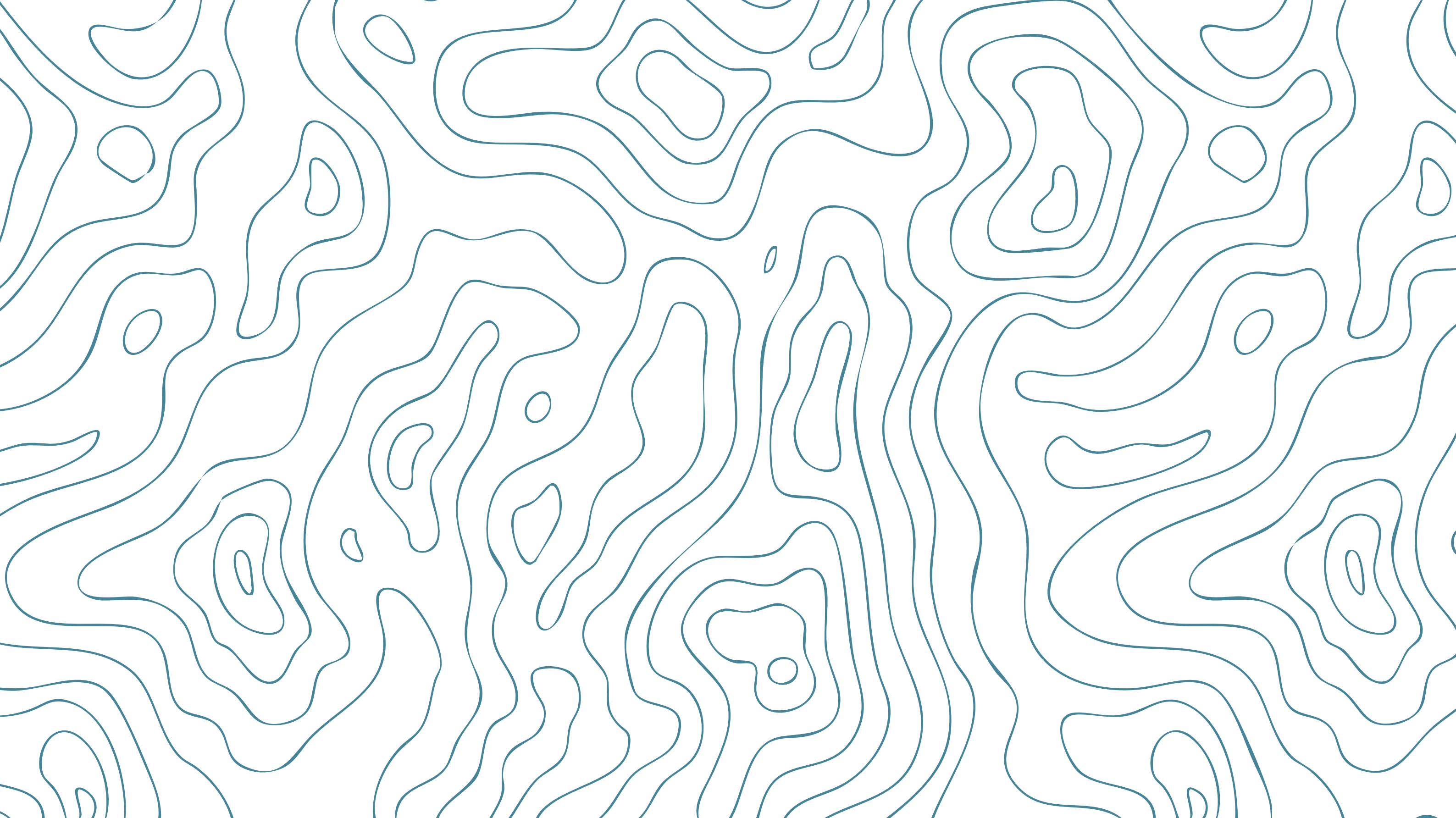




Who drinks water?

Who doesn't?

But, there is a problem ...

NEWS 12 SEPTEMBER 2019

Quality of drinking water sources under growing pressure



Drinking Water Sources: Quality Under Pressure

Published on 07/03/2022

Last updated on 23/10/2023

NOS Nieuws • Maandag 3 april 2023, 06:00 •
Aangepast maandag 3 april 2023, 11:55



RIVM: snel actie nodig om drinkwatertekort te voorkomen

Approach needed to tackle polluting activities to protect drinking water sources

Why is this happening?



Welcome!

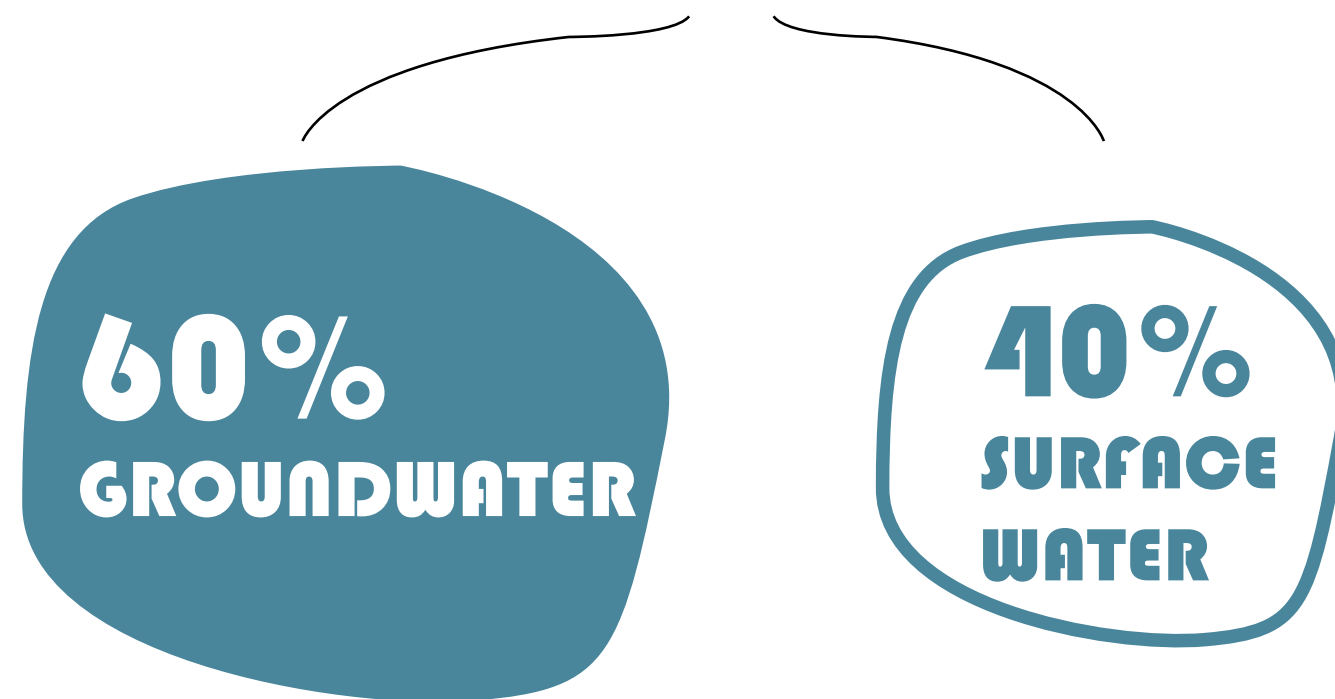
From fields to faucet

Safeguarding groundwater quality used for drinking
water in the rural areas of the province of Utrecht
with integrated solutions

Laetitia Ruiter

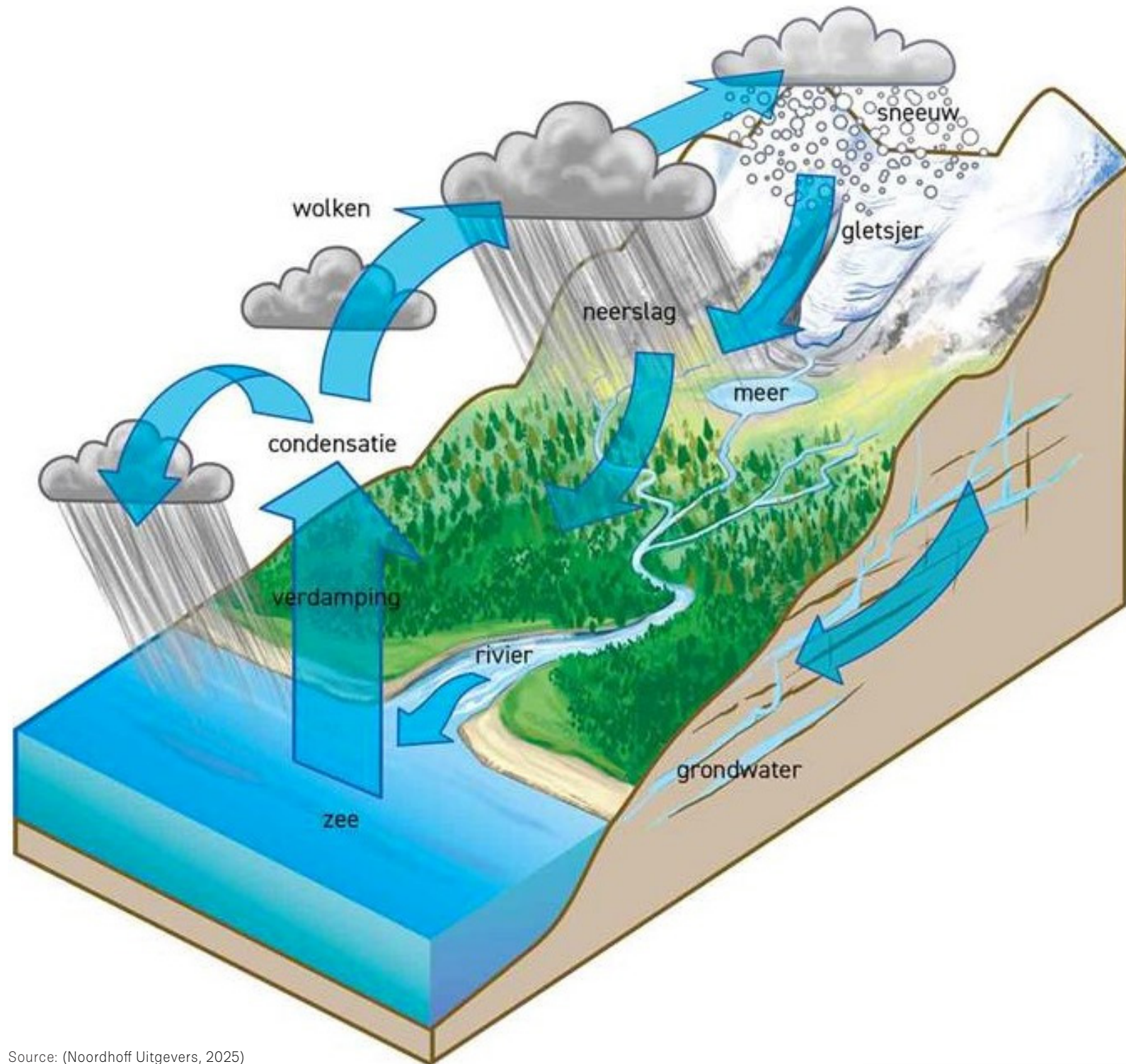
Where does our drinking water
come from?

Drinking water in the Netherlands



What is groundwater?

Water cycle

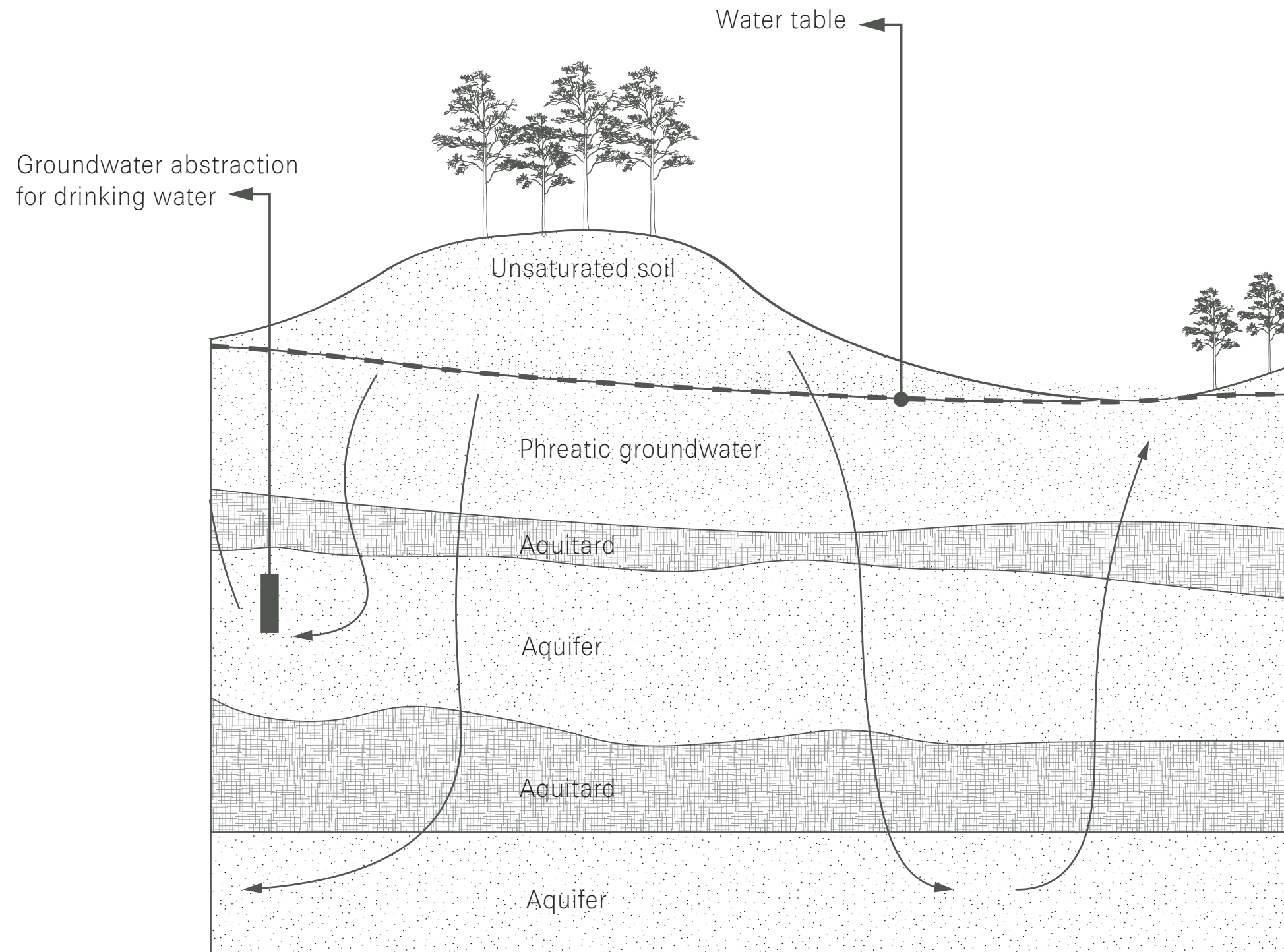


Source: (Noordhoff Uitgevers, 2025)

