

Flourishing Foodvalley

Pattern language as a co-design method to approach the transition towards circular agricultural systems in a hybrid landscape.

I

location

II

problem

III

knowledge
gap

IV

theory

V

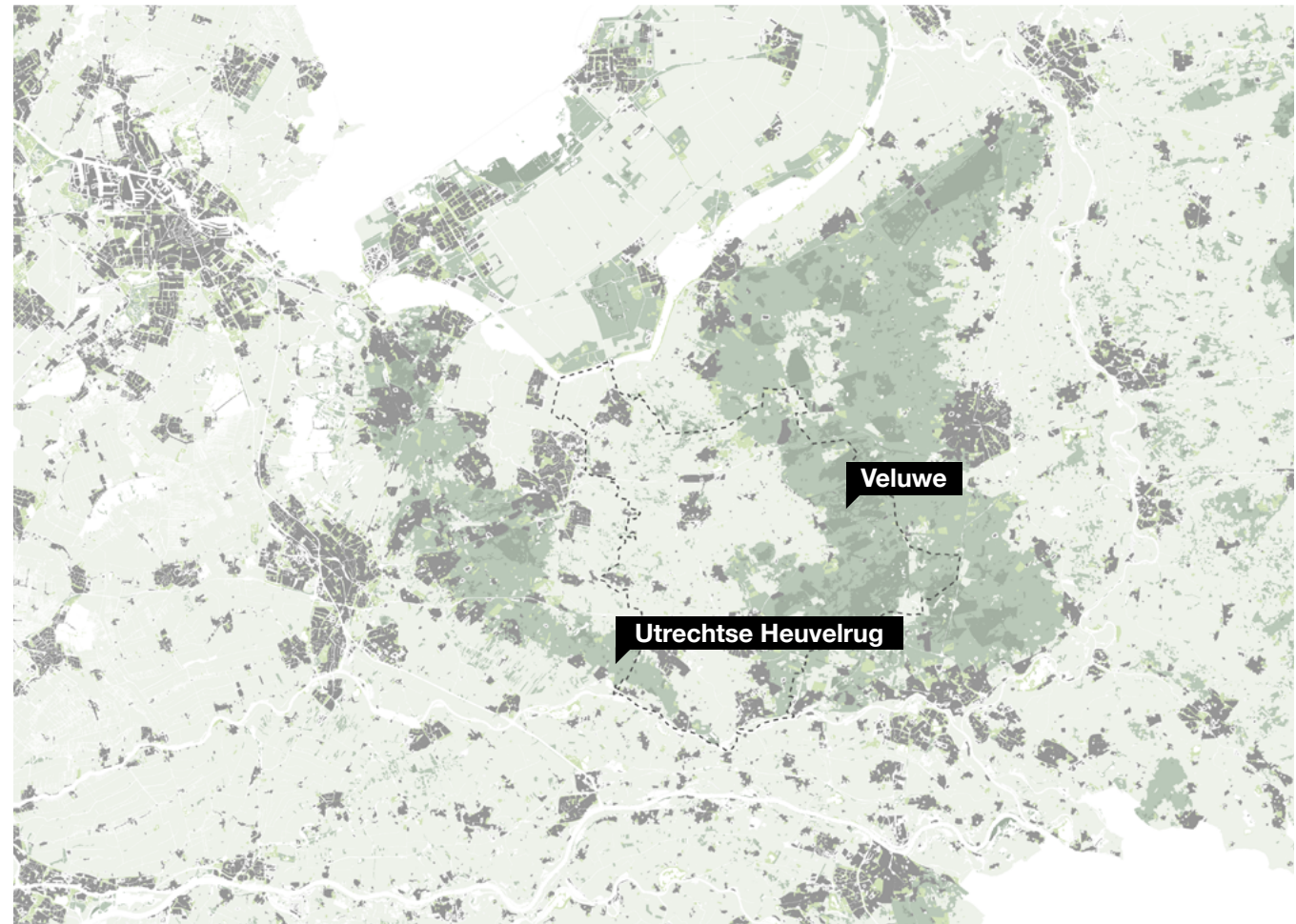
methodology

VI

systemic
design

VII

conclusion
& reflection



- agricultural land
- natural areas
- recreational areas
- urban areas



National government

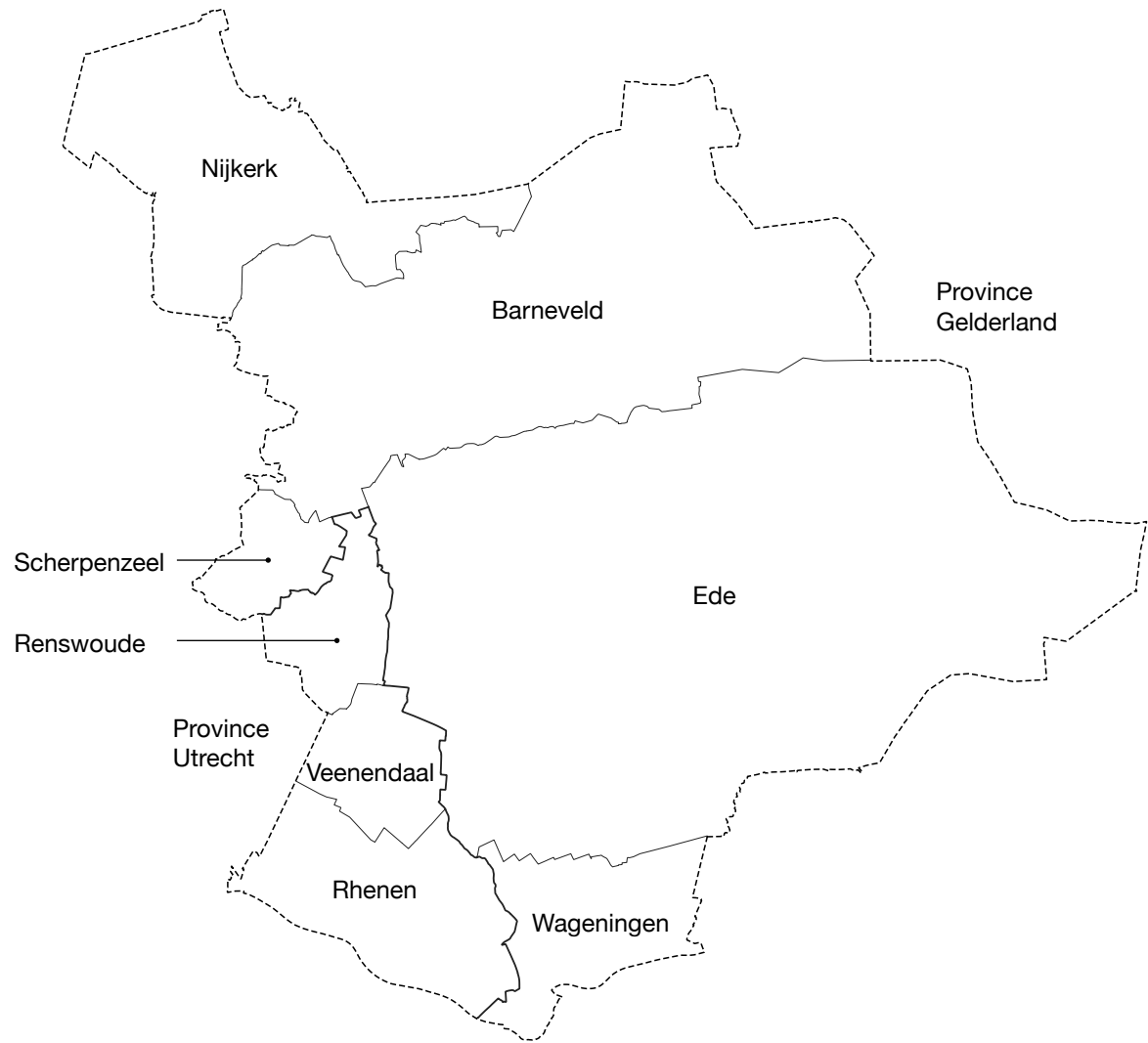
Provinces of Utrecht & Gelderland

Water authority Valley & Veluwe

Municipalities (8)

Knowledge institutes (e.g. WUR)

Agri-food businesses (e.g. Arla & Campina)



Stikstof dwarsboomt bouw van duizenden huizen in Gelderland

ARNHEM - Een derde van de geplande nieuwe woningen in Gelderland kan nu niet worden gebouwd als gevolg van de stikstofcrisis. Ondanks maatregelen als snelheidsverlaging op snelwegen, is de uitstoot van stikstof nog niet genoeg ingeperkt om de bouw van 3000 huizen door te laten gaan.

Boeren demonstreren 'om gehoord te worden'

Stikstof Boeren protesteerden woensdag gemoedelijk tegen het stikstofbeleid en plannen om de landbouw te verkleinen.

Politiek 17 december 2021, 16:18 uur

Nieuwe ministers bekendgemaakt, onder meer voor Natuur en Stikstof



agriculture

urban development

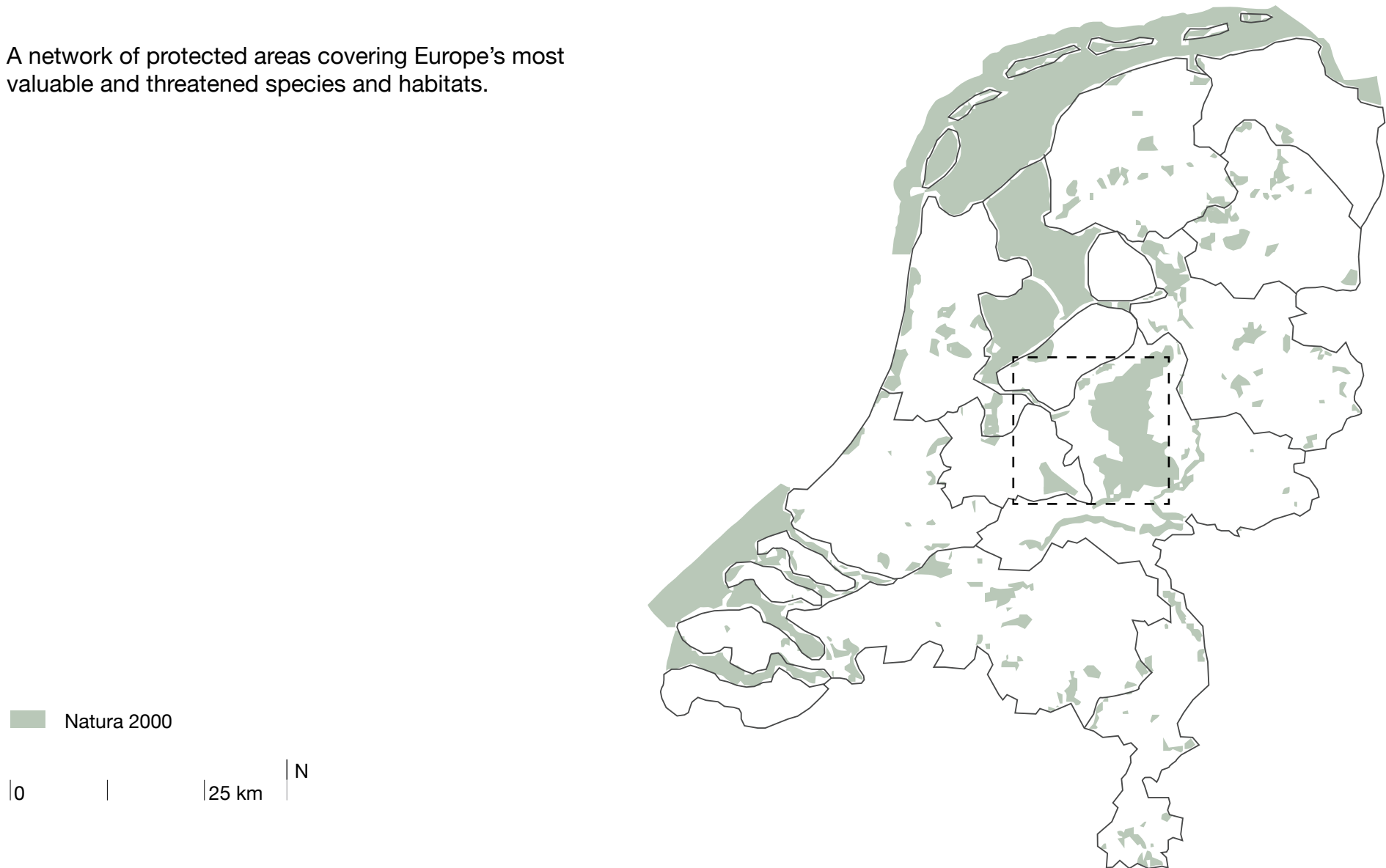
Veluwe



NO_x

NH₃

A network of protected areas covering Europe's most valuable and threatened species and habitats.

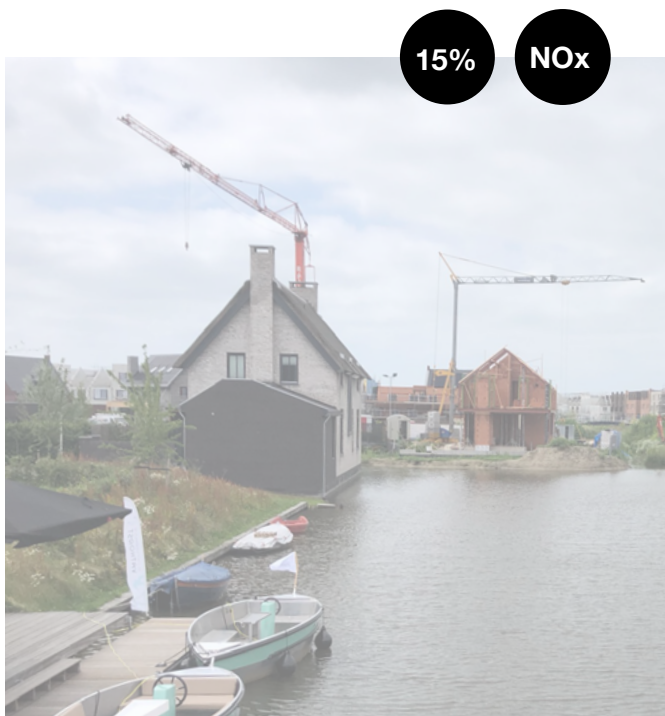


NO_x



NH₃





Continuous cost reductions & focus on efficiency:
scaling up, intensive (monocultural) land – use and the
use of artificial fertilization



(Melkvee, 2018)

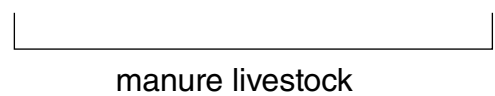


(Siebe Swart, 2020)

N Artificial fertilizer & pesticides

NH3 Ammonia

N2O Greenhouse gas











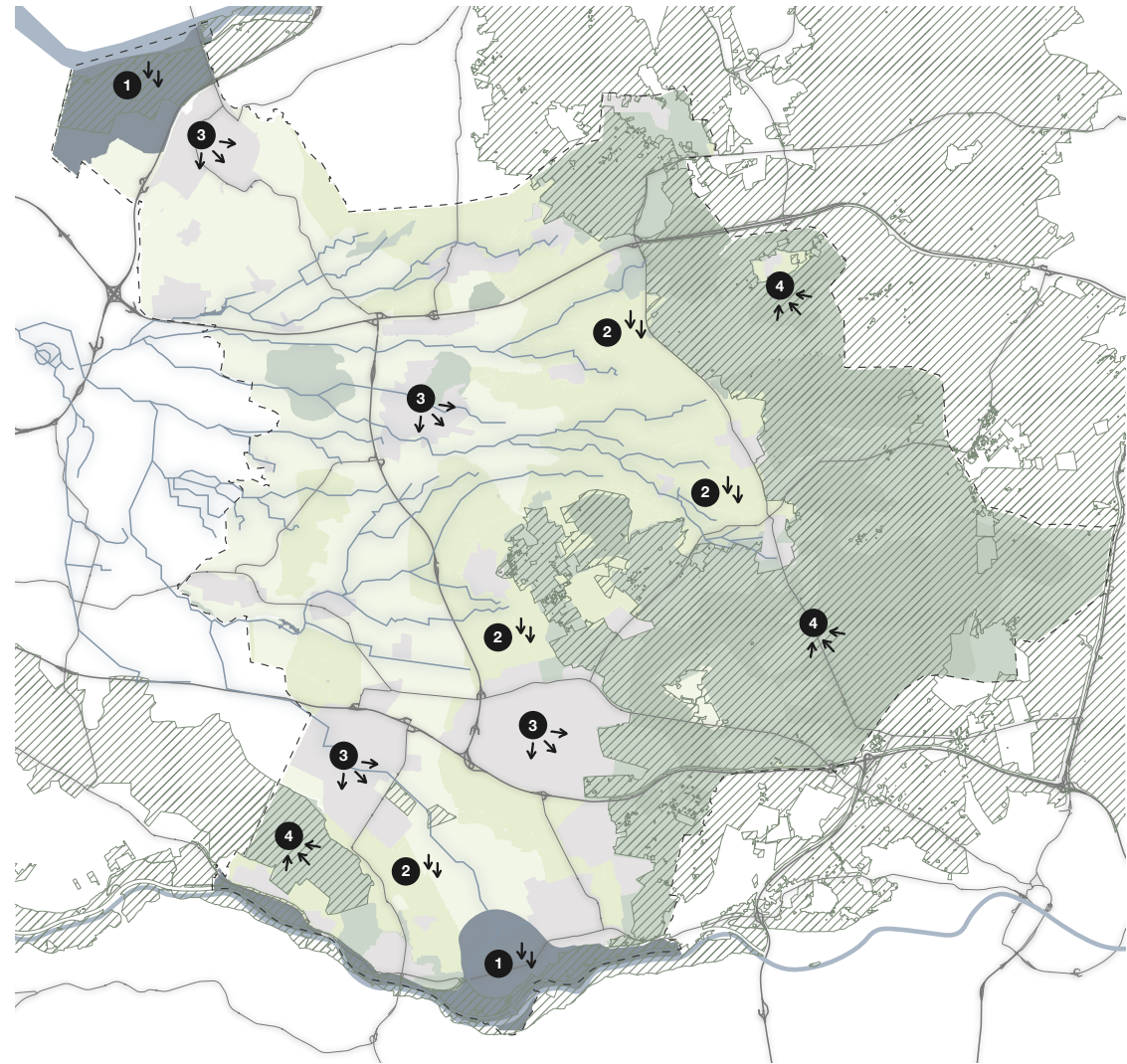
Resource depletion and scarcity, overexploitation of land, and fragmentation and degradation of ecosystems.
Exacerbated by climate change (extreme drought and flooding).















(de Eemskrant, 2020)

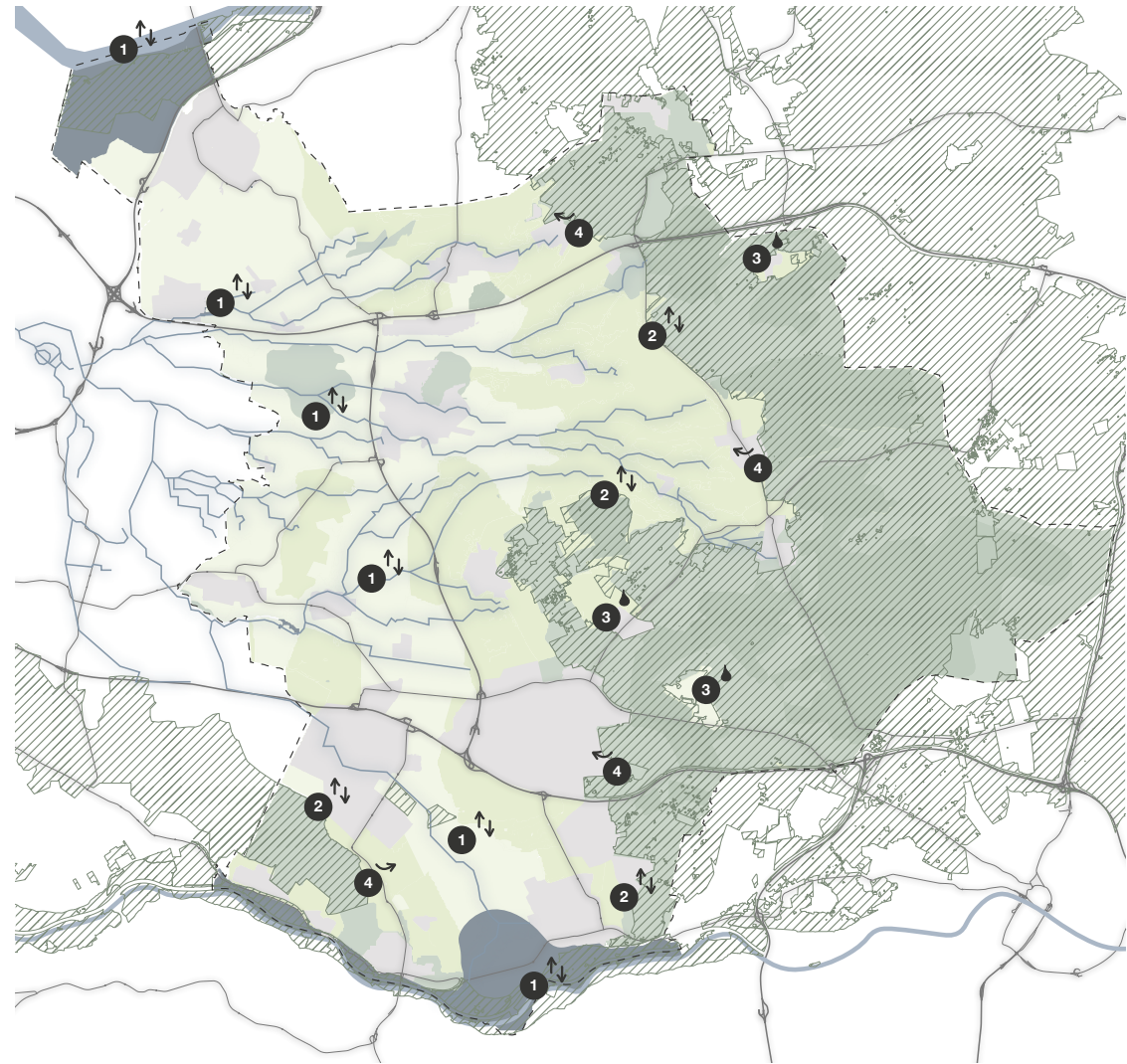
- 1 ↓↓ Peat oxidation - soil subsidence
- 2 ↓↓ Fertile soil under pressure
- 3 ↘↘ Pressure from urbanization
- 4 ↗↗ Pressure on biodiversity

- | | |
|---|---|
|  natura 2000 |  urban areas |
|  forest |  extensive livestock farming |
|  streams |  intensive livestock farming |
|  roads |  'polder' landscape |

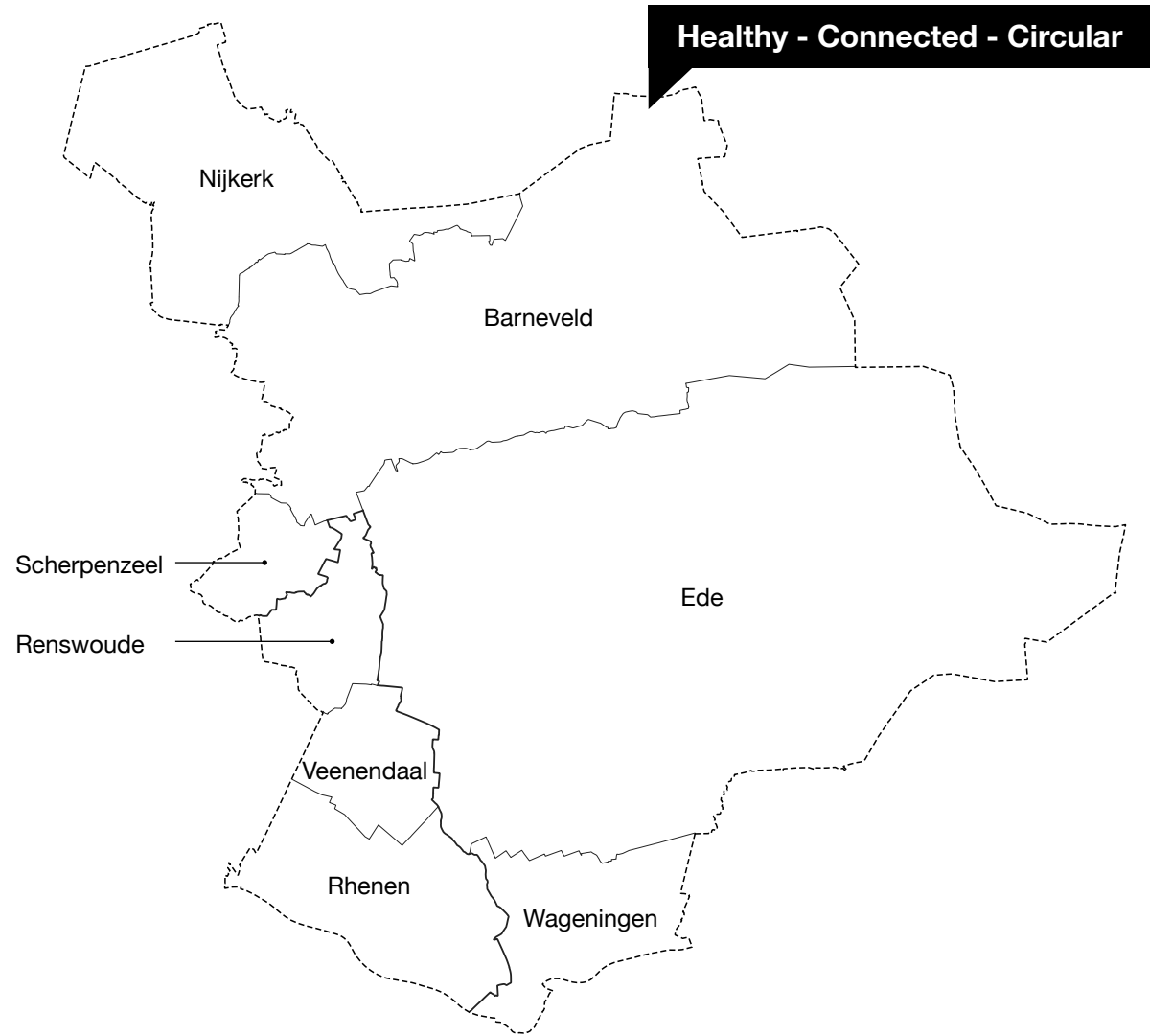


- 1  Fluctuating water levels
- 2  Fluctuating ground water levels
- 3  Extreme dry grounds
- 4  Sinking of ground water

- | | |
|---|---|
|  natura 2000 |  urban areas |
|  forest |  extensive livestock farming |
|  streams |  intensive livestock farming |
|  roads |  'polder' landscape |



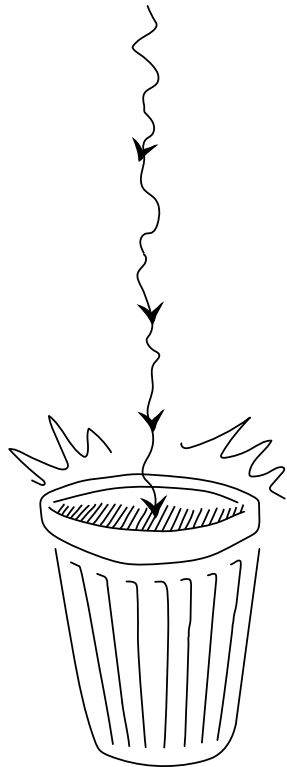
0 | 10 km | N



What does circularity mean?

