3 | Heritage Re-valorisation

Legend

Ecology

- Mine Restoration
- Riparian Zones
- Restoration of Barren Land

Energy

- Biomass plant | Hydro Hub
- Transmission network | 400v
- Transmission network | 100v
- Transmission | 100v extension
- Storage
- Small scale agriculture solar
- Large scale solar
- Small scale bio-fuels
- Energy Forestry

Heritage

- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use



Figure | Strategy Revalorising Heritage Strategy
Source | author

VISION 2060
Strategy 3 | Heritage Re-valorisation

Legend

Ecology

- Mine Restoration
- Riparian Zones
- Restoration of Barren Land

Energy

- Biomass plant | Hydro Hub
- Transmission network | 400v
- Transmission network | 100v
- Transmission | 100v extension
- Storage
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- Energy Forestry

Heritage

- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use



Figure | Strategy Revalorising Heritage Strategy
Source | author

VISION 2060
Strategy 3 | Heritage Re-valorisation

Legend

Ecology
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- Small scale bio-fuels
- Energy Forestry

Heritage
- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use



Figure | Strategy Revalorising Heritage Strategy
Source | author

VISION 2060
Strategy 3 | Heritage Re-valorisation

Legend

Ecology
- Mine Restoration
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- Restoration of Barren Land

Energy
- Biomass plant | Hydro Hub
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- Transmission network | 100v
- Transmission | 100v extension
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- Energy Forestry

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- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use



Figure | Strategy Revalorising Heritage Strategy
Source | author

VISION 2060
Strategy | Superimposition

Legend

Ecology
- Mine Restoration
- Riparian Zones
- Restoration of Barren Land

Energy
- Biomass plant | Hydro Hub
- Transmission network | 400v
- Transmission network | 100v
- Transmission | 100v extension
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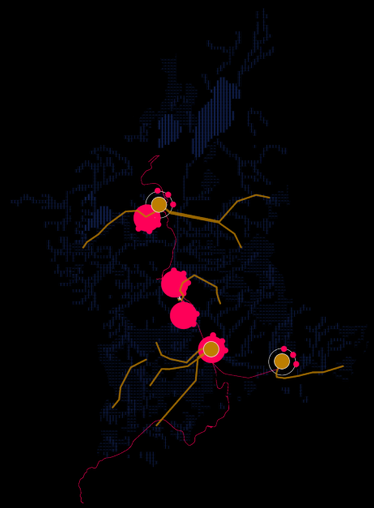
Heritage
- Active Settlements
- Shrinking Settlement
- Network Settlements
- Conveyor Belt
- Railway
- Adaptive re-use



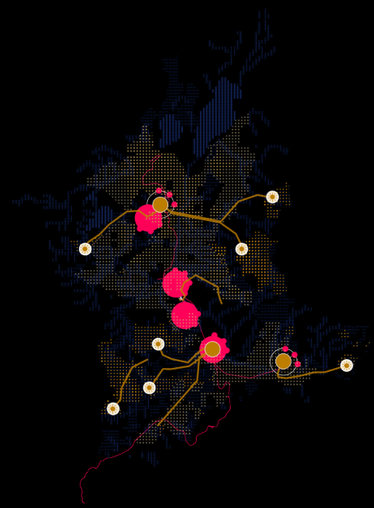
Figure | Vision 2060
Source | author

VISION

Phasing Diagram



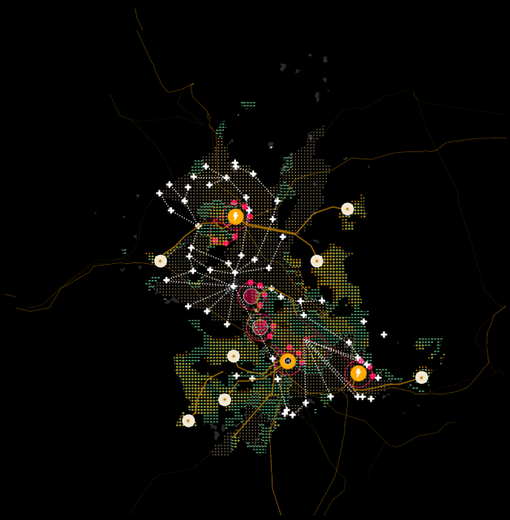
Phase 1 | Preparation



Phase 2 | Initiation



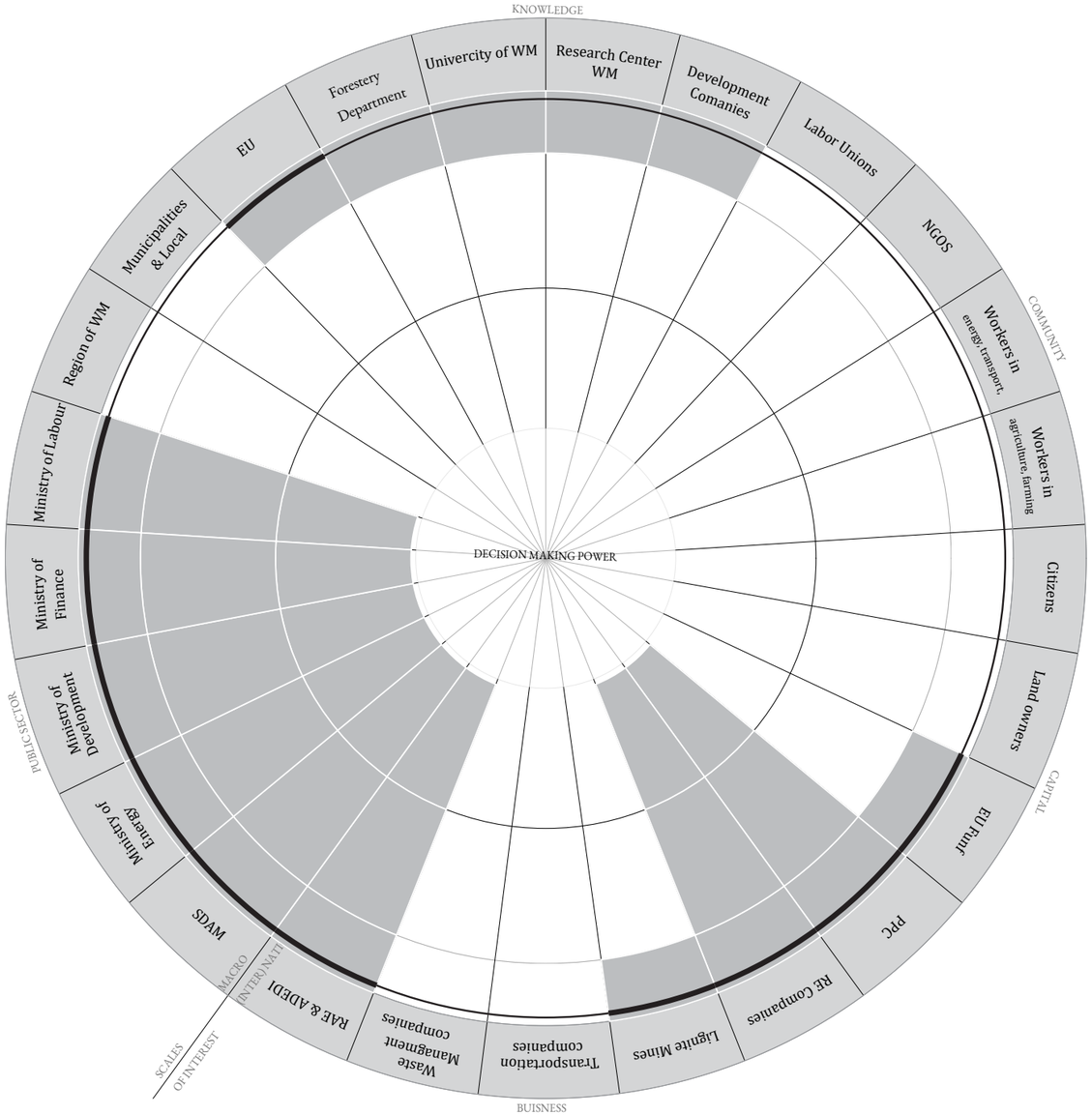
Phase 3 | Intergration



Phase 4 | Furtherance

Figure | Phasing Diagrams
Source | author

Current Stakeholder Access to Decision Making Power

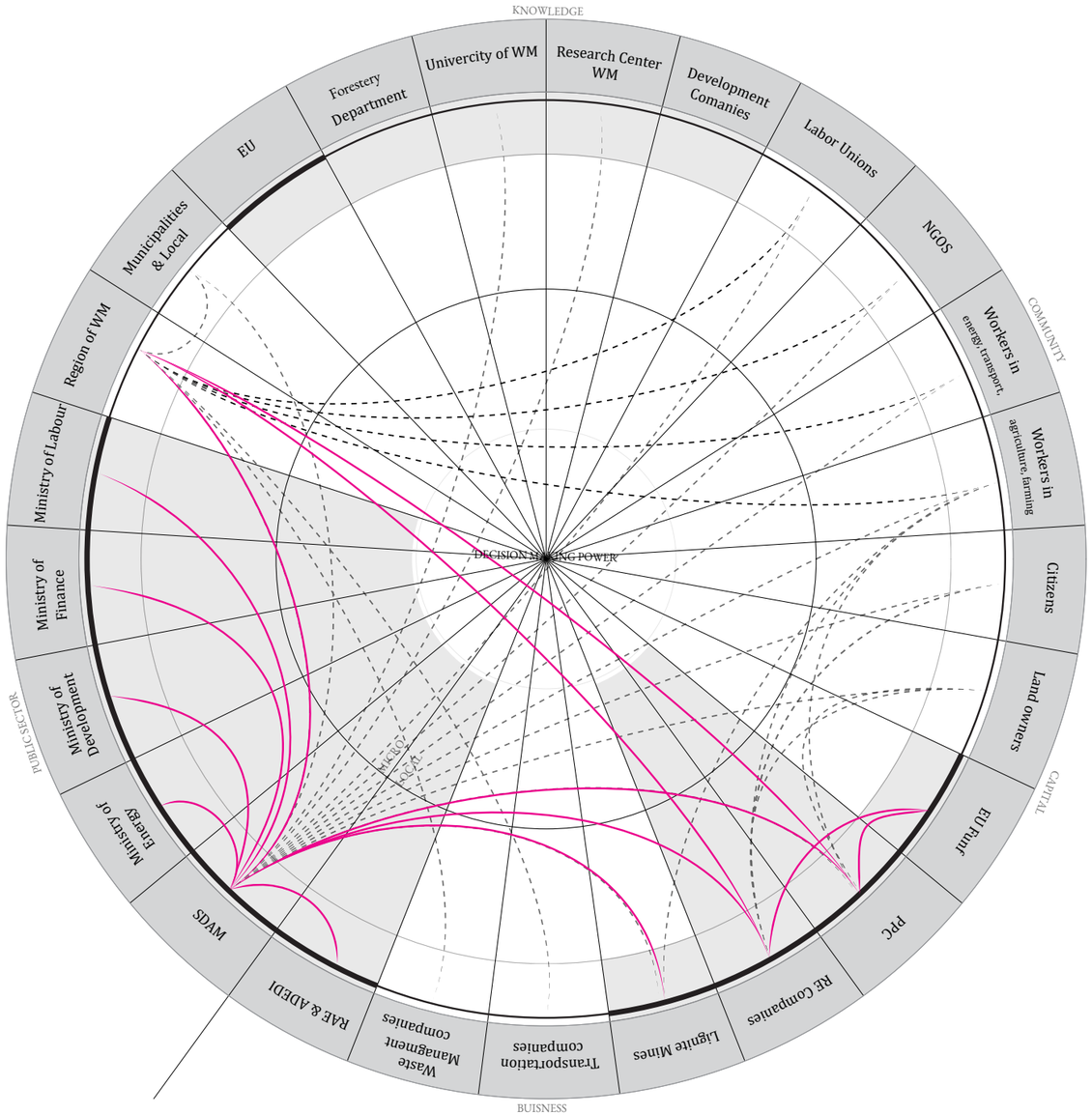


Legend

Power in decision making

Figure | Stakeholder Synergies
Source | author

Current Stakeholder Synergies & Conflicts



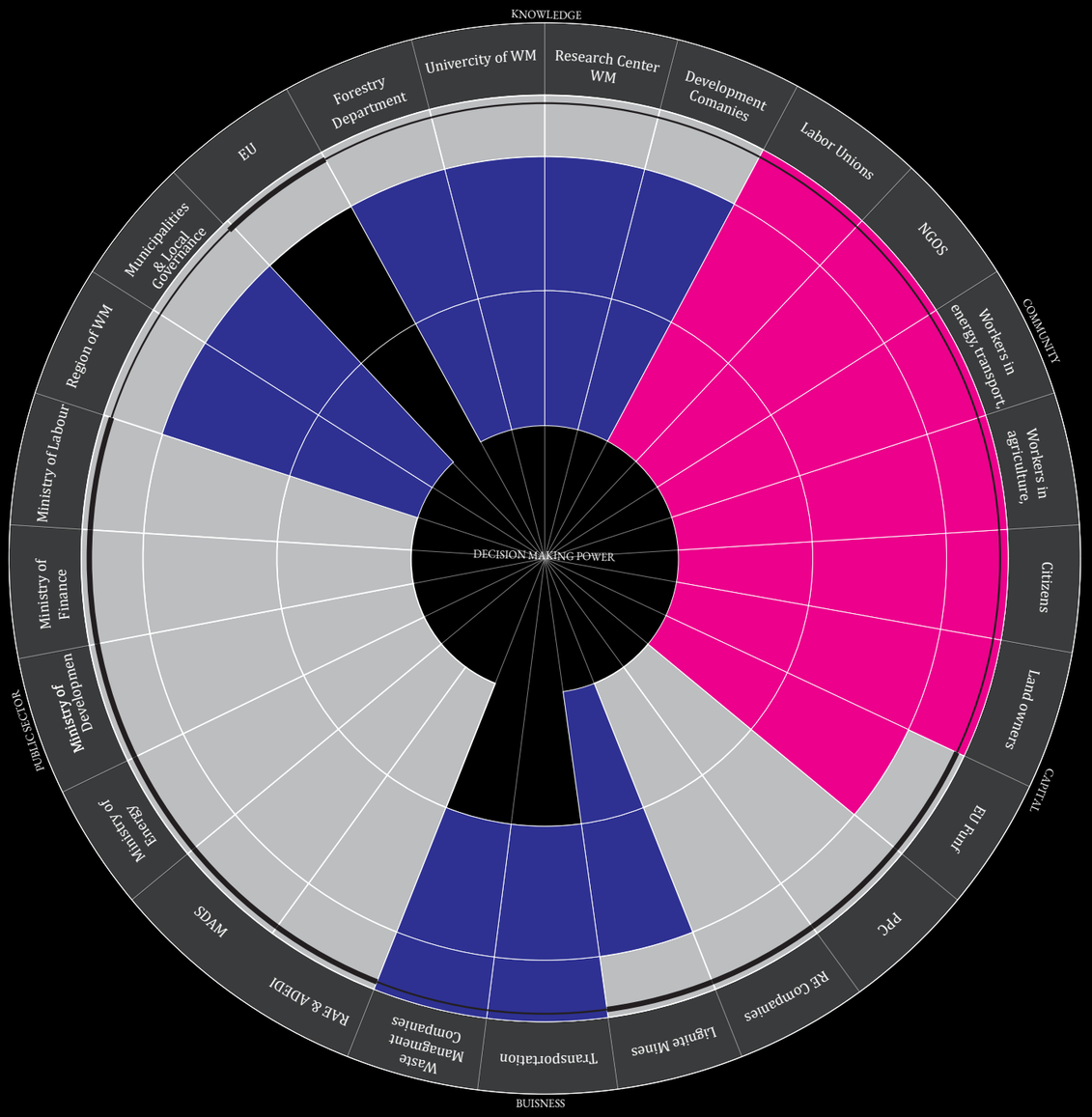
Legend

- Power in decision making
- Conflict
- Synergy

Figure | Stakeholder Synergies
Source | author

VISION

Aspired Stakeholder Power Balance



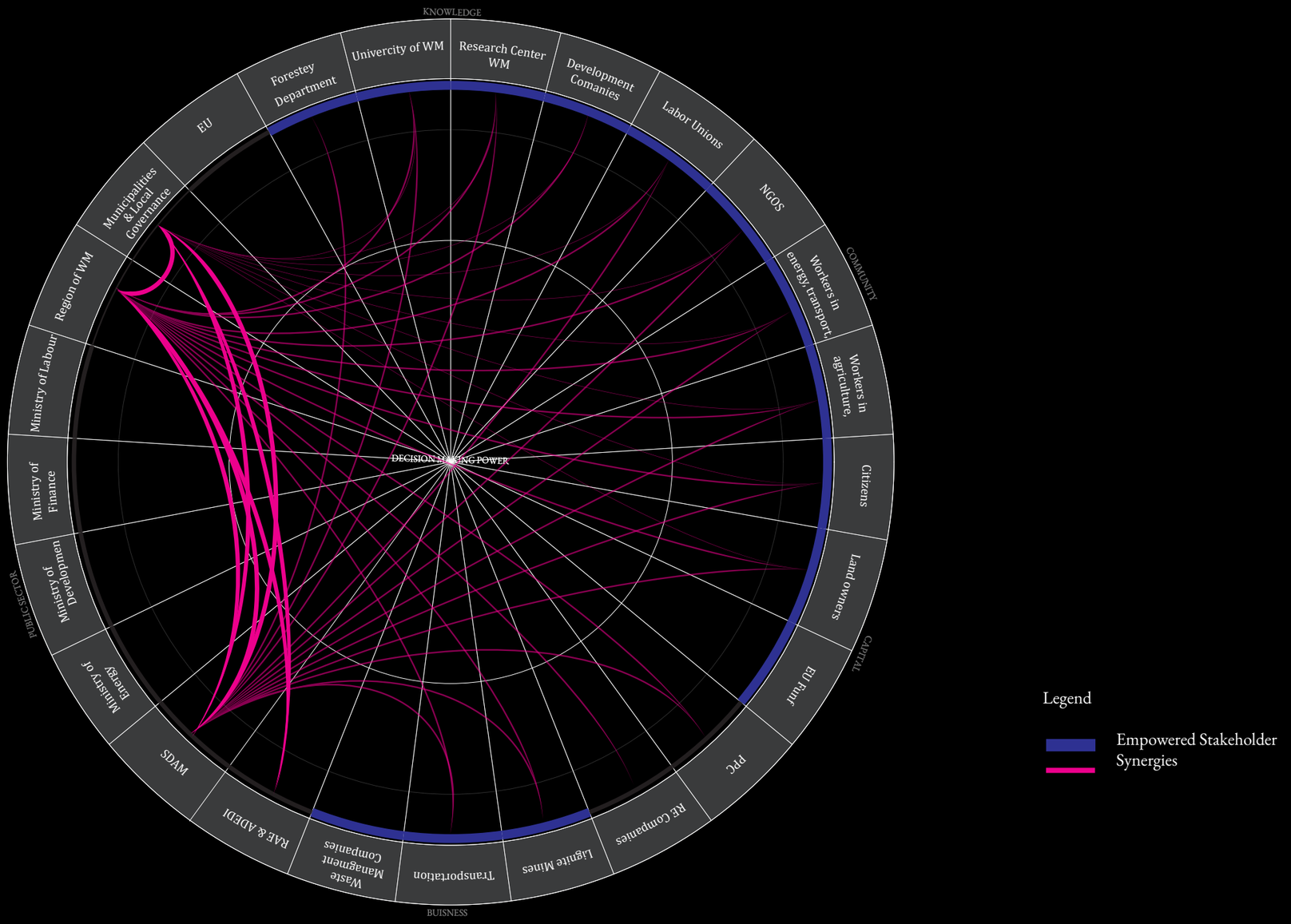
Legend

- Power in decision making
- Power | Knowledge & business | Knowledge intergeneration
- Power | Community | Participatory