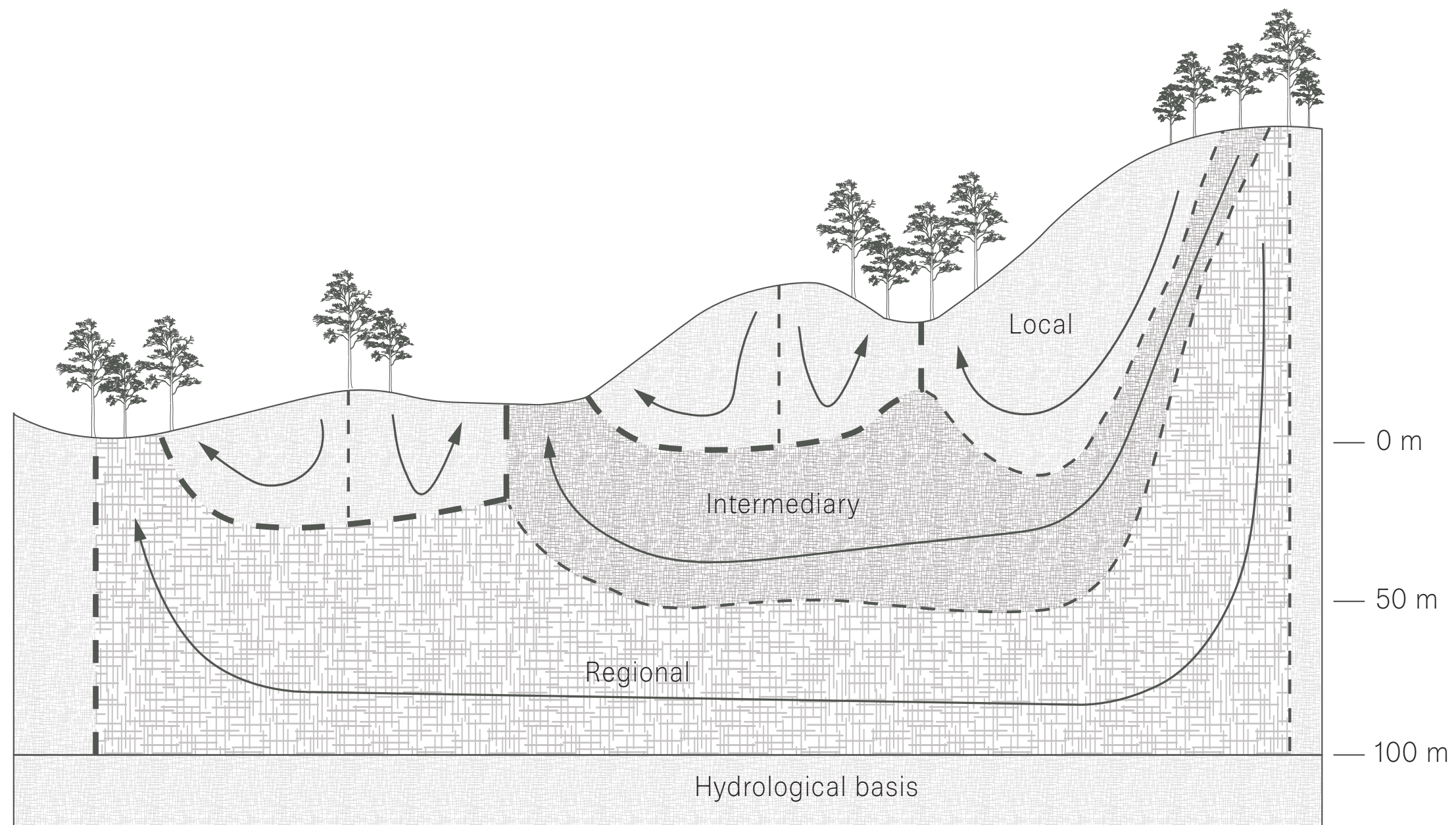
Importance of groundwater

- Important source for drinking water!
- Natural ecosystems
- Agriculture (irrigation)
- Industrial processes (cooling water)

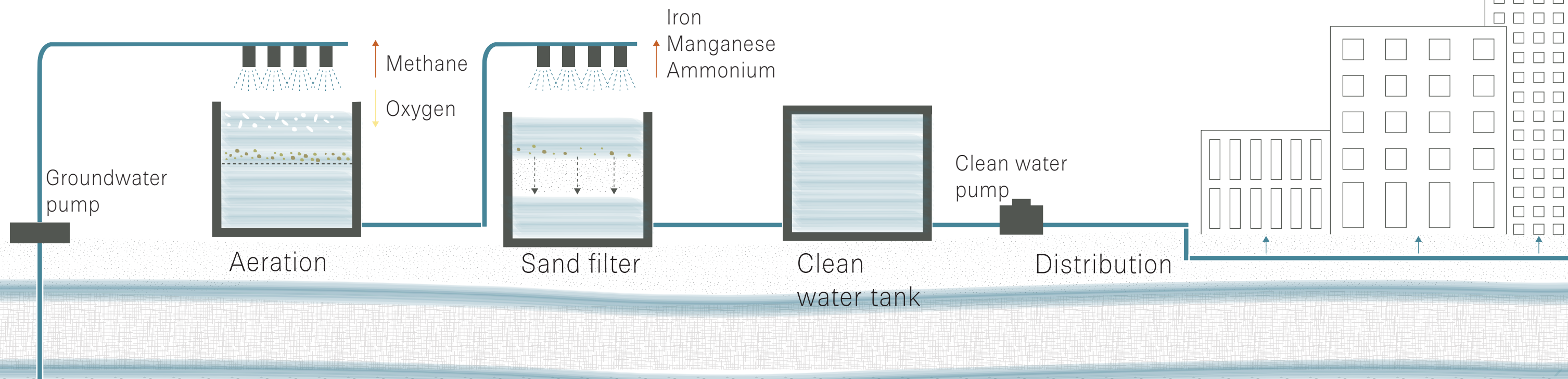
Soil structure



Different types of groundwater systems



Drinking water production

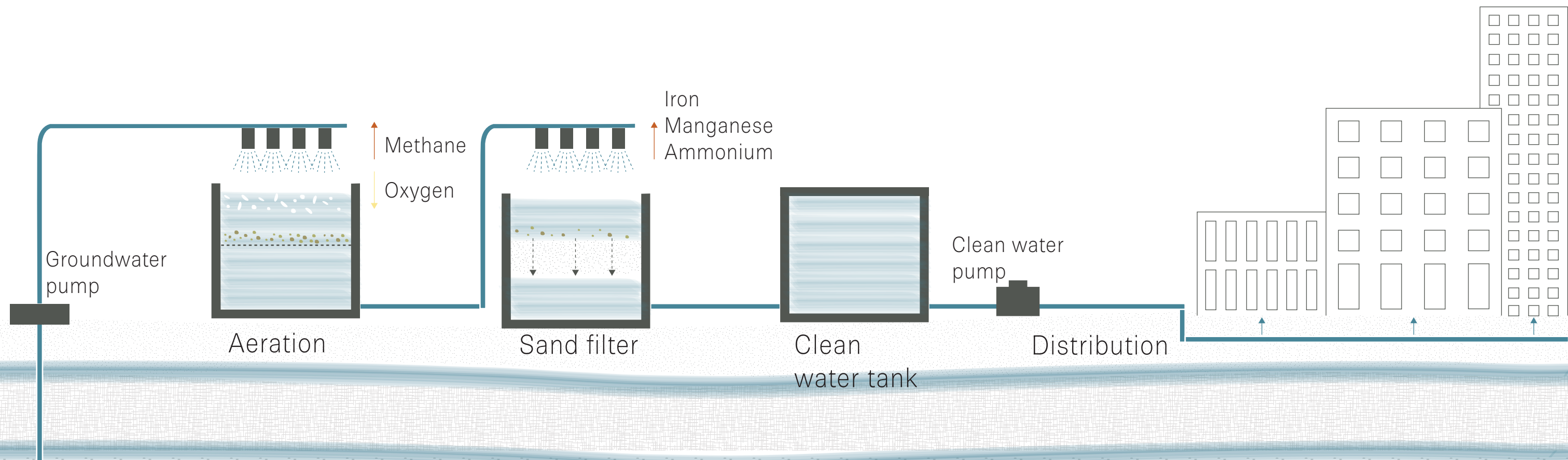


Aeration



Source: (Vewaco, 2025)

Drinking water production

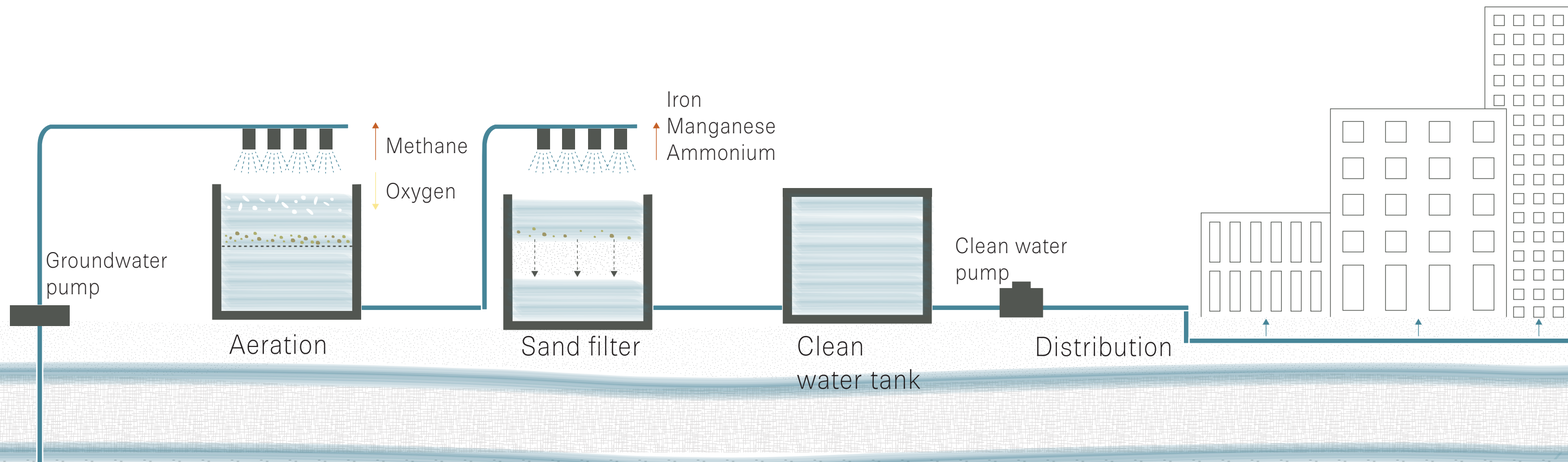


Sand filtration



Source: (CTC Tankbouw, 2025)