015 / 088

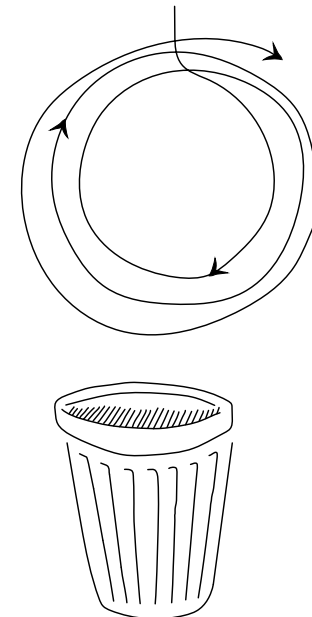
‘ Circularity refers to an alternative production, distribution, and consumption model ’



linear

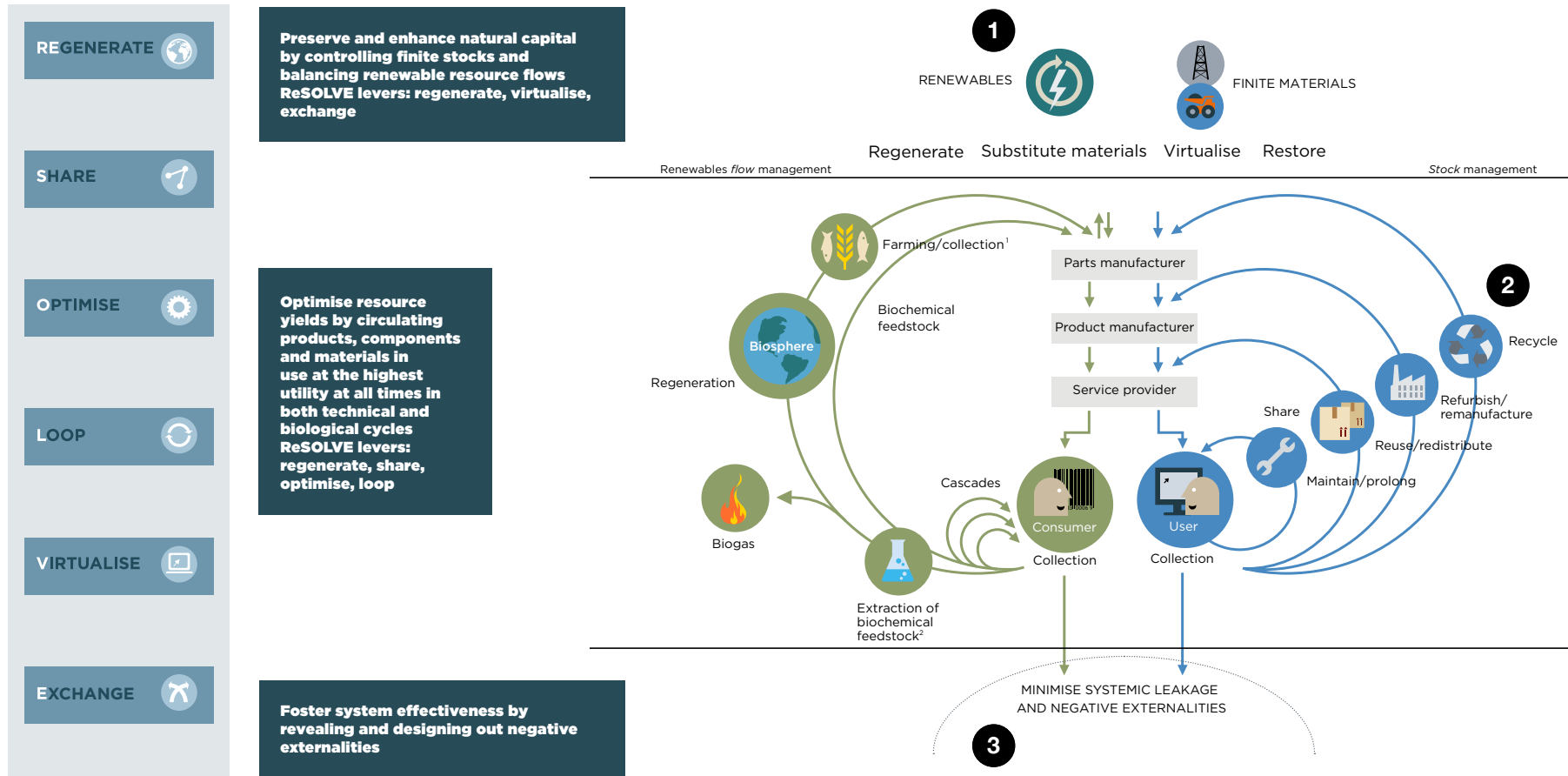


recycling



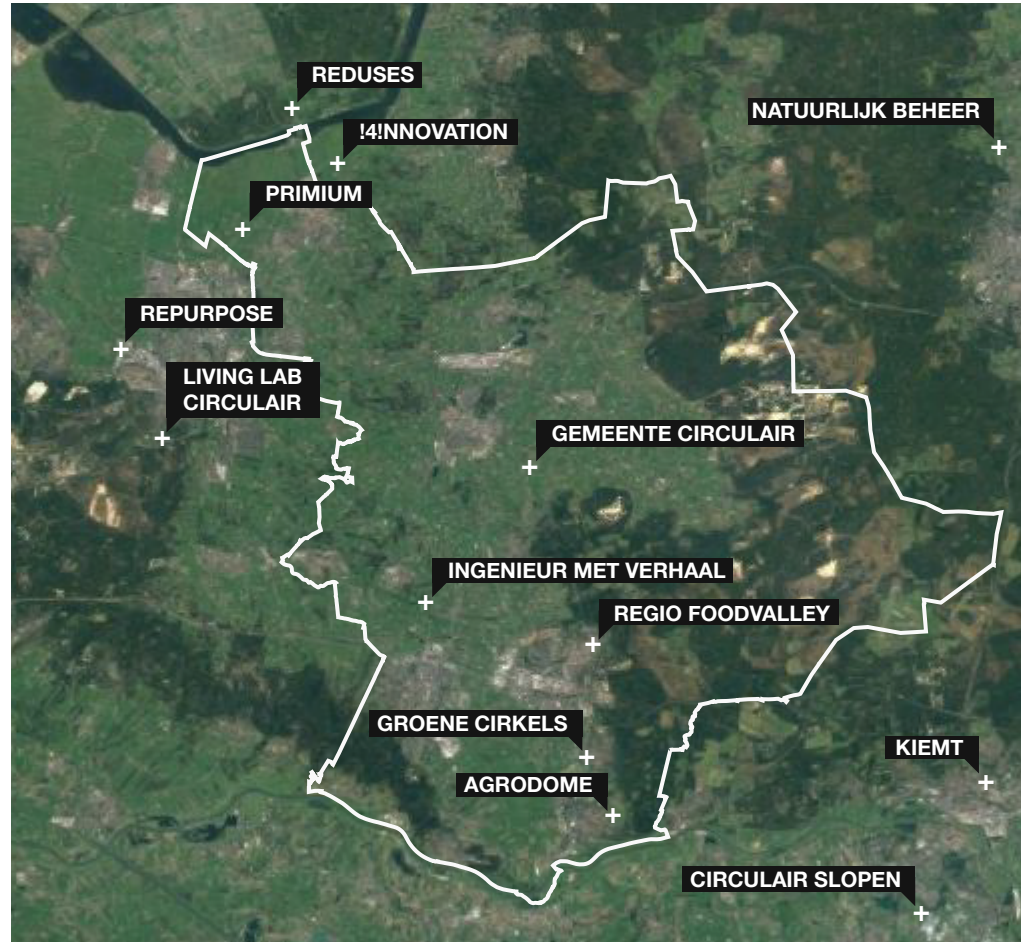
circularity

ReSOLVE framework



(Ellen MacArthur Foundation, 2015)

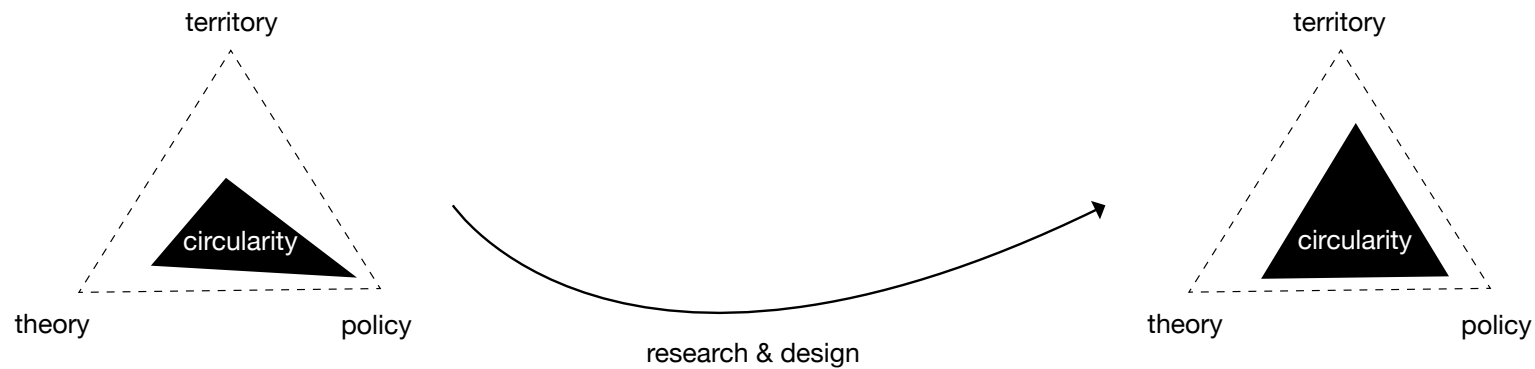
Focus on businesses (industrial and commercial) rather than more comprehensive strategies to manage resources.



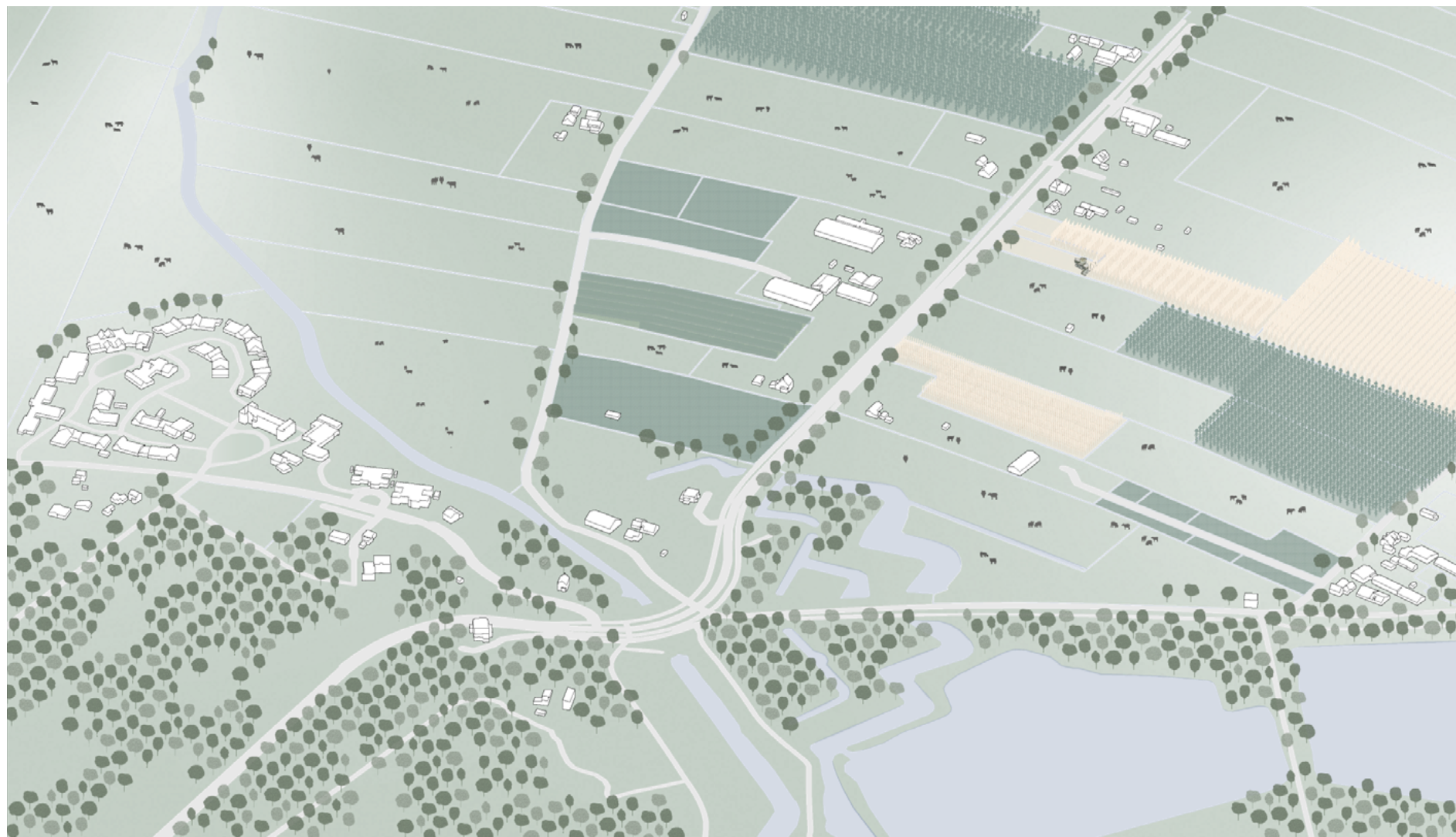
(Foodvalley, 2020)



The knowledge gap concerns insufficient (theoretical) knowledge on a territorial approach regarding circularity. Making it difficult to incorporate circular goals in large-scale regional strategies and designs.



The territory can be used to connect circular development strategies to ecosystem, landscape or territorial assets, in order to improve the region regenerative capacity.





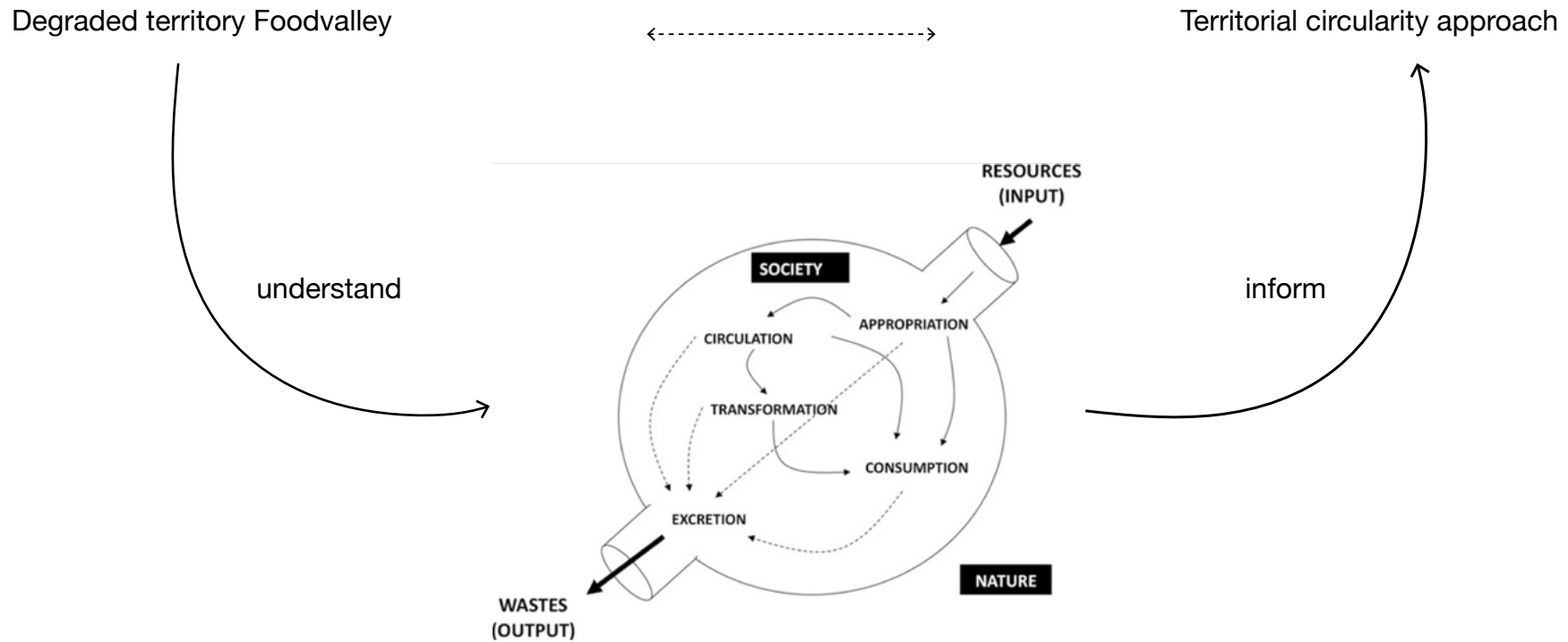
What does the territorial circularity approach need?

Socio - ecological metabolism

021 / 088

'methaphor that compares the built environment to a cell'

A way to examine the current material and energy flows in territory,
and how this is shaped by various social and economic forces.



(reprinted from Molina & Toledo, 2018, p.64)

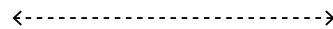
Participatory transition management

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(Roorda et al., 2014; Rotmans et al., 2010)

A way to manage the transition to circular agricultural systems that facilitates collaborative visioning, learning & experimenting

Territorial circularity approach



Regenerative territory
Foodvalley



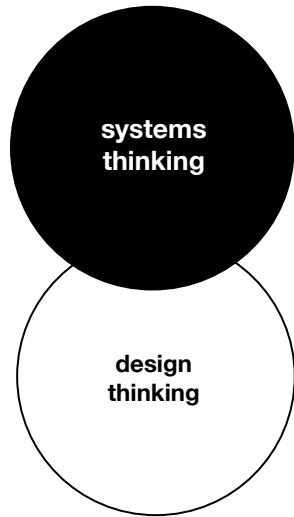
(De Gelderlander, 2021)



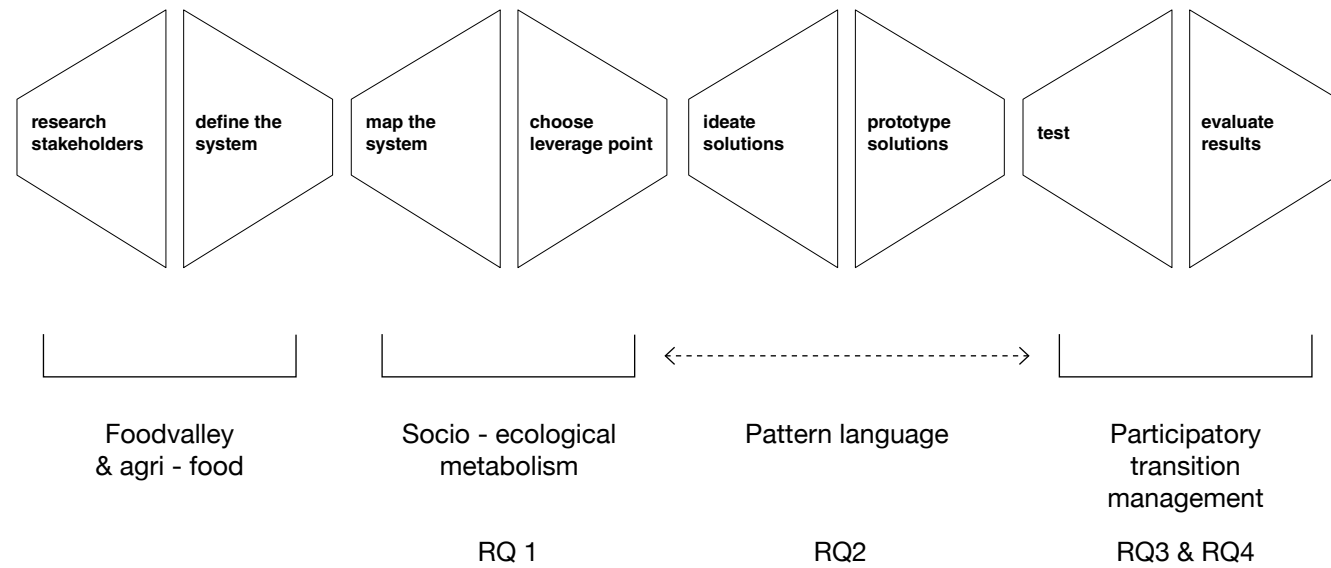
(De Gelderlander, 2021)

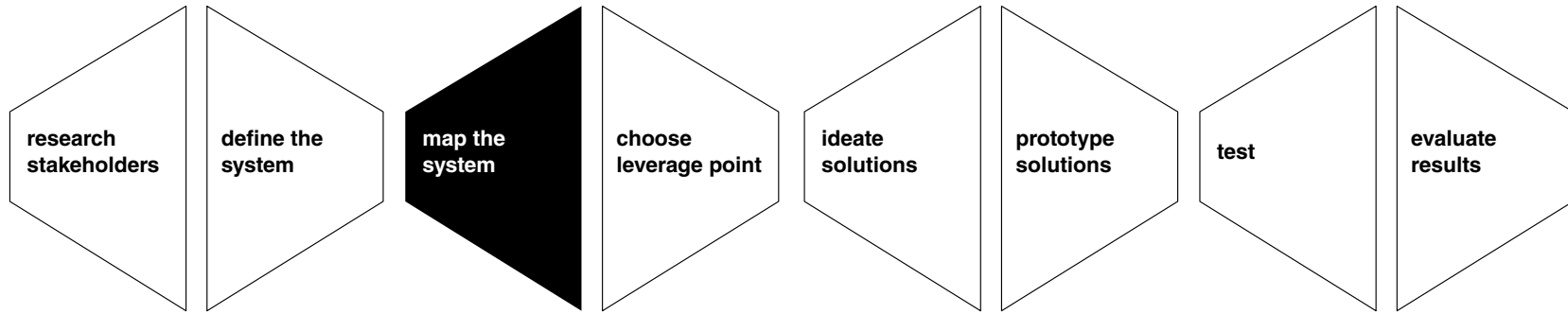
How to reconfigure the territory of the Foodvalley region, to facilitate regenerative circular developments, using a co - creation method?

1. What possible synergies and closed loops can be identified in the current socio-ecological metabolism to increase the Foodvalley region's regenerative capacity?
2. Which circular agriculture patterns are necessary to harvest the possible synergies and closed cycles in the socio - ecological metabolism of the region?
3. What strategy can be used to facilitate co-creation in circular developments, in the agricultural sector of the Foodvalley region?
4. How can the implementation of the circular approach in the Foodvalley region be evaluated in order to formulate policy recommendation as well as further theoretical studies?