Figure | Stakeholder Synergies
Source | author

VISION

Aspired Stakeholder Synergies & Conflicts



Legend

Empowered Stakeholder
Synergies

Figure | Stakeholder Synergies
Source | author

Governance and Policy Collaboration

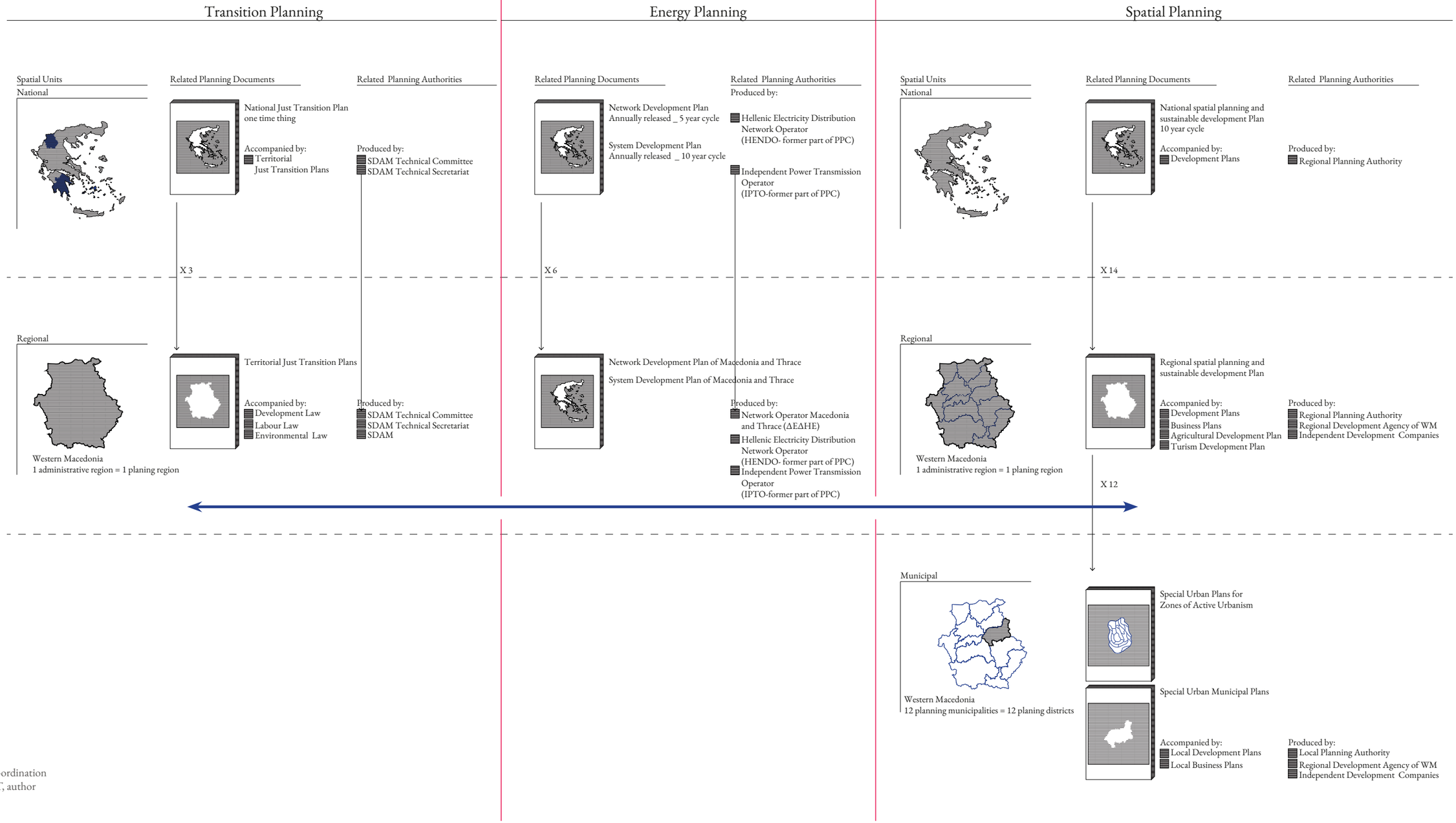
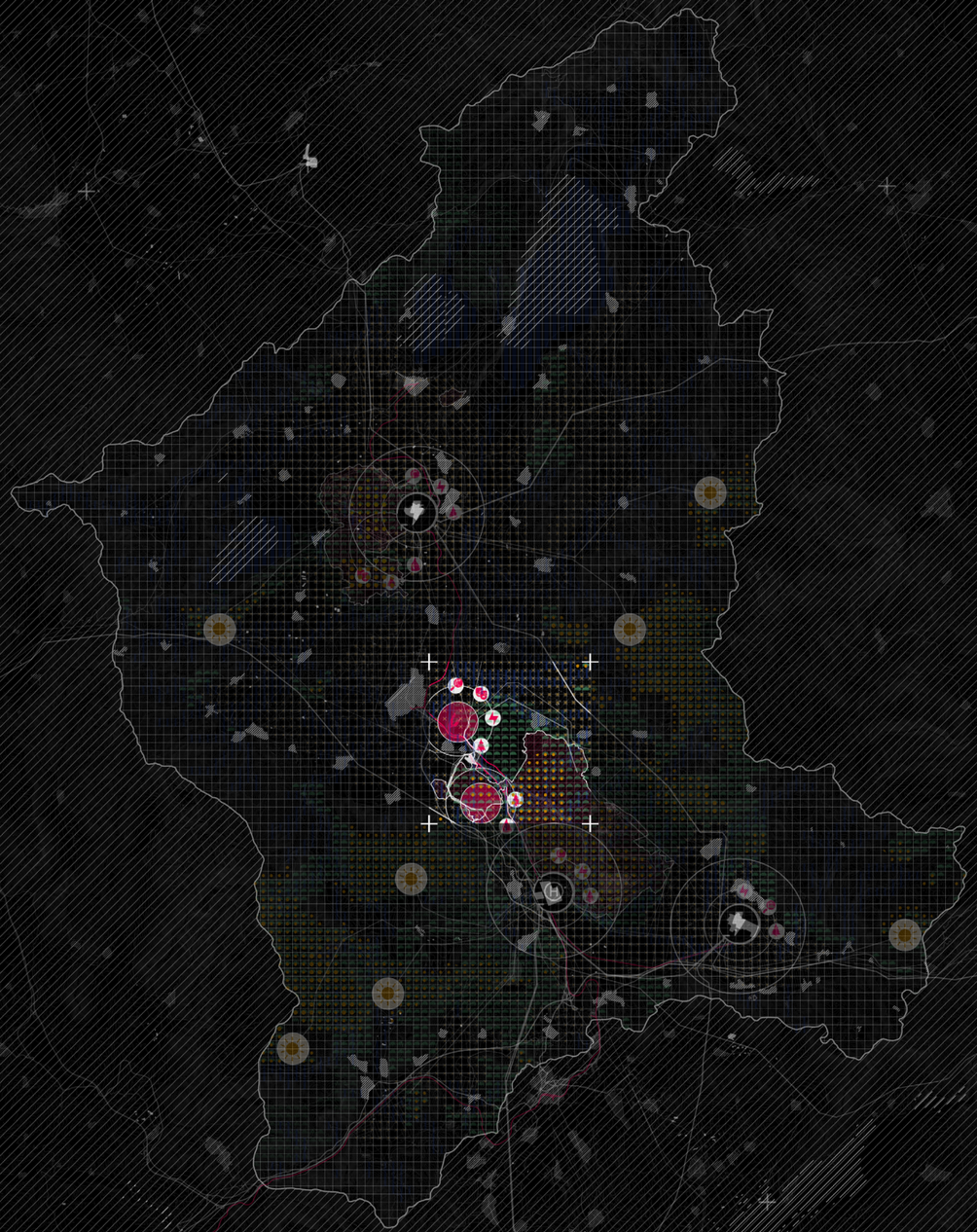
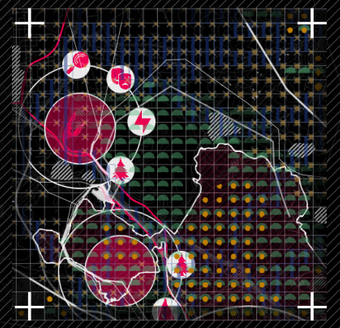


Figure ||Policy co-ordination
Source | ELSTAT, author

STRATEGIC DESIGN

Area Selection





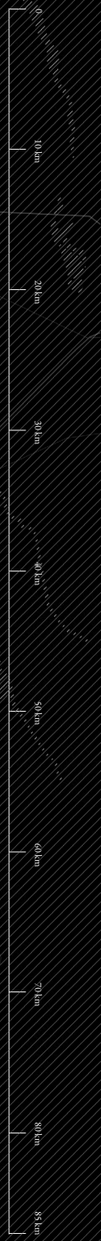


Figure | Strategic site selection
Source | author

Strategic Design

Site | Eordaia Township

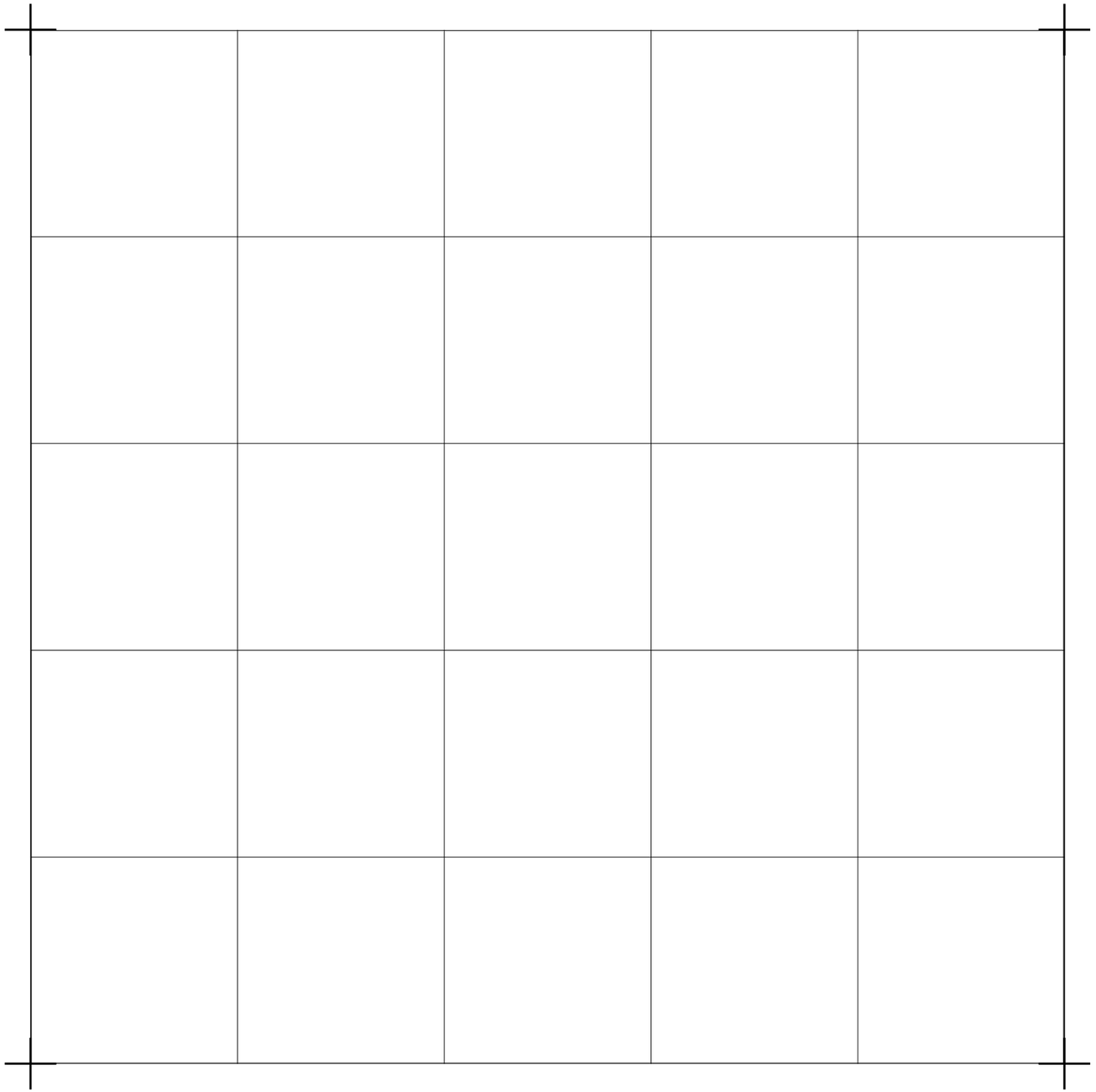


Figure | Site Satellite
Source | google earth

Eordaia 2023

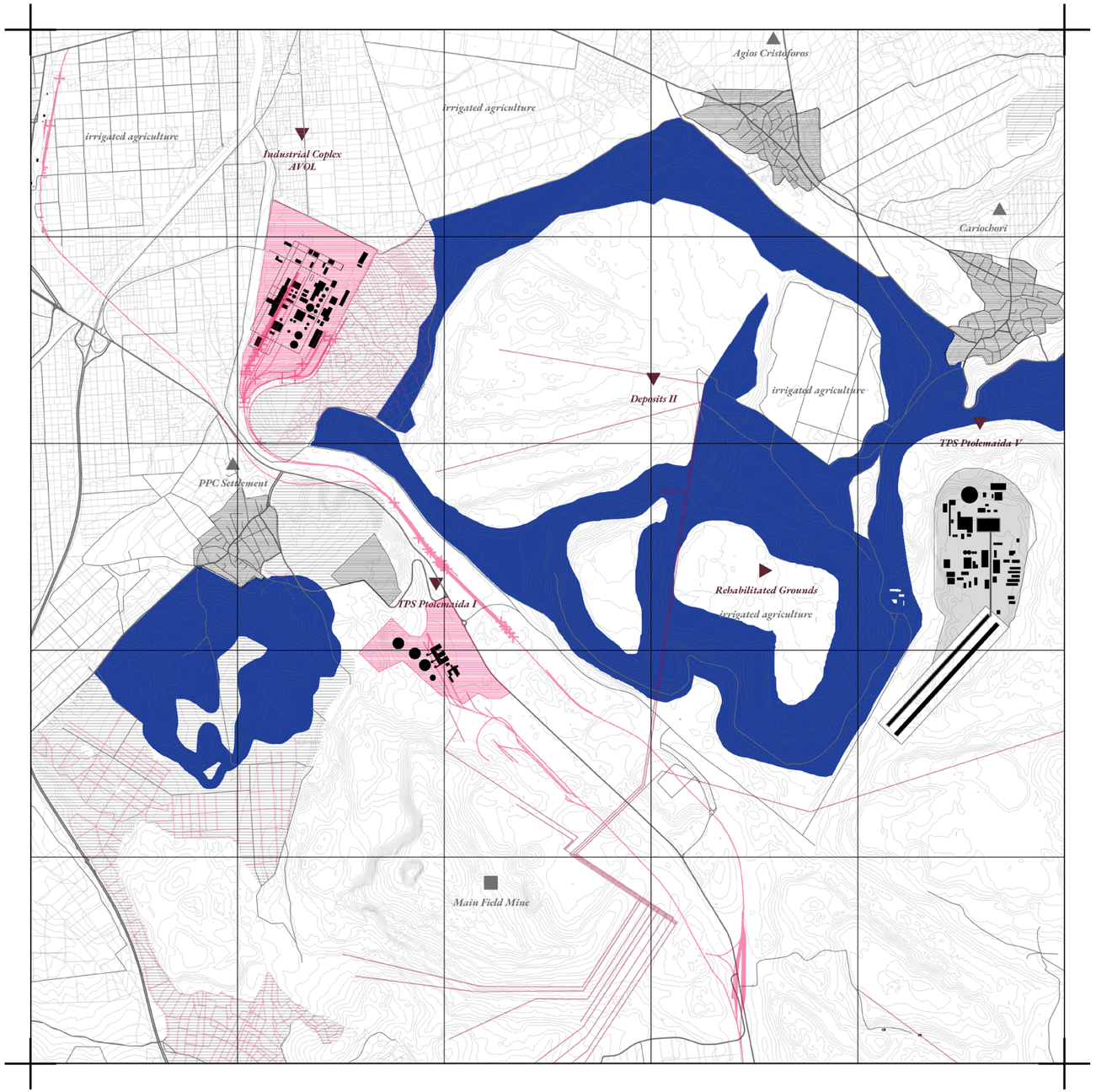


Figure | Curent land uses
Source | Google Earth, Geofabric, EEA (2020)