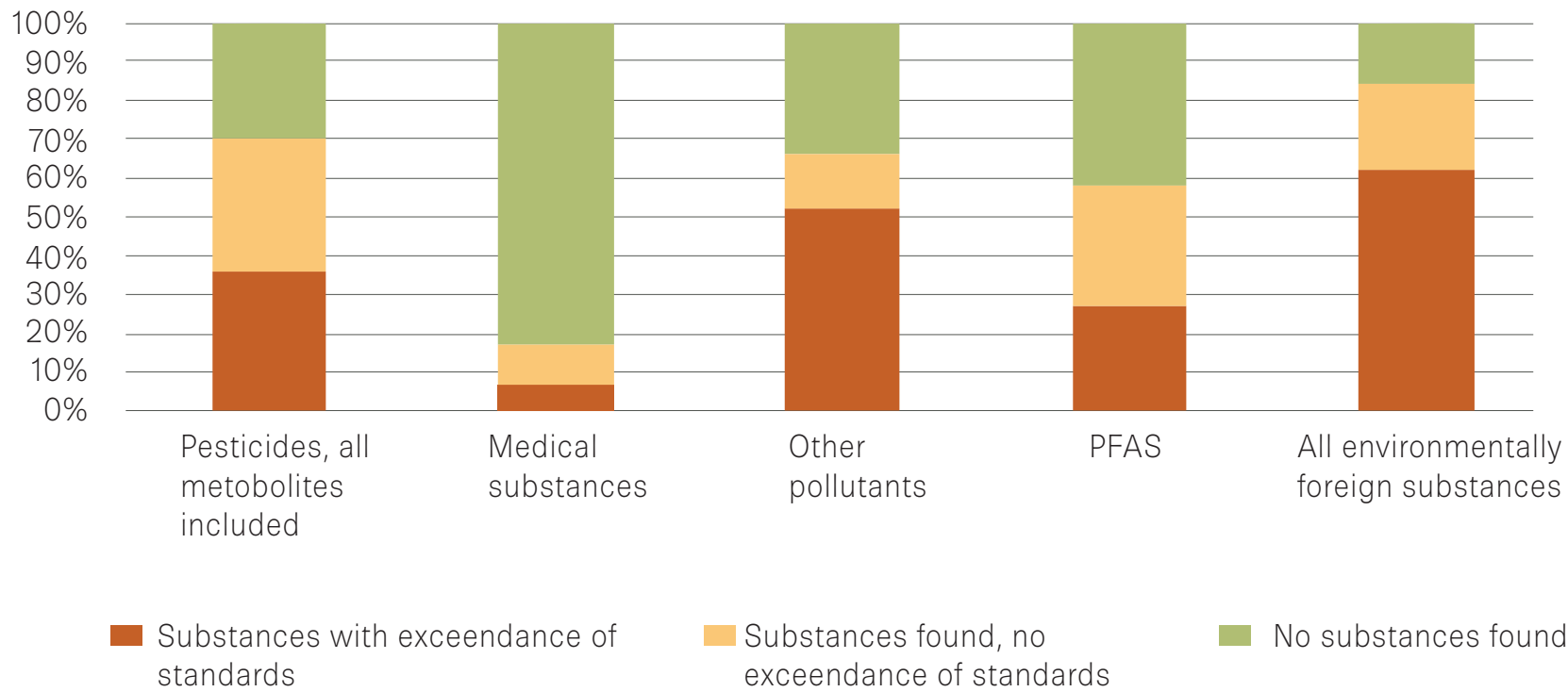
Drinking water production



How does groundwater get polluted?

Condition of groundwater quality in the Netherlands

Environmentally foreign substances in shallow filters



Environmentally foreign substances in groundwater, 2021



Urbanization



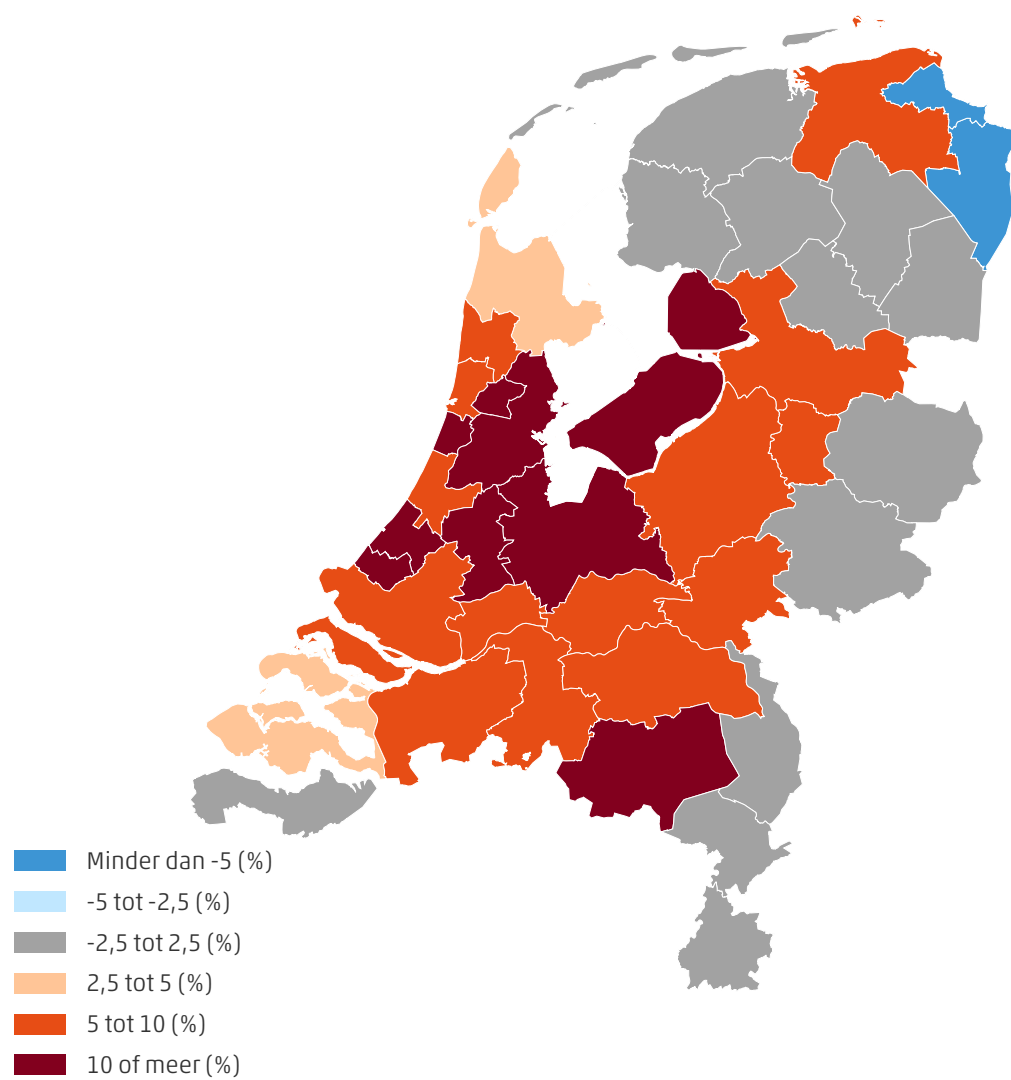
Source: (Passchier, 2024)

Urbanization

- 18.9 million by 2035 in the Netherlands
- 19.6 million by 2050 in the Netherlands

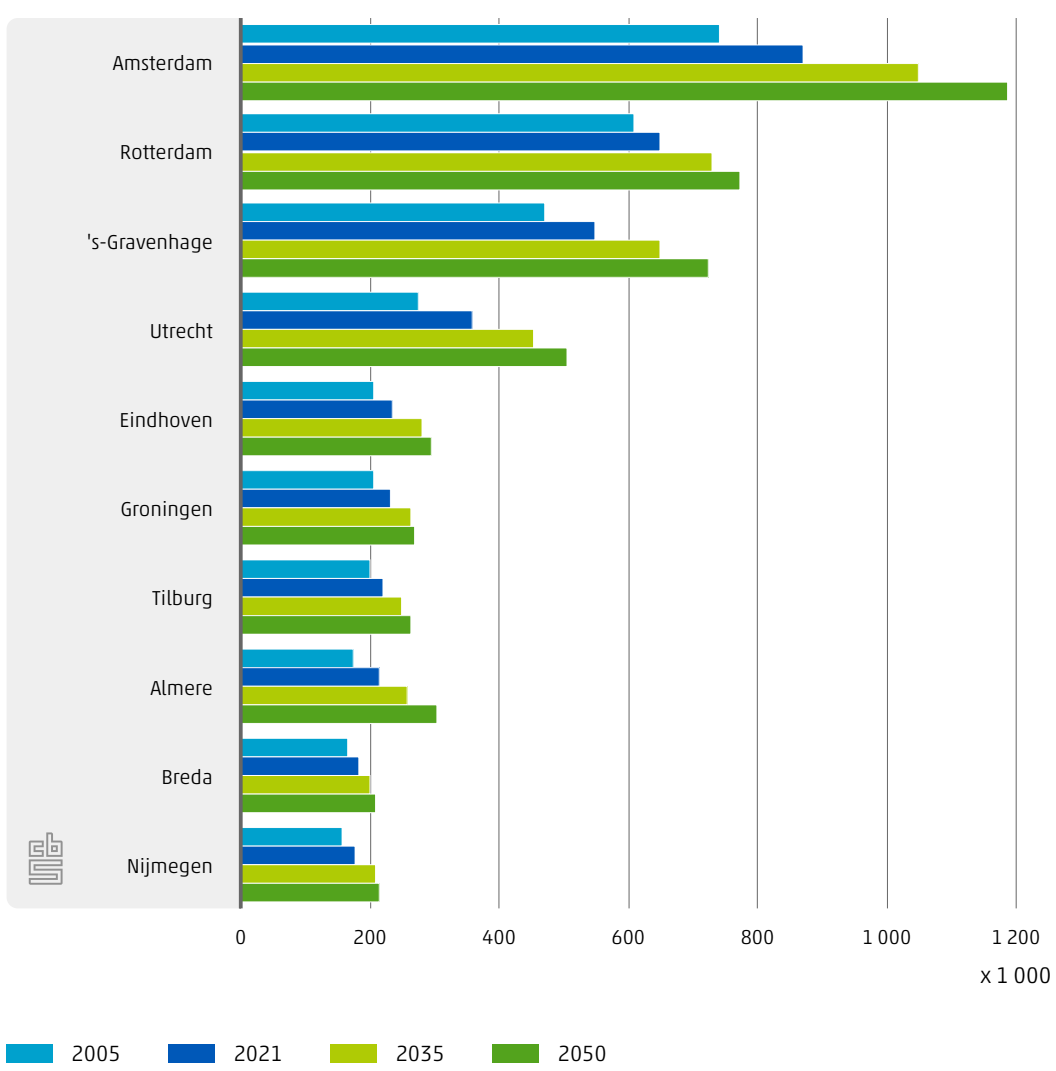
Urbanization

Prediction of population growth per COROP 2021 - 2035



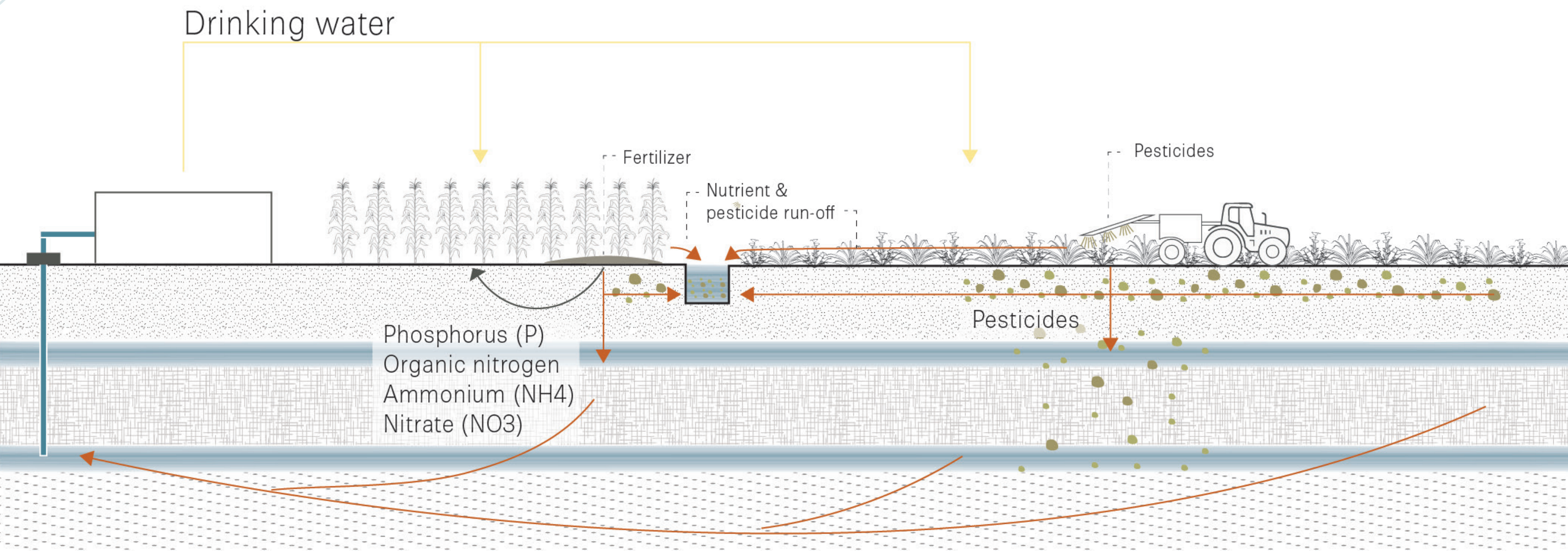
(Netherlands Environmental Assessment Agency & Statistics Netherlands, 2022).