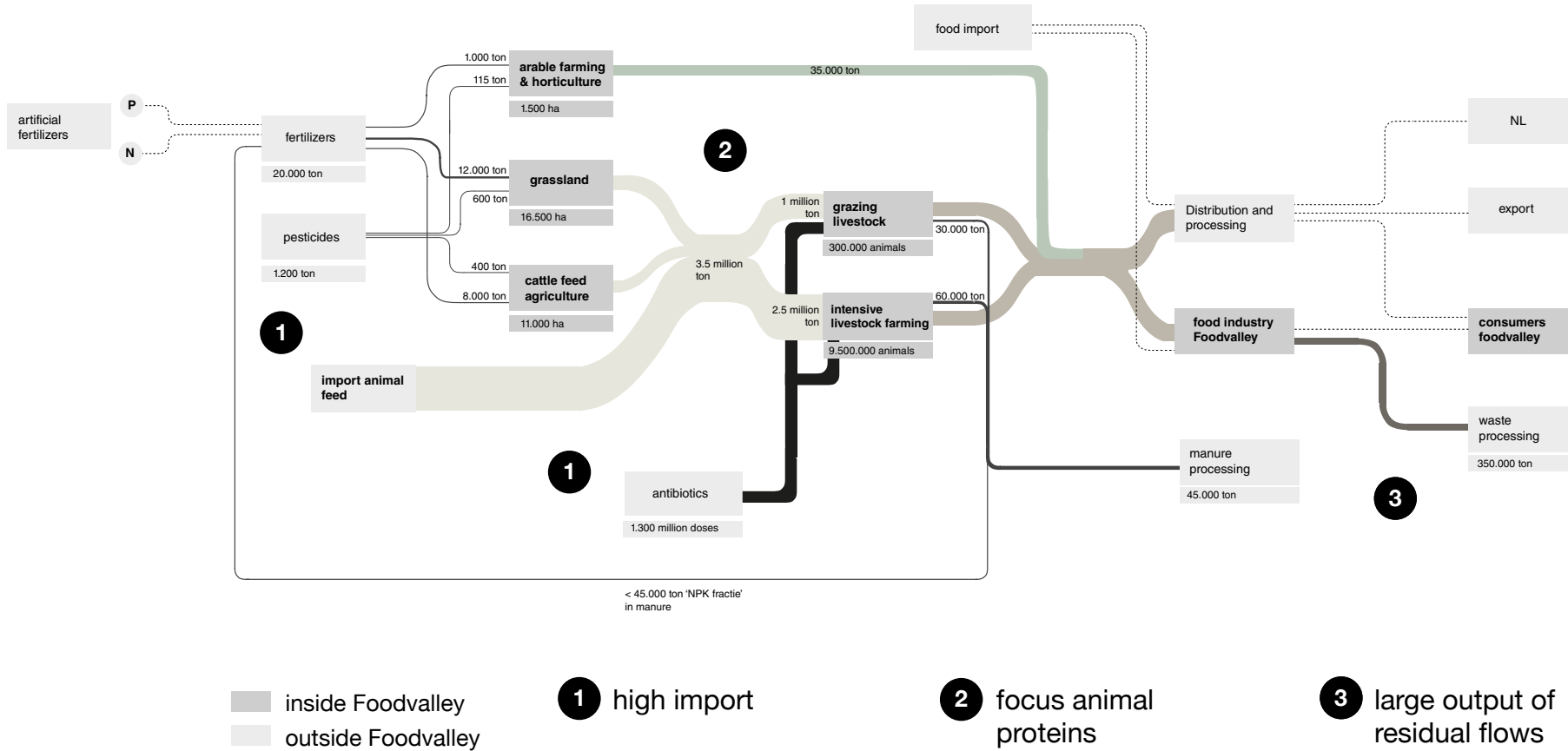
(Ospina, 2015)



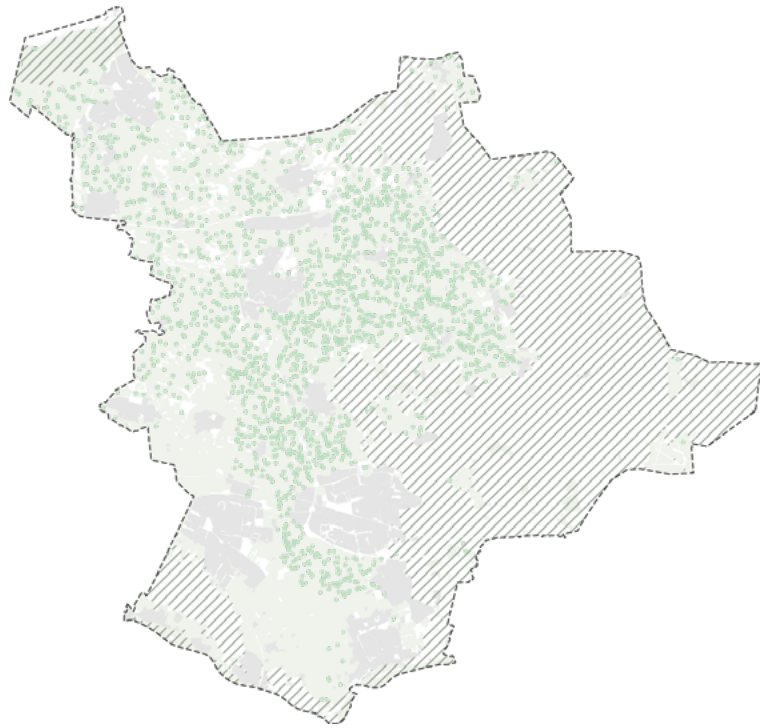


(Ospina, 2015)

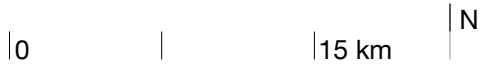
Quantification, not their relation with the territory (spatial, social & ecological context)



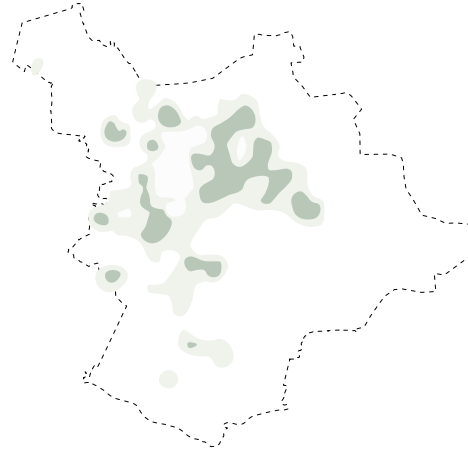
(based on: KPMG, 2019; Metabolic, 2017)



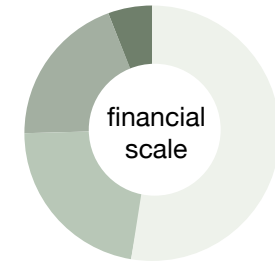
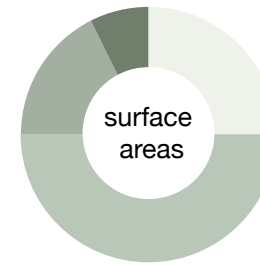
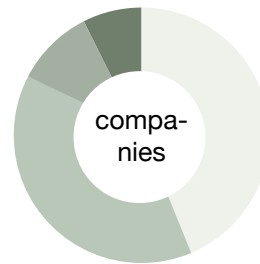
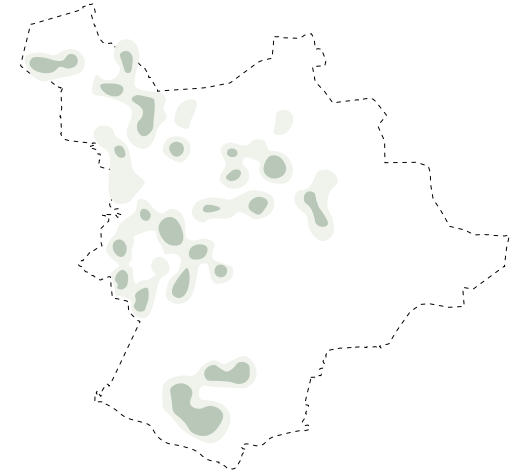
- urban areas
- nature
- agricultural land
- livestock farming



intensive livestock farming

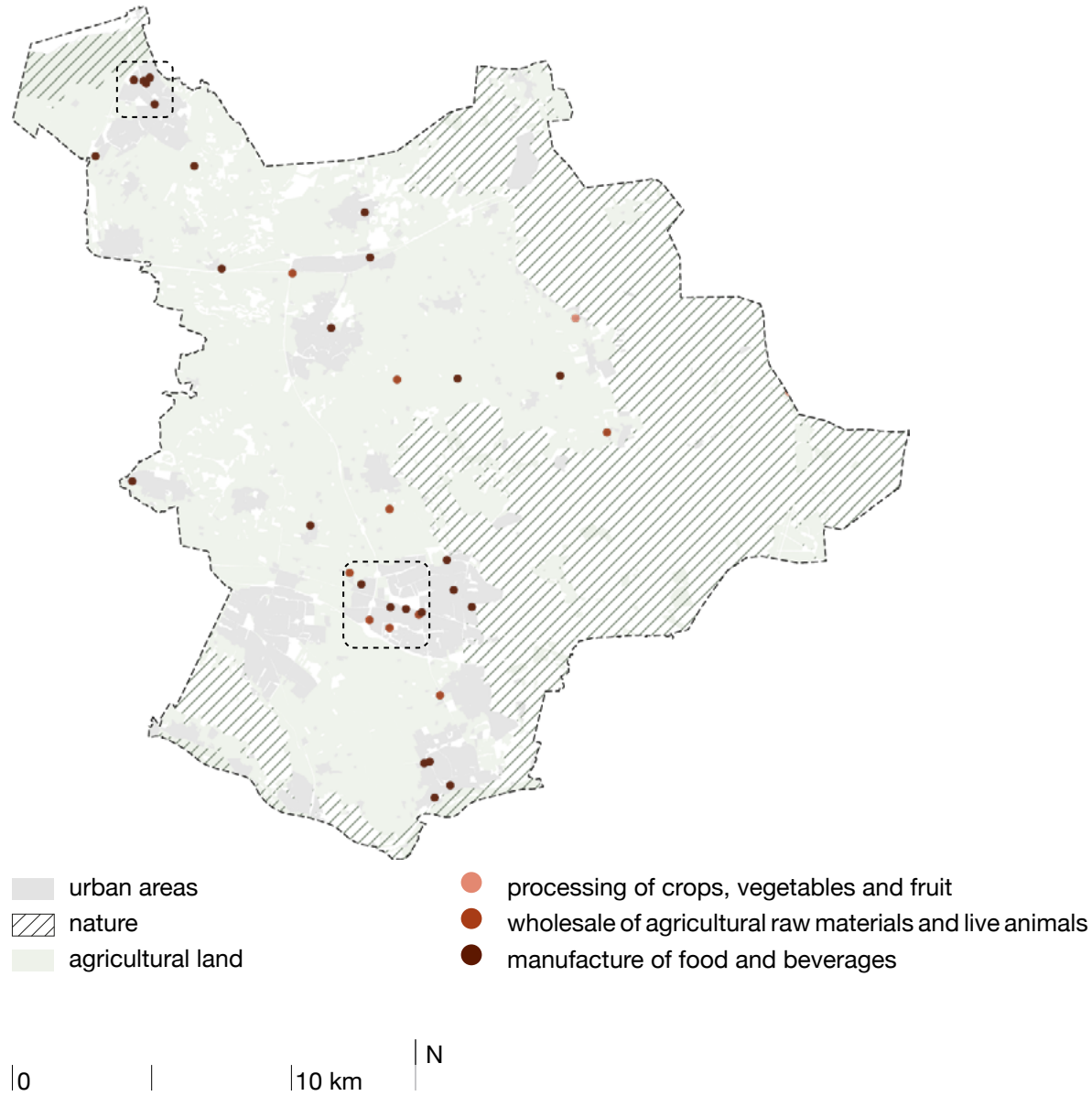


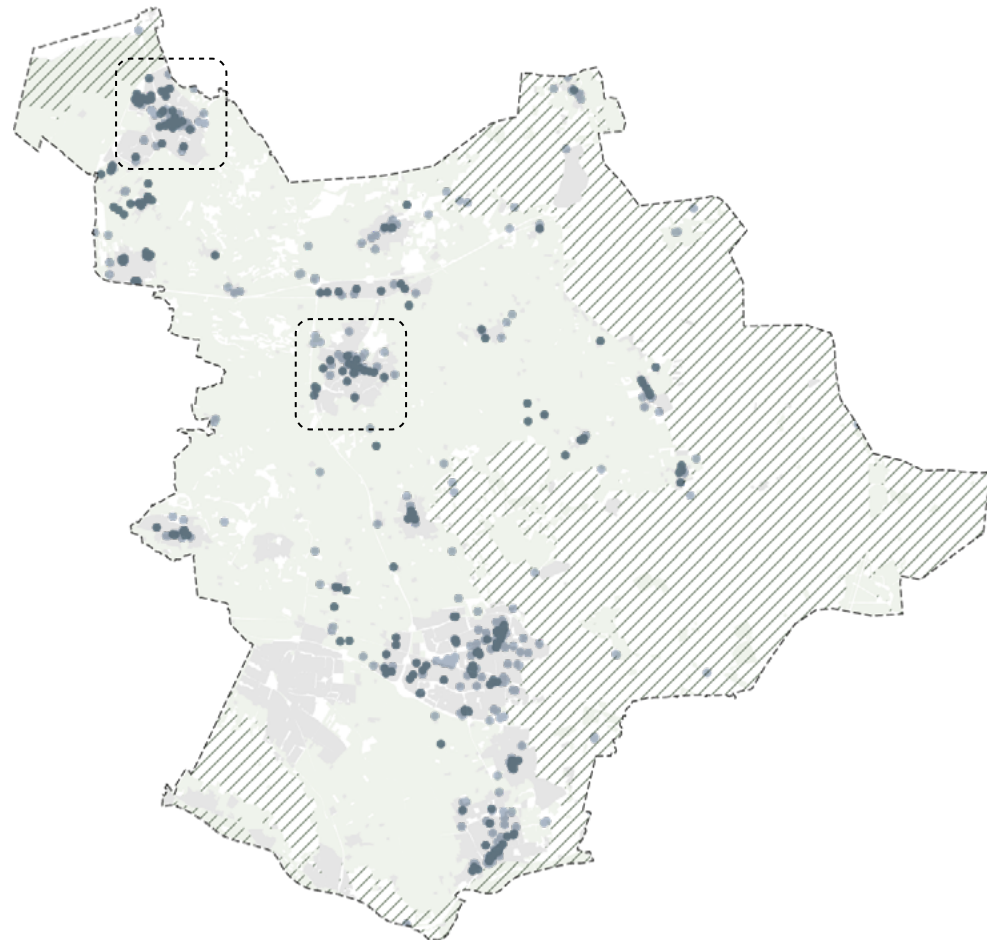
extensive livestock farming



- intensive livestock
- extensive livestock
- mixed livestock
- arable farming

(adapted from Regio Foodvalley, 2019)





- urban areas
- nature
- agricultural land
- supermarkets
- horeca

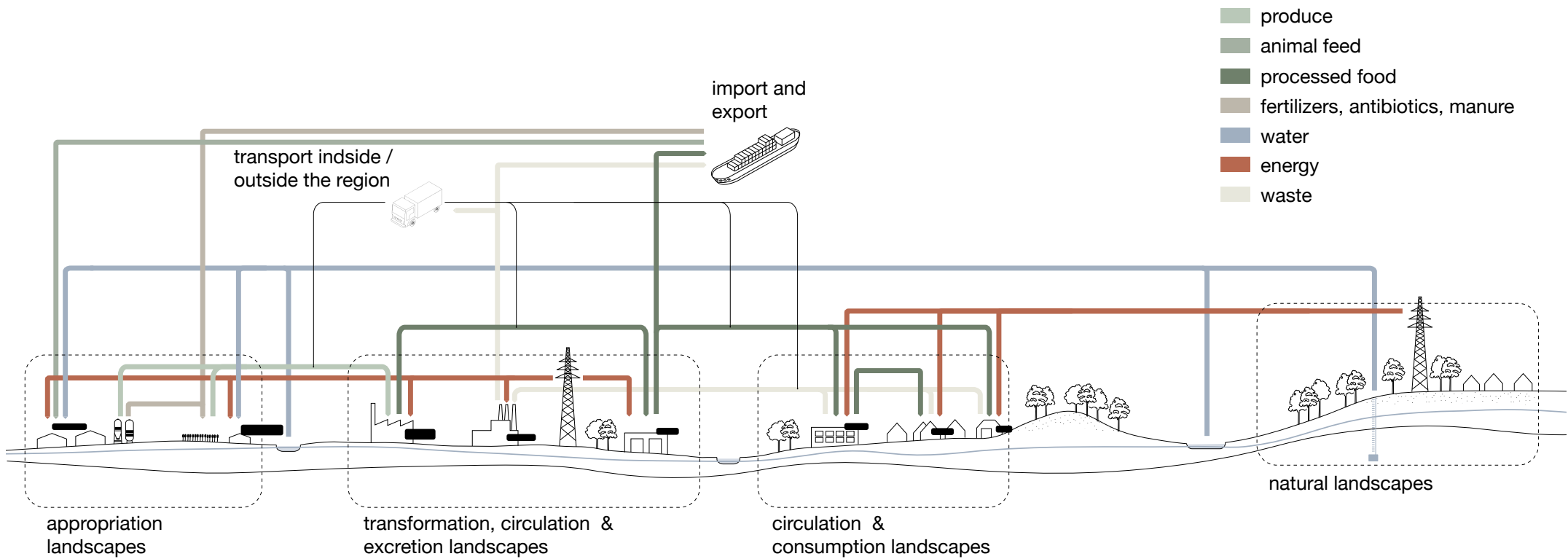
0 | 10 km | N

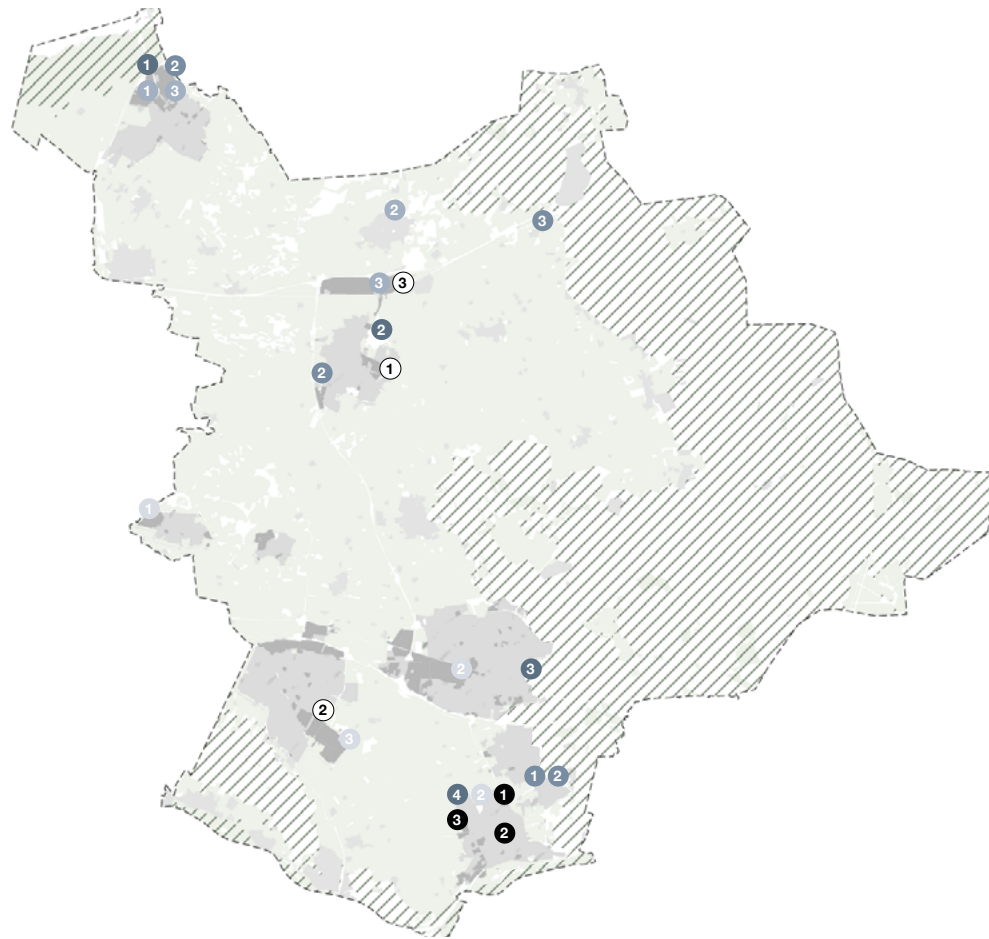


A

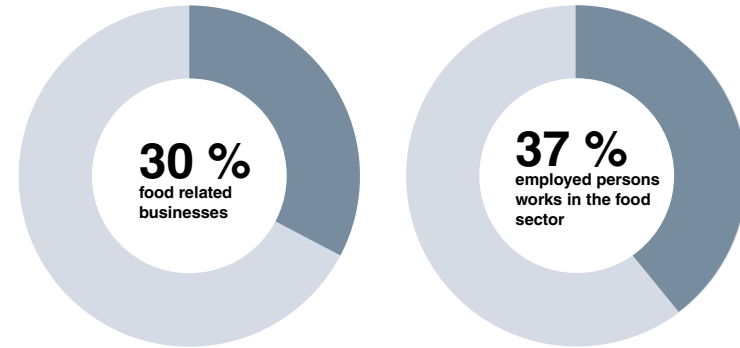


B

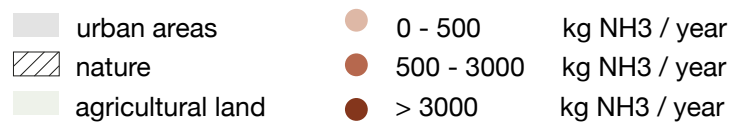
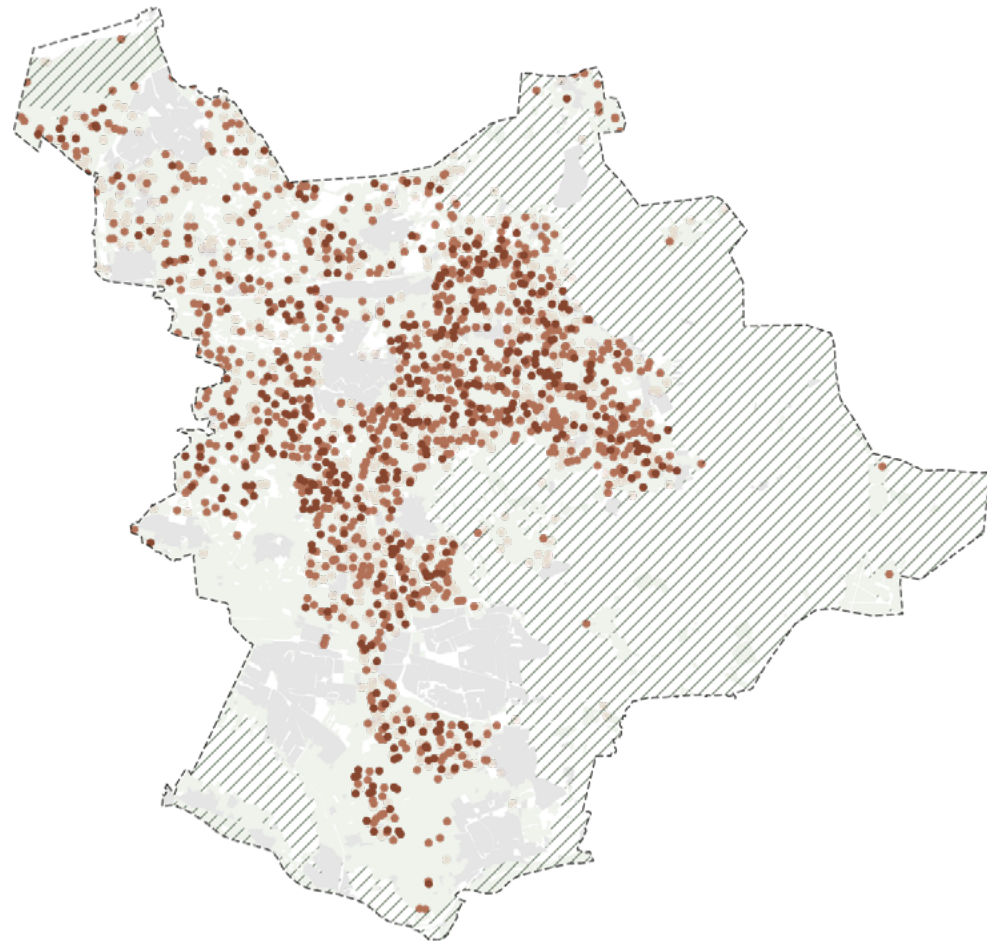




- urban areas
- nature
- agricultural land
- Knowledge food (e.g. Wageningen campus)
- Supply animal feed
- Processing of food (e.g. Arla Foods)
- Trade of food
- Food services
- Transport of food

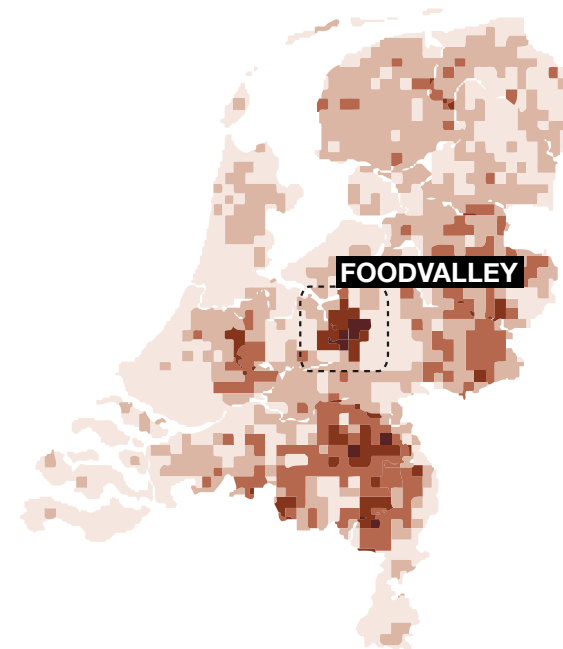


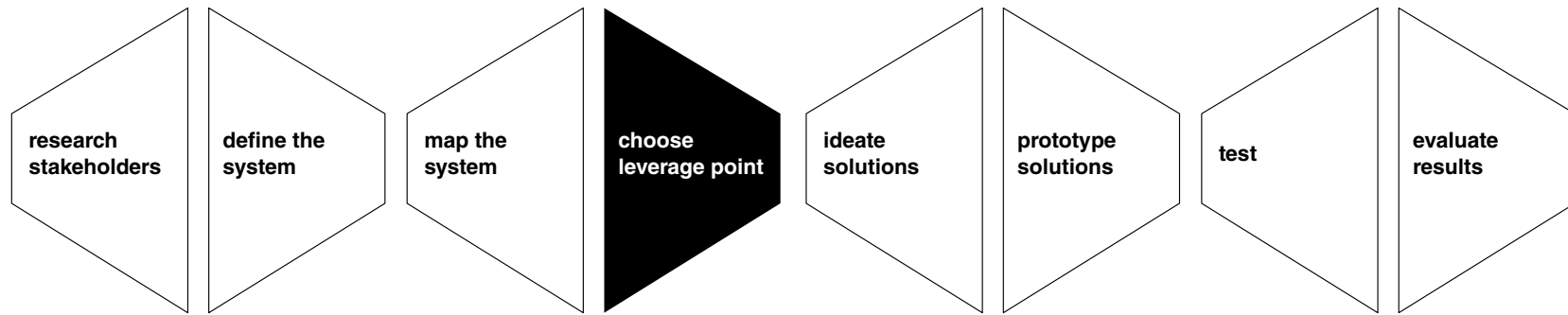
(Christelijke Hogeschool Ede, 2020; Foodvalley, 2019)



Understand how environmental impact of resource use mechanisms is shaped by social & economic forces (e.g. actors and governance).