Eordaia 2060

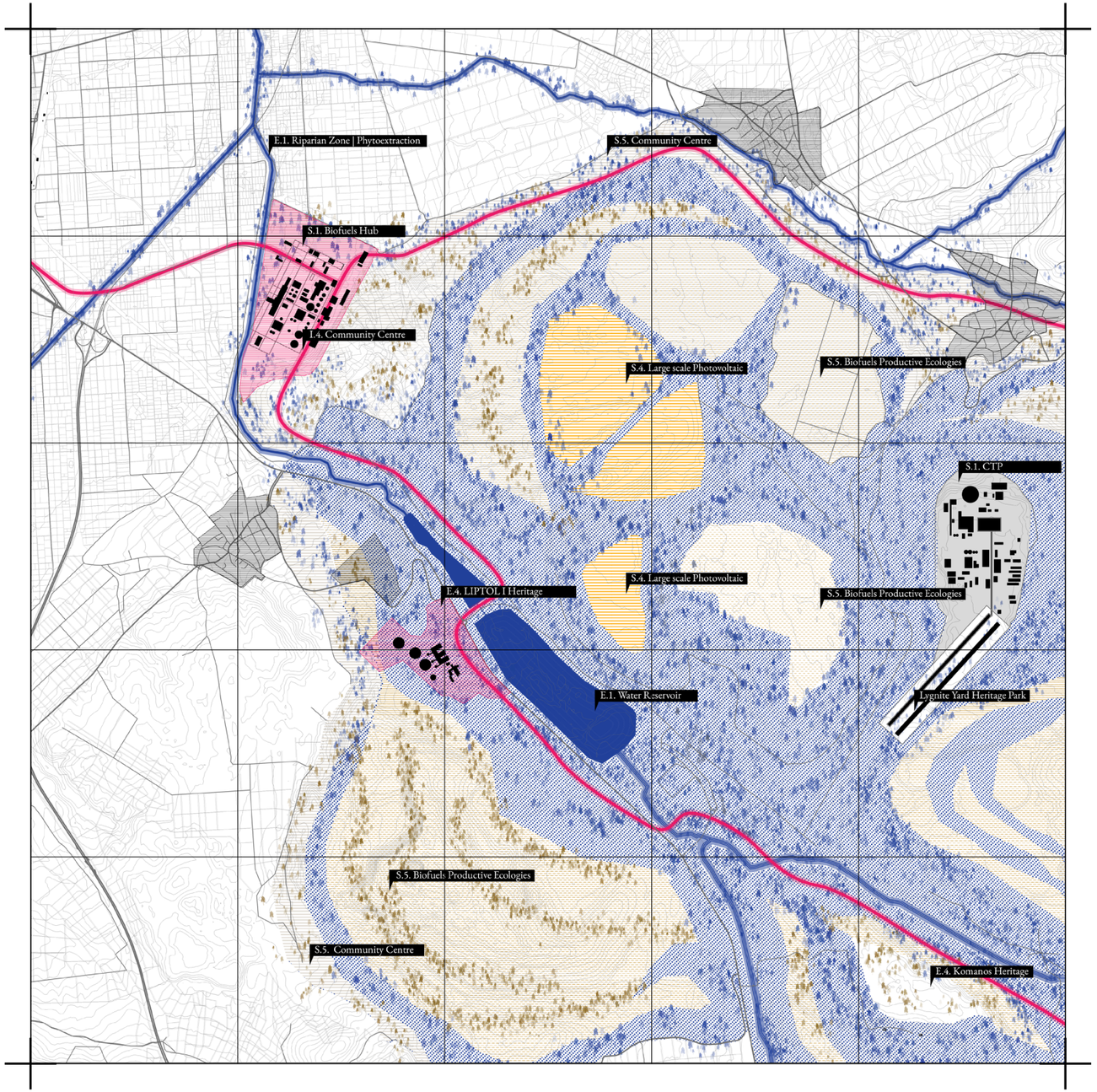


Figure | Proposal
Source | author, Google Earth, Geofabric, EEA (2020)

Eordaia 2060

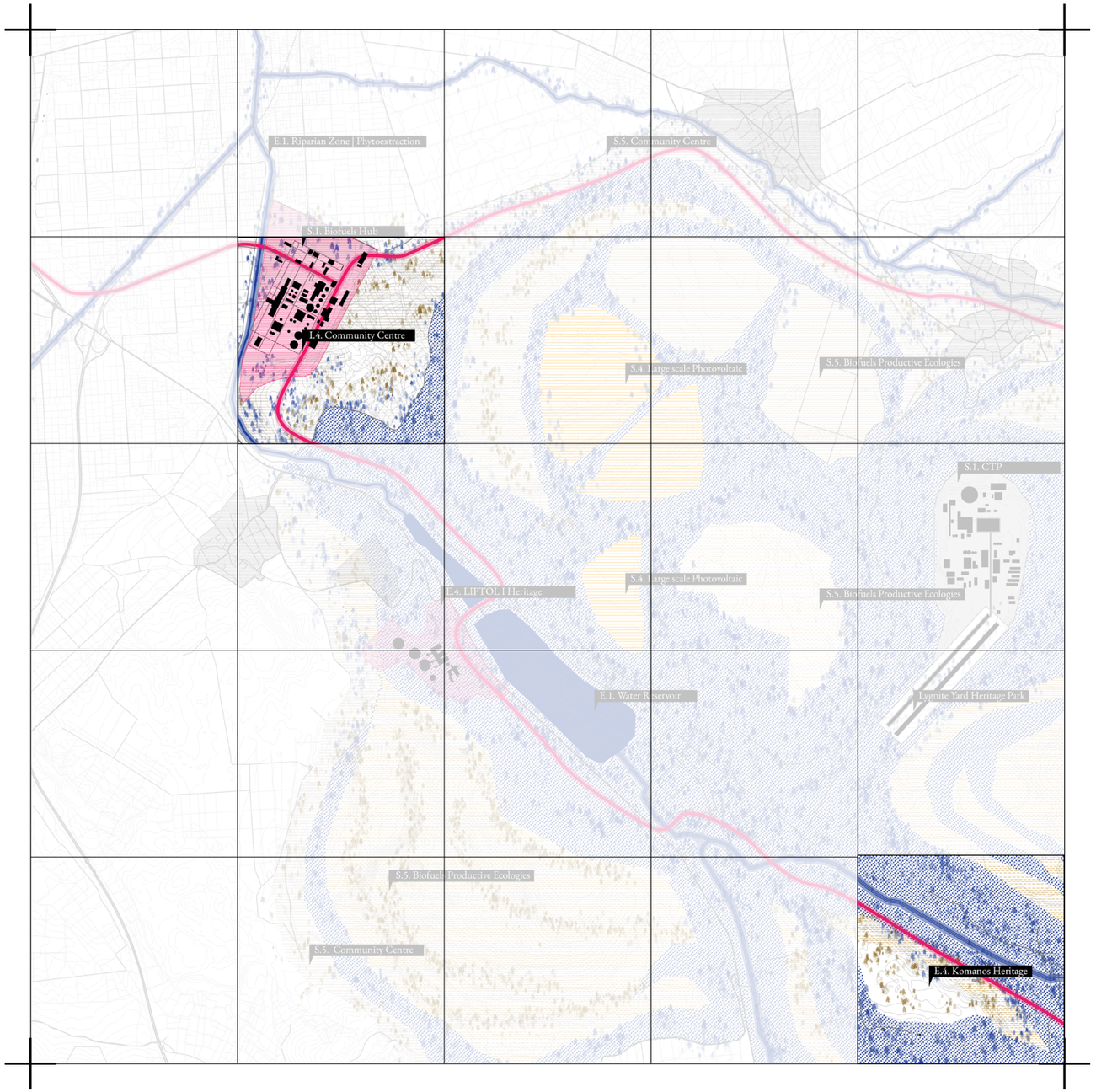


Figure | Proposal
Source | author, Google Earth, Geofabric, EEA (2020)

Heritage Revalorisation | Aeval Industrial Complex



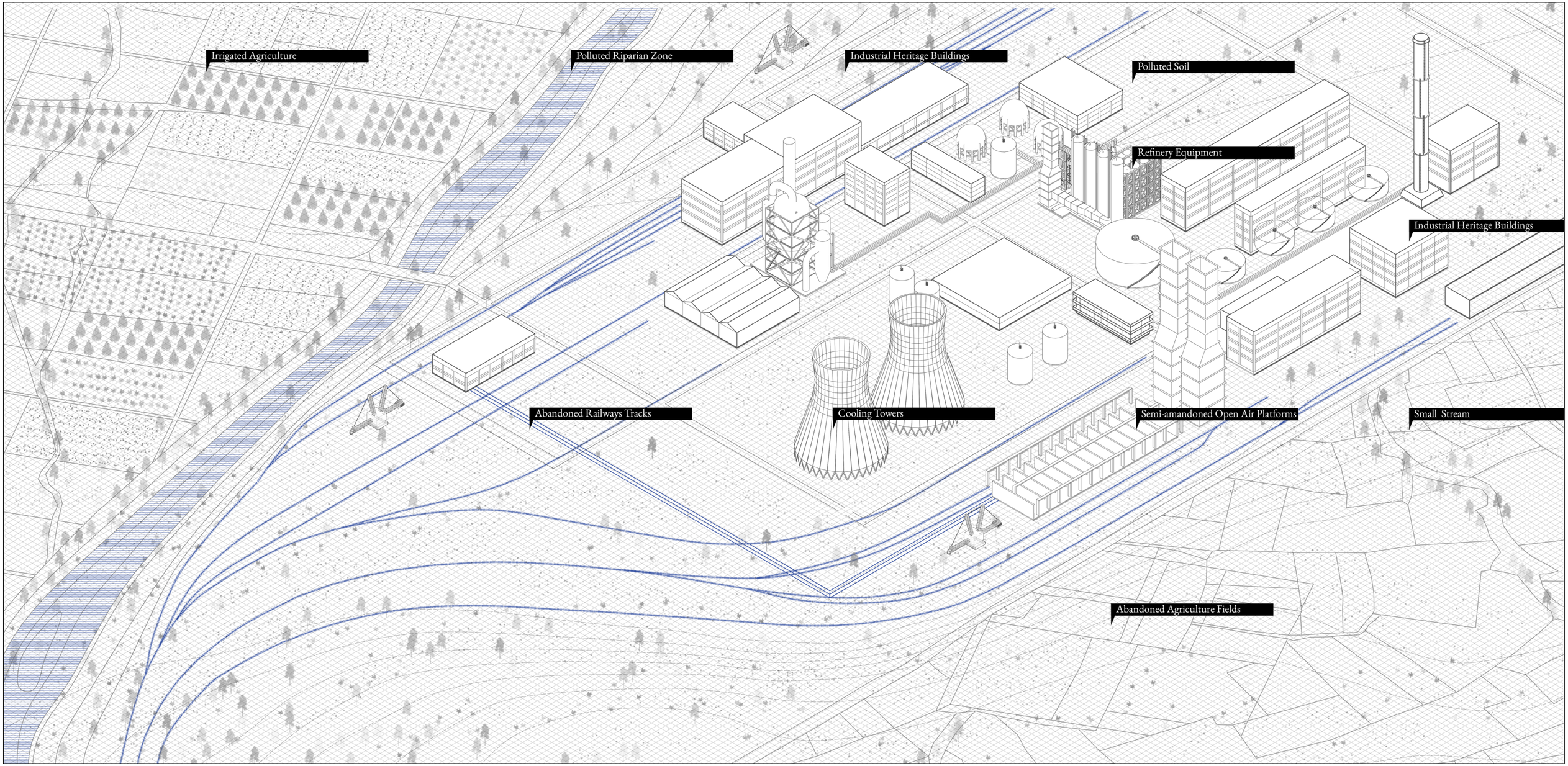
Source | Modica (2014a)

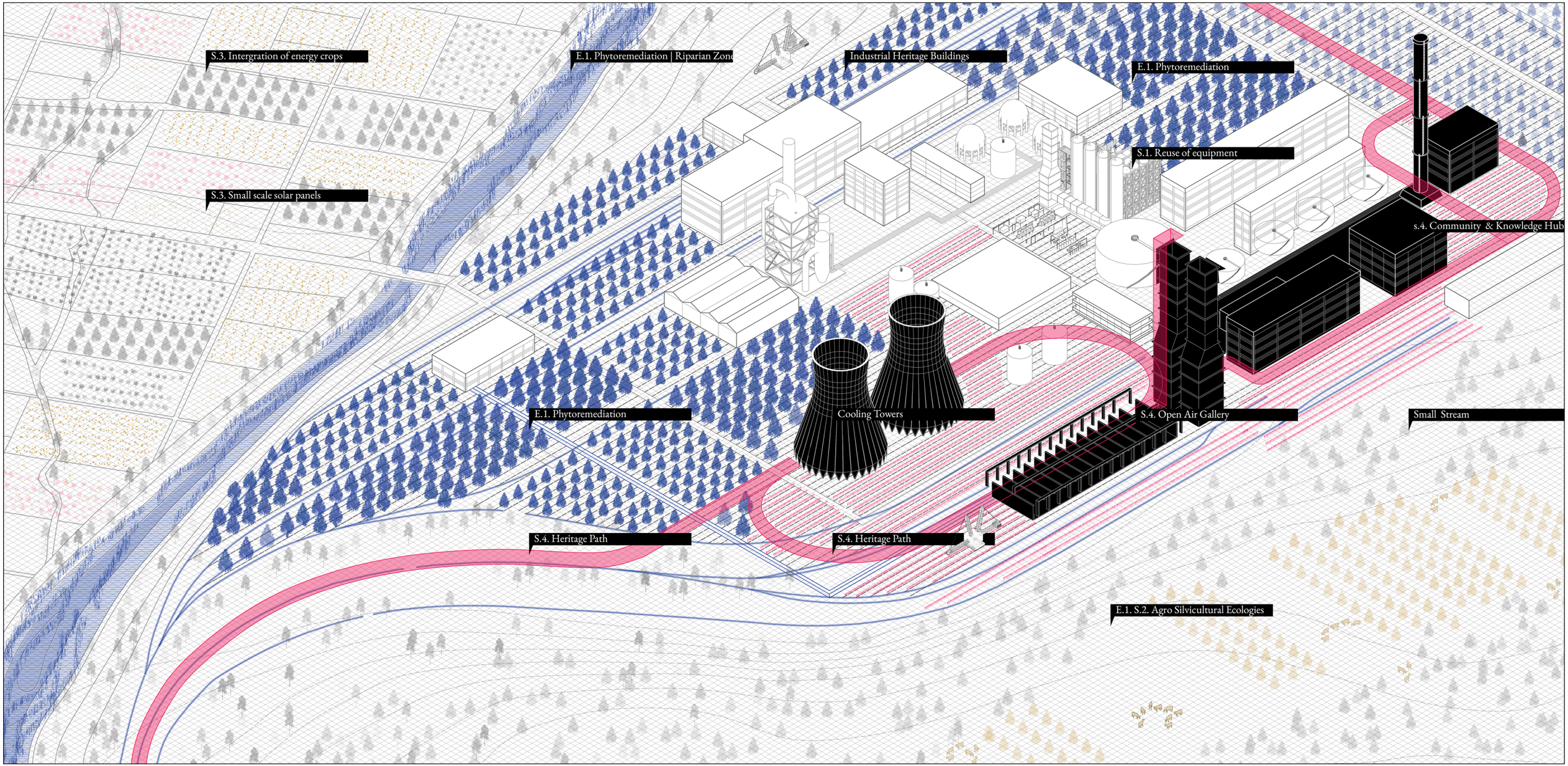


Source | Modica (2014a)



Figure | Site Satellite
Source | Modica (2014a)


Irrigated Agriculture
Polluted Riparian Zone
Industrial Heritage Buildings
Polluted Soil
Refinery Equipment
Industrial Heritage Buildings
Abandoned Railways Tracks
Cooling Towers
Semi-amandoned Open Air Platforms
Small Stream
Abandoned Agriculture Fields


S.3. Intergration of energy crops
E.1. Phytoremediation | Riparian Zone
Industrial Heritage Buildings
E.1. Phytoremediation
S.1. Reuse of equipment
S.3. Small scale solar panels
s.4. Community & Knowledge Hub
E.1. Phytoremediation
Cooling Towers
S.4. Open Air Gallery
Small Stream
S.4. Heritage Path
S.4. Heritage Path
E.1. S.2. Agro Silvicultural Ecologies