Population in the biggest municipalities

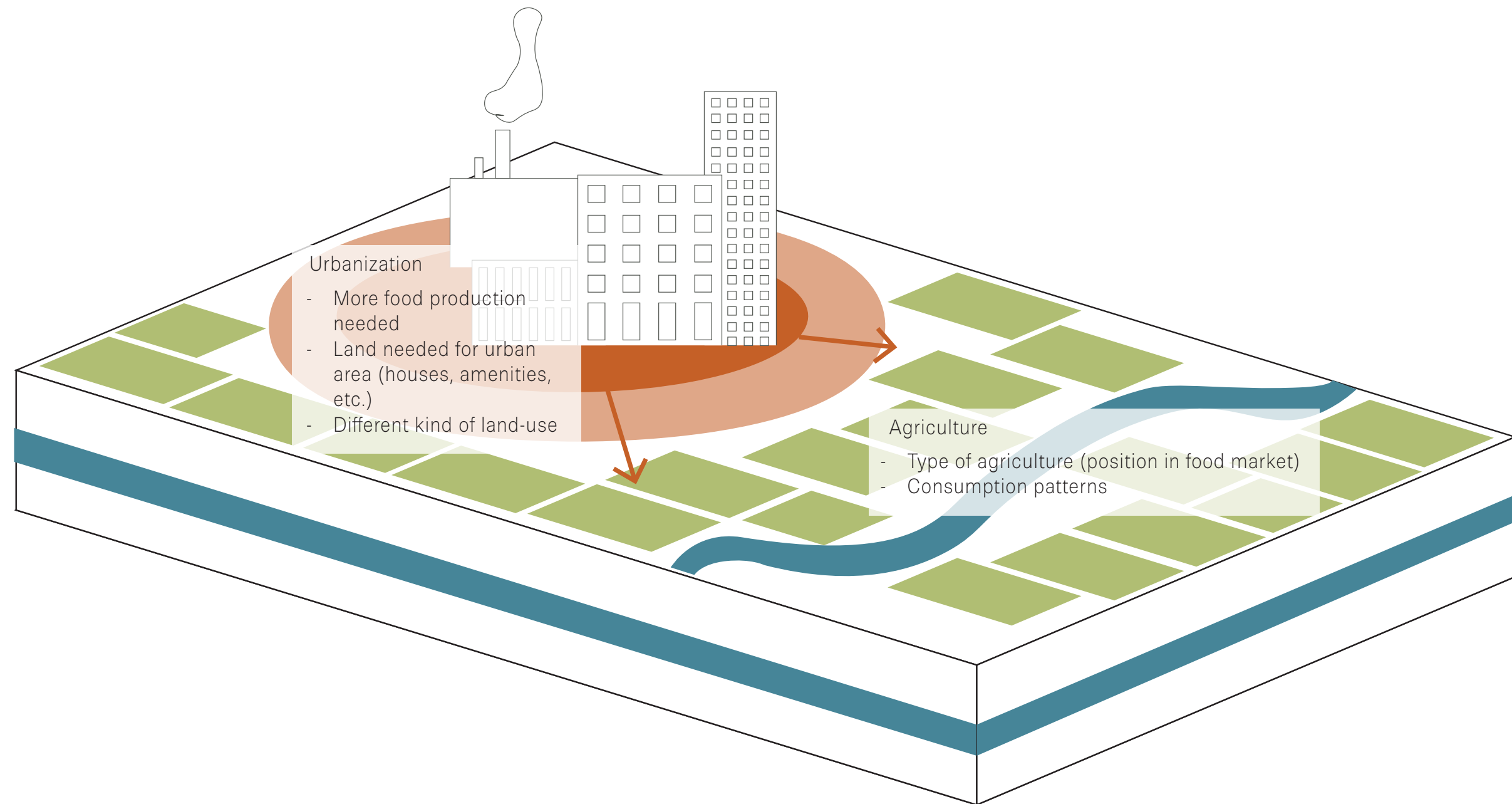


(Netherlands Environmental Assessment Agency & Statistics Netherlands, 2022).

Agriculture



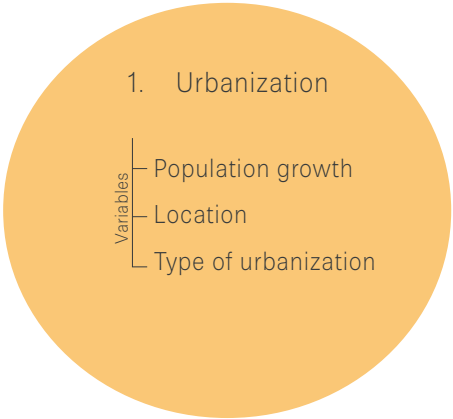
Pressure on rural area



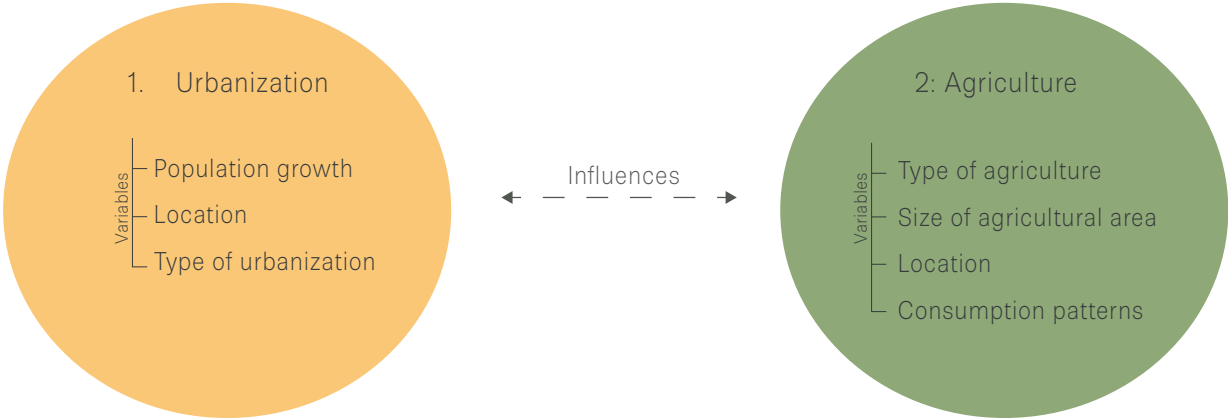
Rural area =geographic area located outside towns and cities