And the relation between resource use and their spatial dimension / underlying infrastructures.





(Ospina, 2015)

Leverage point

(Meadows, 1999)

A place in the system where a finely tuned, strategic intervention is capable of creating lasting change, creating positive ripple effects that spread.



Constant, parameters, number



Material stock & flows



Buffer sizes



Relative delays



Negative feedback loops



Positive feedback loops



Information flows



Rules of the system



Structure of the system



Goals of the system



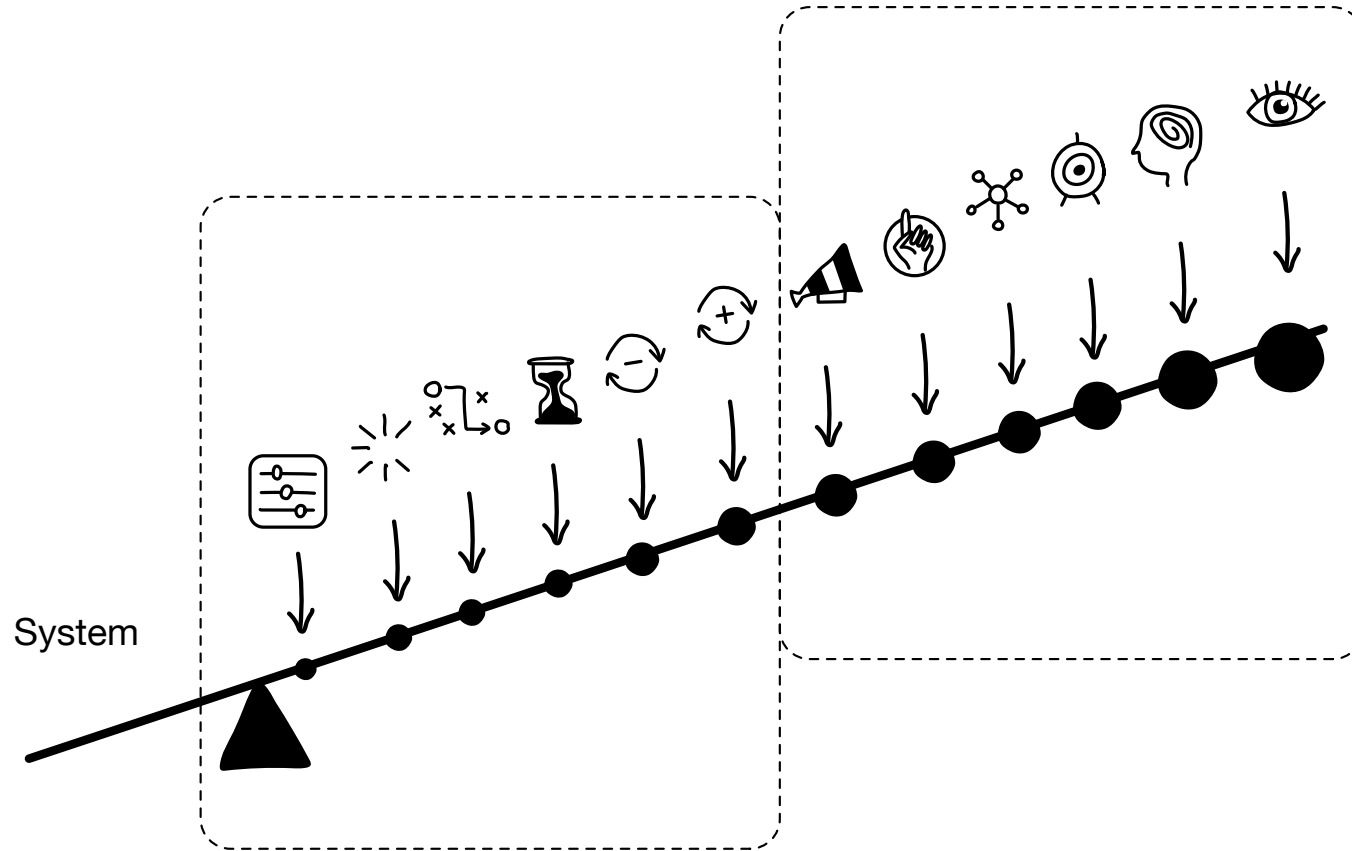
Mindset / paradigm



Power to see the paradigm

Leverage impact

(Ehrlichman, 2021; Meadows, 1999)



System

Most design interventions are based on these leverage points


These leverage points have a higher transformative capacity, but these are harder to design for

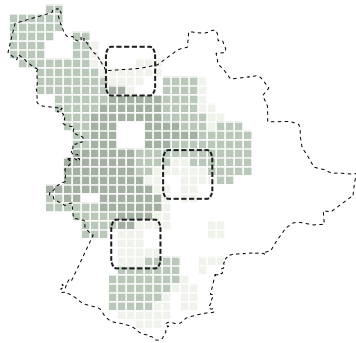
RQ1:
Possible synergies and closed loops
to increase regenerative capacity

I Current system has certain leverage points, where strategic interventions can help to increase the regenerative capacity of the region.




II Leverage points have different order of effectiveness, and therefore a differing transformative impact

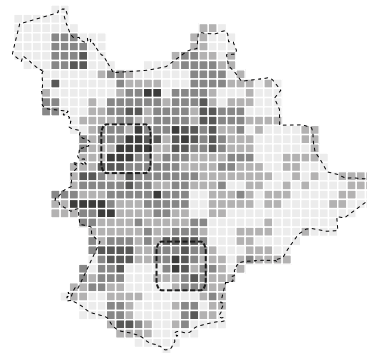
III Territorial approach (socio - ecological metabolism) helps to determine suitability for strategic intervention (where, which actors)

 Use substitute for artificial fertilizer






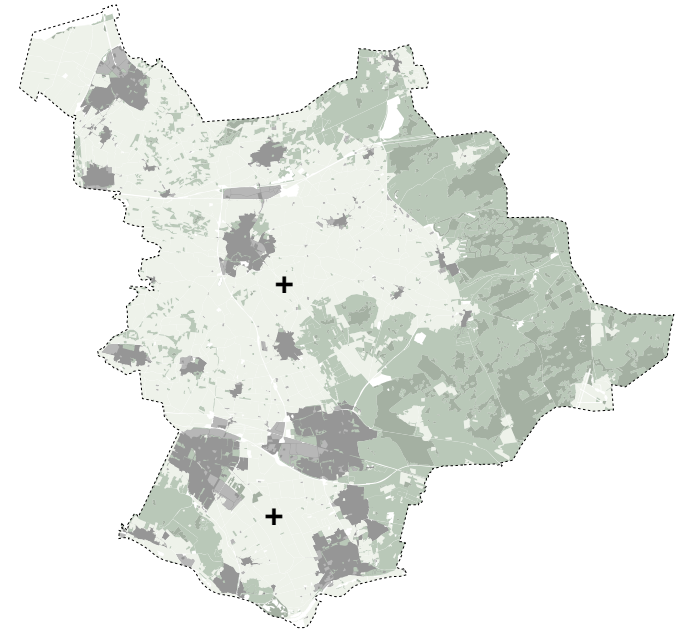
Main land-use type

-  arable farming
-  extensive livestock farming
-  intensive livestock farming

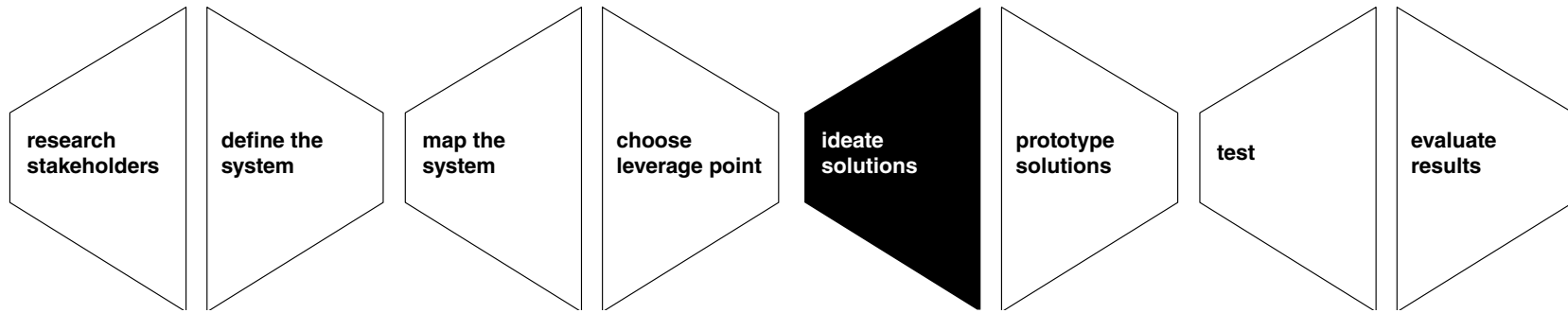


Nitrogen deposition

-  low deposition
-  medium deposition
-  high deposition



+ Suitability strategic intervention



(Ospina, 2015)



Uses (raw) materials and resources efficiently and carefully. Renewables are preferred.



Has a closed balance (no waste). Priority to localizing and shortening chains (reduce, re-use, recycle).



Operates on the basis of renewable energy and is CO2 neutral.



Handles the available land/water available with care. Preserves and protects biodiversity



Is resilient and adaptive to changing conditions



Offers fair value creation and working conditions.



Protects human well-being and health, and is accessible to all.

Current system



Leverage points

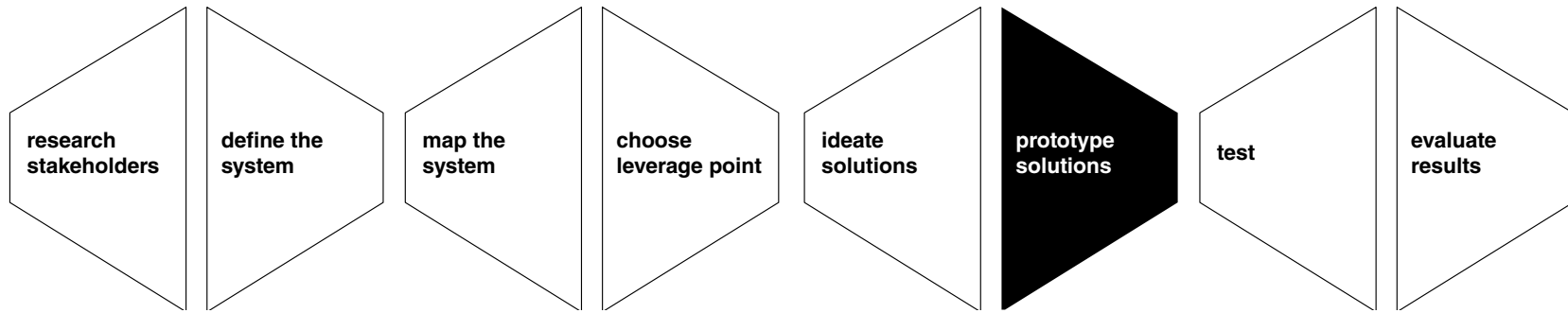


Design solutions

Goals



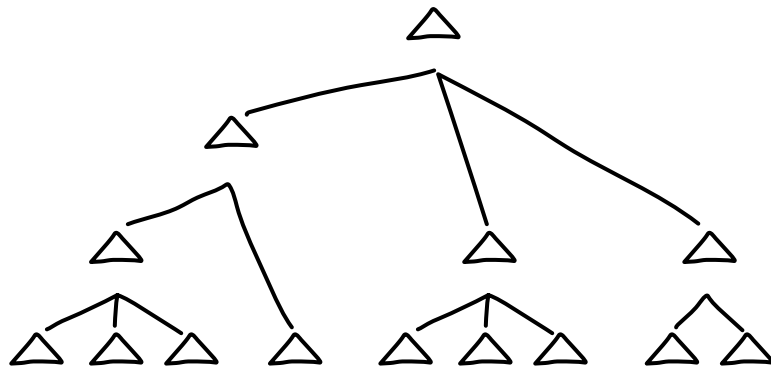
Desired system



(Ospina, 2015)

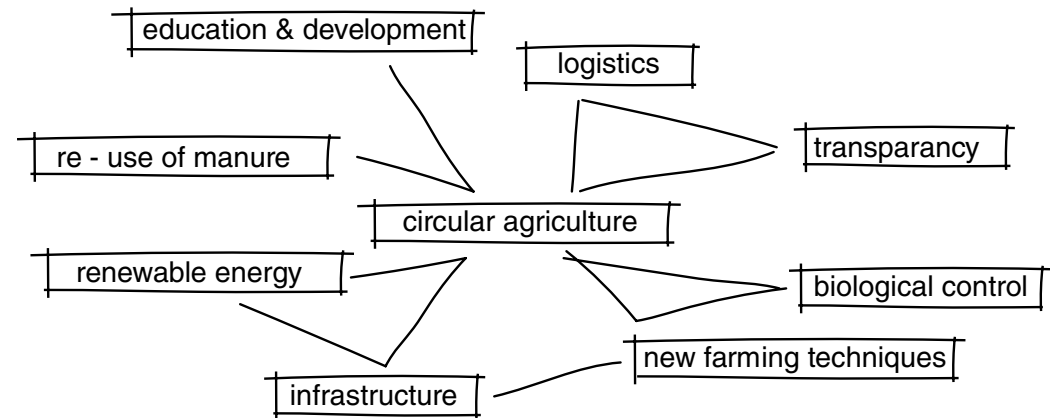
'Patterns involve a generic set of ingredients and possible solutions, translatable to a wide range of conditions.' (Alexander et al., 1976)

Breaks down complexity into easily understood 'blocks of knowledge.'



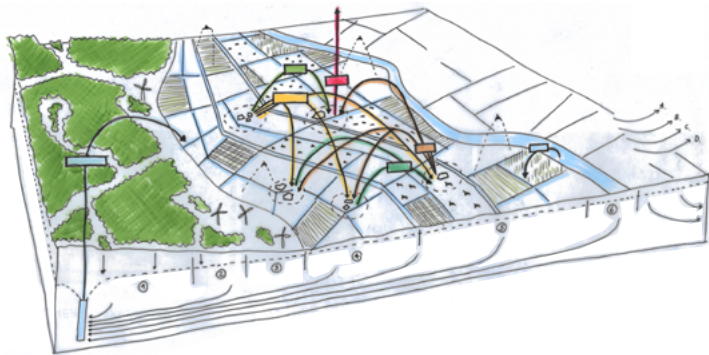
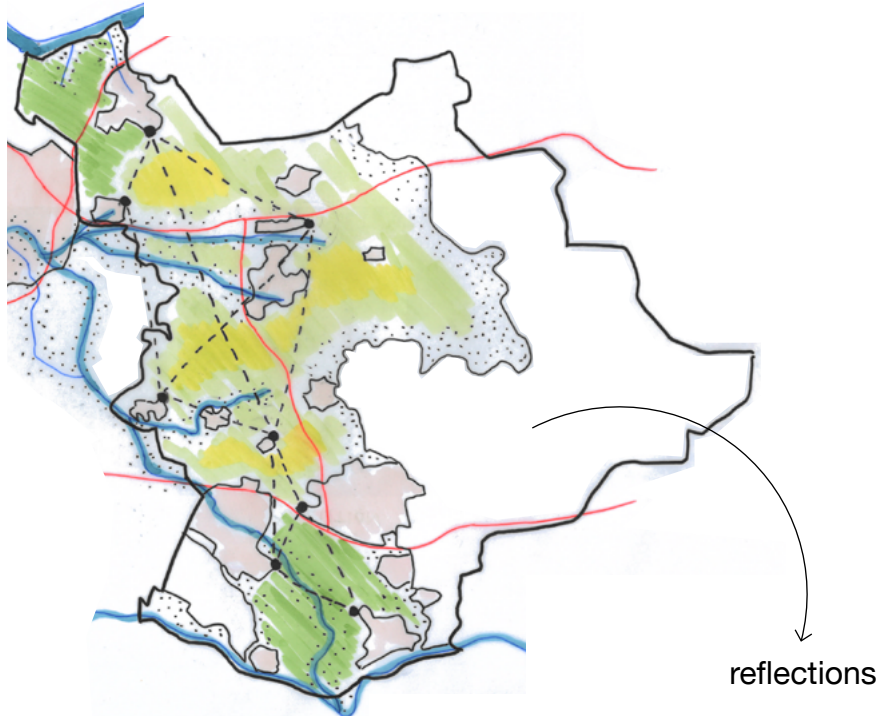
A set of requirements - organised hierarchically

(adapted from: Hausleitner, 2021)

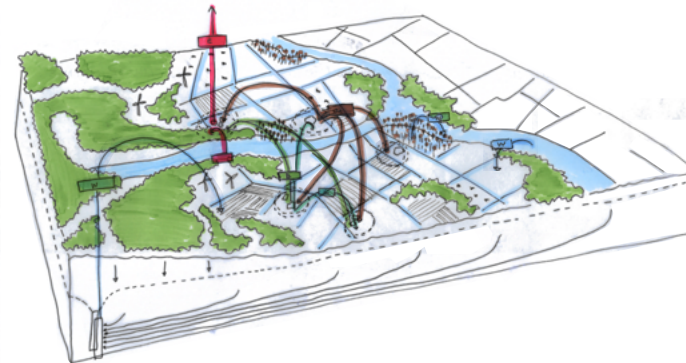
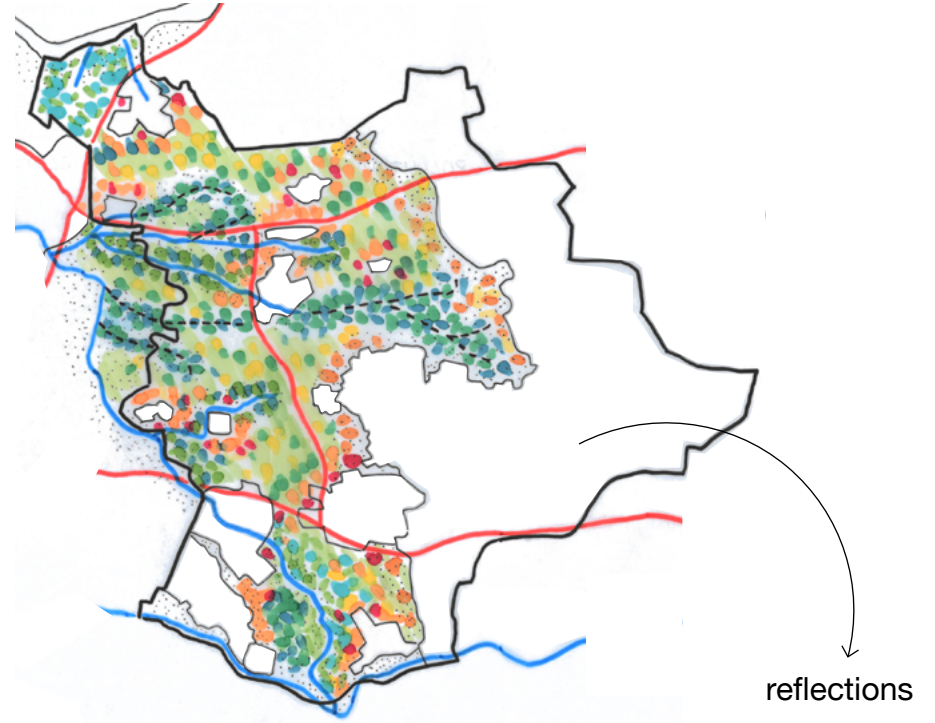


Represented in a network of solutions you can start anywhere!

agro - industrial
optimize system, diminish externalities



agro - ecological
transform system, avoid externalities

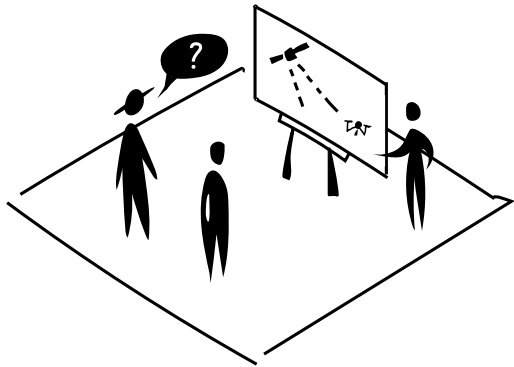


P.4 DEVELOPMENT & EDUCATION

1 **2** **3**

HYPOTHESIS

4 Training centers are required to facilitate education, knowledge sharing, and the development of relevant skills.








5

RELATED PATTERNS




6 T.1, T.3, R.1, R.2, R.7, N.1, F.2, F.3

1. Five scales of actions

-  T = transcalar
-  P = program / principle
-  F = farm _____ micro
-  N = network _____ meso
-  R = region _____ macro

2. Title of pattern

3. The colors refer to the three different types of actions defined to achieve circularity.

-  Blue = systemic circularity
-  Green = territorial circularity
-  Red = promoting circularity

4. Hypothesis of what patterns implies

5. Representative image

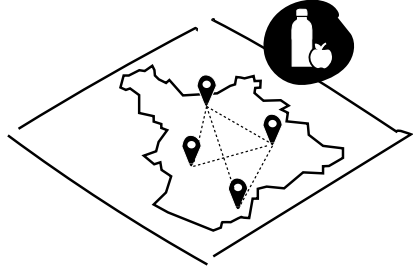
6. Related patterns, indicates connection to other patterns.

VI. systemic design - prototype solutions

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



The diagram illustrates a local food economy loop. It features a map of a region with four location pins connected by dashed lines, forming a diamond shape. Above the map is a circular icon containing a bottle and an apple, representing a product. The map is enclosed in a larger diamond shape, suggesting a regional scale.

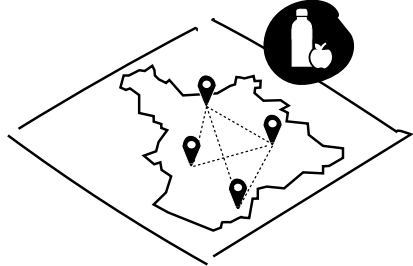
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P4

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



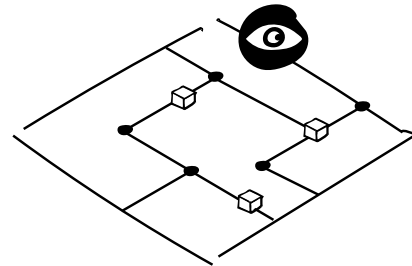
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

T.1 TRANSPARENCY FOOD CHAIN


HYPOTHESIS

Transparency in environmental, economic, and social processes aids in the development of trust and acceptance of food production, while also establishing a foundation for business interaction and collaboration in the agr-food chain.



RELATED PATTERNS

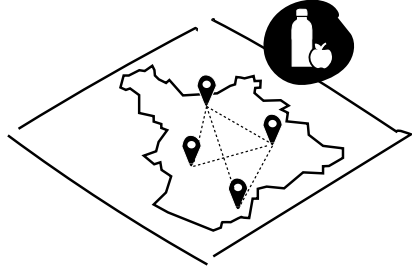
T.2, R.1, R.2, N.1, P.1, P.2, P.3, P.4



R.1 LOCAL FOOD ECONOMY


HYPOTHESIS

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RELATED PATTERNS

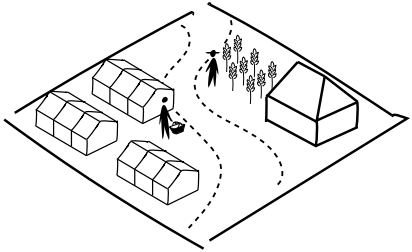
T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4



N.1 BLURRING BOUNDARY


HYPOTHESIS

In the hybrid landscape, the transition zones between different functions are an ideal space for agri-food businesses and supporting services that aid in the circular transition. Furthermore, people may begin to appreciate and protect their natural ecosystem as a result of a meaningful connection.