Phase 1 | Planning
Year | 0-2

Phase 2 | Open Paths
Year | 2-5

Phase 3 | Building renovation
Year | 5-15

Phase 4 | Building re-use
Year | 15-25

Phase 5 | Park Managment
Year | 25 +

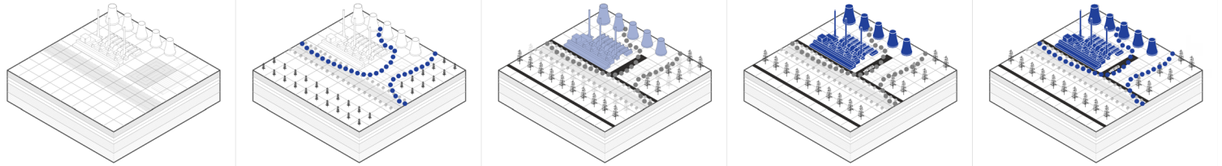


Figure 122
Phasing of phytoremediation

Phase 1 | Planting
Year | 5

Phase 2 | Thinning in rows
Year | 5-10

Phase 3 | Diversifying in rows
Year | 10-15

Phase 4 | Thinning in rows
Year | 15-20

Phase 5| Final Thinning Stabilization
Year | 20-25

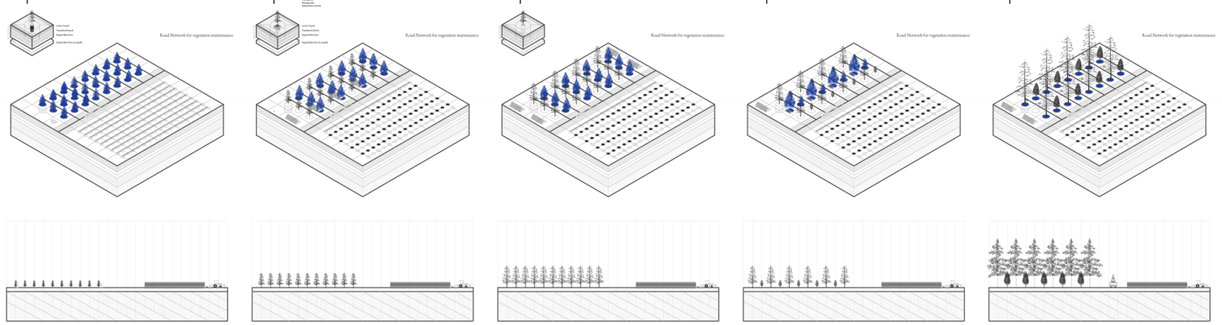


Figure 122
Phasing of phytoremediation

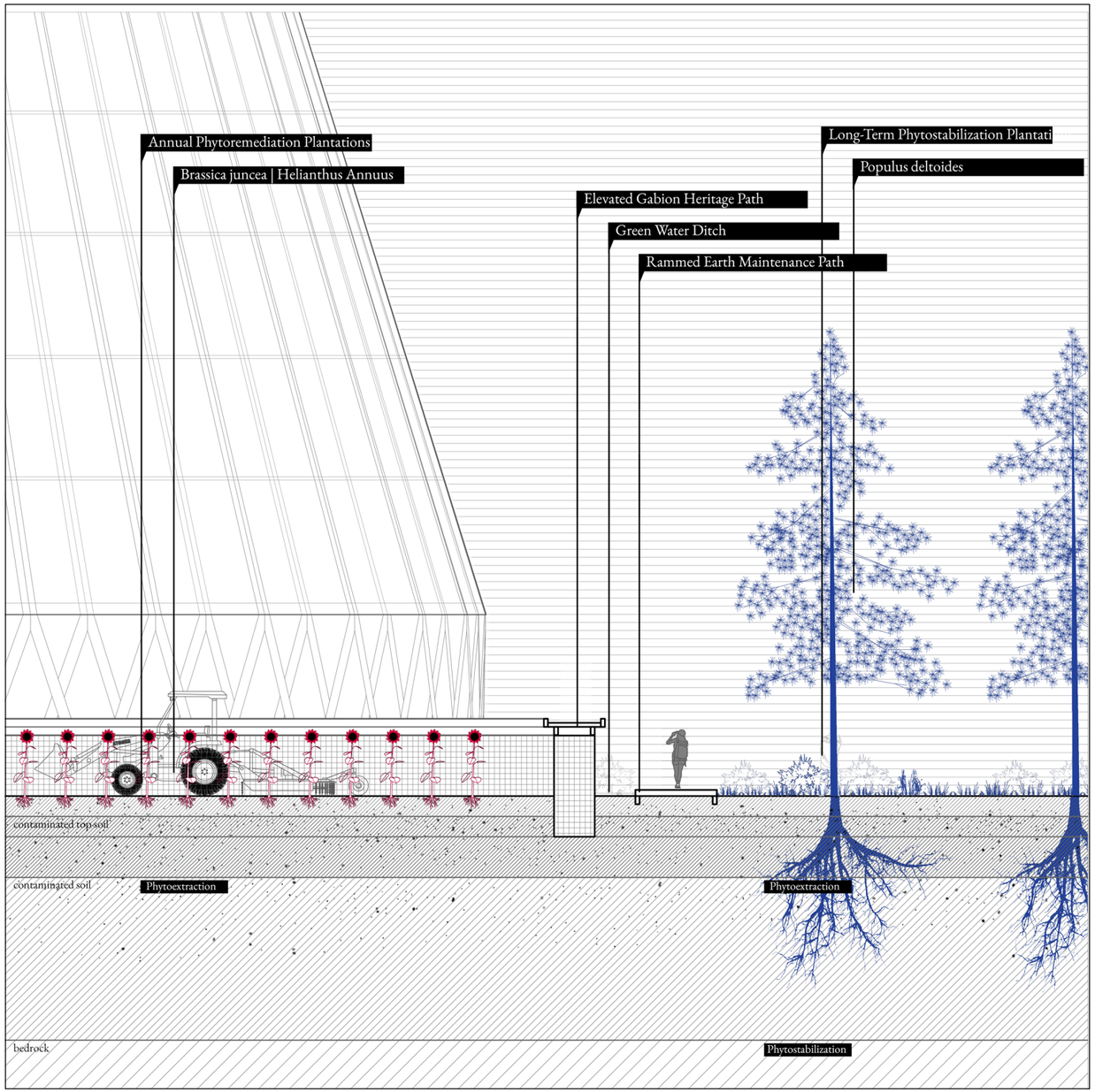
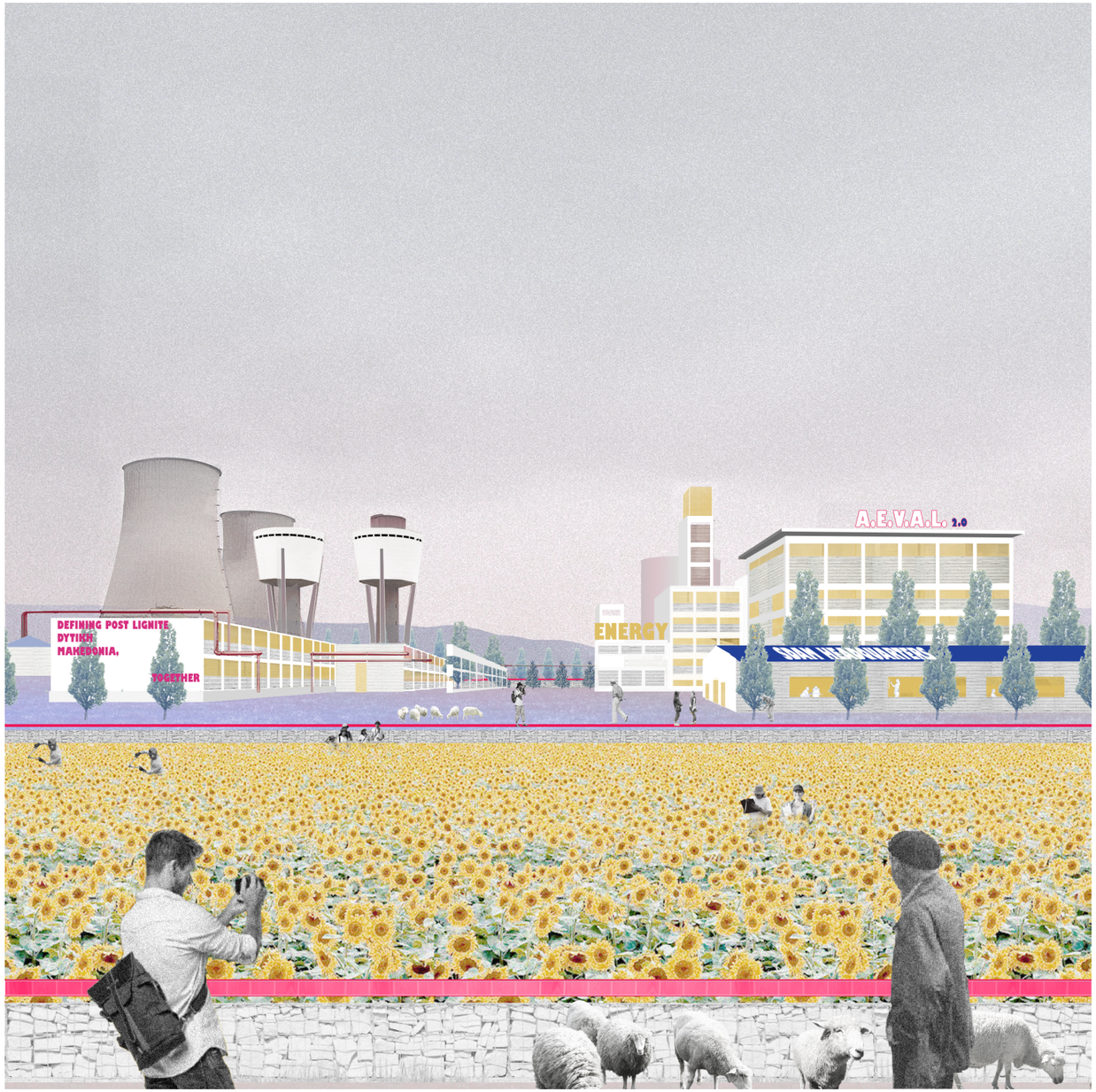


Figure | Detail of phytoremediation
Source | author

Aeval Industrial Complex | 2060 | Spatial Impression







Source | Modica (2014a)



Source | Modica (2014a)

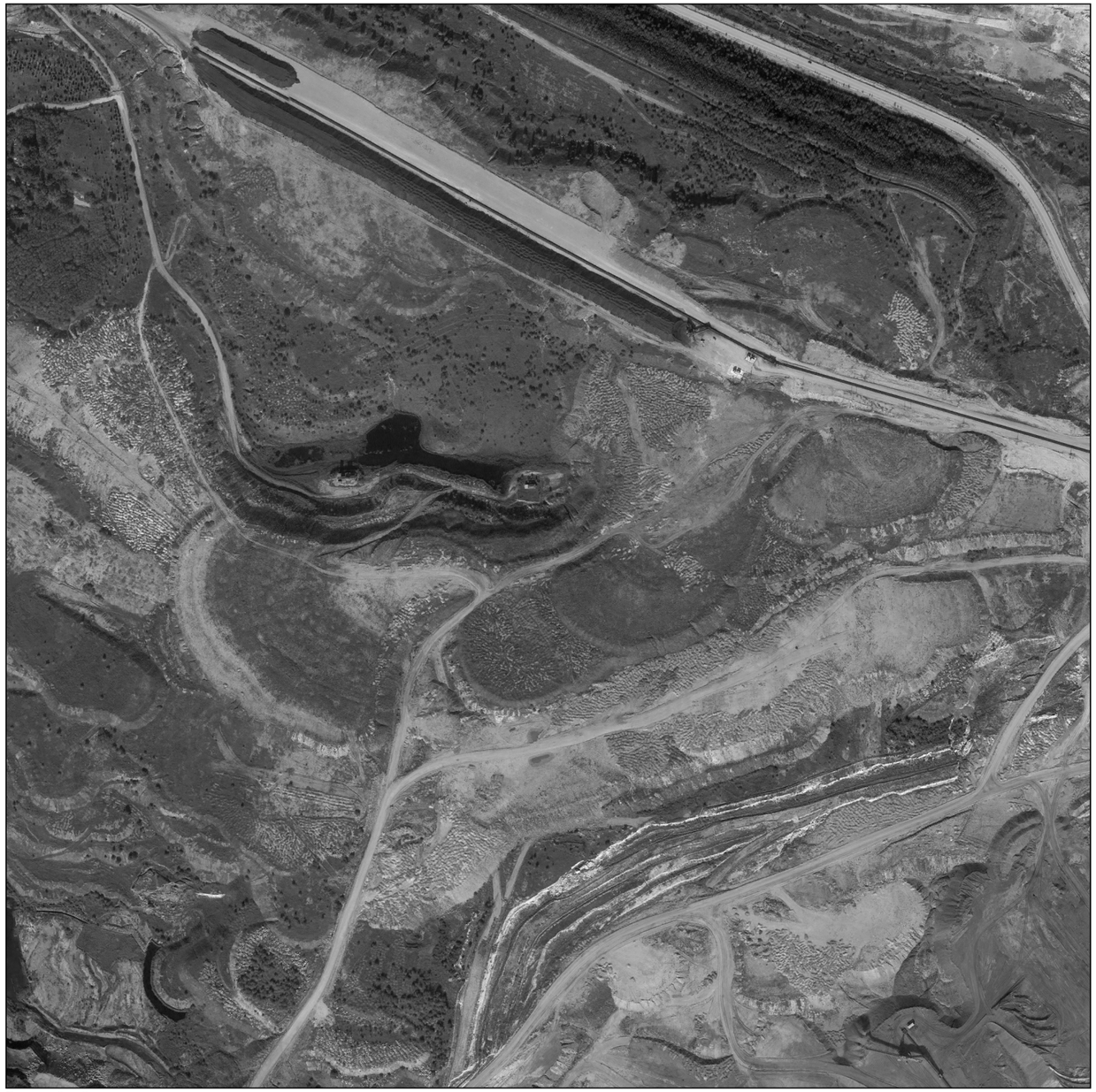
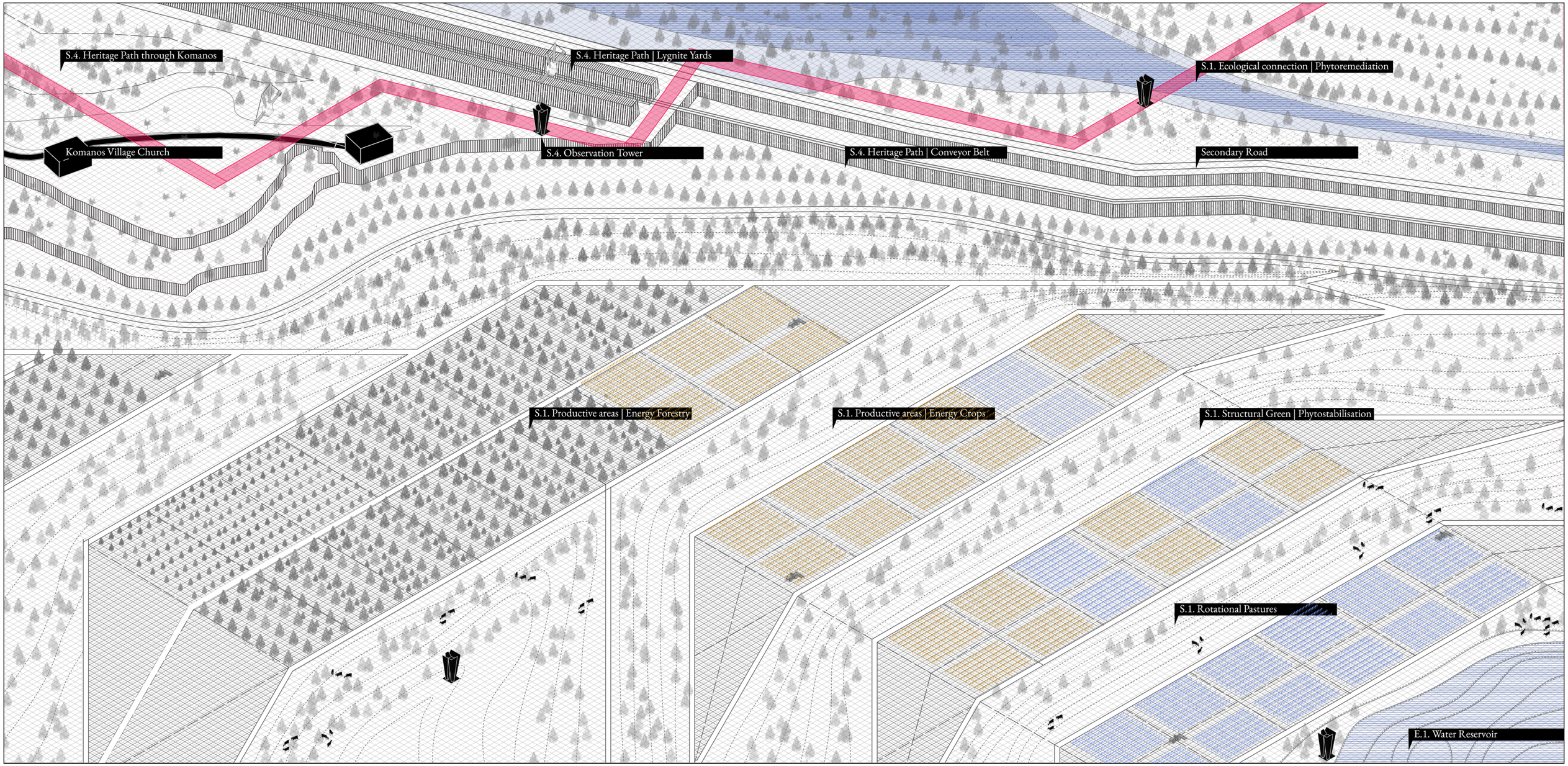


Figure | Site Satellite
Source | Modica (2014a)