Integrated solutions are needed

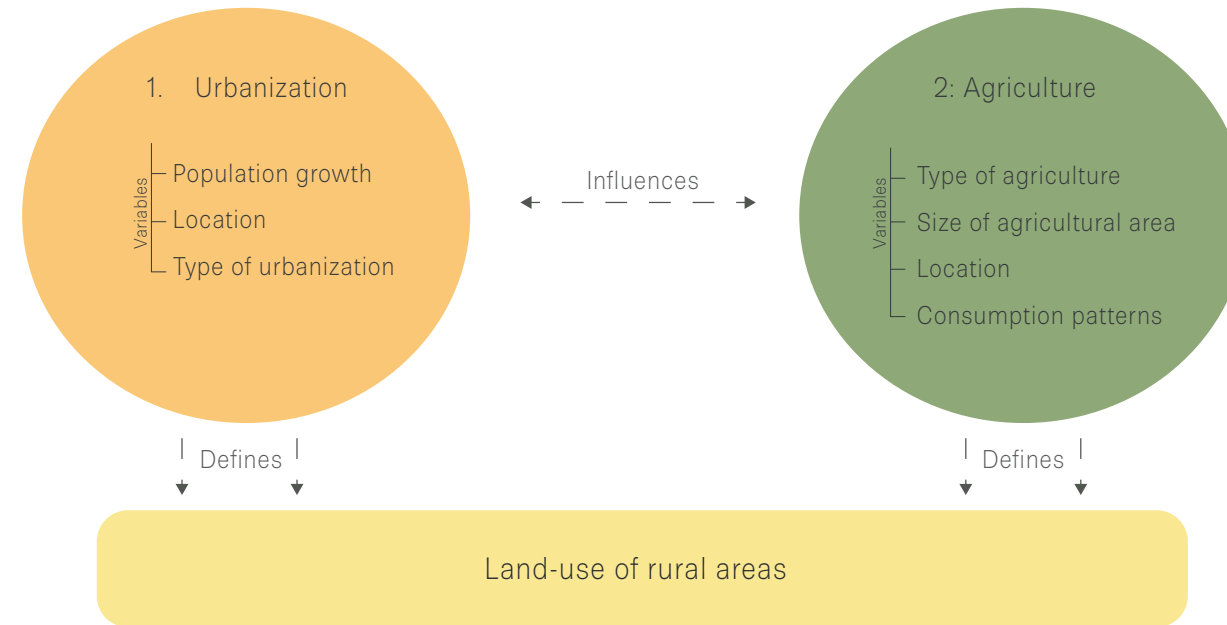
Problem diagram



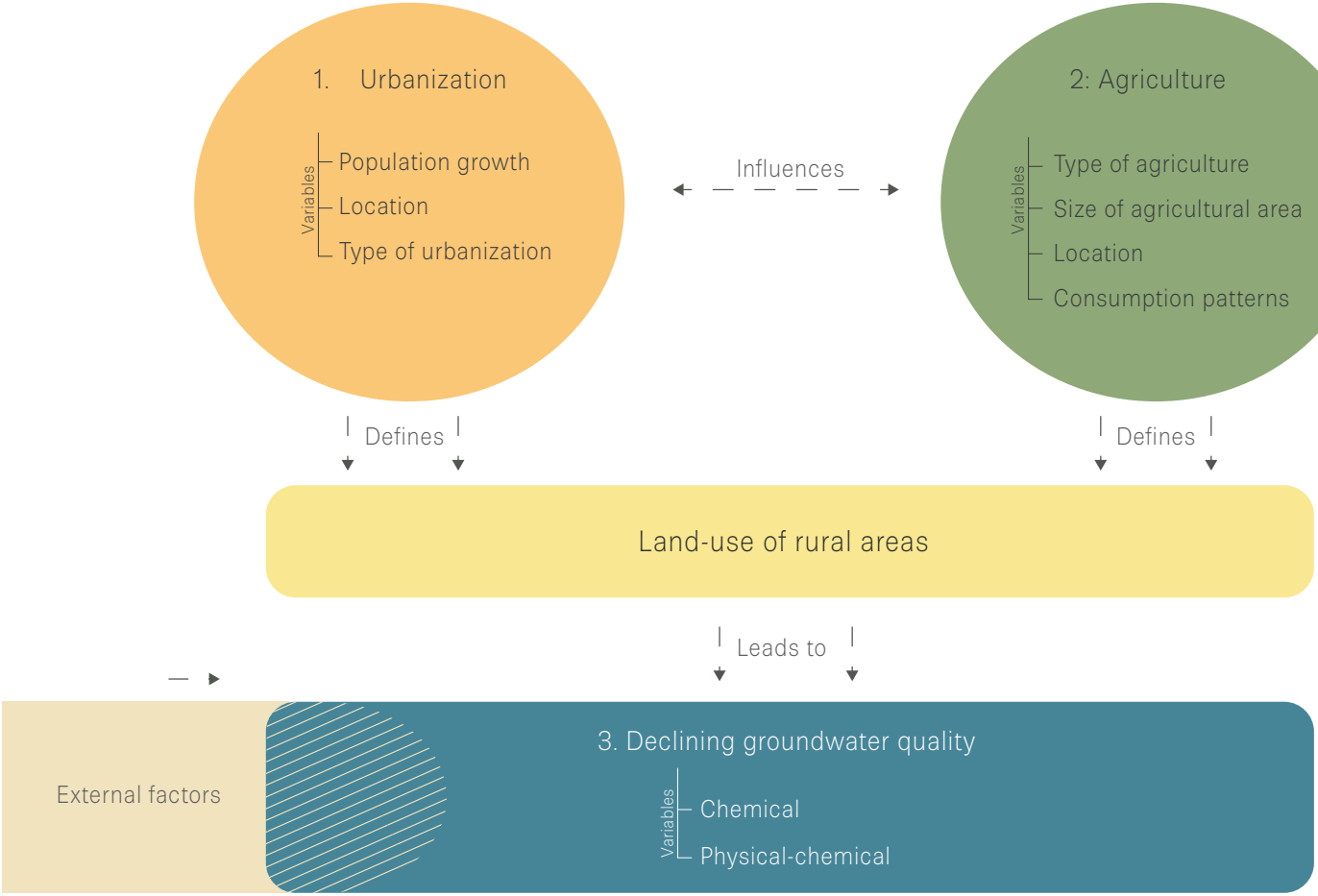
Problem diagram



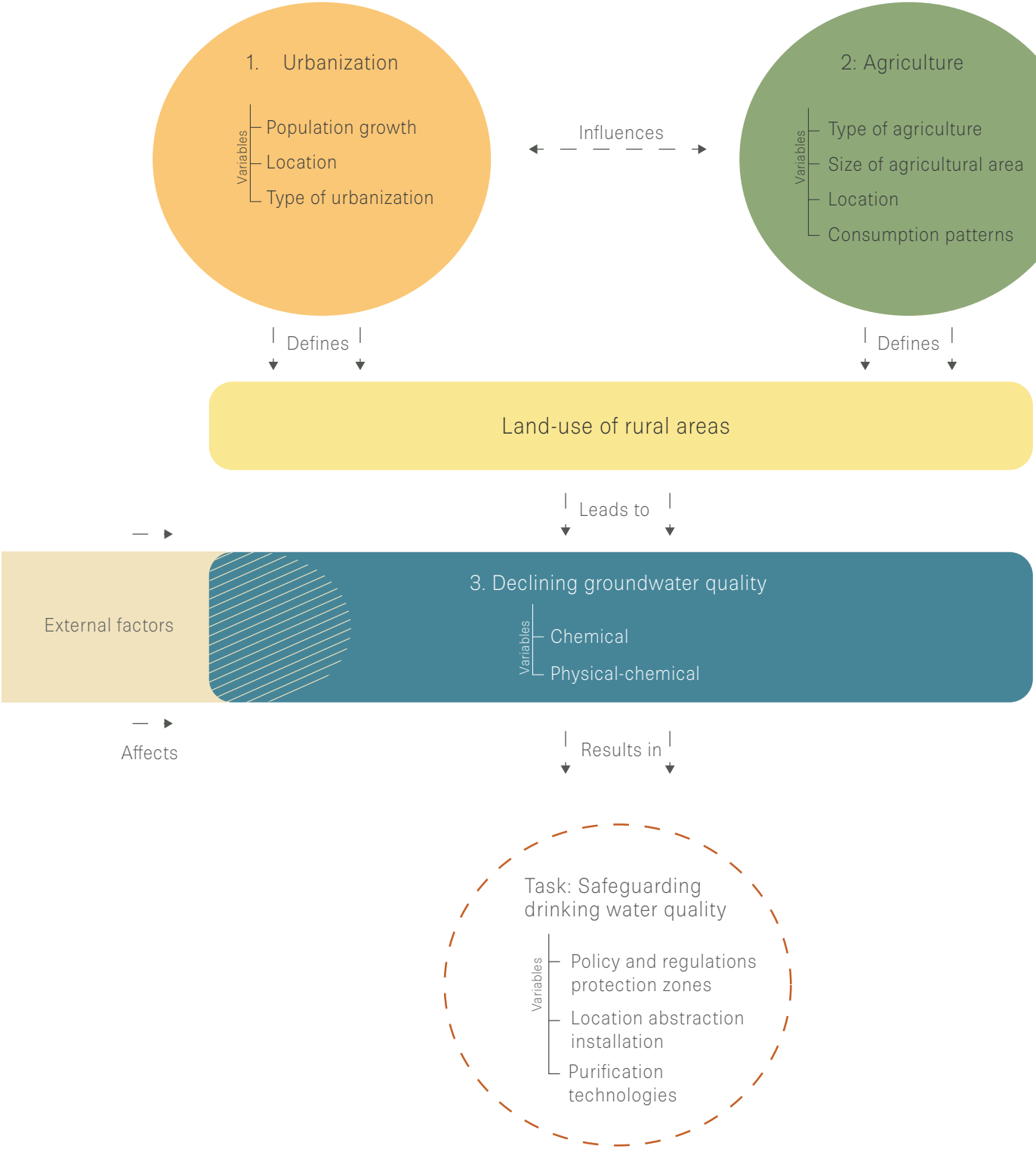
Problem diagram



Problem diagram



Problem diagram



Location - province of Utrecht



Location - province of Utrecht

- Province of Utrecht one of the fastest growing population of the Netherlands;



Location - province of Utrecht

- Province of Utrecht one of the fastest growing population of the Netherlands;
- Continuation of the Utrecht Rural Area Program (continuation of sustainability goals for agriculture);



Location - province of Utrecht

- Province of Utrecht one of the fastest growing population of the Netherlands;
- Continuation of the Utrecht Rural Area Program (continuation of sustainability goals for agriculture);
- Variety of landscapes;



Location - province of Utrecht

- Province of Utrecht one of the fastest growing population of the Netherlands;
- Continuation of the Utrecht Rural Area Program (continuation of sustainability goals for agriculture);
- Variety of landscapes;
- Own motivation.

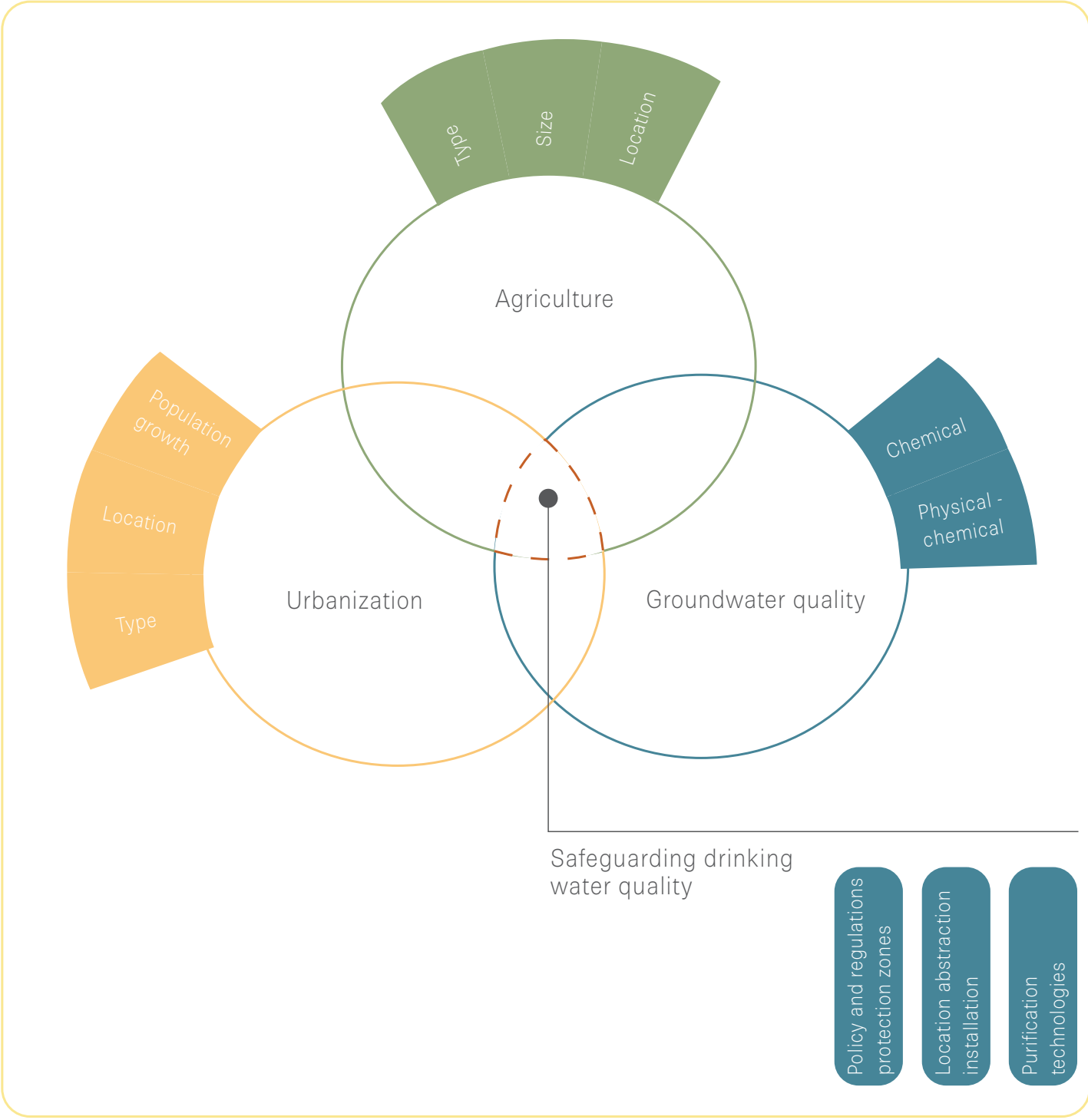


Research question

“How could the **groundwater quality** at groundwater abstractions for **public drinking water**, in the **rural areas** of the province of Utrecht be spatially safeguarded by 2050, by applying **integrated solutions** for groundwater quality, agriculture and as well as urbanization?”

Conceptual framework

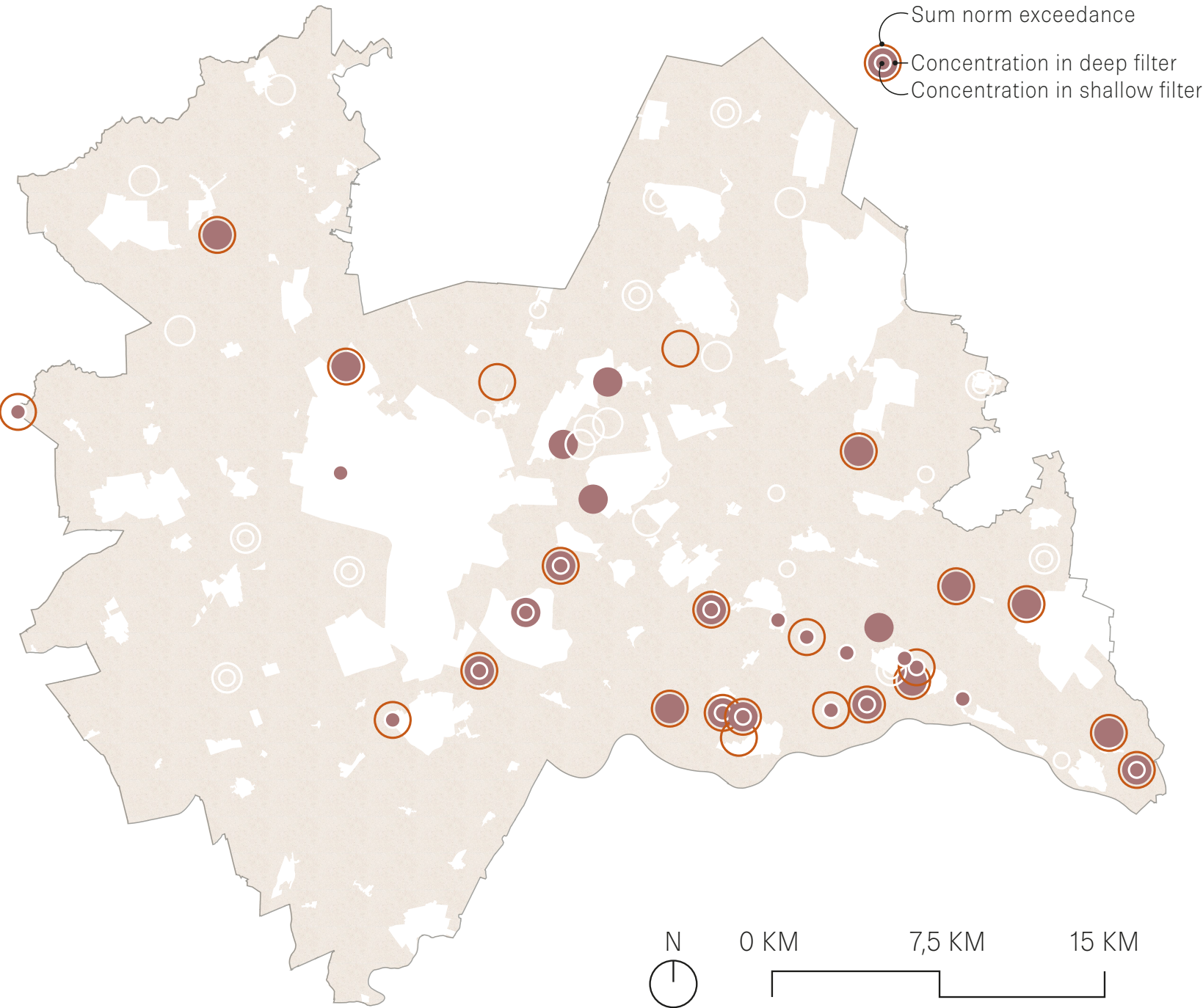
Spatial boundary of research: rural areas



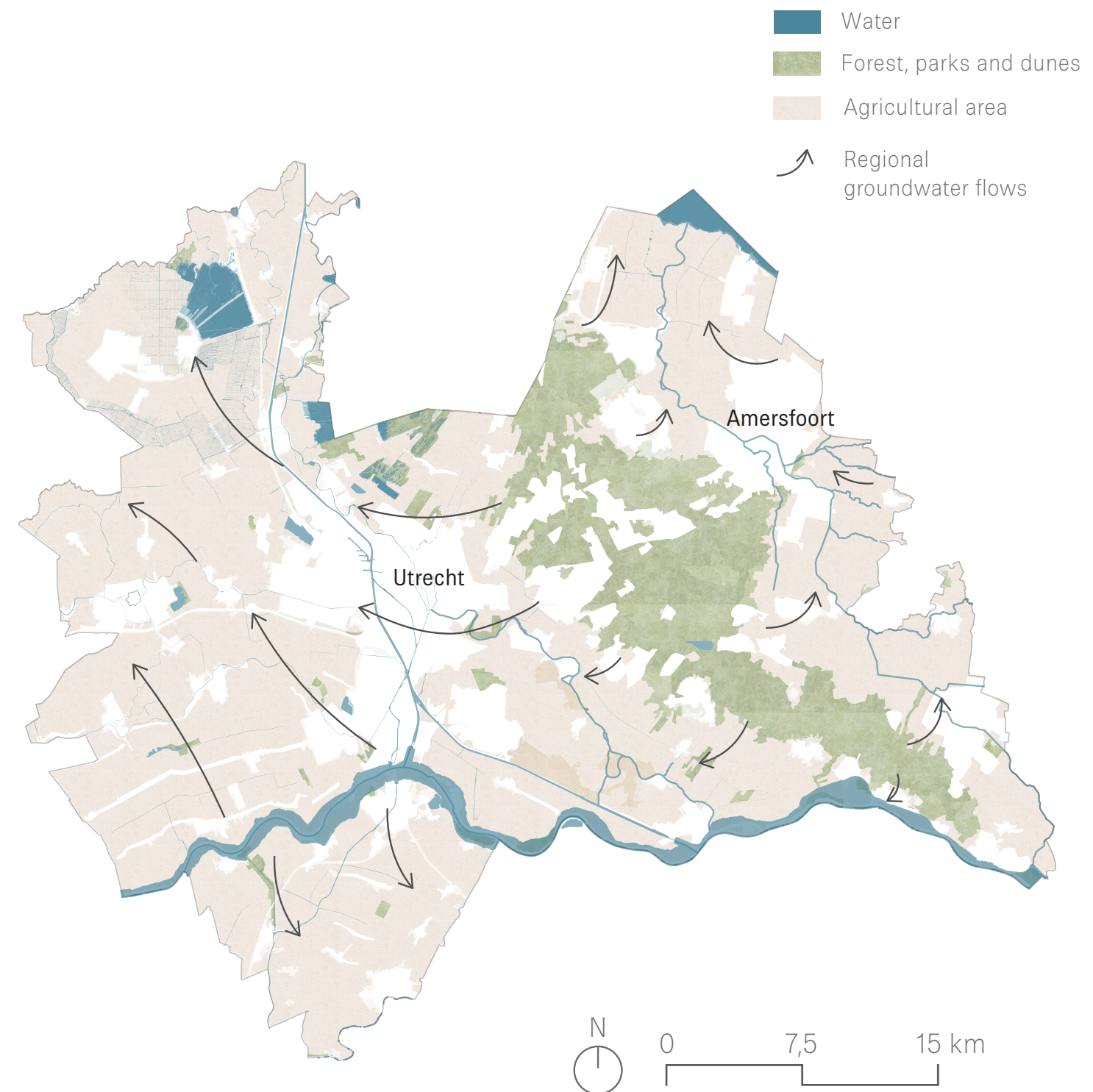
What is the situation in the
province of Utrecht?