RELATED PATTERNS

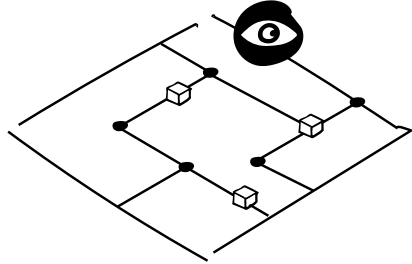
T.1, T.2, R.1, R.2, R.3, N.2, P.1



T.1 TRANSPARENCY FOOD CHAIN


HYPOTHESIS

Transparency in environmental, economic, and social processes aids in the development of trust and acceptance of food production, while also establishing a foundation for business interaction and collaboration in the agri-food chain.

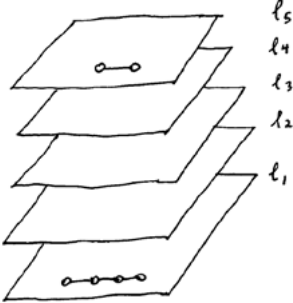


RELATED PATTERNS

T.2, R.1, R.2, N.1, P.1, P.2, P.3, P.4



T	T1 TRANSPARENCY FOOD CHAIN	T2 LANDSCAPE AWARENESS	T3 RESILIENT ECOSYSTEM	T4 FRUGAL FRESHWATER	T5 INFILTRATION & STORAGE	T6 FRAME BIODIVERSITY	T7 NATURE-INCLUSIVE CRAFTSMANSHIP	T8 DIVERSE TENURE MODELS	T9 AUTOMATION	T10 SEPERATION OF WASTE (WATER)
	T11 EFFICIENT LOGISTICS	T12 DATA IS ESSENTIAL	T13 MULTISCALE INFRASTRUCTURE	T14 BIO-BASED VALORISATION	T15 FINANCIAL NUDDGE	T16 CLOSING OF NUTRIENT CYCLES	T17 SOIL IS SACRED	T18 COLLABORATING TECHNOLOGIES	T19 USE ALTERNATIVE PROTEINS	
R	R1 LOCAL FOOD ECONOMY	R2 THINK AS A REGION	R3 PLACE CONDITIONS	R4 ECOLOGICAL NETWORK	R5 ROBUST WATERSYSTEM	R6 DECENTRALIZED RESOURCE LOOPS	R7 ADOPTING CLEAN FARMING TECHNIQUES	R8 ENERGY MIX	R9 ZONING FUNCTIONS	
	N1 BLURRING BOUNDARY	N2 RECREATIONAL ROUTE	N3 PRODUCTIVE LANDSCAPES	N4 IMPORTANT NODES	N5 LOGISTICS & STORAGE HUB	N6 HUB WASTE MANAGEMENT	N7 PROCESSING & PACKAGING HUB	N8 ADD NATIVE LANDSCAPE ELEMENTS	N9 VALUE RESIDUAL FLOWS	N10 VARYING UNIT SIZES
F	F1 EMPTY SPACE	F2 NATURE-INCLUSIVE FARMING	F3 HIGH-TECH FARMING	F4 BIOLOGICAL CONTROL	F5 CROP ROTATION	F6 MONITORING LAND & WATER	F7 PRODUCE ANIMAL FEED OWN FARM	F8 LAND SHARING		
	P1 ARTIFACTS & KIOSKS	P2 FARMERS MARKET	P3 CO-OPERATION TOURISM	P4 DEVELOPMENT & EDUCATION	P5 ADD ECOSYSTEM SERVICES	P6 WET CULTIVATION	P7 GREEN BUFFERS	P8 NATURAL PURIFYING BANKS	P9 HERB-RICH GRASSLAND	P10 SHRUBS, HEDGE-ROWS & SINGLES
P	P11 PRECISION FARMING	P12 AGRO FORESTRY	P13 SOLAR SHARING	P14 CULTIVATING RESOURCES	P15 EXTENSIVE LIVESTOCK FARMING	P16 STRIP CROPPING				

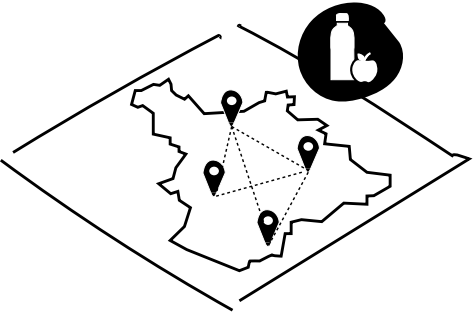


Two groups of patterns are too far apart in scale (reprinted from Salingaros, 2000, p.156)

R.1 LOCAL FOOD ECONOMY

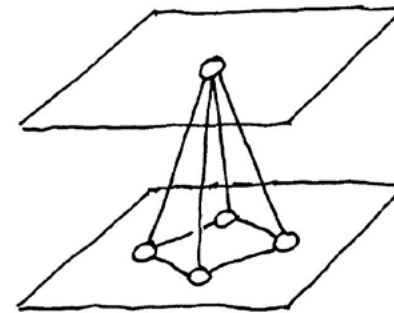
HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

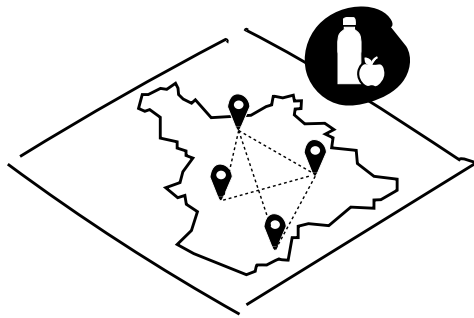


Higher level pattern (reprinted from Salingaros, 2000, p.156)

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



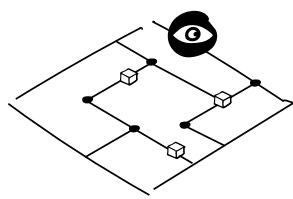
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

T.1 TRANSPARENCY FOOD CHAIN

HYPOTHESIS

Transparency in environmental, economic, and social processes aids in the development of trust and acceptance of food production, while also establishing a foundation for business interaction and collaboration in the agri-food chain.



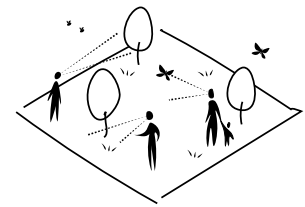
RELATED PATTERNS

T.2, R.1, R.2, N.1, P.1, P.2, P.3, P.4

T.2 LANDSCAPE AWARENESS

HYPOTHESIS

The landscape must be allowed to develop, but its characteristics must be preserved and even enhanced where possible. Enhance regional landscape character and advocate for site-appropriate land use to promote landscape awareness and diversity.



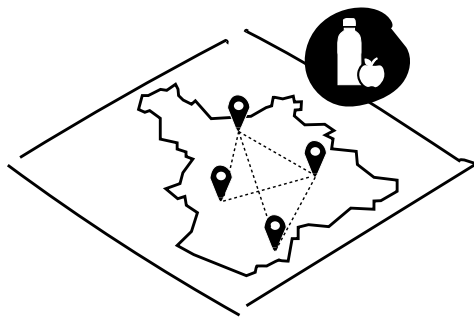
RELATED PATTERNS

T.3, R.1, N.1, N.2, F.2, P.1, P.3

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



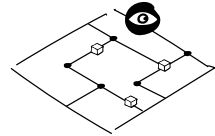
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

T.1 TRANSPARENCY FOOD CHAIN

HYPOTHESIS

Transparency in environmental, economic, and social processes aids in the development of trust and acceptance of food production, while also establishing a foundation for business interaction and collaboration in the agri-food chain.



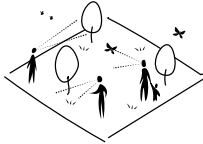
RELATED PATTERNS

T.2, R.1, R.2, N.1, P.1, P.2, P.3, P.4

T.2 LANDSCAPE AWARENESS

HYPOTHESIS

The landscape must be allowed to develop, but its characteristics must be preserved and even enhanced where possible. Enhance regional landscape character and advocate for site-appropriate land use to promote landscape awareness and diversity.



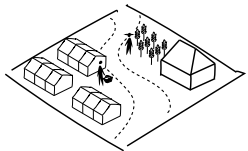
RELATED PATTERNS

T.3, R.1, N.1, N.2, F.2, P.1, P.3

N.1 BLURRING BOUNDARY

HYPOTHESIS

In the hybrid landscape, the transition zones between different functions are an ideal space for agri-food businesses and supporting services that aid in the circular transition. Furthermore, people may begin to appreciate and protect their natural ecosystem as a result of a meaningful connection.



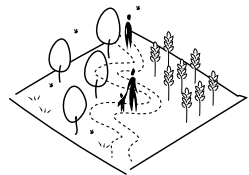
RELATED PATTERNS

T.1, T.2, R.1, R.2, R.3, N.2, P.1

N.2 RECREATIONAL ROUTE

HYPOTHESIS

Local communities benefit from recreational routes because they provide a place for everyone to meet and socialize, run events, exercise, and enjoy nature.



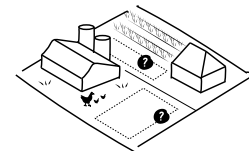
RELATED PATTERNS

T.1, T.2, T.3, R.3, R.4, N.1, P.1, P.3

F.1 EMPTY SPACE

HYPOTHESIS

Vacant land, empty rooftops, drosscapes, and buffer zones are examples of residual spaces that can be used to generate energy or provide ecosystem services.



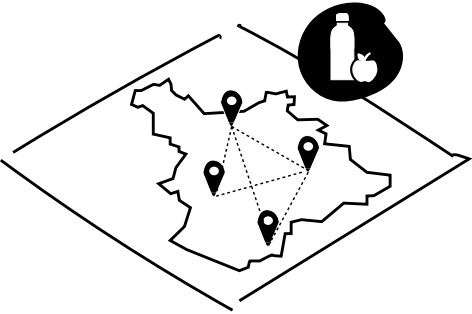
RELATED PATTERNS

T.3, R.3, R.6, N.10, F.8, P.5

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



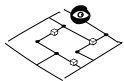
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

T.1 TRANSPARENCY FOOD CHAIN

HYPOTHESIS

Transparency in consumption, production, and retail processes will be the foundation to build and maintain a local circular, high and resilient economy.



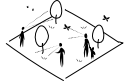
RELATED PATTERNS

T.1, R.2, R.3, R.6, R.9, N.1

T.2 LANDSCAPE AWARENESS

HYPOTHESIS

The awareness and understanding of the landscape, its history, and its potential will be the foundation to build and maintain a local circular, high and resilient economy.




RELATED PATTERNS

T.1, R.2, R.3, R.6, R.9, N.1

N.1 BLURRING BOUNDARY

HYPOTHESIS

In the urban landscape, the transition zones between different functions are an ideal space to promote sustainable and resilient communities that are self-sufficient. Furthermore, people may wish to aggregate and provide their social network and access to a range of services.




RELATED PATTERNS

T.1, T.2, N.1, N.2, N.3, N.4, N.9

N.2 RECREATIONAL ROUTE

HYPOTHESIS

Local communities benefit from recreational infrastructure if they provide value for people to meet and socialize, for events, recreation, and enjoy nature.



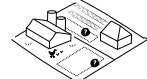
RELATED PATTERNS

T.1, T.2, N.1, N.2, N.3, N.4, N.9, P.1, P.2

F.1 EMPTY SPACE

HYPOTHESIS

Unused and empty offices, shops, and other spaces are examples of market waste that can be used to generate energy or provide ecosystem services.



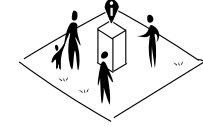
RELATED PATTERNS

T.1, R.2, R.3, N.1, N.2, P.1, P.2

P.1 ARTIFACTS & KIOSKS

HYPOTHESIS

In order to involve stakeholders, it is vital to display the extent to which areas are sustainable as necessary. A kiosk with visible indicators of the water, energy, water, resource consumption cycle, as well as the generated waste production.



RELATED PATTERNS

T.1, T.2, T.3, T.12, R.2, N.1, N.2

P.2 FARMERS MARKET

HYPOTHESIS

Farmers produce from the region is sold at the farmers market, which strengthens the relationship between consumers and producers.



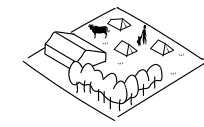
RELATED PATTERNS

T.1, R.1, R.2, R.6, N.1, N.4, F.1, P.4

P.3 CO-OPERATION TOURISM

HYPOTHESIS

People are able to appreciate and protect both nature and farming practices more consciously as a result of ecotourism activities.



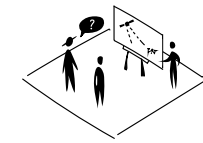
RELATED PATTERNS

T.1, T.2, T.3, T.12, R.2, R.3, N.1, N.2, F.1, F.3

P.4 DEVELOPMENT & EDUCATION

HYPOTHESIS

Training centers are required to facilitate education, knowledge sharing, and the development of new skills for a circular agri-food chain.



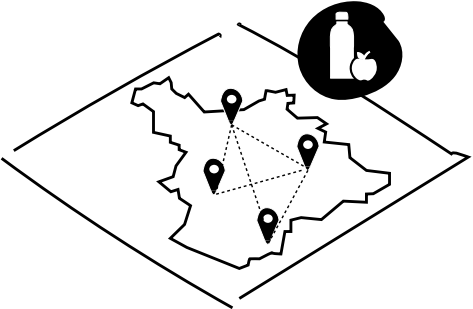
RELATED PATTERNS

T.1, T.3, R.1, R.2, R.3, N.1, F.2, F.3

R.1 LOCAL FOOD ECONOMY

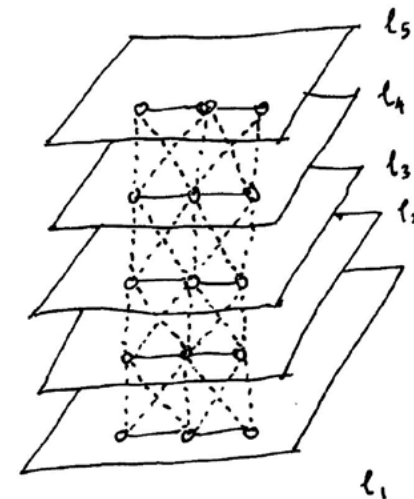
HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

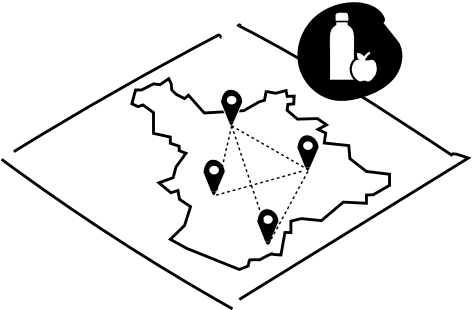


Hierarchical connections patterns
(reprinted from Salingaros, 2000, p.156)

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS

Local loops shorten the distances food and resources travel. Reducing the distances between production sites, processing and packaging, distribution and storage, retail, re-use and recovery, and pack to production. Contributing to regional-scale circularity and a close connection between consumer & producers.



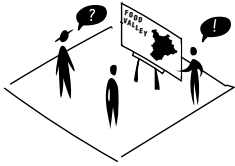
RELATED PATTERNS

T1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

R.2 THINK AS A REGION

HYPOTHESIS

Unique alliances and ideas are formed at the regional level by connecting enterprising actors and various disciplines, allowing for the best use of local specifics in regional collaboration.



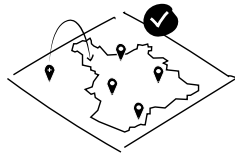
RELATED PATTERNS

T.1, T.3, R.1, R.2, R.9, N.1, P.4

R.3 PLACE CONDITIONS

HYPOTHESIS

Taking advantage of the location's characteristics, particularly the existing conditions. The state of the suburb/area, or along the green and blue networks, as well as roads and railways. These unique circumstances can be used to accommodate the appropriate agrifood-related activities (production, processing, distribution, etc.) while preserving the ecosystem.



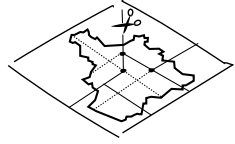
RELATED PATTERNS

T.2, T.3, T.12, R.1, R.2, R.7, R.9, N.4, P.4, P.5

R.6 DECENTRALIZED RESOURCE LOOPS

HYPOTHESIS

Circularity of flows on a regional scale is dependent on decentralized infrastructure and local logistics. Infrastructure for grey and black water treatment, energy generation and distribution, and waste and material processing systems. Recycled materials, generated energy, and cleaned water can all be used in novel ways to reduce reliance on primary raw materials while also alleviating environmental pressures.



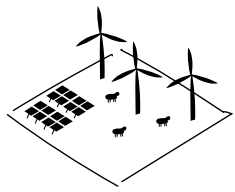
RELATED PATTERNS

T.10, T.12, T.13, T.14, R.1, R.2, N.3, N.4, N.9, P.4

N.3 PRODUCTIVE LANDSCAPES

HYPOTHESIS

Circular agricultural production in the Foodvalley region necessitates the generation of renewable energy on a local / regional scale.



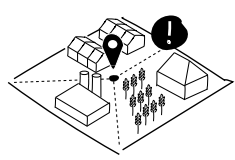
RELATED PATTERNS

T.13, R.1, R.3, R.6, R.7, R.8, R.9, N.10, F.1

N.4 IMPORTANT NODES

HYPOTHESIS

Agricultural production benefits from being near relevant infrastructure, processing hubs, logistic hubs and good access to distribution networks.

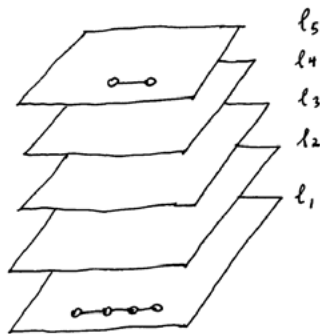


RELATED PATTERNS

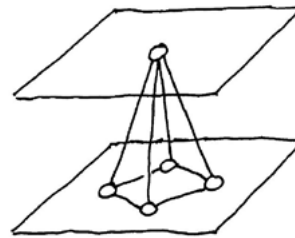
T.11, R.1, R.2, R.3, R.6, R.9, N.5, N.6, N.7

RQ2:**Circular agriculture patterns that harvest the synergies & closed cycles**

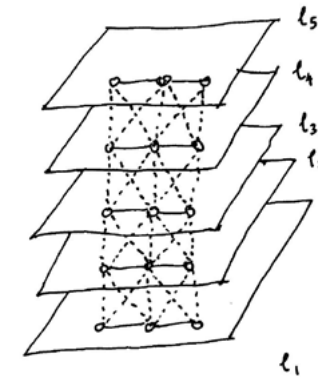
- I Consist of several scales of actions
- II Consist of higher - level and lower - level patterns
- III Build one connected framework (language), connections exist both on the same levels, and across levels
- IV Help to render facets of circularity (e.q. social & systemic) to the territory by addressing required spatial conditions



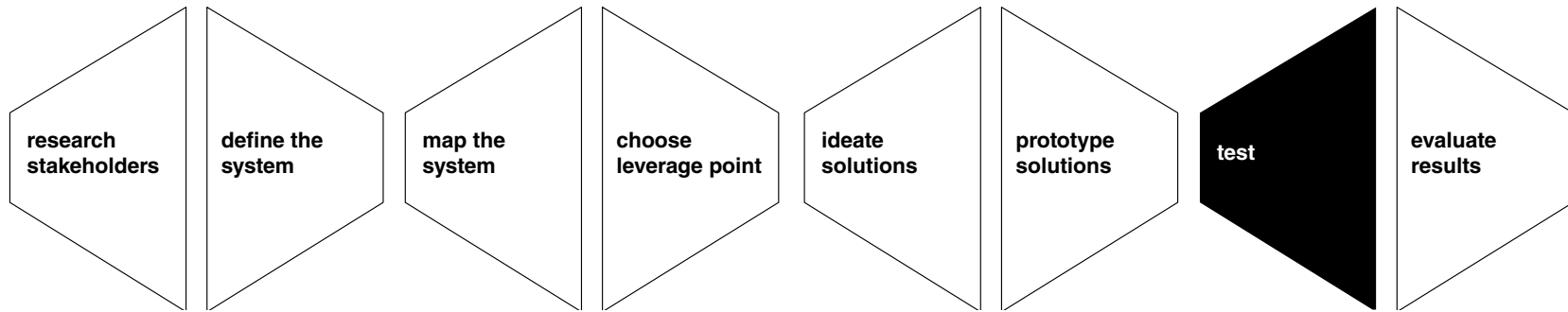
Two groups of patterns are too far apart in scale (reprinted from Salingaros, 2000, p.156)



Higher level pattern (reprinted from Salingaros, 2000, p.156)



Hierarchical connections patterns (reprinted from Salingaros, 2000, p.156)

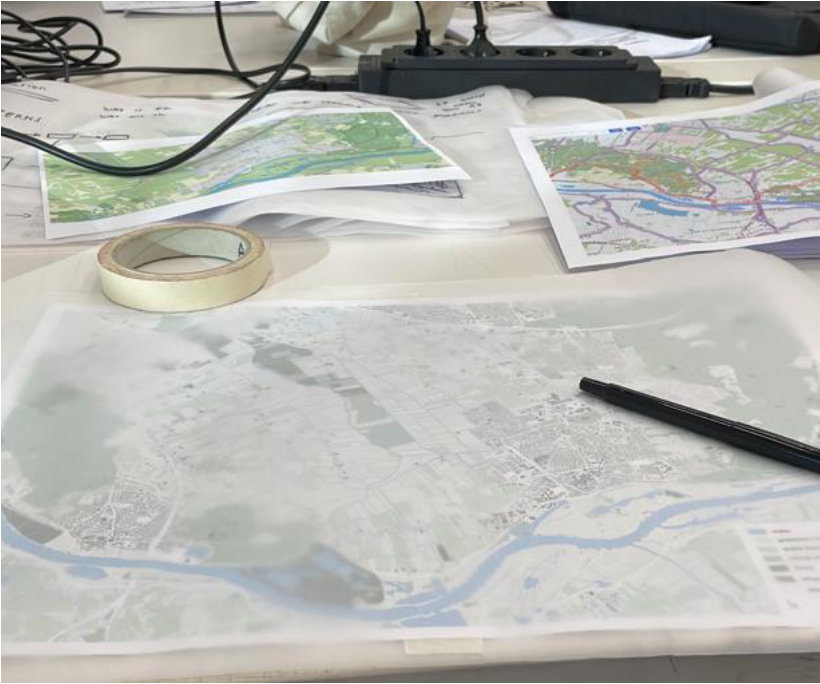


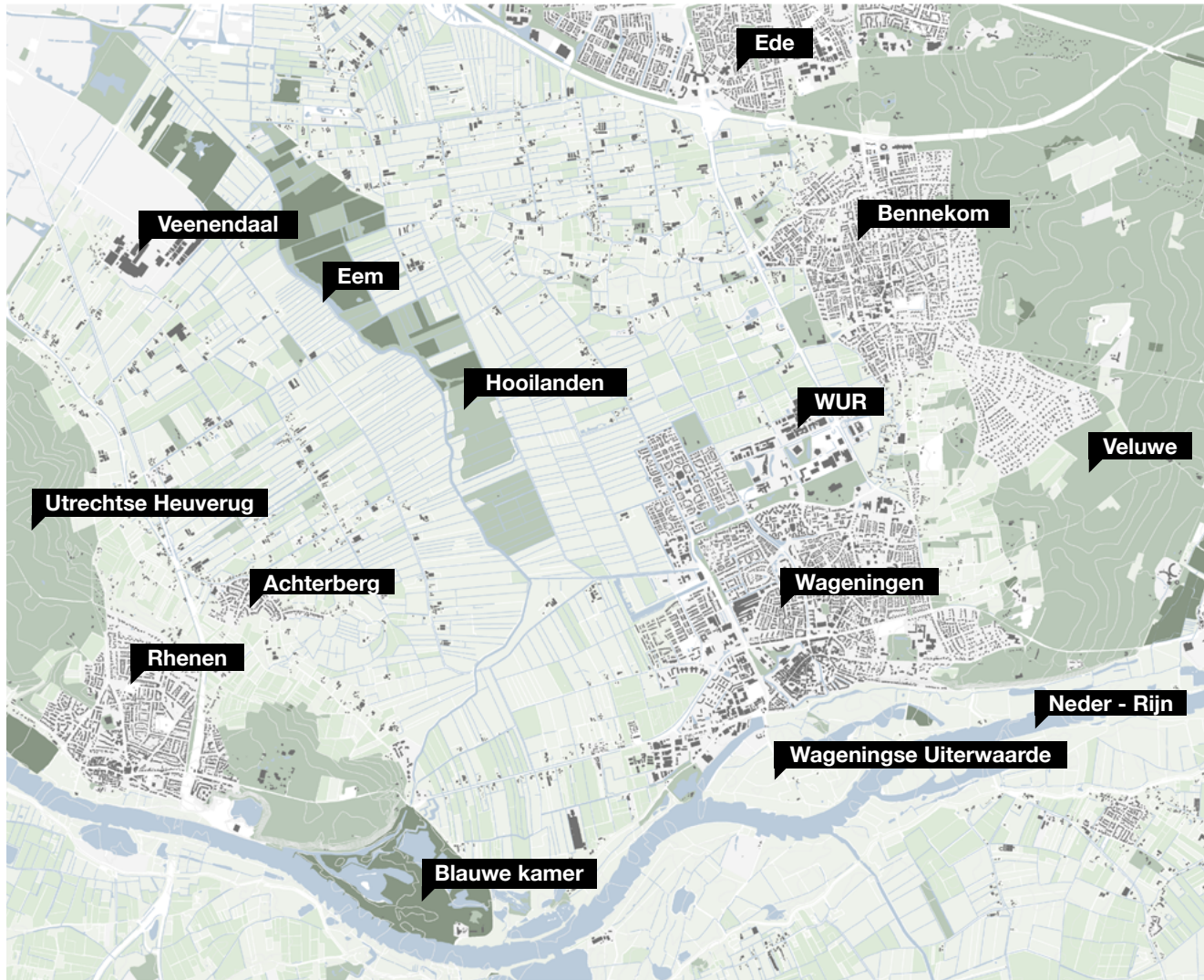
(Ospina, 2015)