Ecological Restoration | Kardia Field | 2023



Ecological Restoration | Kardia Field | 2060



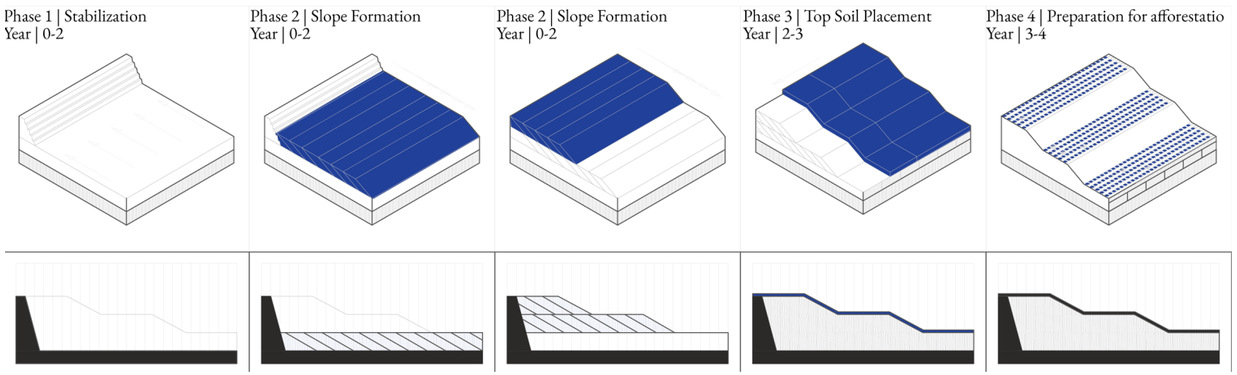


Figure 142
Phasing of mine restoration in Kardia Field mine

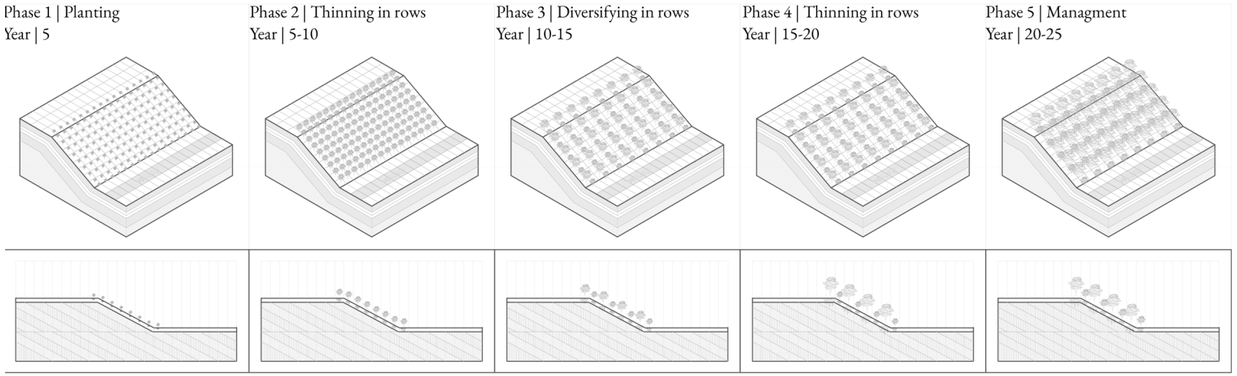


Figure 143
Phasing of energy forestry in Kardia Field mine

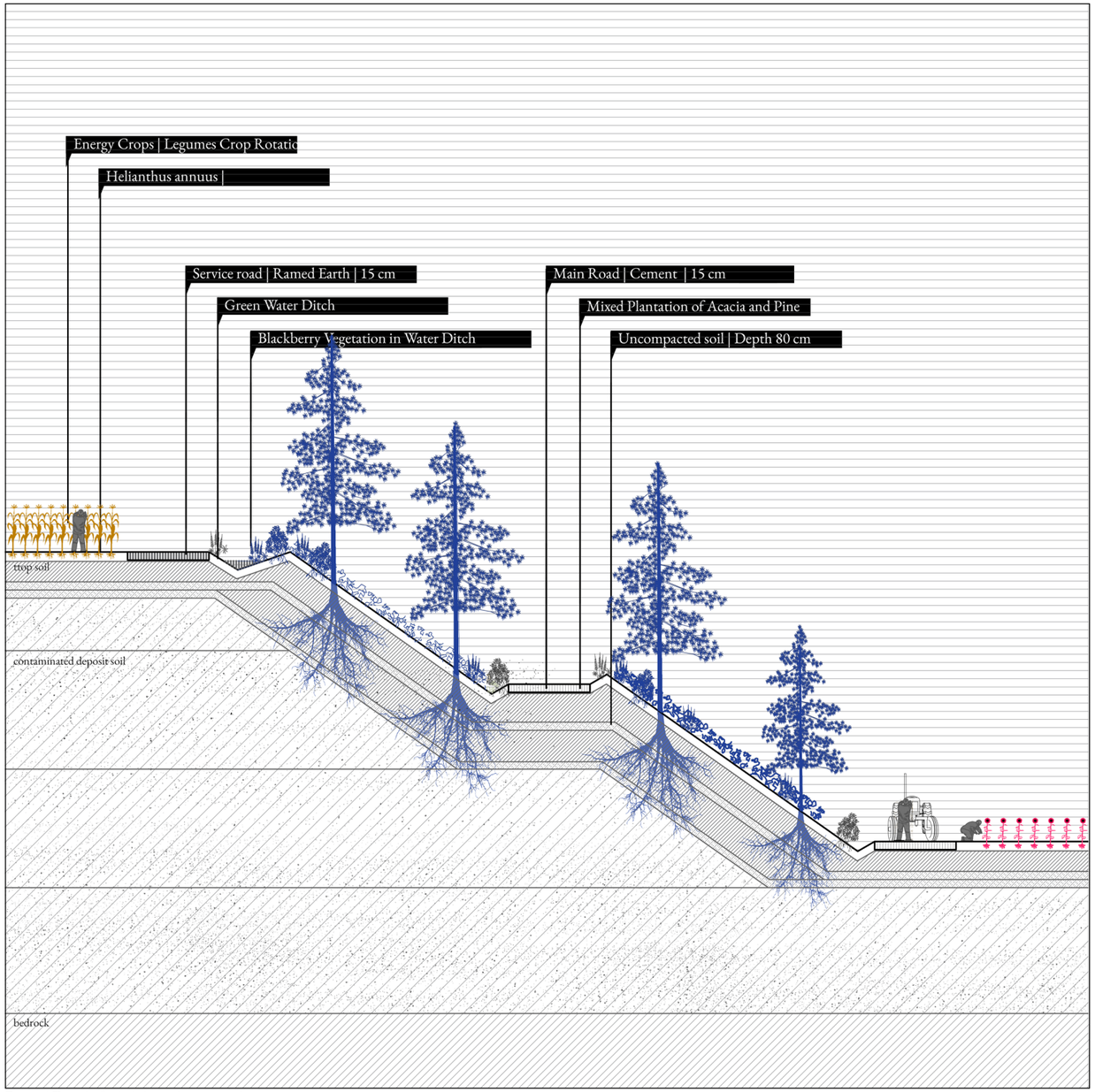
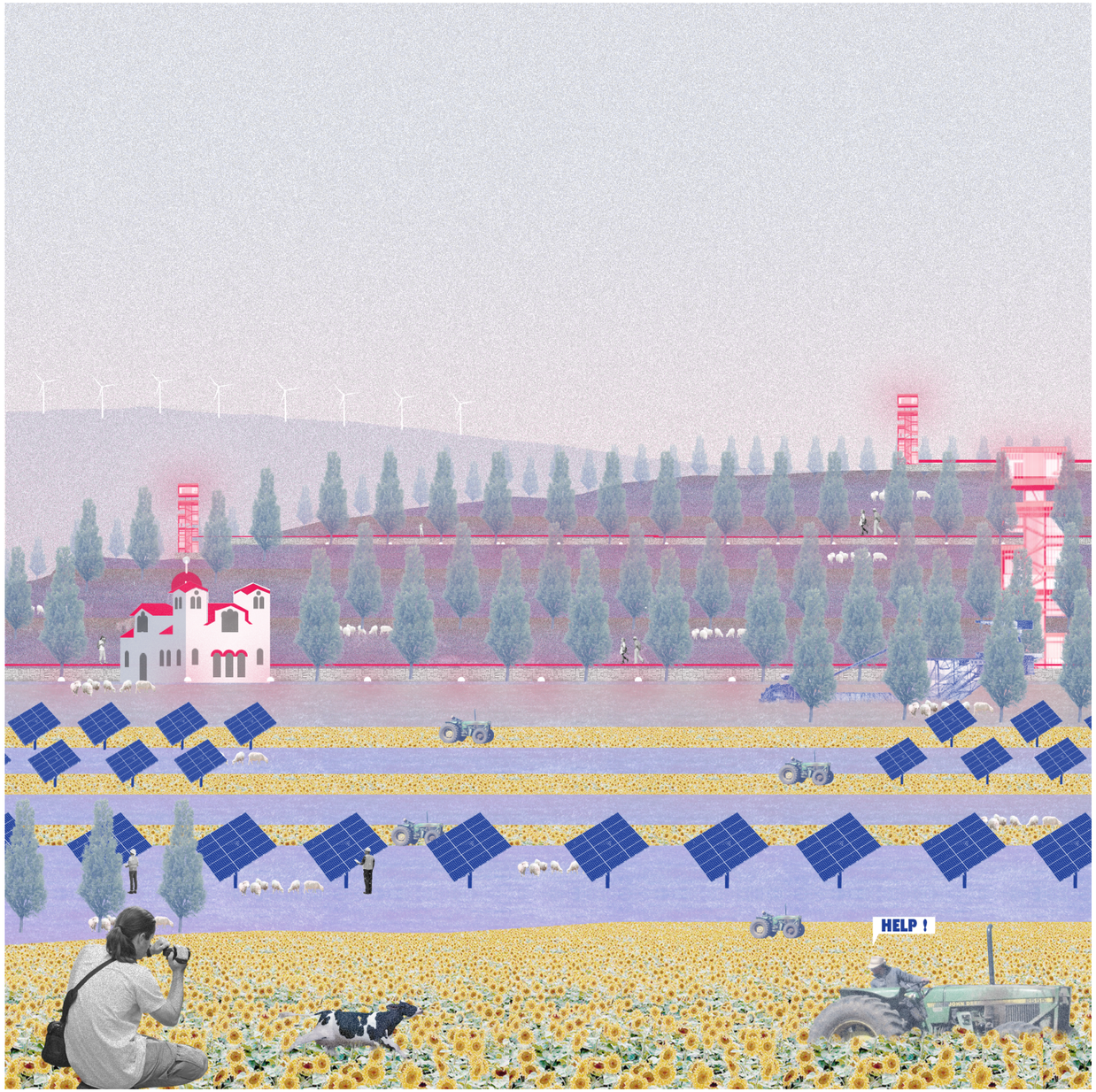


Figure | Detail of rehabilitated mines and new energy landscape in Kardia Field mine _ source | author

Kardia Field | 2060 | Spatial Impression



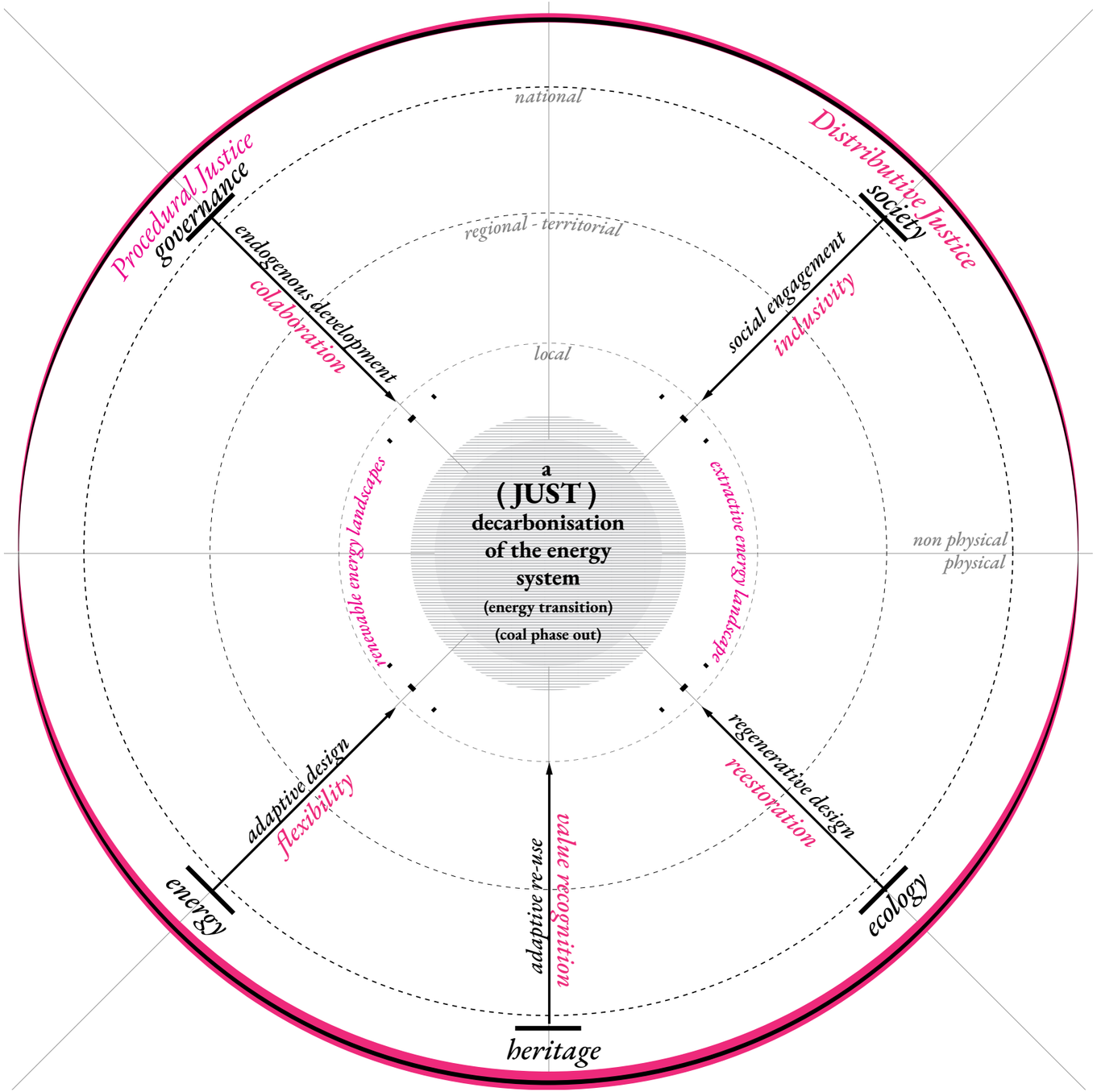


Conclusions

1. Answering the research question

Main RQ

How can the re-configuration of the ***energy landscape*** of Western Macedonia establish a more ***environmentally*** and ***socially*** sustainable region while ensuring ***spatial, distributive and procedural*** Justice?



3. On transferability of methodology

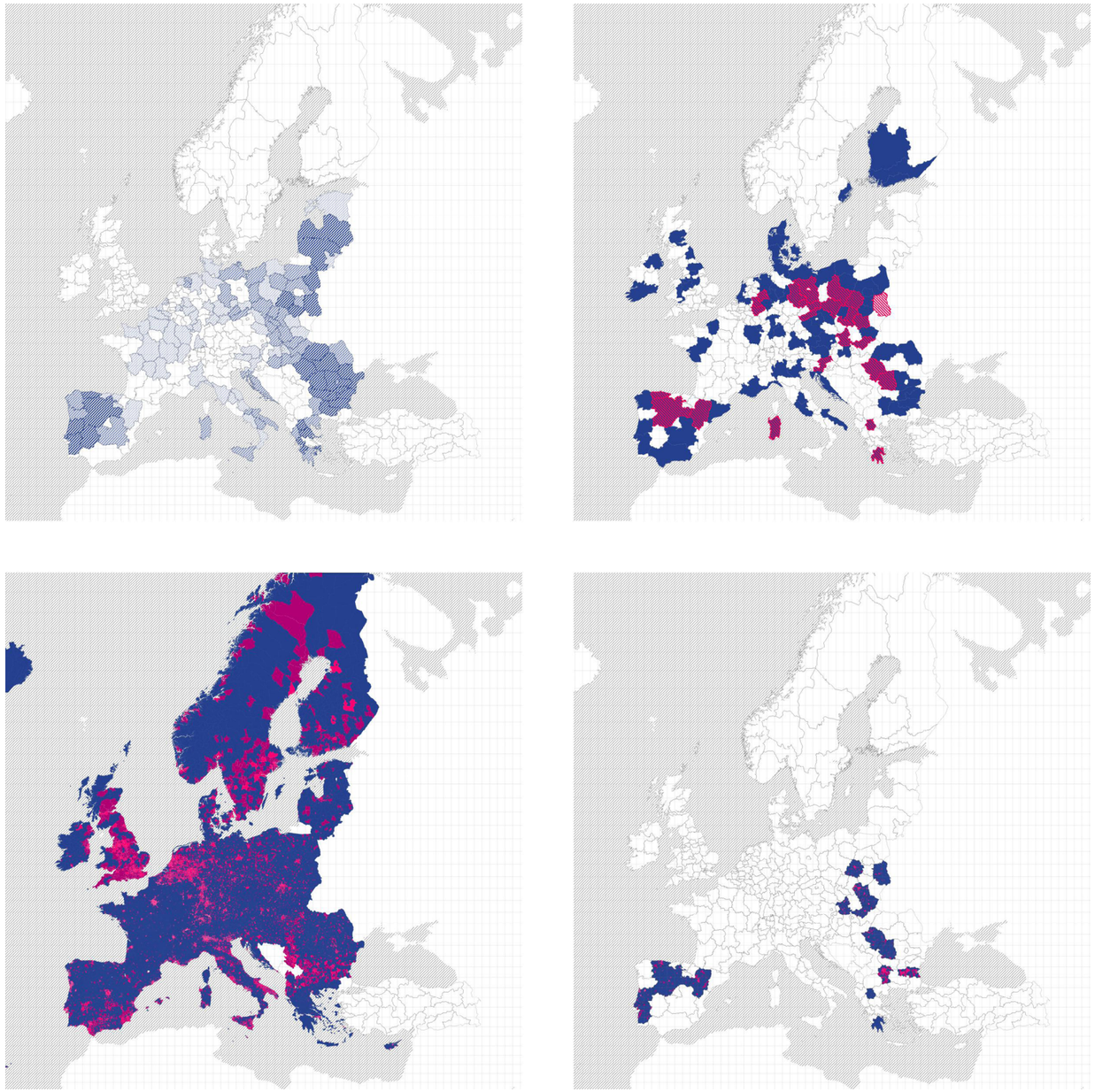


Figure | Transferability Matrix
Sources | EEA (2020), Patricia et al. (2018)