Groundwater quality in the province of Utrecht

Pesticides

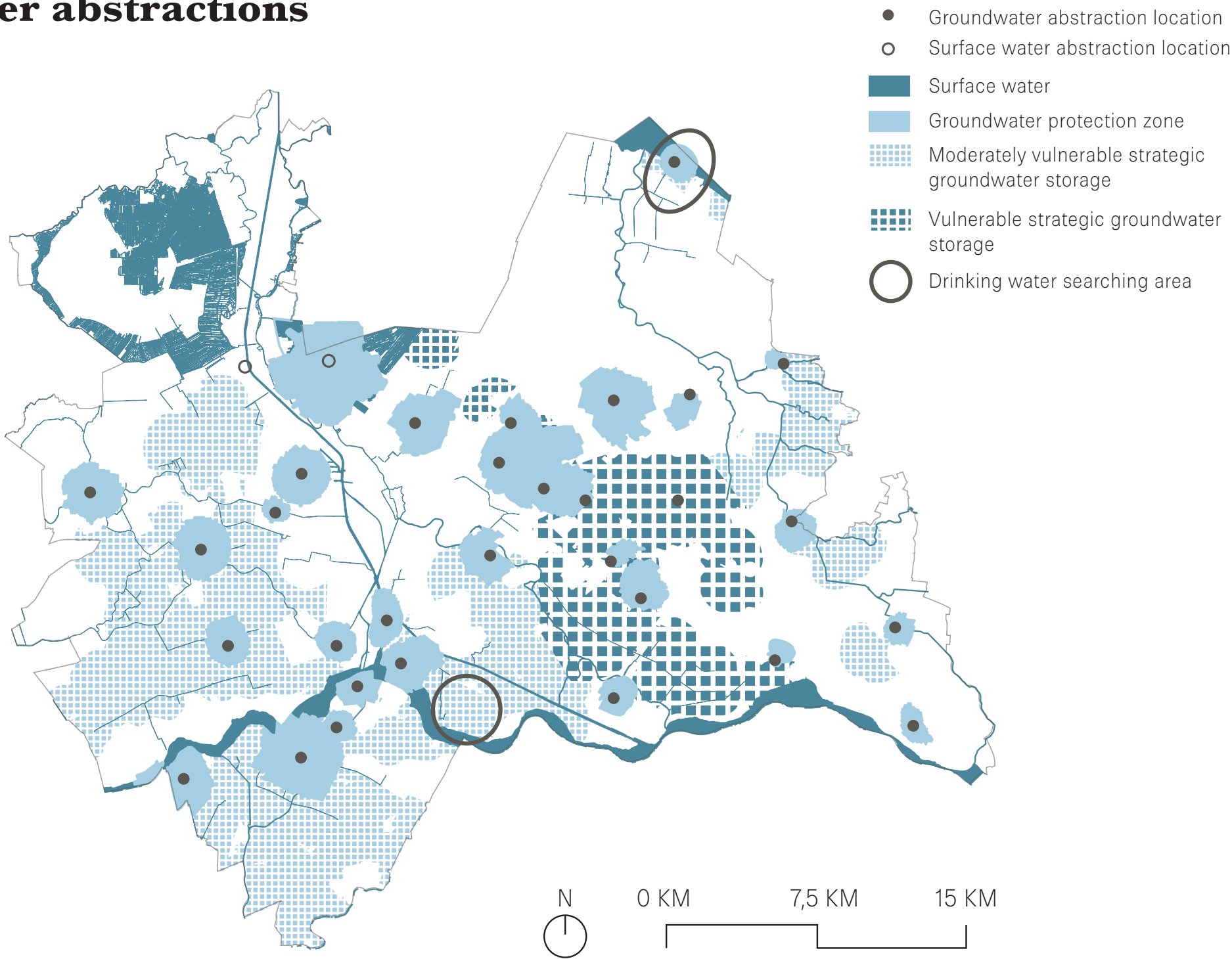


Regional groundwater flows



Spatial organization groundwater abstractions

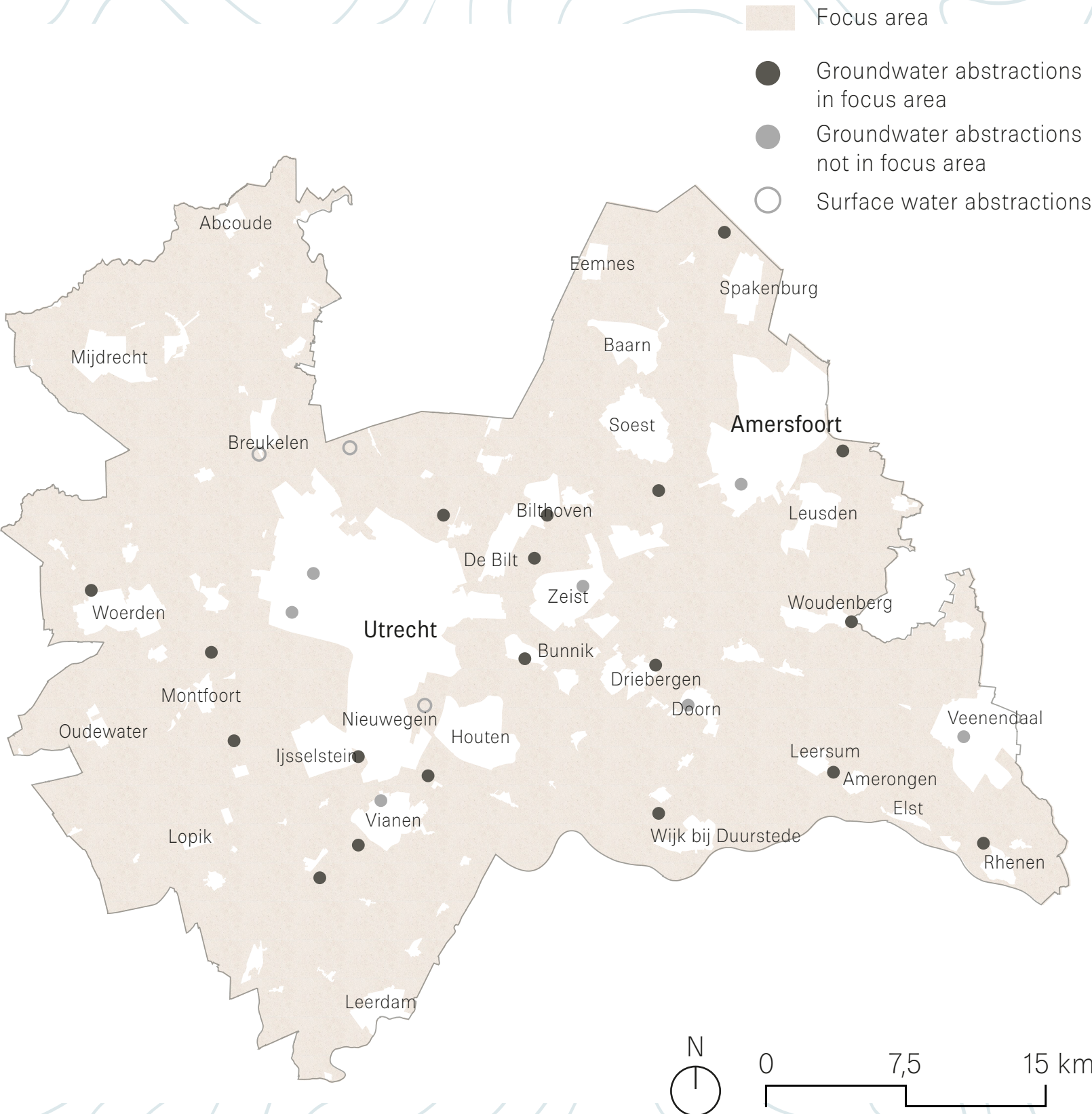
29 GROUNDWATER ABSTRACTIONS



Focus area - rural areas

Rural area =geographic area located outside towns and cities

19 GROUNDWATER ABSTRACTIONS

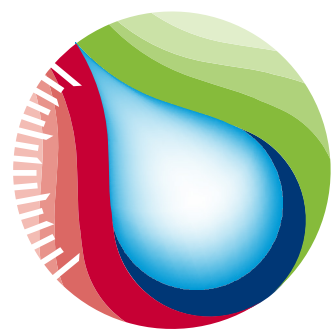


How to find integrated solutions?