Collaboratively

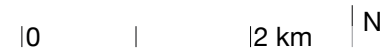


Individually





- 1 Prioritize patterns > common goals or vision
- 2 Design > with selected patterns
- 3 Detailing > with additional patterns



Collaboratively



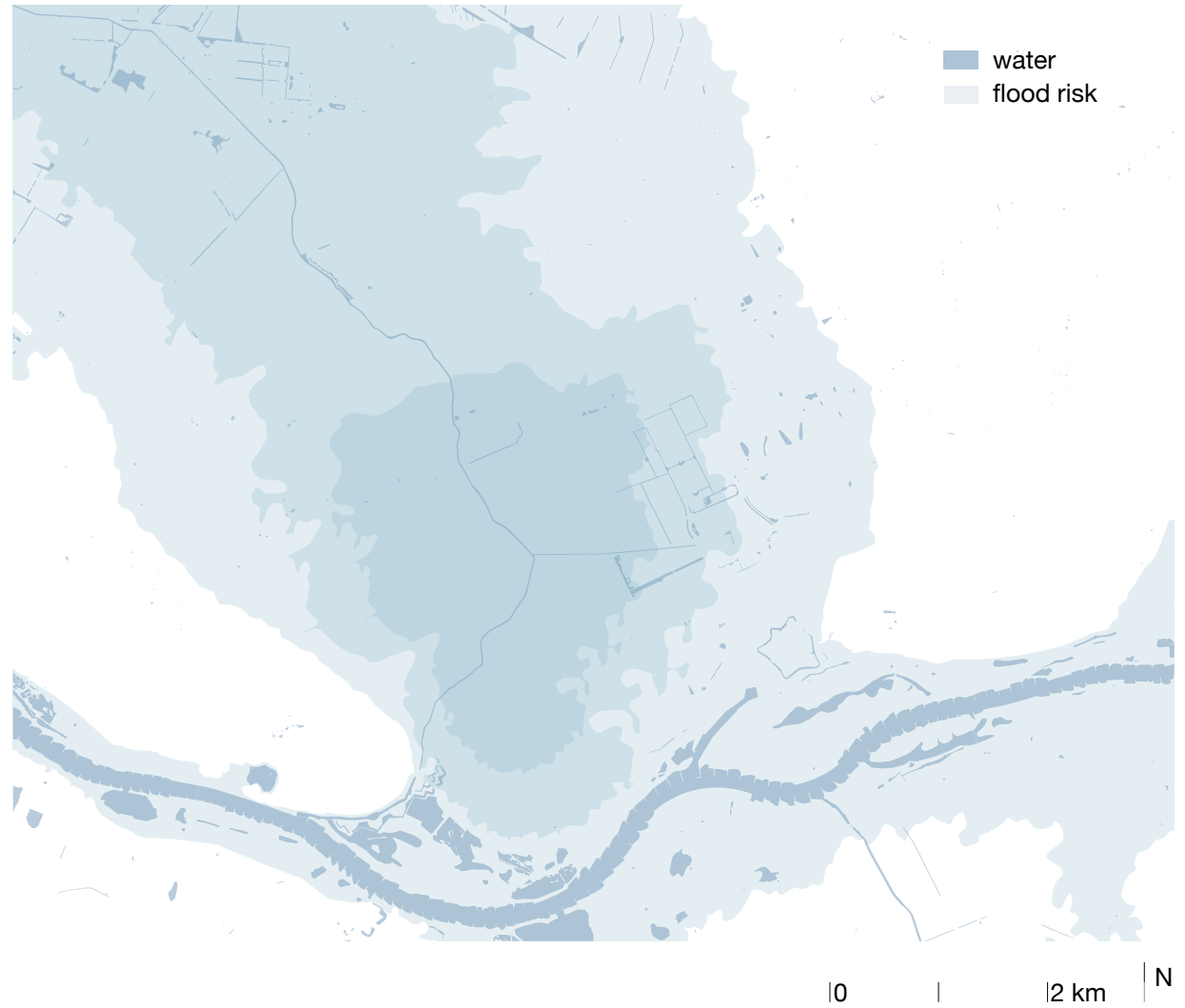
Individually



**Water authority
Vallei en Veluwe**

Description

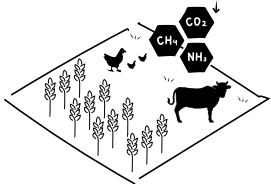
Needs & ambitions



Agriculture transition & short chains

R.7 ADOPTING CLEAN FARMING TECHNIQUES

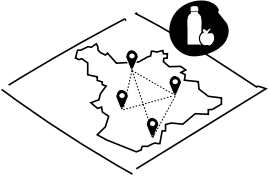
HYPOTHESIS
Organic and low-agri-chemical farming techniques reduce pollution and the indirect ecological footprint of food.



RELATED PATTERNS
T.3, T.16, T.17, T.19, N.9, N.10, F.2, F.3, F.8, P.4

R.1 LOCAL FOOD ECONOMY

HYPOTHESIS
Local loops contribute to regional-scale circularity by reducing distances from resource to processing site, distribution, retail, and then to re-use, remanufacture, material recovery, and back to the production cycle.




RELATED PATTERNS
T.1, T.11, R.2, R.3, R.6, R.9, N.1, N.3, N.4, N.9, P.4

Healthy food & healthy living environment

T.3 RESILIENT ECOSYSTEM

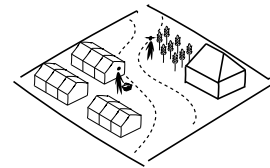
HYPOTHESIS
All organisms must adapt to their surroundings in order to survive. This entails adapting to the climatic conditions of the ecosystem in order to survive. By preserving and improving ecosystems and their biodiversity, the overall resilience of the ecosystem will be increased.



RELATED PATTERNS
T.2, T.6, R.3, R.4, R.5, R.7, N.1, N.8, F.2, F.8, P.4, P.5

N.1 BLURRING BOUNDARY

HYPOTHESIS
In the hybrid landscape, the transition zones between different functions are an ideal space for agrifood businesses and supporting services that aid in the circular transition. Furthermore, people may begin to appreciate and protect their natural ecosystem as a result of a meaningful connection.

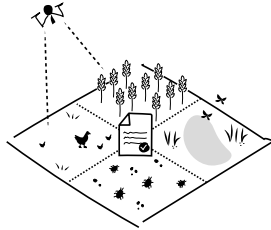


RELATED PATTERNS
T.1, T.2, R.1, R.2, R.3, N.2, P.1

Human capital

T.8 DIVERSE TENURE MODELS

HYPOTHESIS
A variety of land and property tenure models make agrifood-related businesses accessible to people based on their financial means and ownership requirements.

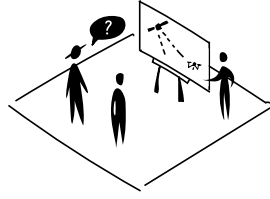


RELATED PATTERNS
T.15, R.1, R.2, R.7, N.10, F.2, F.3, F.8

Innovation & cluster development

P.4 DEVELOPMENT & EDUCATION

HYPOTHESIS
Training centers are required to facilitate education, knowledge sharing, and the development of relevant skills for a circular agrifood chain.

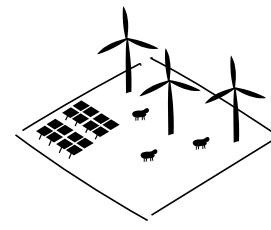


RELATED PATTERNS
T.1, T.3, R.1, R.2, R.7, N.1, F.2, F.3

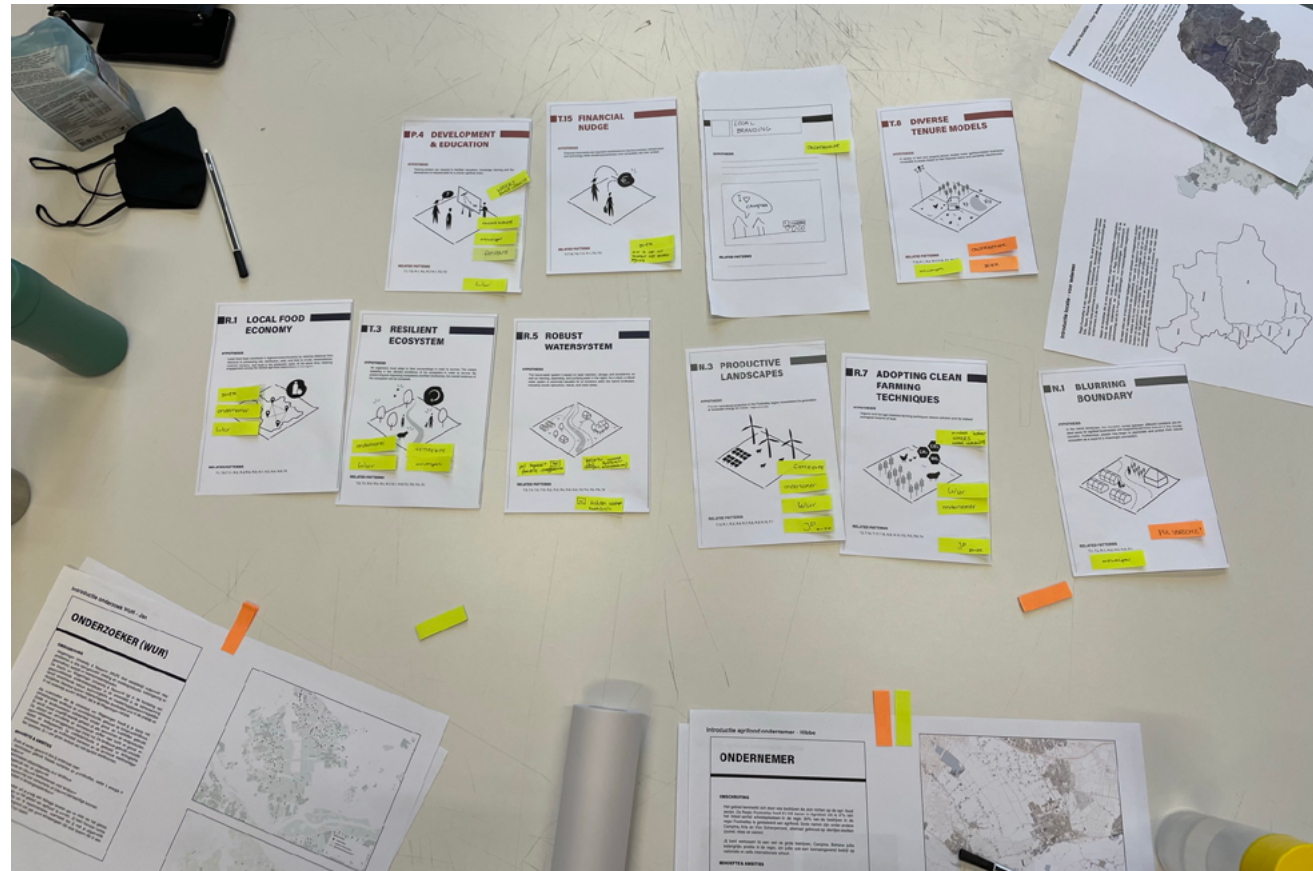
Energy transition

N.3 PRODUCTIVE LANDSCAPES

HYPOTHESIS
Circular agricultural production in the Foodvalley region necessitates the generation of renewable energy on a local / regional scale.



RELATED PATTERNS
T.13, R.1, R.3, R.6, R.7, R.8, R.9, N.10, F.1



- 1 Prioritize patterns > common goals or vision



2 Design > with selected patterns

R.7 ADOPTING CLEAN FARMING TECHNIQUES

HYPOTHESIS
Organic and low-agro-chemical farming techniques reduce pollution and the indirect ecological footprint of food.

RELATED PATTERNS
T.3, T.16, T.17, T.18, N.5, N.10, F.2, F.3, F.4, F.4

T.3 RESILIENT ECOSYSTEM

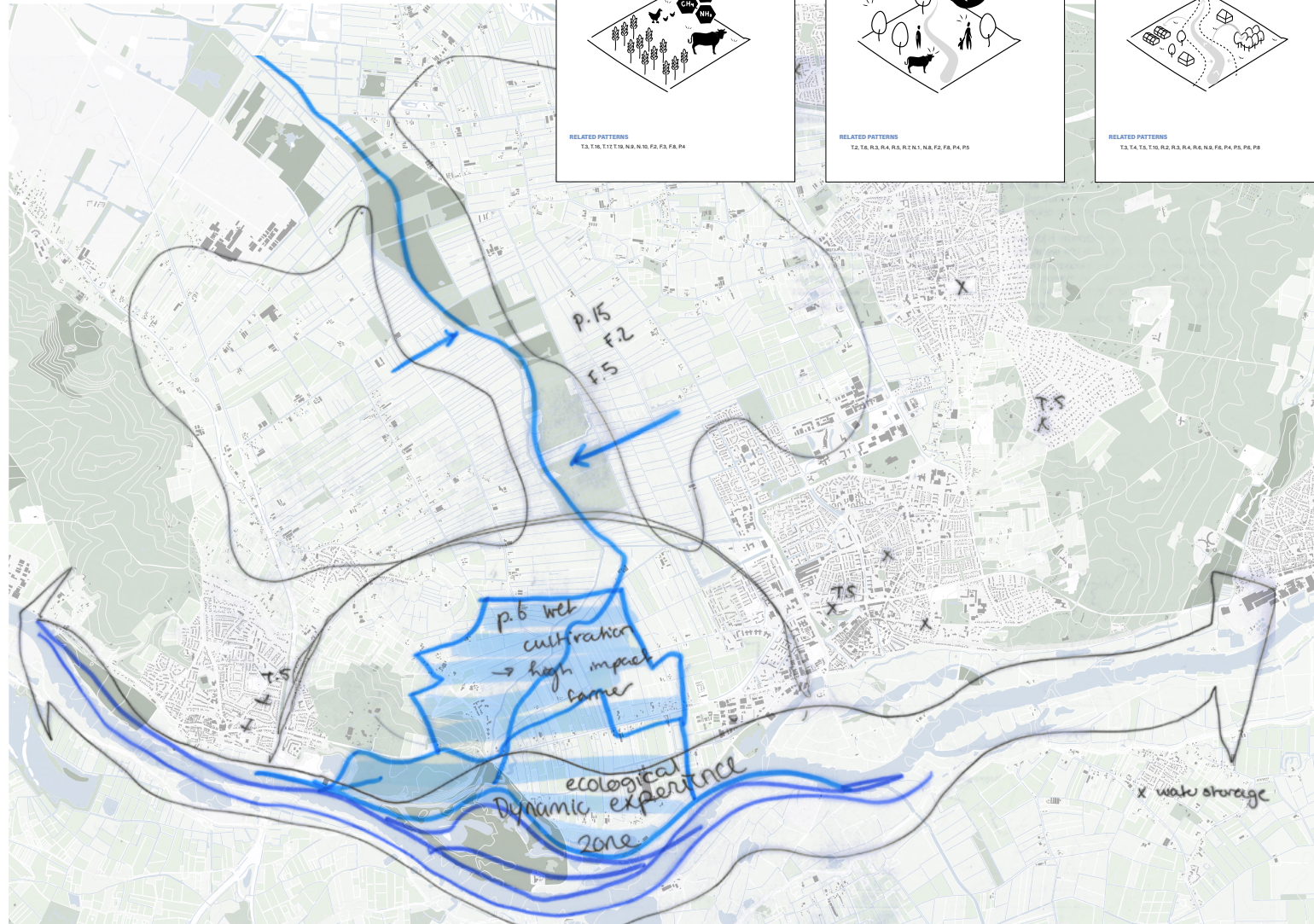
HYPOTHESIS
All organisms must adapt to their surroundings in order to survive. This entails adapting to the climatic conditions of the ecosystem in order to survive. By preserving and improving ecosystems and their biodiversity, the overall resilience of the ecosystem will be increased.

RELATED PATTERNS
T.2, T.6, R.3, R.4, R.5, R.2, N.1, N.8, F.2, F.4, F.5

R.5 ROBUST WATERSYSTEM

HYPOTHESIS
The future water system is based on water retention, storage, and acceptance, as well as cleaning, separating, and purifying water in the region. As a result, a robust water system is extremely valuable for all functions within the hybrid landscape, including circular agriculture, nature, and urban areas.

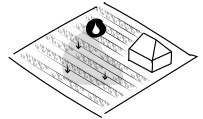
RELATED PATTERNS
T.3, T.4, T.5, T.10, R.2, R.3, R.4, R.6, N.6, F.6, F.4, P.5, P.6, P.8



3 Detailing > with additional patterns

T.5 INFILTRATION & STORAGE

HYPOTHESIS
 Rather than defending our land against the water, it is critical to work with it. The experience of retention, storage, and acceptance /evaporation cannot be overstated. This water can be re-used for beneficial purposes such as irrigation, potable water supplies, groundwater replenishment, and environmental restoration.



RELATED PATTERNS
 T2, T3, T4, R3, R3, F1, F6, F6, P5, P5, P8

P.6 WET CULTIVATION

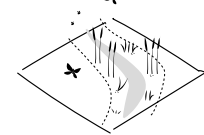
HYPOTHESIS
 Agricultural plots are extremely demanding to enable agriculture. Wet cultivation is a form of agriculture that is suitable for use in areas that benefit from a high groundwater level.



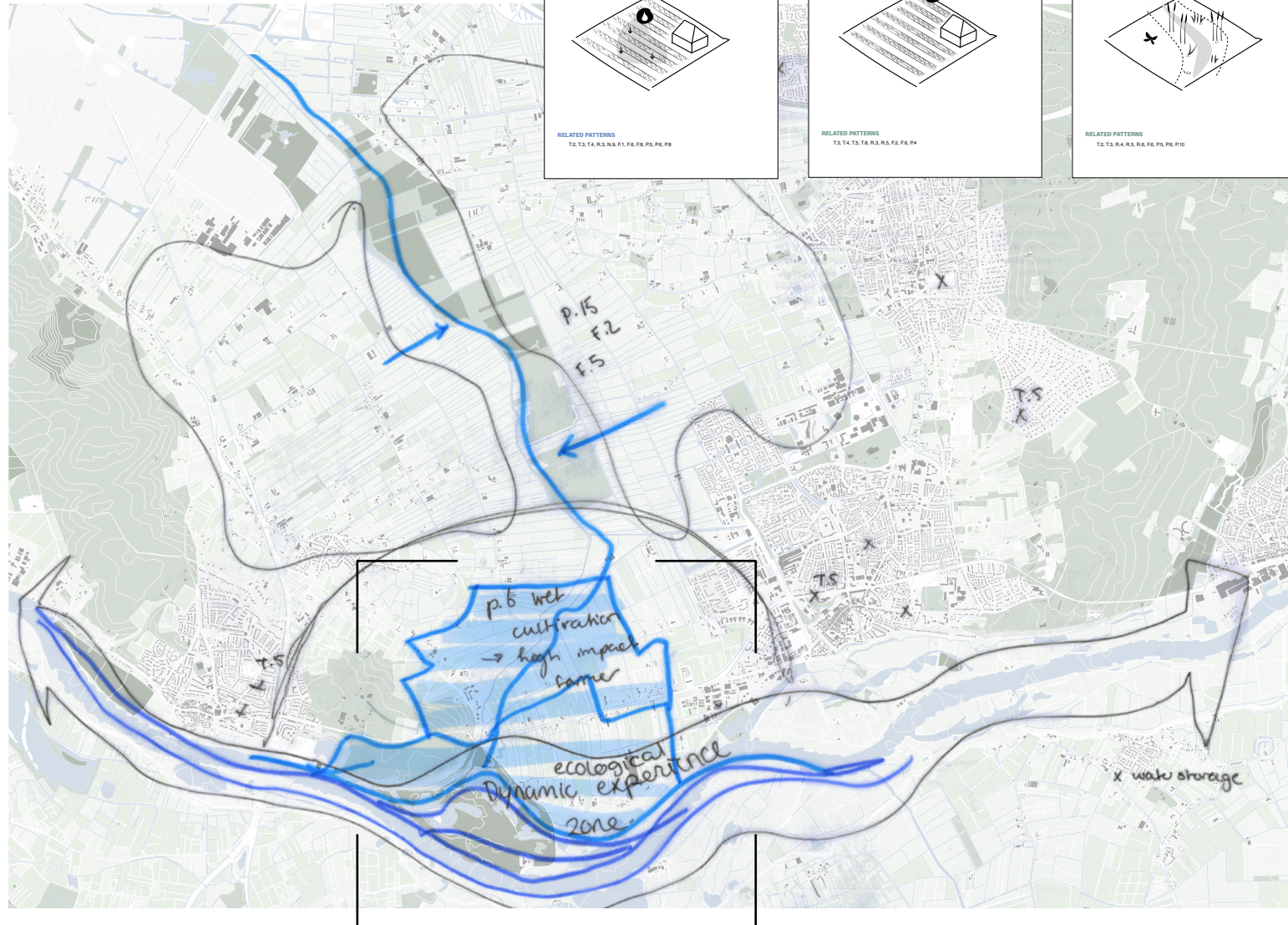
RELATED PATTERNS
 T3, T4, T5, T6, R3, R5, F2, F6, P4

P.8 NATURAL PURIFYING BANKS

HYPOTHESIS
 Nature-friendly banks are those that, in addition to providing flood protection, value the environment and aesthetics. Because of the difference in water levels, this bank is considered a dynamic ecological zone. Waterholes and their banks can help promote biodiversity and environmental correctness in this way.

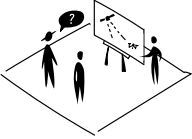


RELATED PATTERNS
 T2, T3, R4, R3, R6, F6, P5, P5, P10



P.4 DEVELOPMENT & EDUCATION

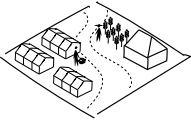
HYPOTHESIS
 Training centers are required to facilitate education, knowledge sharing, and the development of relevant skills for a circular agri-food chain.



RELATED PATTERNS
 T1, T3, R1, R2, R7, N1, F2, F3

N.1 BLURRING BOUNDARY

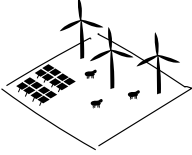
HYPOTHESIS
 In the hybrid landscape, the transition zones between different functions are an ideal space for agri-food businesses and supporting services that aid in the circular transition. Furthermore, people may begin to appreciate and protect their natural ecosystem as a result of a meaningful connection.