4. On the limitations of this transition

- *Transition already in progress*
- *Division in stakeholders*
- *Mistrust in national, regional governance*
- *Geopolitical uncertainties*



Figure | Miners collectively pulling a hose
Source | Economopoulos & Elektrismou (1998)

On the journey

ITHAKA

Σὰ βγεῖς στὸν πηγαιμὸ γιὰ τὴν Ἰθάκη,	As you set out for Ithaka
νὰ εὔχεσαι νἄναι μακρὺς ὁ δρόμος,	hope your road is a long one,
γεμάτος περιπέτειες, γεμάτος γνώσεις.	full of adventure, full of discovery.
Τοὺς Λαιστρυγόνας καὶ τοὺς Κύκλωπας,τὸν	Laistrygonians, Cyclops,
θυμωμένο Ποσειδῶνα μὴ φοβᾶσαι,	angry Poseidon—don't be afraid of them:
τέτοια στὸν δρόμο σου ποτέ σου δὲν θὰ βρεῖς,	you'll never find things like that on your way
ἂν μέν' ἡ σκέψις σου ὑψηλή, ἂν ἐκλεκτὴ	as long as you keep your thoughts raised high,
συγκίνησις τὸ πνεῦμα καὶ τὸ σῶμα σου ἀγγίζει.	as long as a rare excitement stirs your spirit and your body.
Τοὺς Λαιστρυγόνας καὶ τοὺς Κύκλωπας,	Laistrygonians, Cyclops,
τὸν ἄγριο Ποσειδώνα δὲν θὰ συναντήσεις,	wild Poseidon—you won't encounter them
ἂν δὲν τοὺς κουβανεῖς μὲς στὴν ψυχή σου,	unless you bring them along inside your soul,
ἂν ἡ ψυχή σου δὲν τοὺς στήνει ἐμπρός σου.	unless your soul sets them up in front of you.
Νὰ εὔχεσαι νά 'ναι μακρὺς ὁ δρόμος.	Hope your road is a long one.
Πολλὰ τὰ καλοκαιρινὰ πρωϊὰ νὰ εἶναι	May there be many summer mornings when,
ποὺ μὲ τί εὐχαρίστηση, μὲ τί χαρὰ	with what pleasure, what joy,
θὰ μπαίνεις σὲ λιμένας πρωτοειδωμένους·	you enter harbors you're seeing for the first time;
Νὰ σταματήσεις σ' ἐμπορεῖα Φοινικικά,	may you stop at Phoenician trading stations
καὶ τὲς καλὲς πραγμάτειες ν' ἀποκτήσεις,	to buy fine things,
σεντέφια καὶ κοράλλια, κεχριμπάρια κ' ἔβενους,	mother of pearl and coral, amber and ebony,
καὶ ἡδονικὰ μυρωδικὰ κάθε λογῆς,	sensual perfume of every kind—
ὅσο μπορεῖς πιὸ ἄφθονα ἡδονικὰ μυρωδικά.	as many sensual perfumes as you can;
Σὲ πόλεις Αἰγυπτιακὲς πολλὲς νὰ πᾷς,	and may you visit many Egyptian cities
νὰ μάθεις καὶ νὰ μάθεις ἀπ' τοὺς σπουδασμένους.	to learn and go on learning from their scholars.
Πάντα στὸ νοῦ σου νἄχῃς τὴν Ἰθάκη.	Keep Ithaka always in your mind.
Τὸ φθάσιμον ἐκεῖ εἶν' ὁ προορισμός σου.	Arriving there is what you're destined for.
Ἀλλὰ μὴ βιάζῃς τὸ ταξείδι διόλου.	
	But don't hurry the journey at all.
Καλλίτερα χρόνια πολλὰ νὰ διαρκέσει.	Better if it lasts for years,
Καὶ γέρος πιὰ ν' ἀράξῃς στὸ νησί,	so you're old by the time you reach the island,
πλούσιος μὲ ὅσα κέρδισες στὸν δρόμο,	wealthy with all you've gained on the way,
μὴ προσδοκώντας πλούτη νὰ σὲ δώσῃ ἡ Ἰθάκη.	not expecting Ithaka to make you rich.
Ἡ Ἰθάκη σ' ἔδωσε τ' ὡραῖο ταξίδι.	Ithaka gave you the marvelous journey.
Χωρὶς αὐτὴν δὲν θἄβγαινες στὸν δρόμο.	Without her you wouldn't have set out.
Ἄλλα δὲν ἔχει νὰ σὲ δώσει πιά.	She has nothing left to give you now.
Κι ἂν πτωχικὴ τὴν βρῇς, ἡ Ἰθάκη δὲν σὲ γέλασε.	And if you find her poor, Ithaka won't have fooled you.
Ἔτσι σοφὸς ποὺ ἔγινες, μὲ τόση πείρα,	Wise as you will have become, so full of experience,
ἤδη θὰ τὸ κατάλαβες ἡ Ἰθάκες τί σημαίνουν	you'll have understood by then what these Ithakas mean.

ΙΘΑΚΗ

Figure | top | Ithaka
Source | Cavafy, C. P. (1992). Collected poems. Princeton University Press.

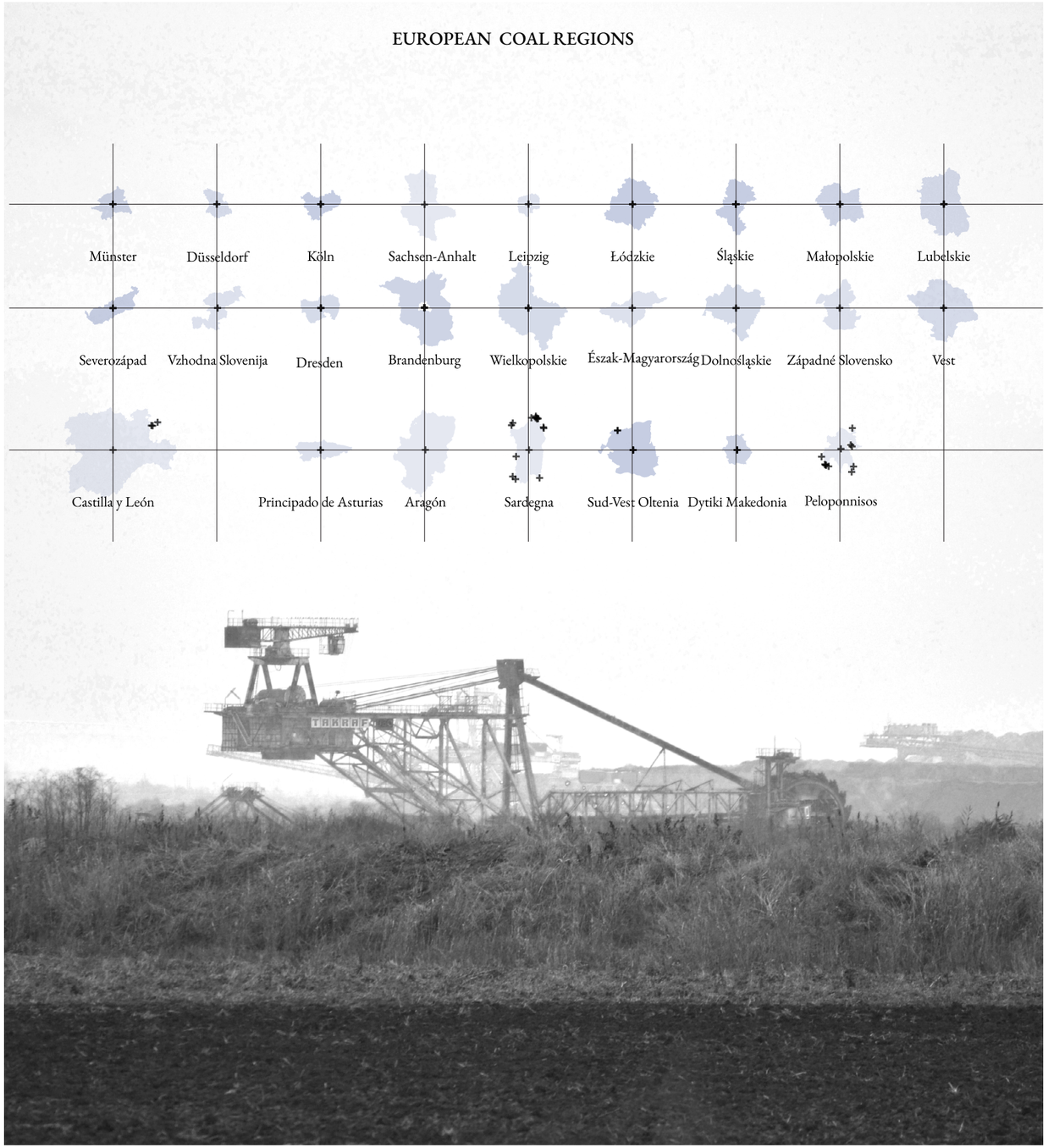


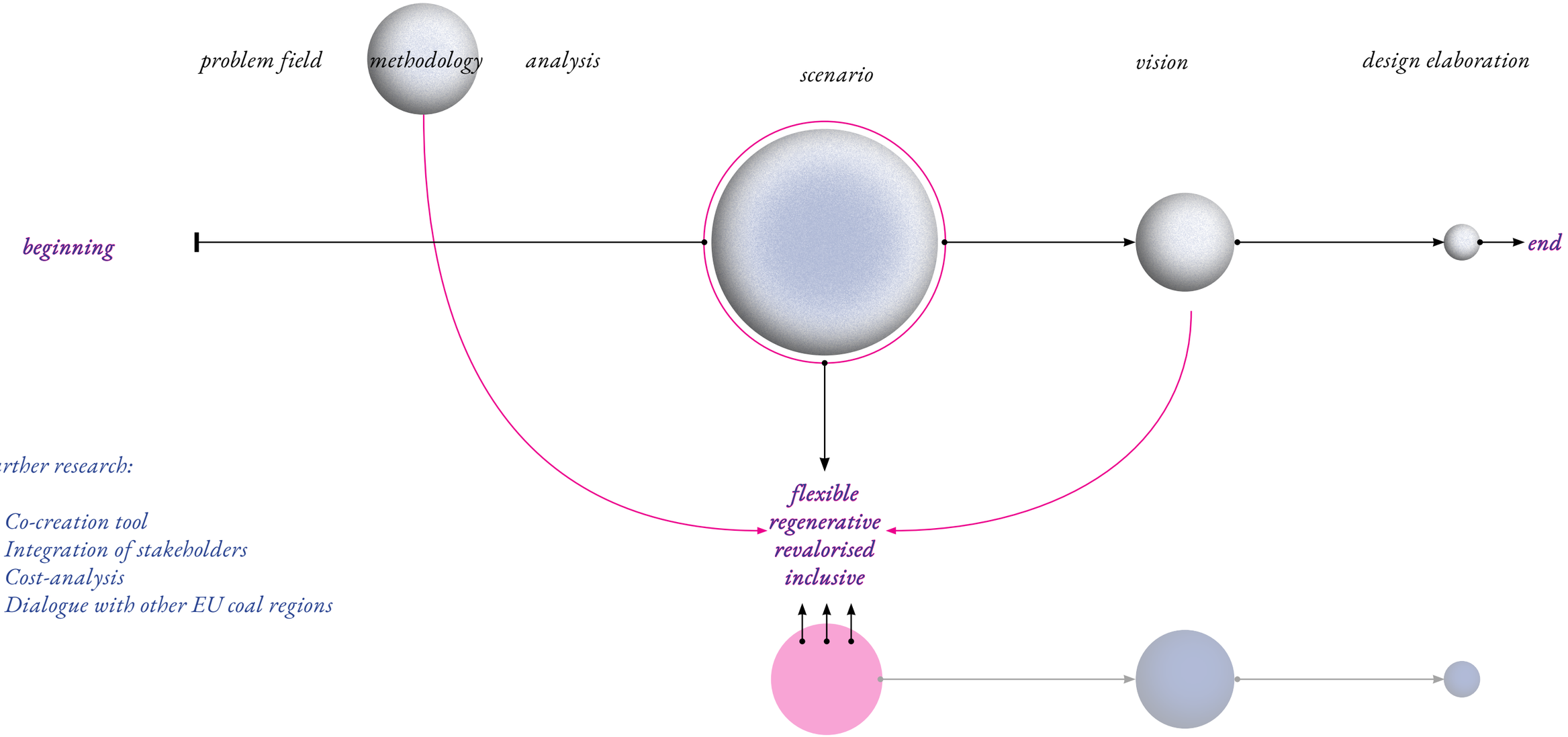
Figure | right | EU coal regions in transition
Source | copernicus, author

Thank you

everyone here and at home !

Appendicies

Limitations of this project



Further research:

- *Co-creation tool*
- *Integration of stakeholders*
- *Cost-analysis*
- *Dialogue with other EU coal regions*

Figure | limitations of method
Source | author

Scaling Up

- *Need for recognition of local conditions*
- *Need for cross-boundary collaborations*
- *Need for inter-grated planning*
- *Urgent need for empowerment of local communities*

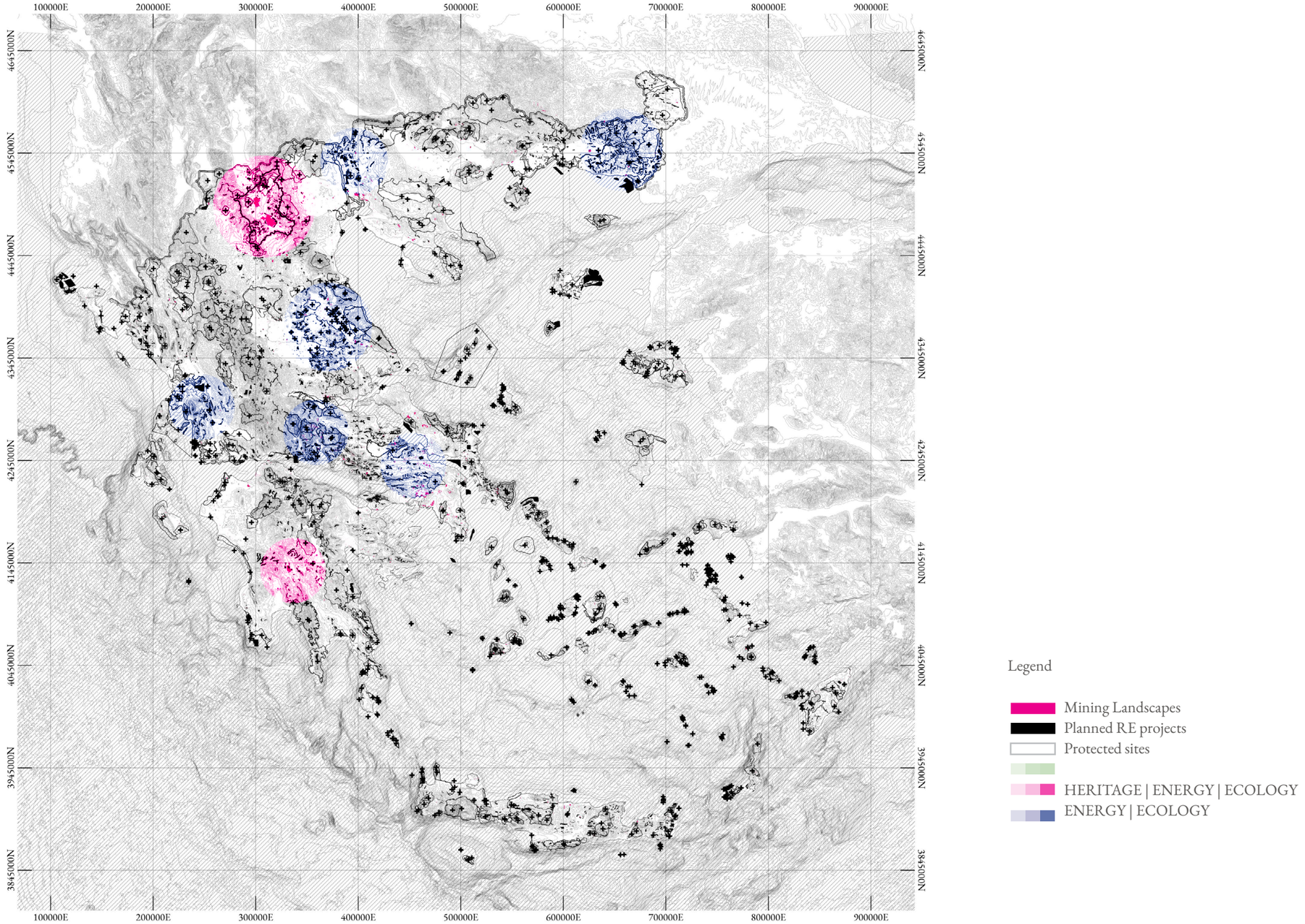


Figure | scaling up
Source | copernicus, ELSTAT, author

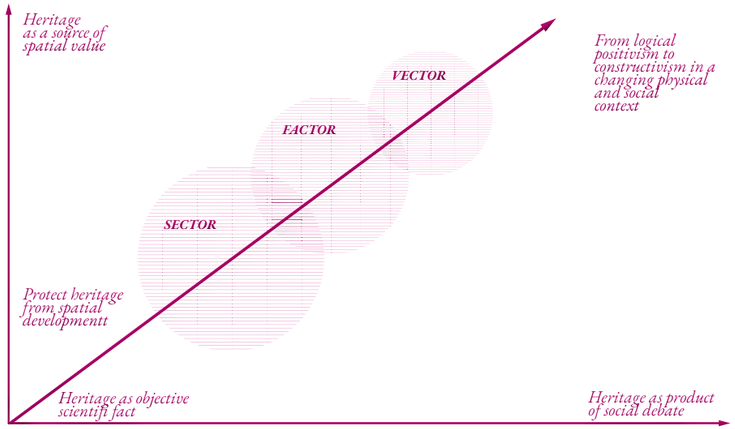
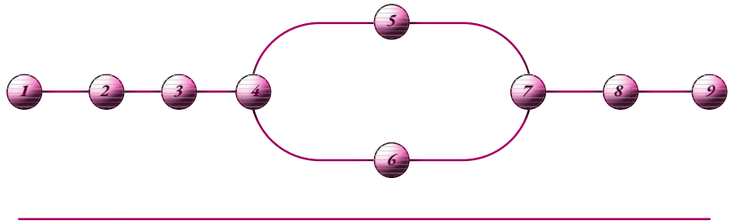