Interviews and brainstormsessions



PROVINCIE ■■ UTRECHT



waterschap
**vallei en
veluwe**



HOOGHEEMRAADSCHAP
**DE STICHTSE
RIJNLANDEN**



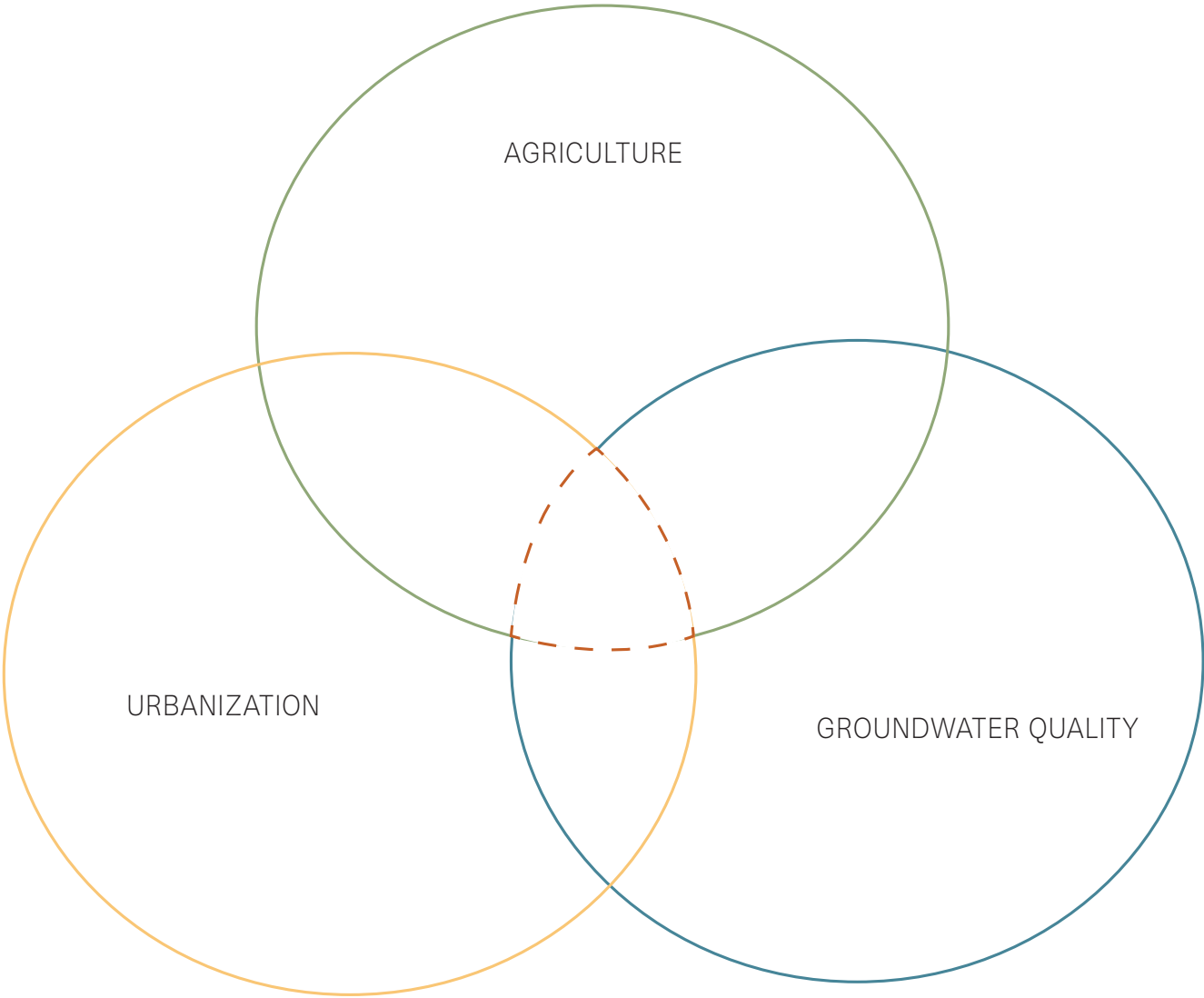
Waterschap
Rivierenland



Interviews and brainstorm sessions

Pattern placement

Matrix

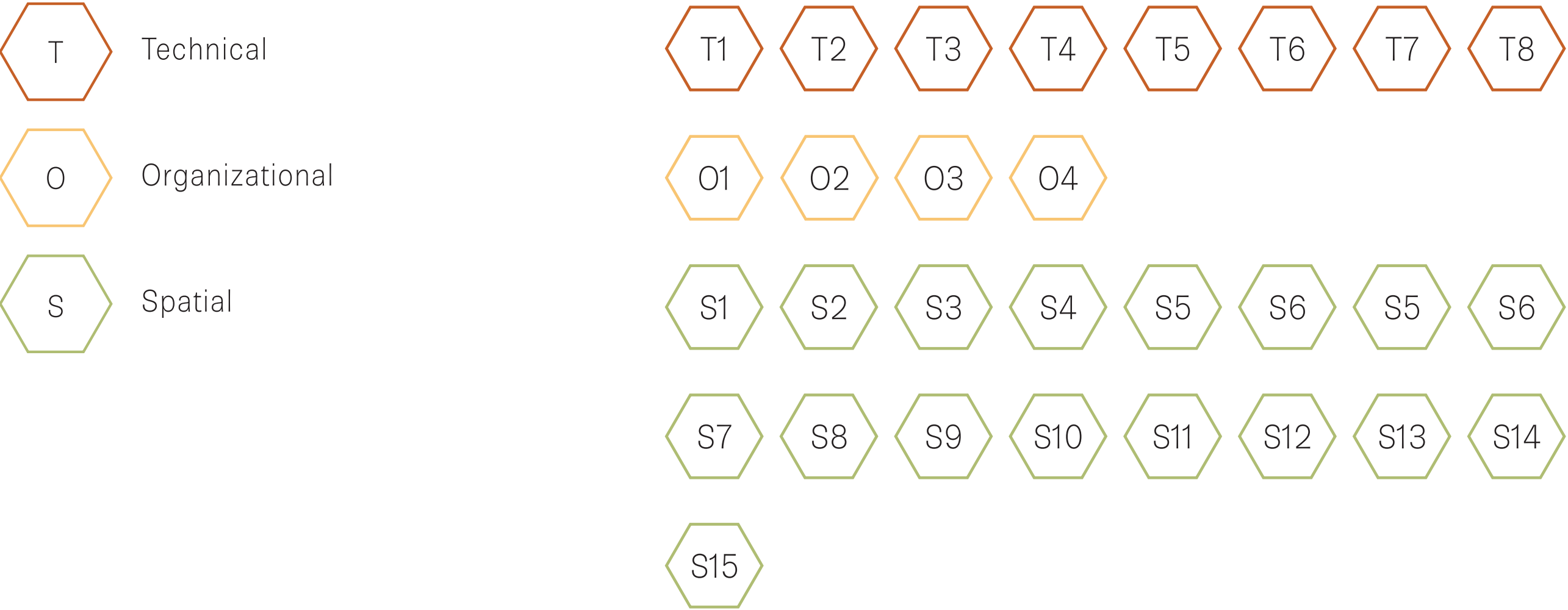


Gross border	
Regional	
City	
local	
Concrete	Abstract

Making use of the method “Pattern language”

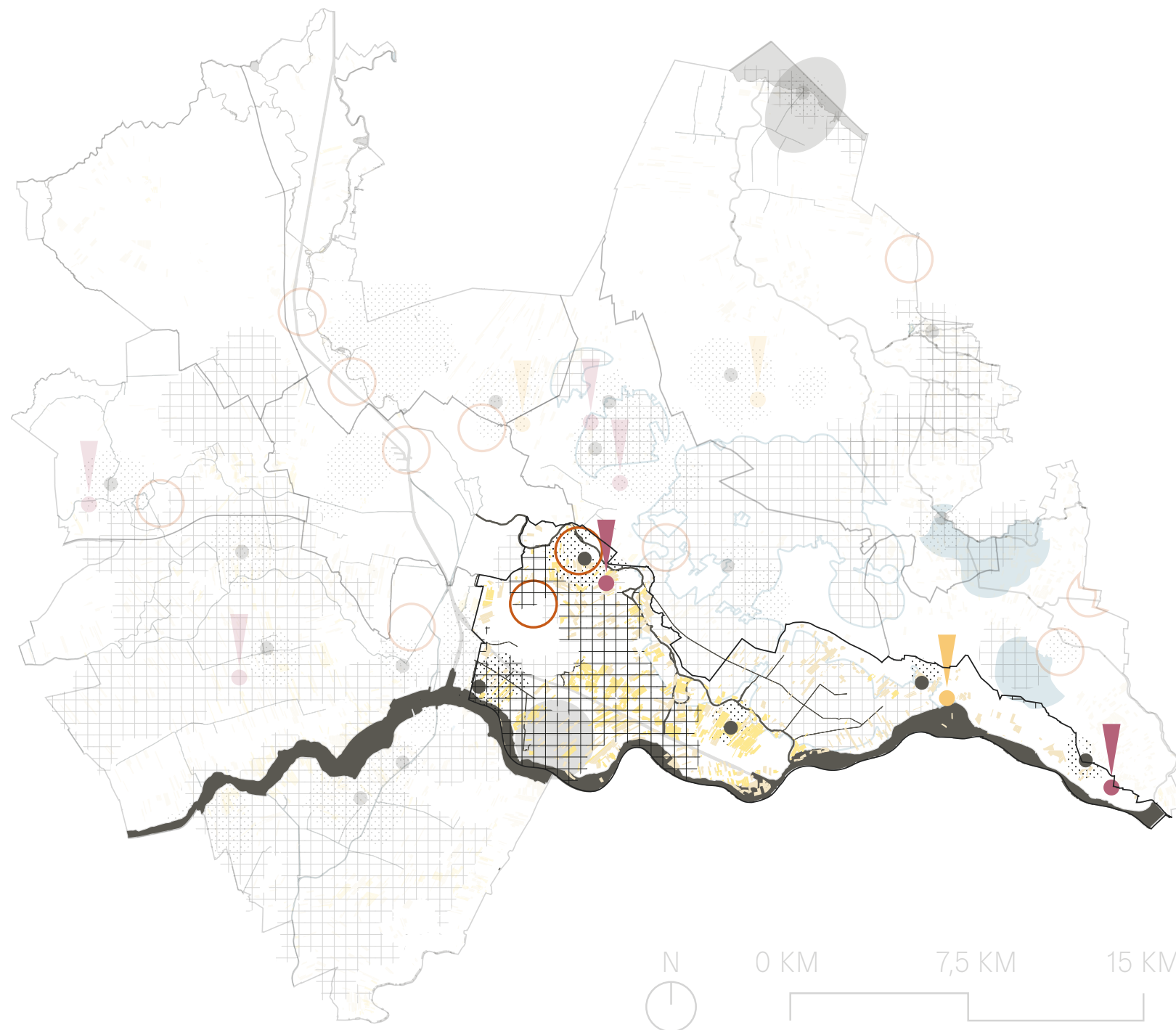
A pattern language is an organized and coherent set of patterns, each of which describes a problem and the core of a solution that can be used in many ways within a specific field of expertise.

Division of patterns

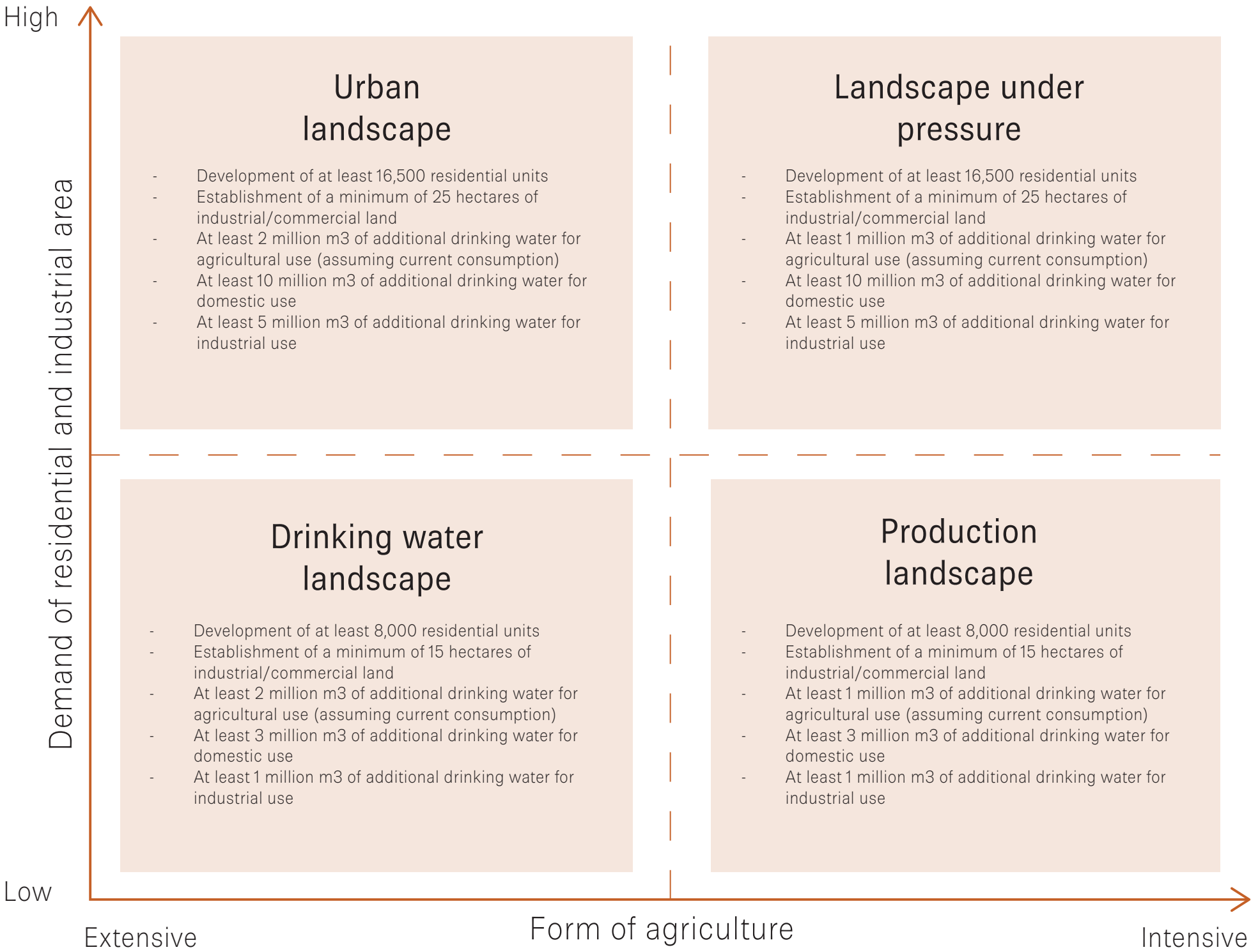


Focus area - Kromme Rijnstreek

- Groundwater abstraction location
- Surface water abstraction location
- Surface water
- ▨ Groundwater protection zone
- ▧ Strategic groundwater storage
- Drinking water searching area
- ! Vulnerable drinking water abstractions
- ! Very vulnerable drinking water abstractions
- Fruit cultivation
- Arable farming
- Tree cultivation
- Potential location for large scale integral development living and working around node



Scenarios



The workshop

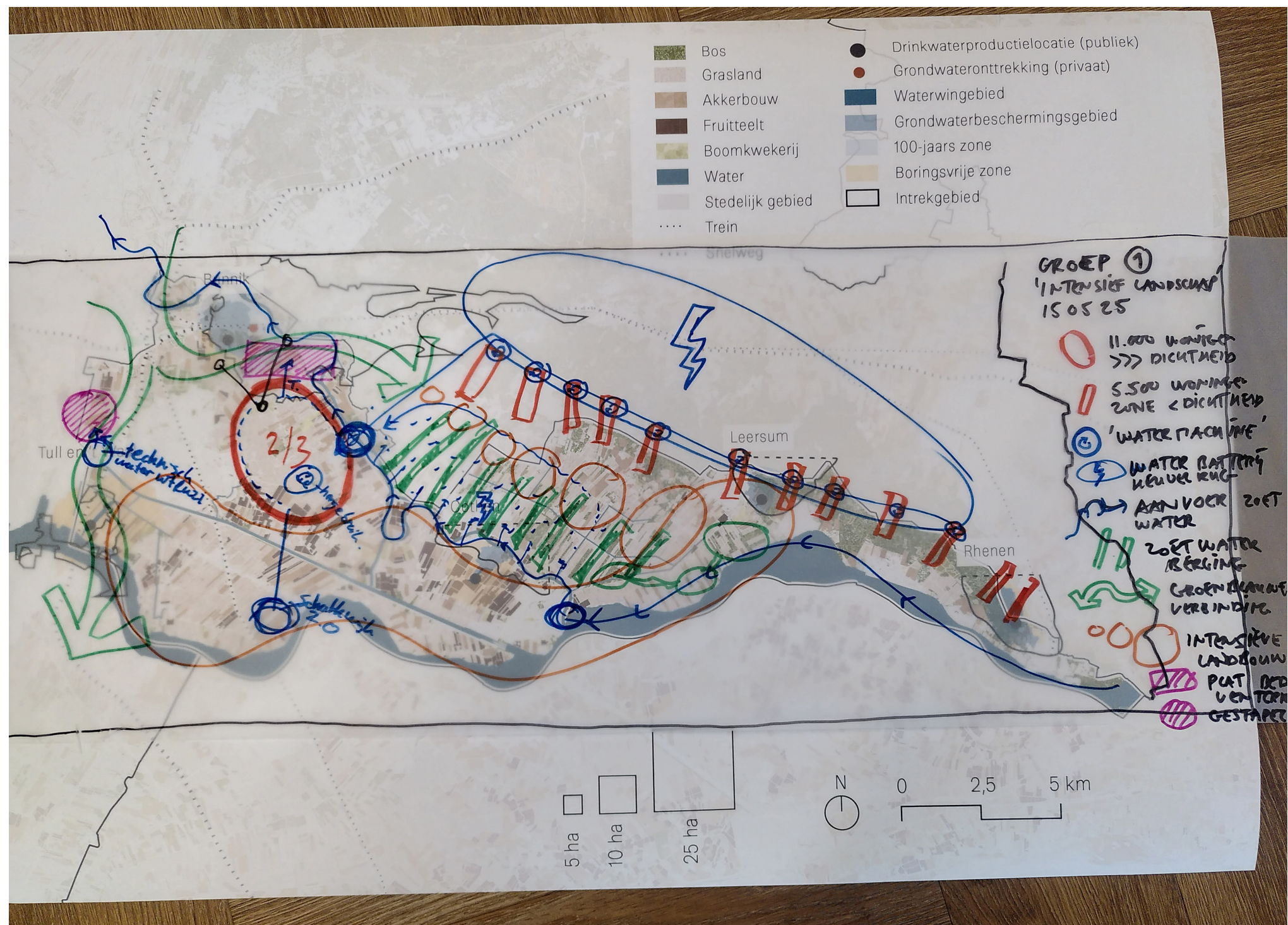
Goal:

- Initiating dialogue between different domains;
- Exploring potential trade-offs between groundwater, agriculture, and urbanization;
- Generating input for a future design of case study area 'Kromme Rijnstreek' within a specific scenario;
- Potentially developing new (additional) solutions (expansion of the card game).