RELATED PATTERNS
 T1, T2, R1, R2, R3, R2, P1

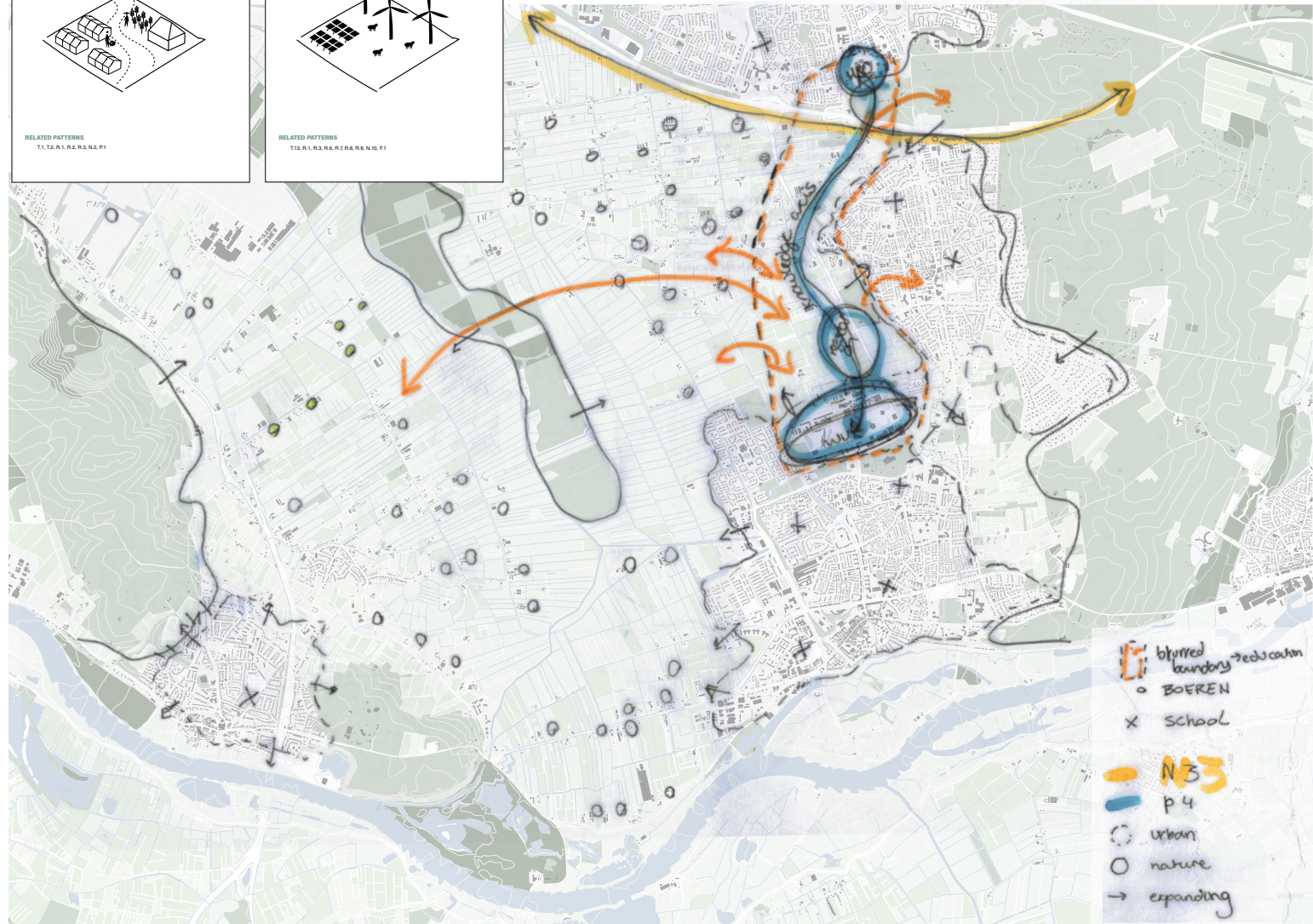
N.3 PRODUCTIVE LANDSCAPES

HYPOTHESIS
 Circular agricultural production in the Food Valley region necessitates the generation of renewable energy on a local / regional scale.

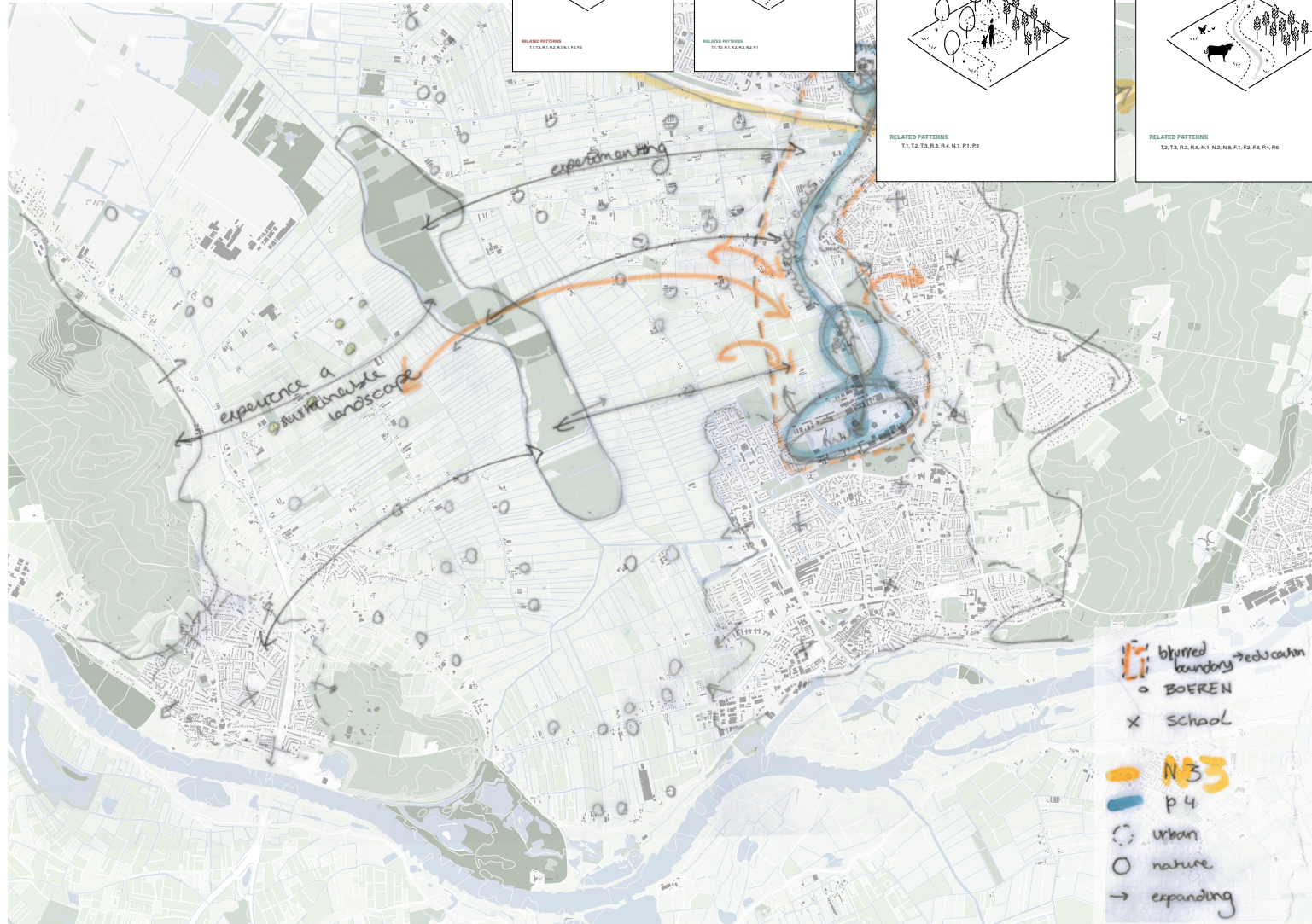
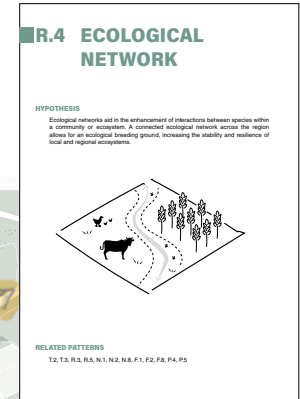
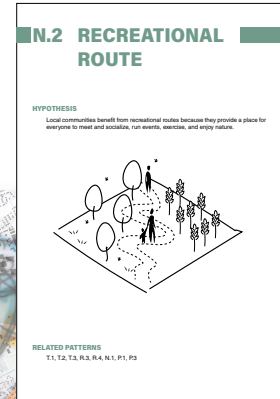
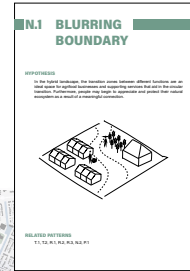
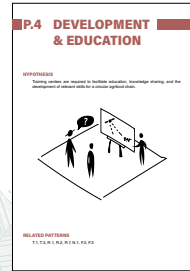


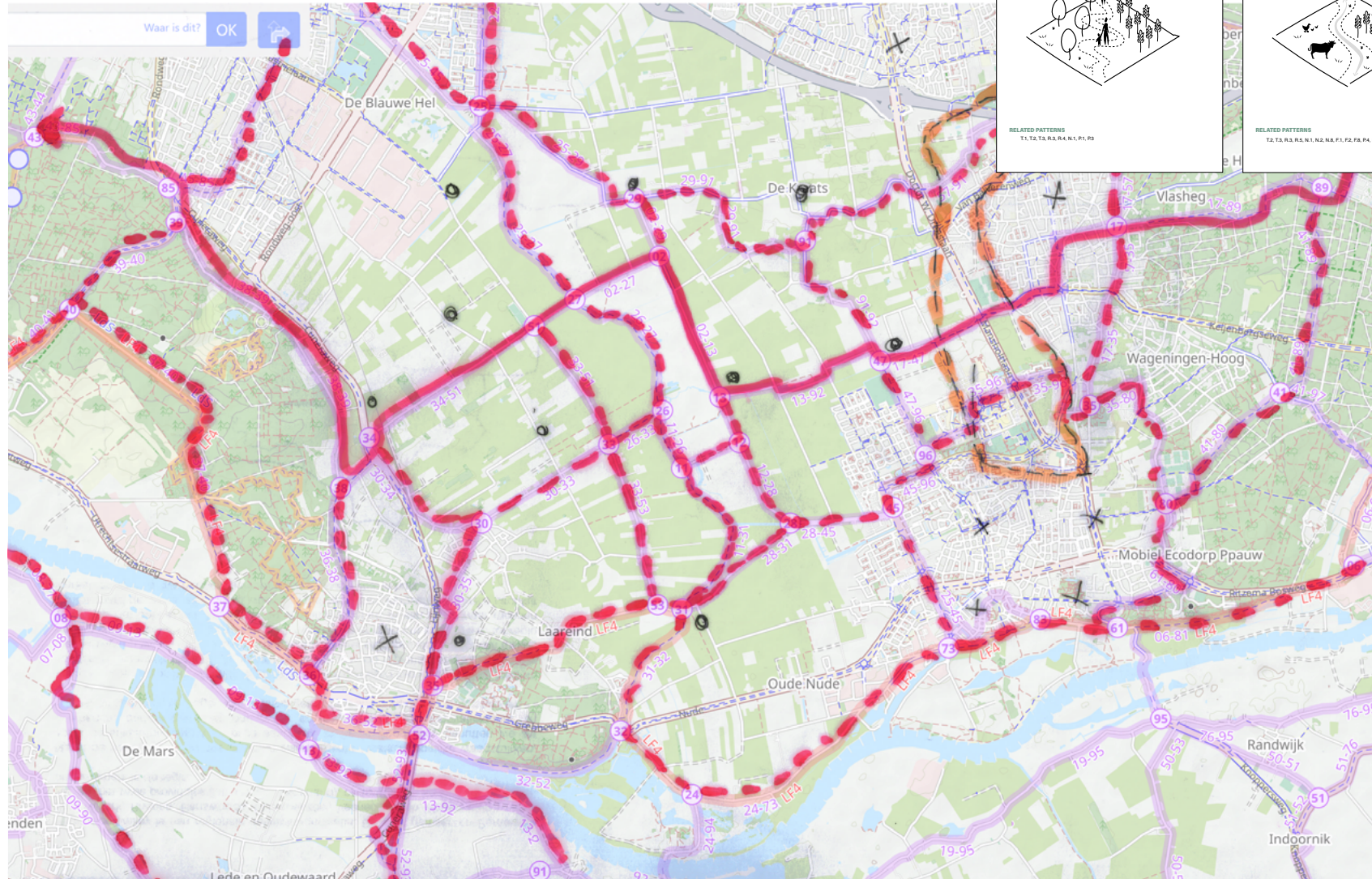
RELATED PATTERNS
 T13, R1, R3, R6, R7, R8, R9, N3, P1

2 Design > with selected patterns



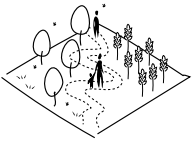
3 Detailing > with additional patterns





N.2 RECREATIONAL ROUTE

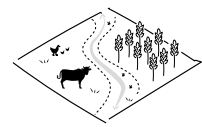
HYPOTHESIS
Local communities benefit from recreational routes because they provide a place for everyone to meet and socialize, run events, exercise, and enjoy nature.



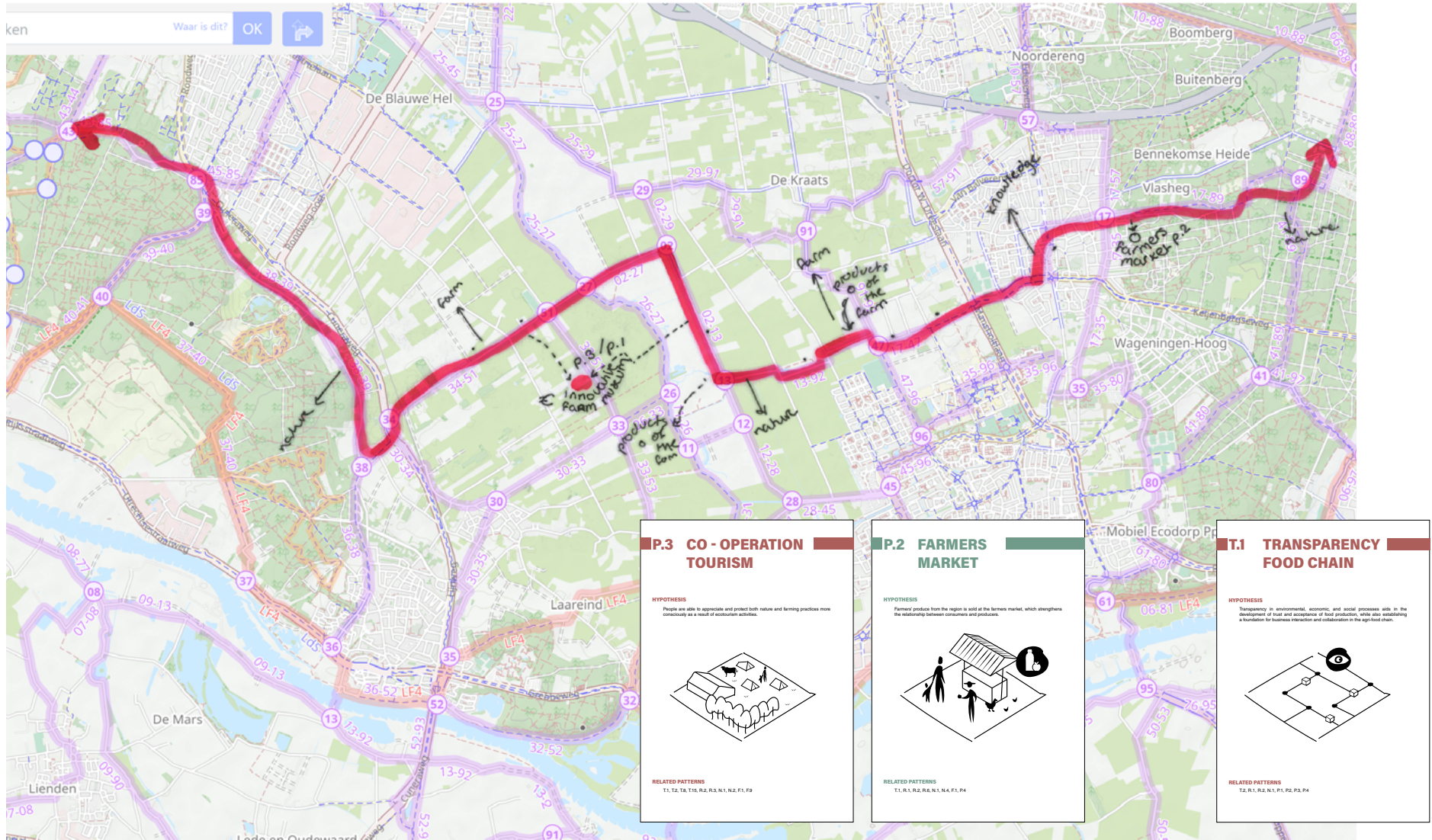
RELATED PATTERNS
T.1, T.2, T.3, R.3, R.4, N.1, P.1, P.5

R.4 ECOLOGICAL NETWORK

HYPOTHESIS
Ecological networks aid in the enhancement of interactions between species within a community or ecosystem. A connected ecological network across the region allows for an ecological breeding ground, increasing the stability and resilience of local and regional ecosystems.



RELATED PATTERNS
T.2, T.3, R.3, R.5, N.1, N.2, N.4, F.1, F.2, F.4, P.4, P.5



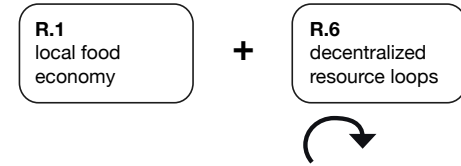
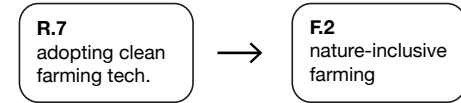
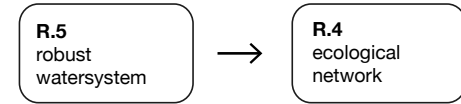
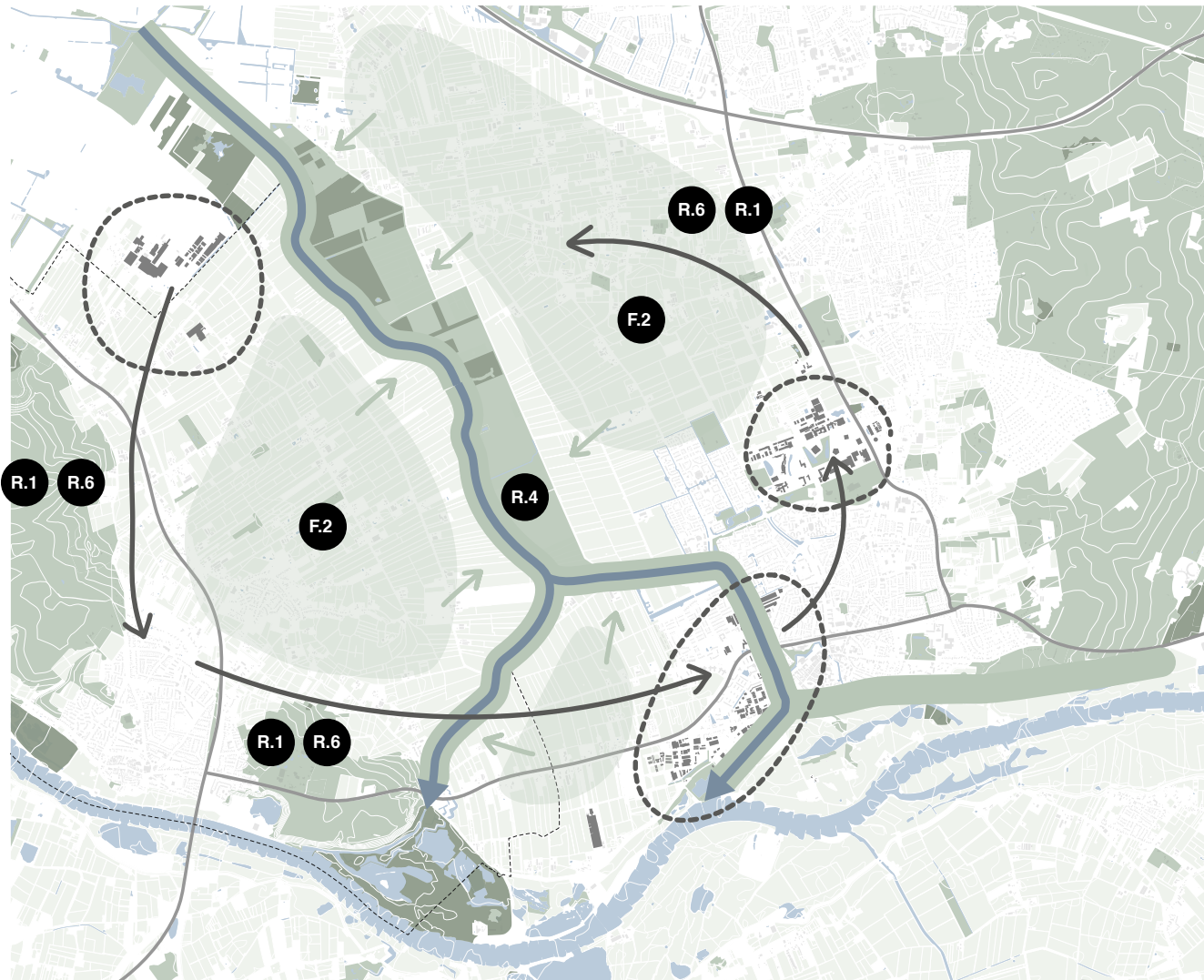
Collaboratively



Individually

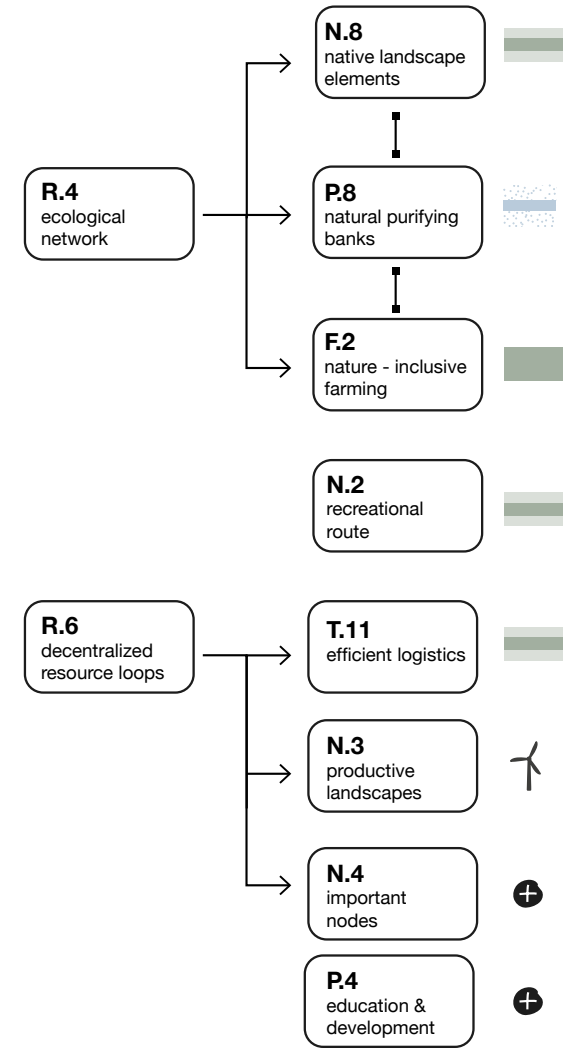
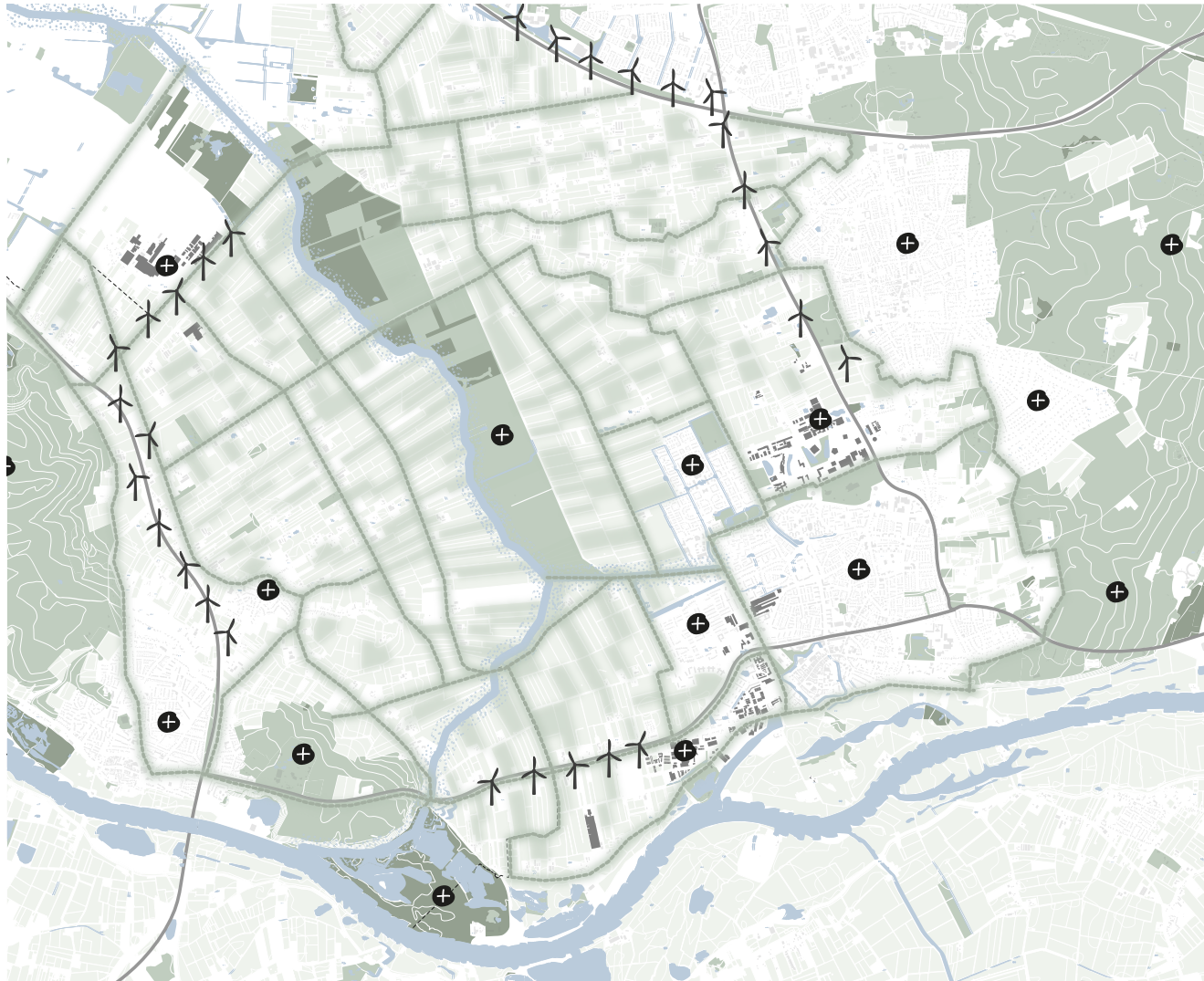


2 Design > with selected patterns



- synergize
- follow - up
- follow - up related to synergy

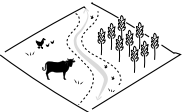
3 Detailing > with additional patterns





R.4 ECOLOGICAL NETWORK

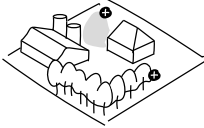
HYPOTHESIS
Ecological networks add in the enhancement of interactions between species within a diversity or restoration. A connected ecological network across the region allows for an ecological breeding ground, increasing the stability and resilience of local and regional ecosystems.