Figure 23: Shifting conceptualizations of heritage
Source: Janssen et al. (2017)



1. Design to build
2. Design stage
3. Construction stage
4. Occupancy.
5. Maintenance
6. Adaption
7. Irreversible building obsolesce sets in
8. Building fully obsolete
9. Despose | Demolish

Figure 24: Shifting conceptualizations of heritage
Source: Janssen et al. (2017)

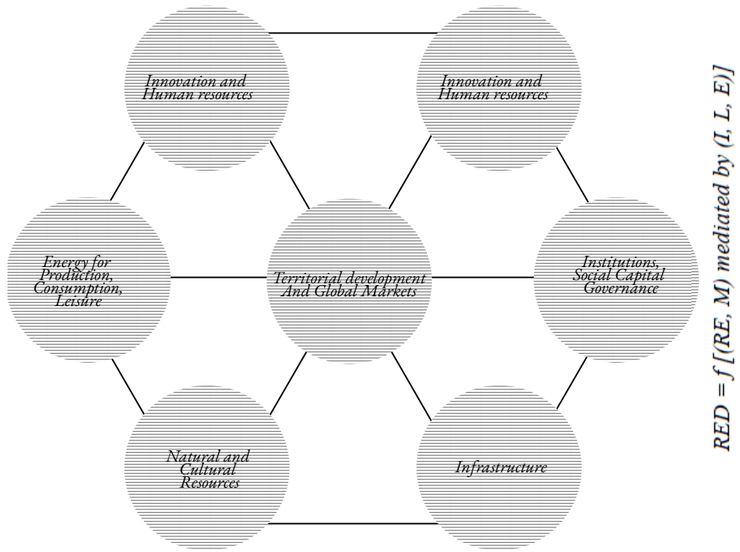


Figure 21: Territorial development diagram adapted from Source: Vázquez-Barquero & Rodríguez-Cohard (2017)

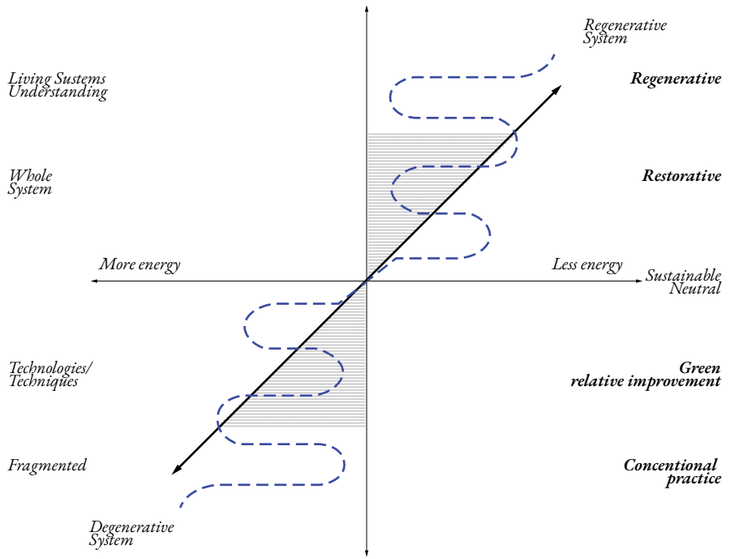


Figure 20: Regenerative Development Diagram
Source: adapted from Reed (2007)

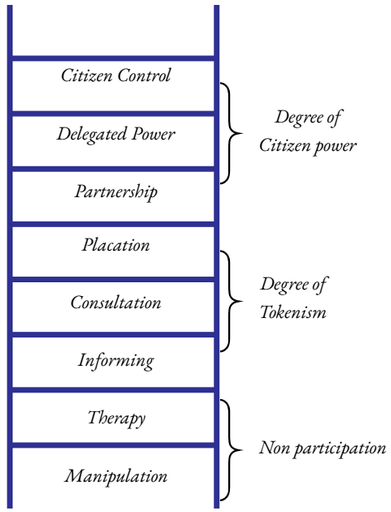
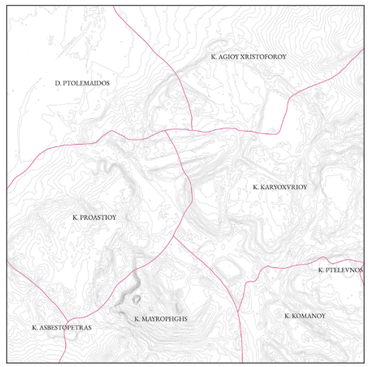
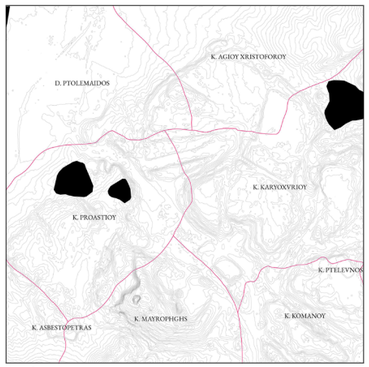