RELATED PATTERNS

N.8 ADD NATIVE LANDSCAPE ELEMENTS

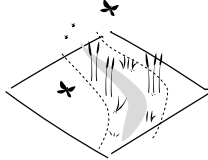
HYPOTHESIS
Landscape elements are the elements that make up the landscape. The addition of landscape elements, either on the one hand, climate-smart ecosystem management. These measures, on the other hand, concern the expansion of existing landscape elements in both the countryside and the city.



RELATED PATTERNS
T.2, T.3, T.6, R.4, R.5, F.1, F.8, P.5, P.7, P.10, P.12

P.8 NATURAL PURIFYING BANKS


HYPOTHESIS
Nature-friendly banks are those that, in addition to providing flood protection, value the environment and landscape. Because of the differences in water height, this bank is considered a dynamic ecological zone. Waterbodies and their banks can help promote biodiversity and environmental connectedness in this way.



RELATED PATTERNS
T.2, T.3, R.4, R.5, R.6, F.6, P.5, P.6, P.10

F.2 NATURE-INCLUSIVE FARMING

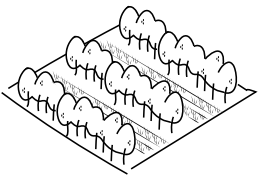
HYPOTHESIS
Nature-inclusive agriculture promotes a resilient food- and ecosystem. The aim is to create systems that are ecologically sound and economically viable and do not exploit or pollute the environment.



RELATED PATTERNS
T.2, T.3, T.7, T.8, T.15, T.17, T.18, R.4, R.7, N.10, F.8, P.4, P.5

P.16 STRIP CROPPING


HYPOTHESIS
Strip cropping is a rewarding farming practice that provides advantages in addition to increased yields. Strip cropping is a good way to reduce soil erosion. Neighboring species that are properly selected have a positive impact on each other, increasing field productivity as well as underground and above-ground diversity and biodiversity.



RELATED PATTERNS
T.3, T.7, T.17, R.4, R.7, N.10, F.2, F.4, F.8

P.12 AGRO FORESTRY

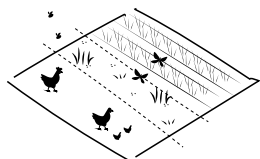
HYPOTHESIS
Agroforestry allows landowners to grow trees and shrubs in conjunction with crop and/or animal farming systems. Agroforestry can improve agricultural system resiliency (protect crops, improve nutrient utilization) and mitigate the effects of climate change (carbon storage).



RELATED PATTERNS
T.3, T.7, T.8, T.15, T.16, R.4, R.7, N.8, N.10, F.2, F.4, F.8, P.5, P.7

P.7 GREEN BUFFERS

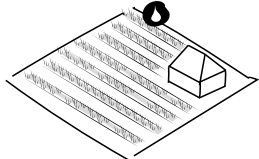
HYPOTHESIS
Creating natural strips or green buffers along producing land parcels aids the farm's maintenance, by allowing natural enemies of diseases and pests to thrive. It raises farmers' awareness of the importance of the natural environment in their farming practices.



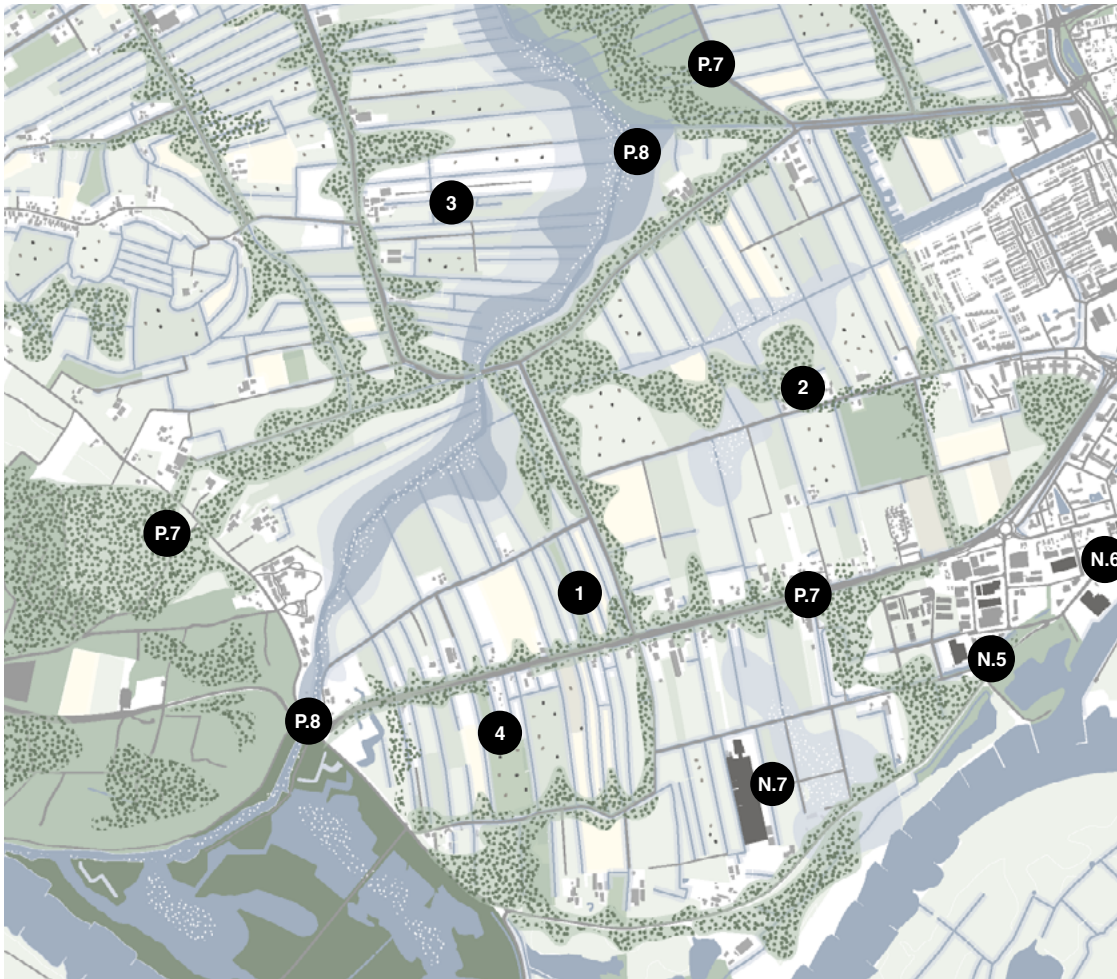
RELATED PATTERNS
T.3, T.6, T.17, R.4, N.8, F.1, F.2, F.4, F.8, P.5

P.6 WET CULTIVATION

HYPOTHESIS
Agricultural plots are extensively dewatered to enable agriculture. Wet cultivation is a form of agriculture that is suitable for use in areas that benefit from a high groundwater level.



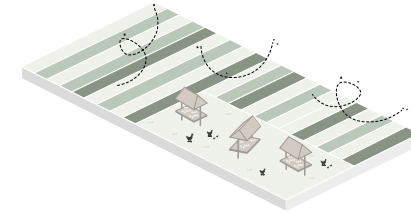
RELATED PATTERNS
T.3, T.4, T.5, T.8, R.3, R.5, F.2, F.6, P.4



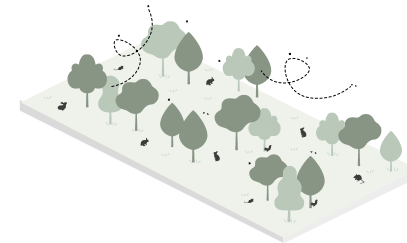
- N.5** Logistics & storage hub
- N.6** Waste management hub
- N.7** Processing & packaging hub

- P.7** Green buffers
- P.8** Natural river banks
- F.2** Nature inclusive farming

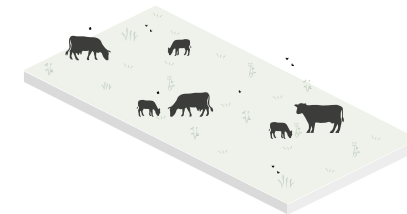
- 1** Strip cropping & tourism



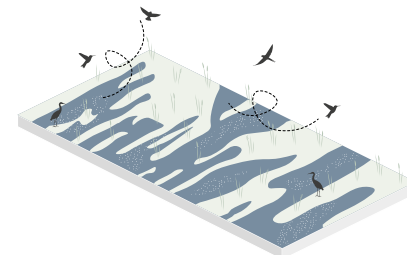
- 2** Agro-forestry

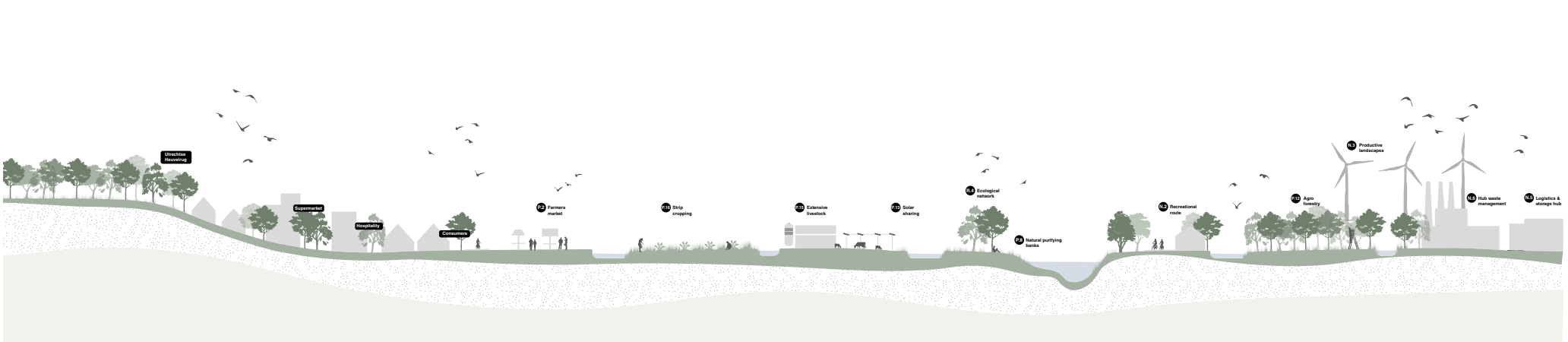
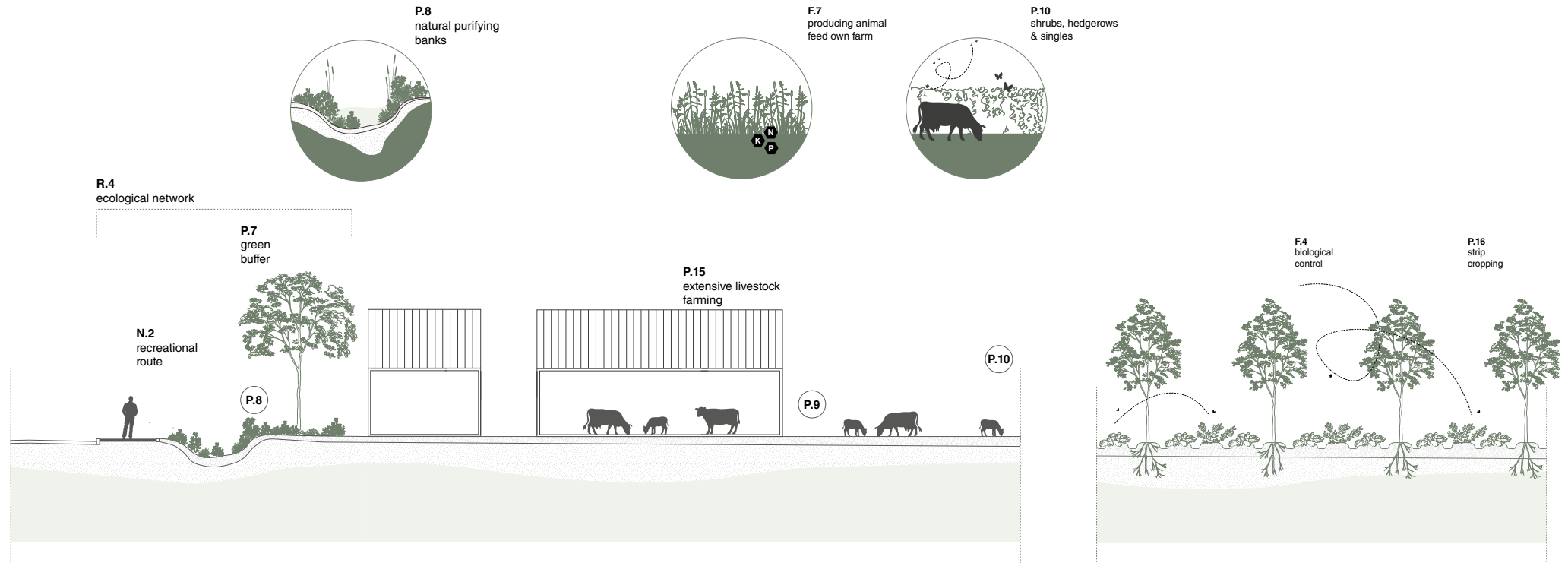


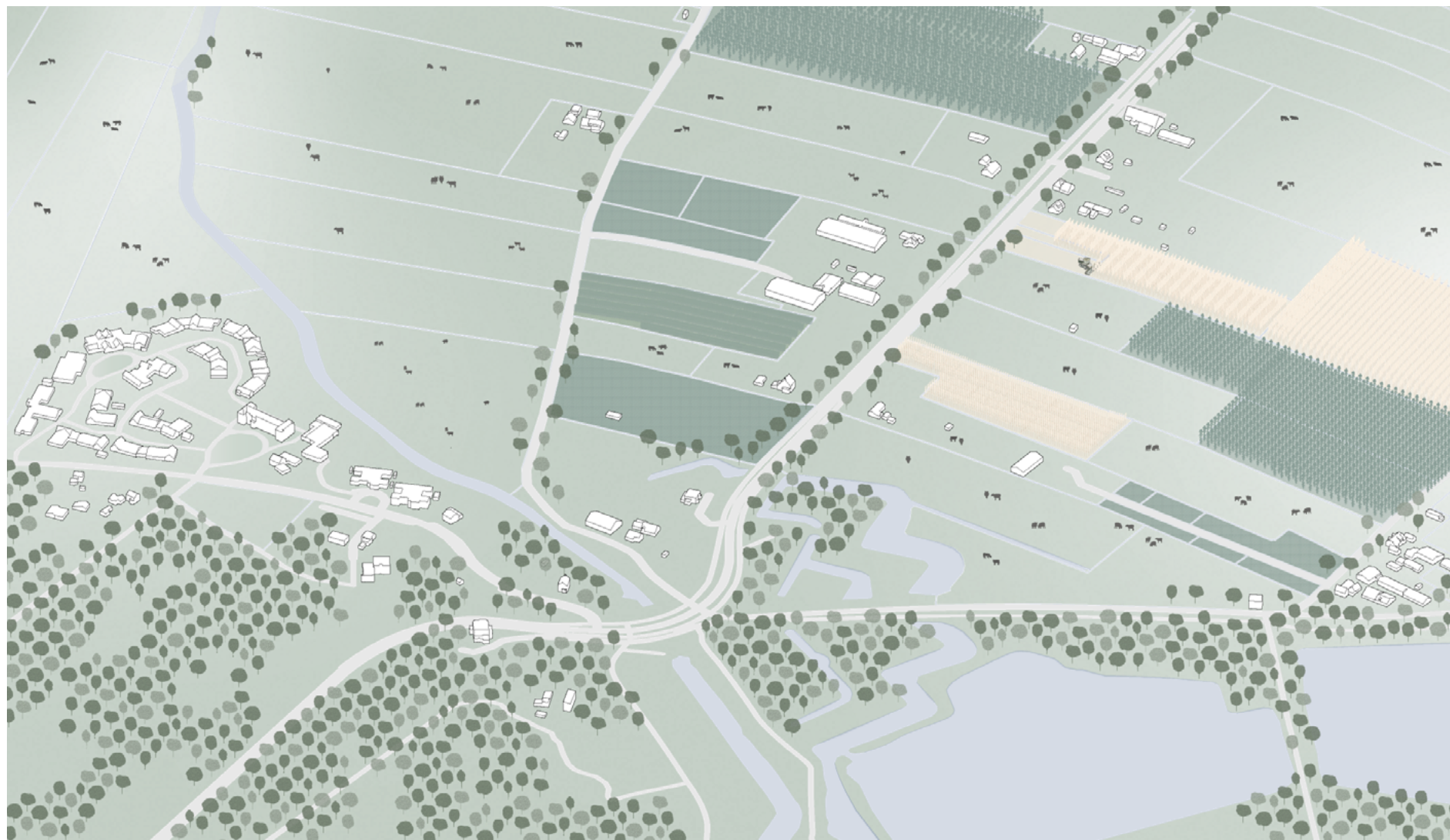
- 3** Extensive livestock farming



- 4** Wet cultivation











Depending on the selection of the patterns,
regenerative circular developments can look like this...

Productive
landscapes

N.3

Recreational
route

N.2

Green
buffers

P.7

Natural
purifying
banks

P.8

Producing animal
feed own farm

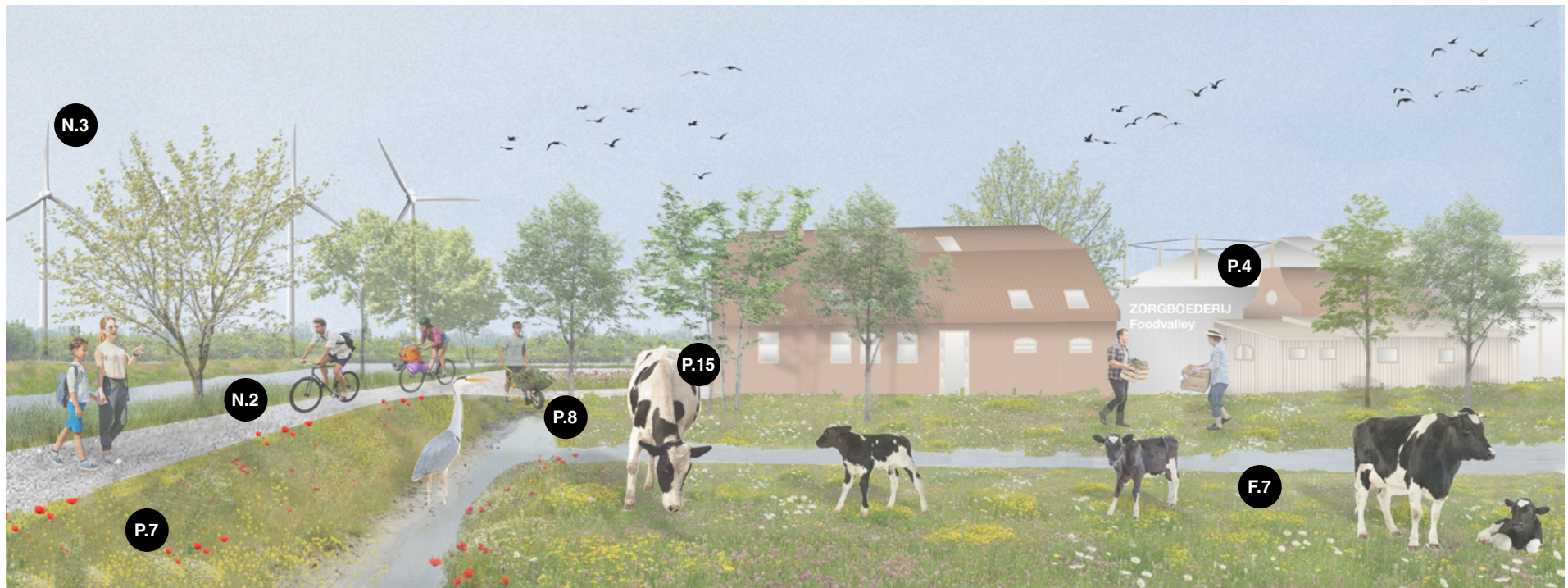
F.7

Extensive
livestock farming

P.15

Development
& education

P.4



Recreational route

N.2

Green buffers

P.7

Natural purifying banks

P.8

Blurring Boundary

N.1

Agro - forestry

P.12

Co - operation with tourism

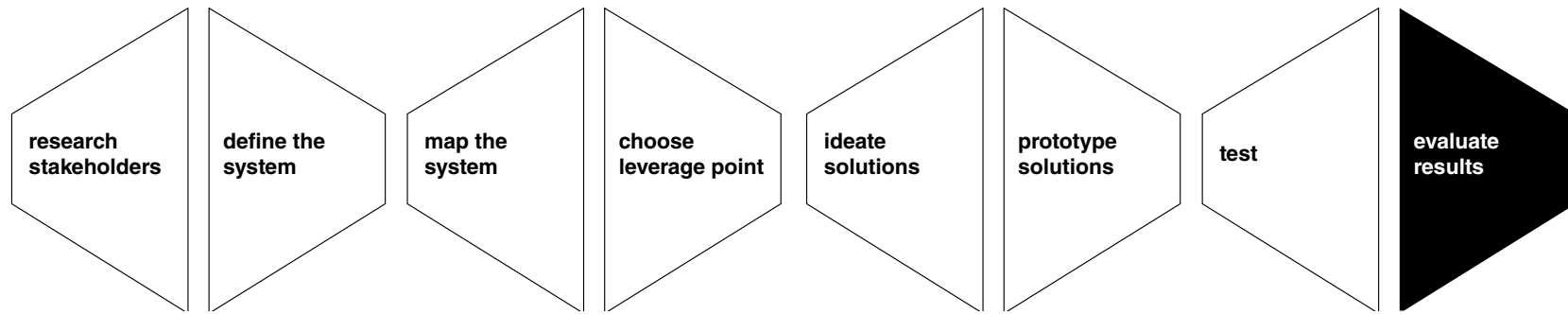
P.3



RQ3:
**Strategy to facilitate co - creation
circular developments**

- I Consists of co -creation workshop that use patterns to enable solution oriented dialogue between private & public parties
- II Prioritizes certain patterns, according to (common) goals
- III Connects patterns to existing spatial conditions / structures
- IV Adds detail by incorporating related patterns
- V The designer can use the results as input to create a design for the area.





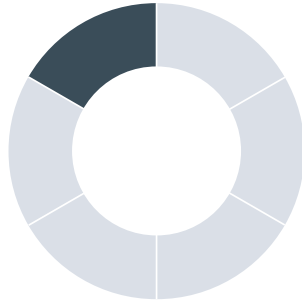
(Ospina, 2015)

RQ4:
Evaluation circular approach -
- qualitative

Familiar topic(s)?
(1 - 5)



Use P.L. before?
(yes - no)



P.L. > understand the subject
(in relation to the design)?
(1 - 5)



Use P.L. again?
(yes - no)



5 = very much
4 = somewhat
3 = neutral
2 = not really
1 = not at all

yes
no

Design conclusions:

1. Outline various options in a co-creative process, allowing discussion of future development options.
2. Take advantage of the location's existing conditions.
3. Connect different scales. Assign each stakeholder the appropriate level of action.
4. Connect different functions in a spatial and social way.
5. Enhance spatial diversity to create synergies.

RQ4:
Evaluation circular approach -
quantitative



Operates on the basis of renewable energy and is CO2 neutral.

N.3 PRODUCTIVE LANDSCAPES

HYPOTHESIS
Circular agricultural production in the Foodvalley region necessitates the generation of renewable energy on a local / regional scale.

RELATED PATTERNS
T.13, R.1, R.3, R.6, R.7, R.8, R.9, N.10, E.1

S **E** **P**

Indicator



1 wind turbine (400 x 450 m) = 5.3 GWh / year
= 3000 households per year



1 wind turbine = 28.000 solar panels (9 ha)
= 20 soccer fields



1 wind turbine = manure from 2.354 cows



social impact



ecological impact



economical impact

How to reconfigure the territory of the Foodvalley region, to facilitate regenerative circular developments, using a co - creation method?

- The framework and associated methods can be used to incorporate circularity into spatial plans for the territory (addressing social, ecological & spatial context).
- Using circular agriculture patterns, which represent strategic design solutions, that increase the regenerative capacity of the socio - ecological metabolism.
- Provide space for solution oriented dialogue between stakeholders. By employing these patterns in a co - creation strategy, that enables patterns to be embedded in the context of the Foodvalley region.
- The results include input for site - specific regenerative circular developments on several scales. Needed to continue development after nitrogen crisis.

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Usable for other territories facing similar societal challenges, as patterns identify a solution to recurring problems, transferable to a wide range of conditions.

Urban designer becomes mediator in the process. When actors are engaged, the design becomes significantly more valuable.

Designing 'with' circularity vs. designing circularity. How can circularity improve both resource efficiency as well as environmental, spatial and social quality.

Thank you.
Are there any questions?

Literature

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