Figure 22: The Participatory Ladder of Arnstein
adapted from Source: X

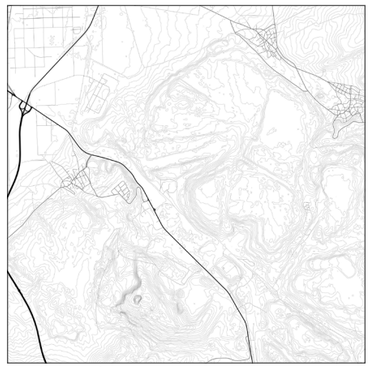
Site Conditions

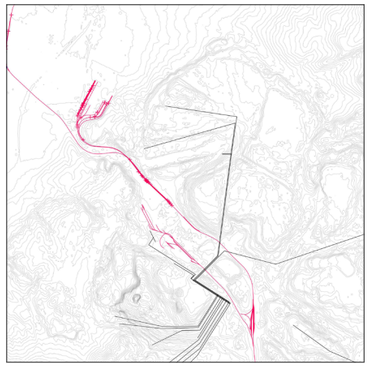


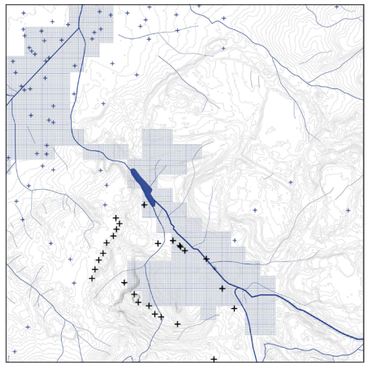
Administrative Boundaries NUTS 4

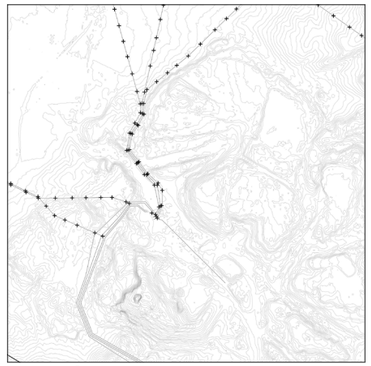


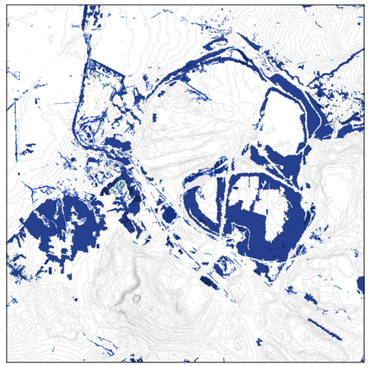
Settlements

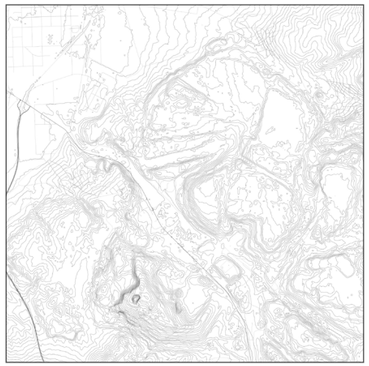

Road Network


Water Structure


Heritage Spaces


Energy Infrastructure





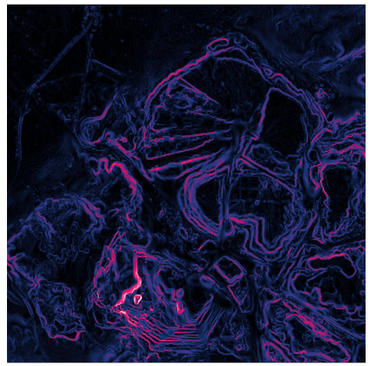


Figure | Local conditions
Source | open street map, google earth, ppc

Problem Framework

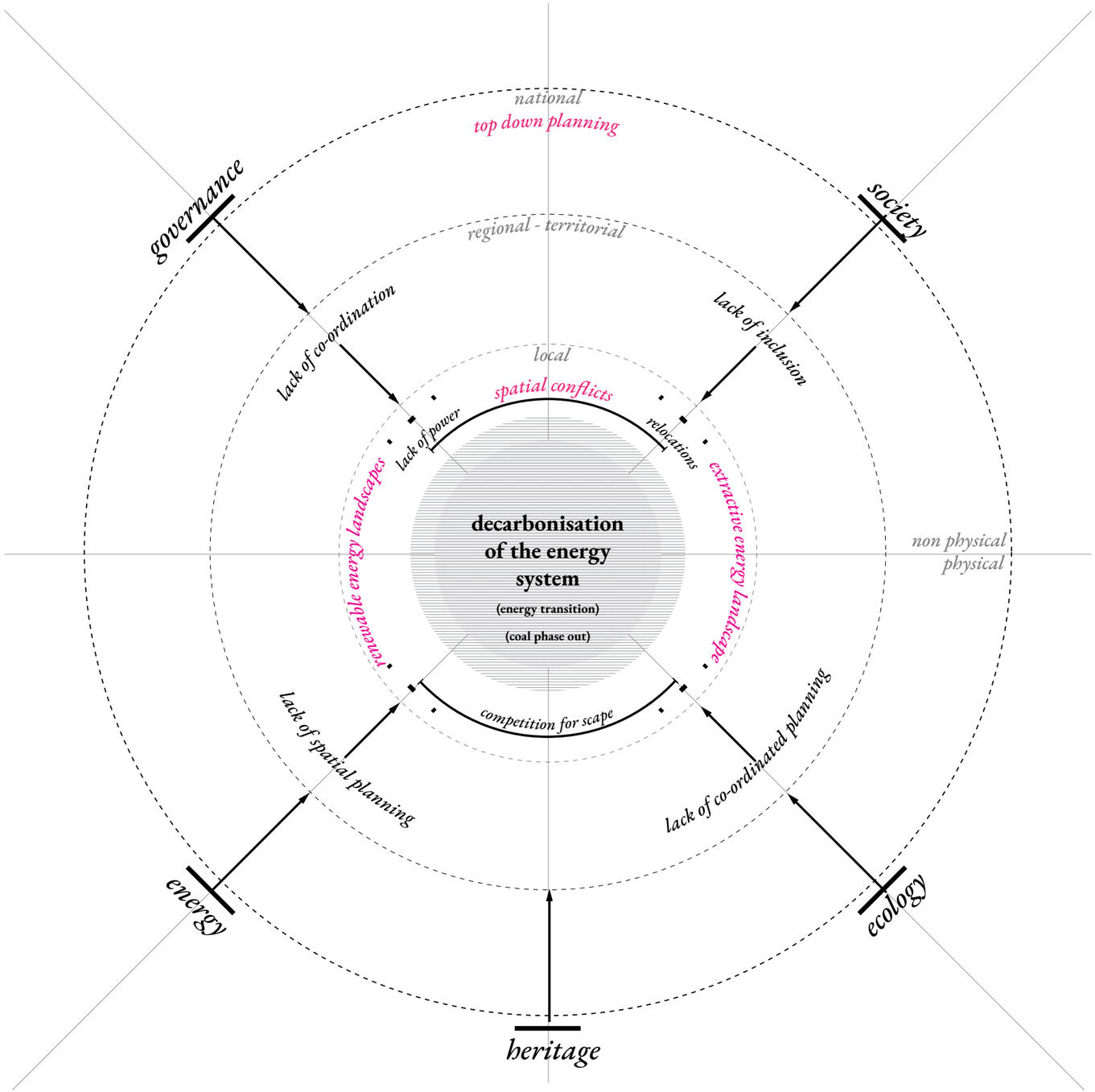


Figure | Problem Statement Framework
Source | author

Phasing

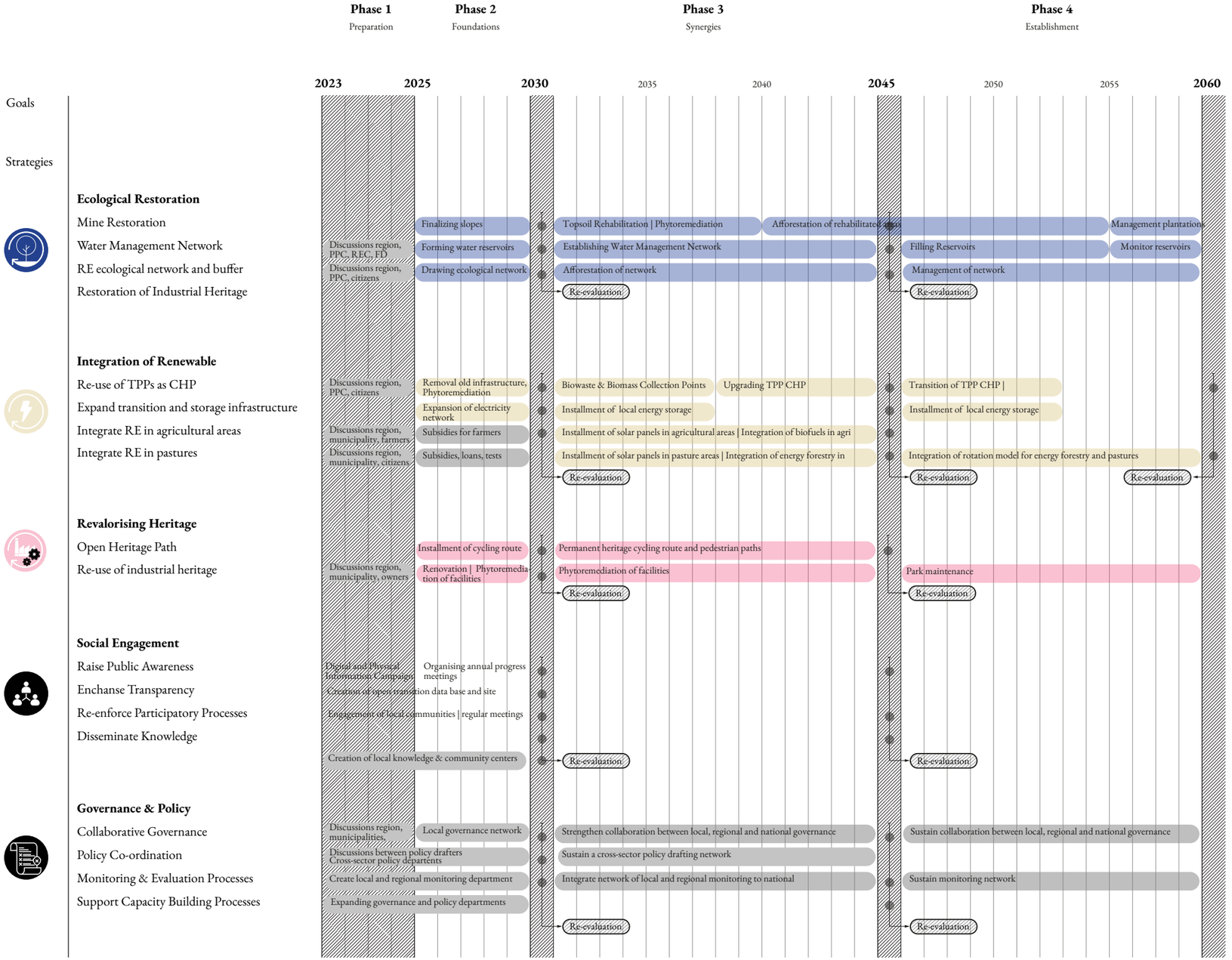


Figure | Strategies Phasing
Source | author

Scenario 1 | Solaria

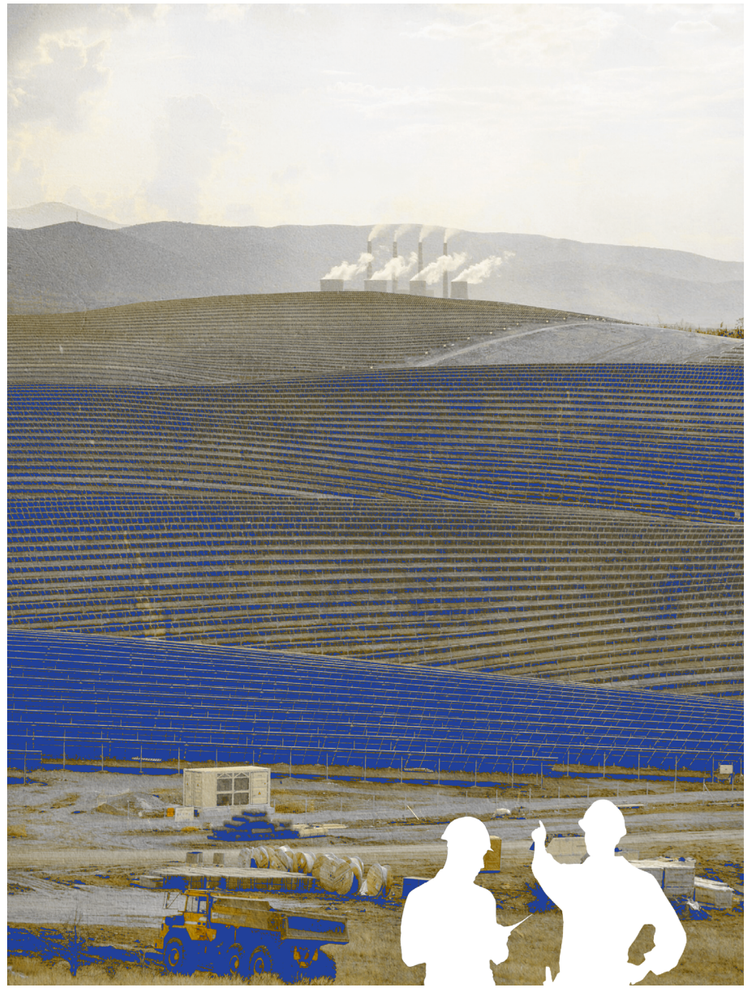


Figure | Collage Solaria | Source | author

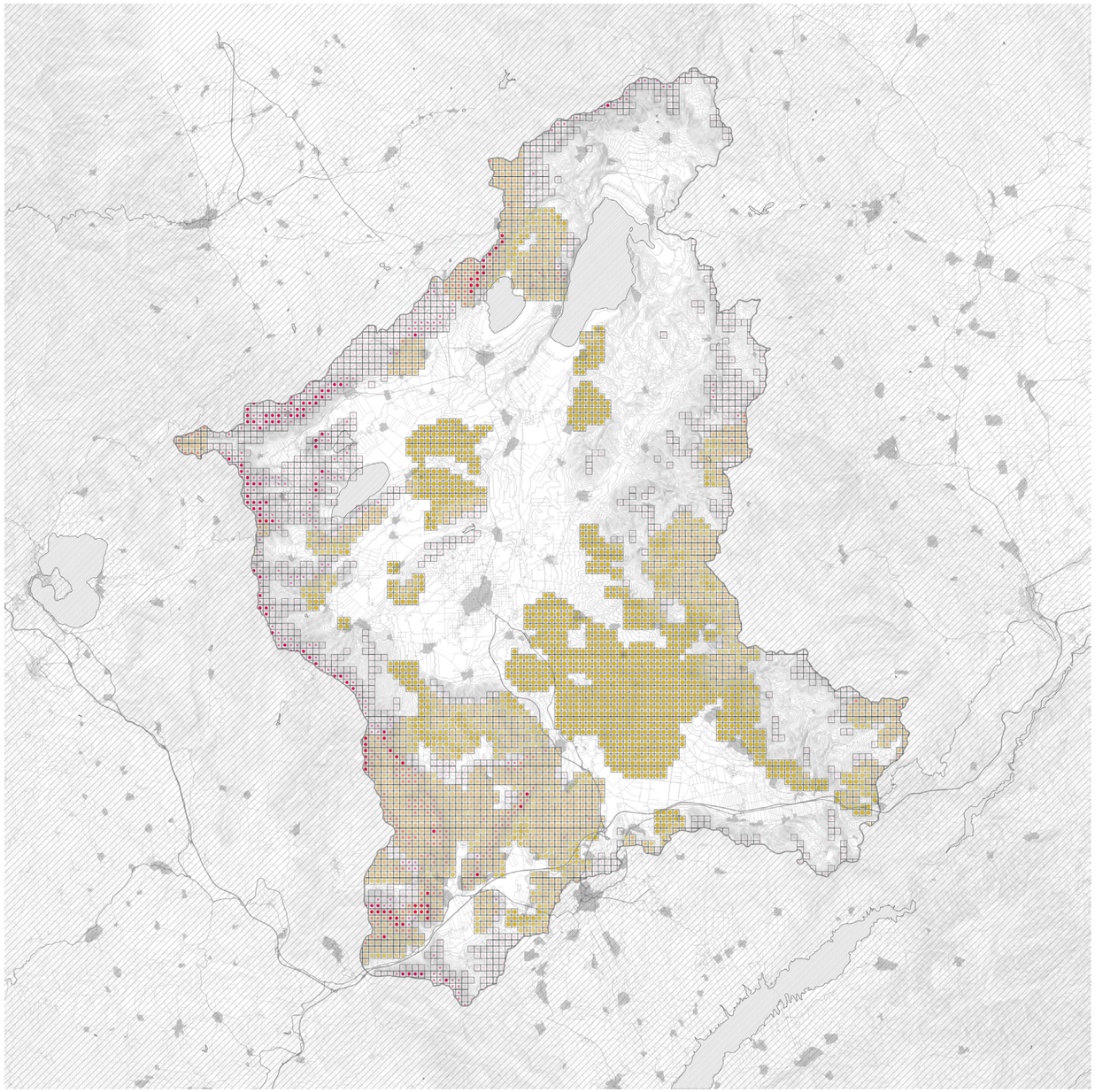


Figure | Scenario Solaria | Territorial Map
Source | author

Scenario 2 | Modernization

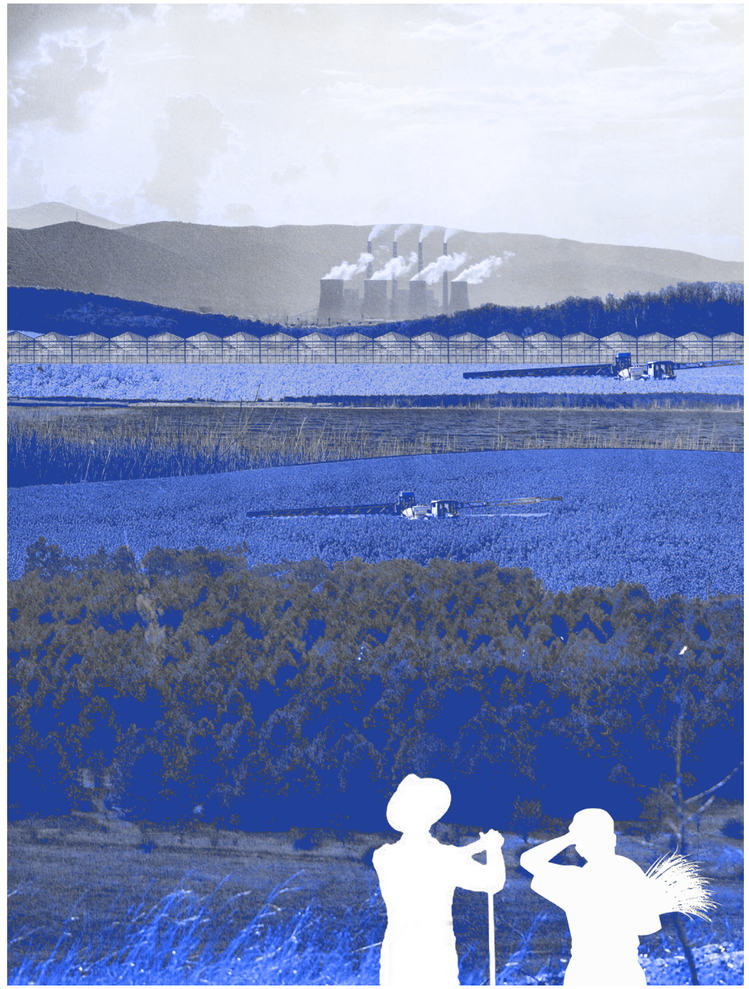


Figure | Collage Solaria | Source | author

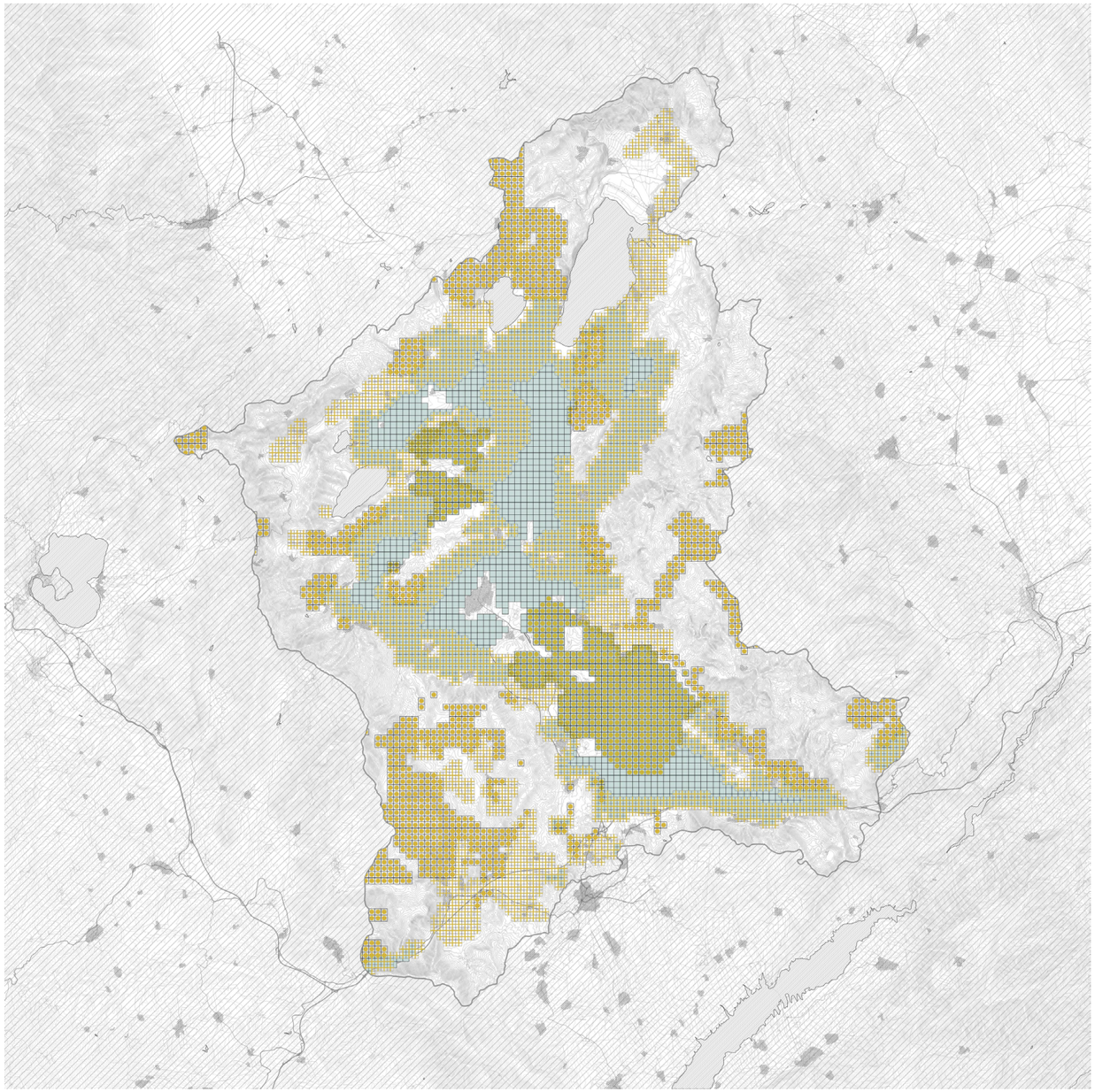


Figure | Scenario Modernisation | Territorial Map
Source | author

Scenario 3 | Biofuels

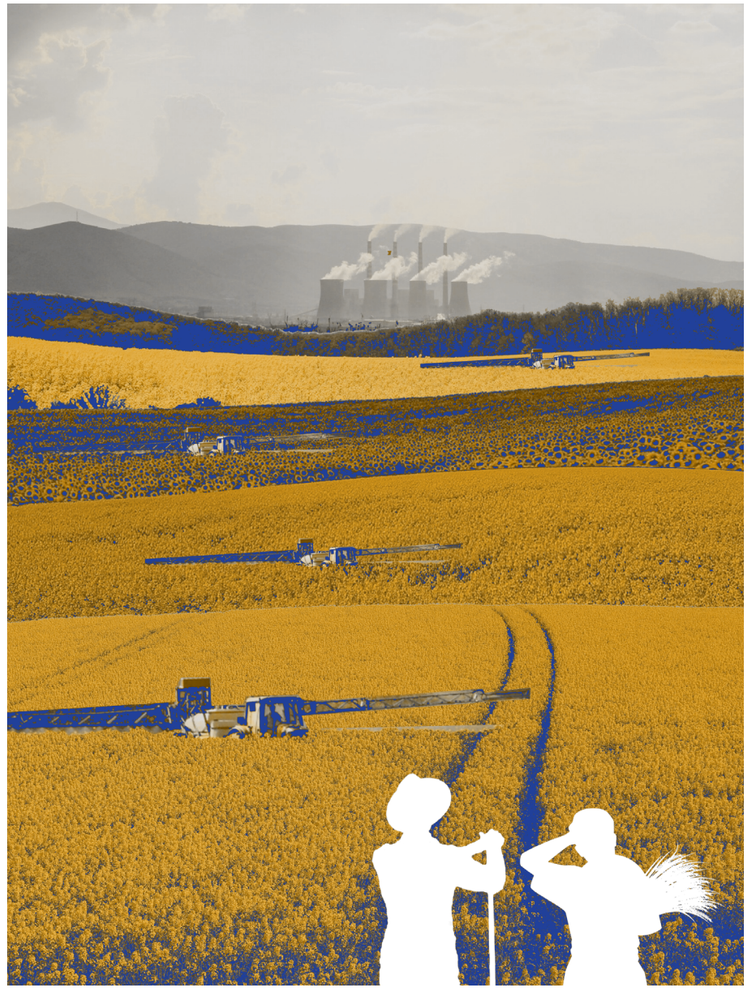


Figure | Collage Solaria | Source | author

Legend

- Large scale solar pastures
- Energy Forestry mines
- Integration bio-fuels agree
- Bio-fuels CTP

N

0 10 km

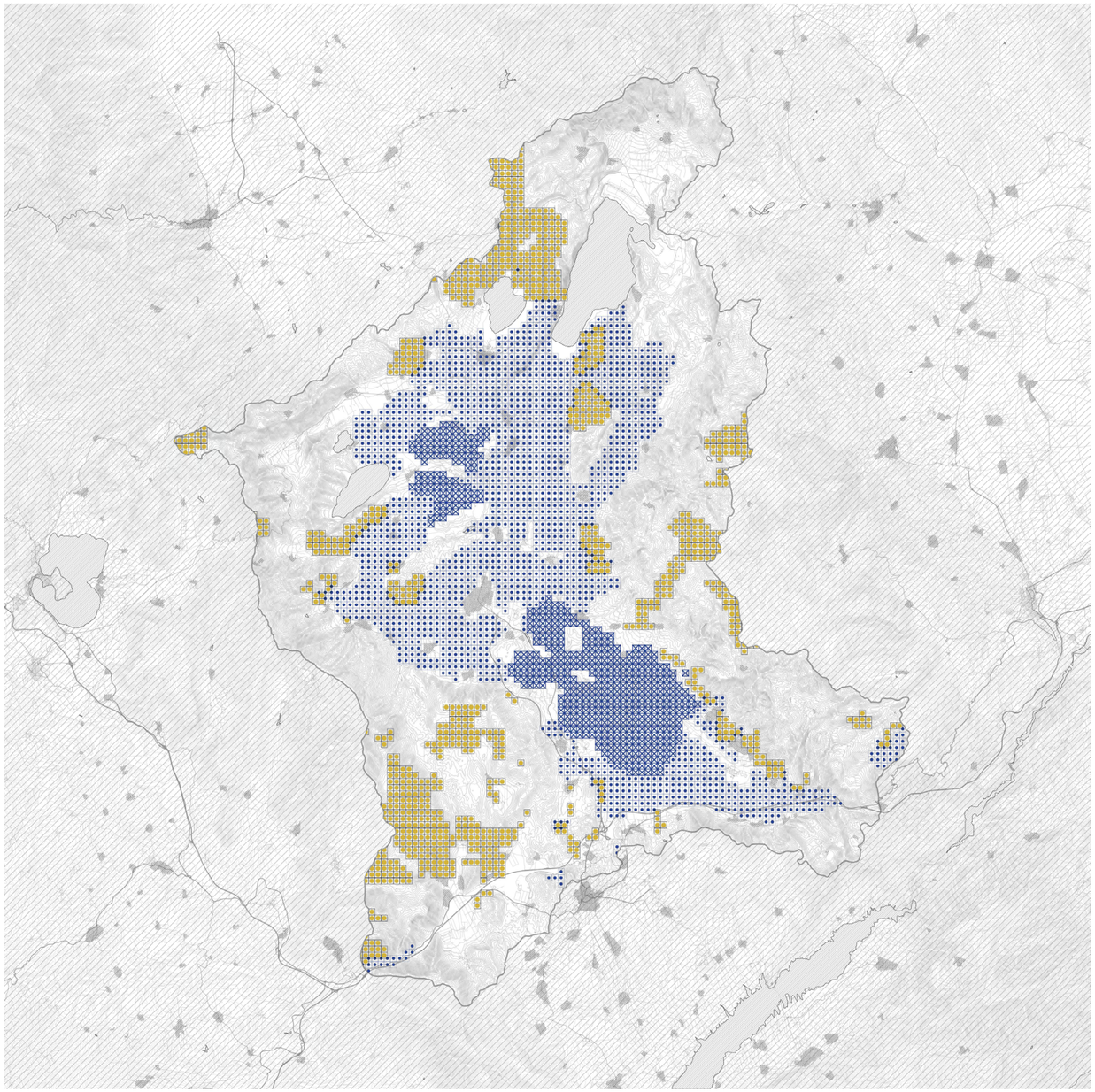


Figure | Scenario Biofuels | Territorial Map
Source | author

Scenario 4 | De-growth



Figure | Collage Solaria | Source | author

Legend

- Energy Forestry in pastures and mines
- Water reservoirs
- Bio-fuels agriculture
- Biomass Power Plant

N

0 10 km

Figure | Scenario Modernisation | Territorial Map
Source | author