The workshop

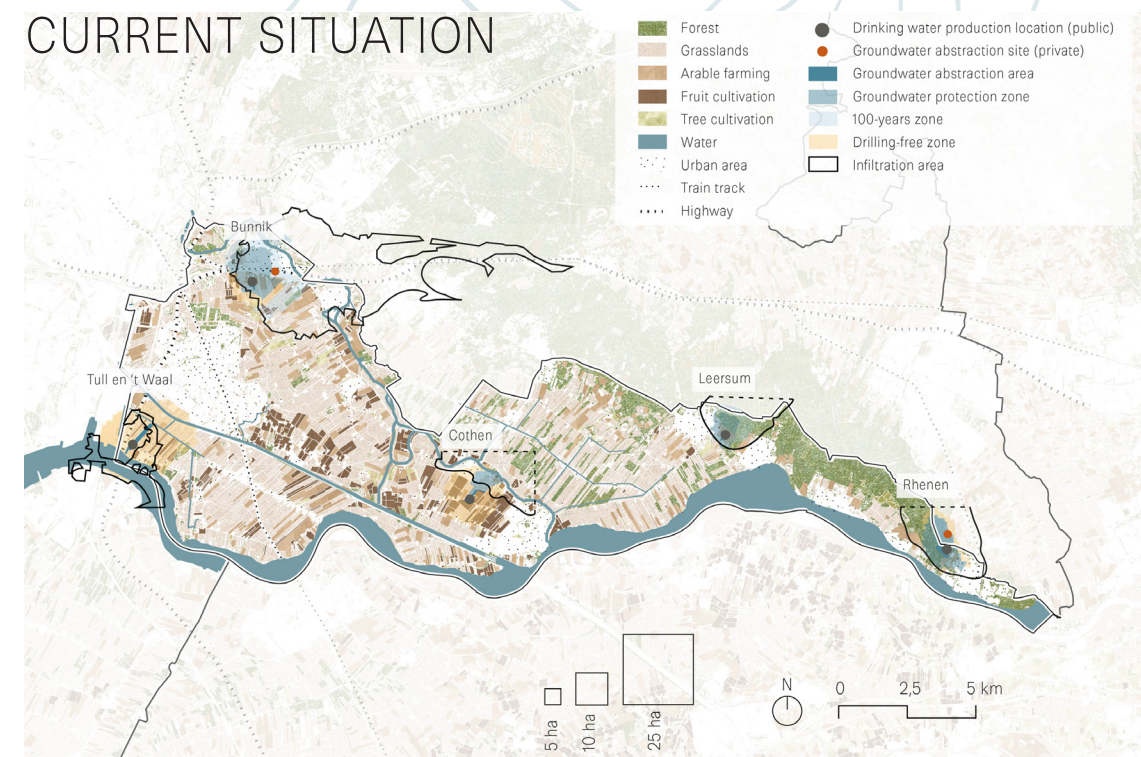
- Professionals from inside and outside province of Utrecht;
- Interdisciplinary teams;
- Groups of 4 - 5 participants, at least one participant from each domain (drinking- and groundwater quality, agriculture and urbanization);
- Used the pattern language to develop design principles;
- Participants made a design per scenario.



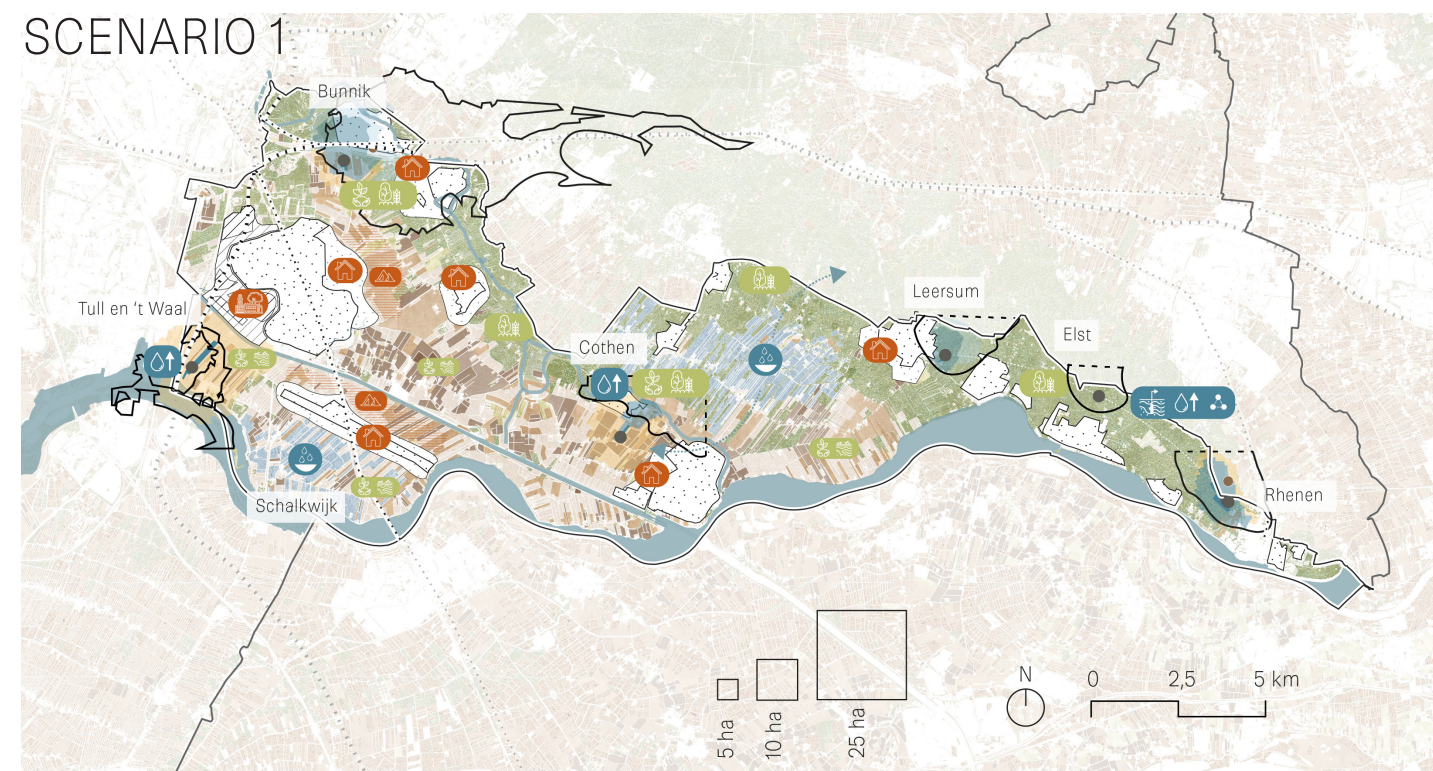


Final designs

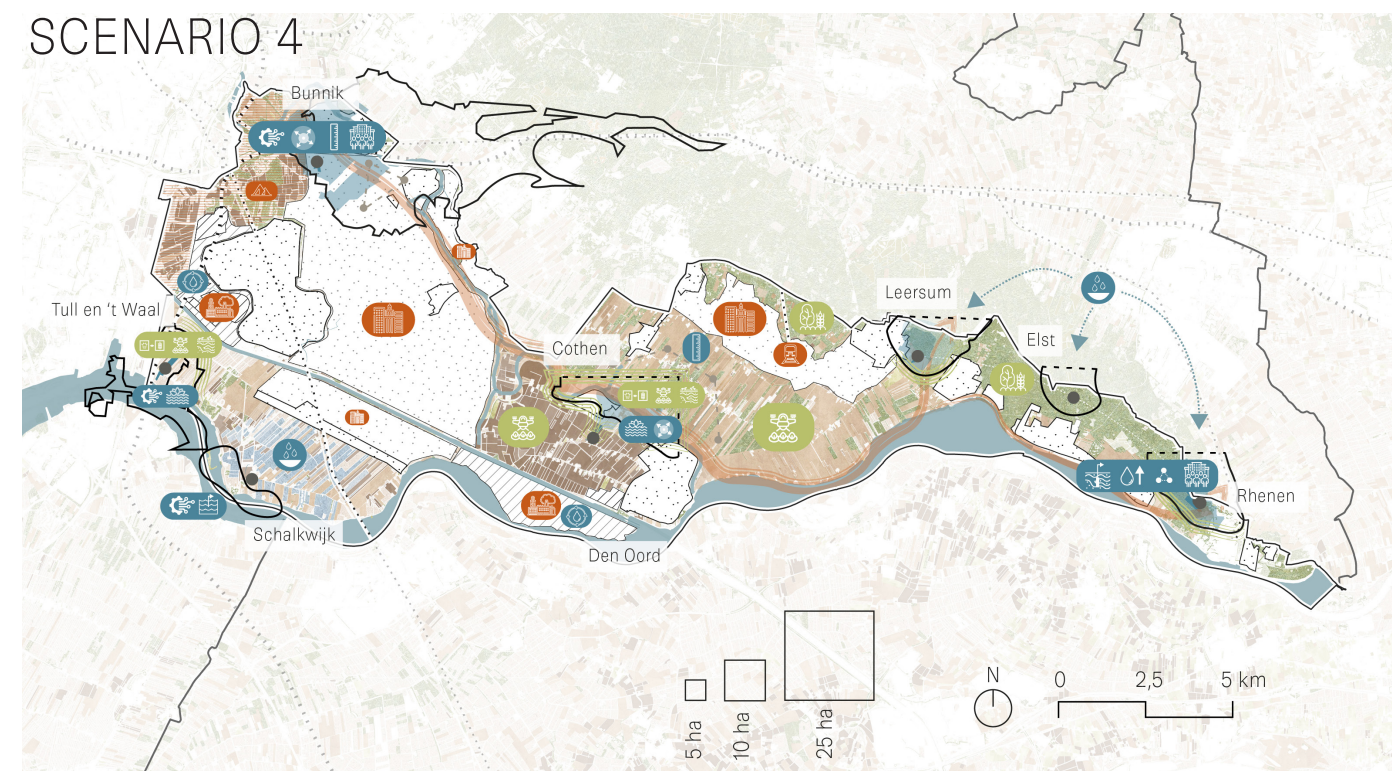
CURRENT SITUATION



SCENARIO 1



SCENARIO 4



Research question

“How could the **groundwater quality** at groundwater abstractions for **public drinking water**, in the **rural areas** of the province of Utrecht be spatially safeguarded by 2050, by applying **integrated solutions** for groundwater quality, agriculture and as well as urbanization?”

Conclusions

1. Sweet water storage is a key solution;
2. Groundwater friendly agriculture, agroforestry, bufferzones and collaboration in circular water management emerged as important solutions for safeguarding groundwater quality;
3. Low urbanization and extensive agriculture - Leveraging the landscape's self-purifying and water storage capacity;
4. High urbanization and intensive agriculture- Focusing on innovation and prevention

Most important solutions

Ruimtelijke oplossing

R3

ZOETWATEROPSLAG IN LANDELIJK GEBIED



Het realiseren van zoetwateropslag en dit laten infiltreren in de bodem, waardoor de grondwaterkwaliteit verbetert.

Concrete acties

Identificeren van strategische locaties om zoetwateropslag toe te passen

Opstellen van beleid en regelgeving voor zoetwateropslag in het desbetreffende gebied

Optioneel: financiële compensatie bieden aan agrariërs om zoetwateropslag te realiseren

Stakeholders

Provincie Utrecht

Gemeenten

Agrariërs

Agrarische collectieven

Lokaal

Stad

Regionaal

Interregionaal

Ruimtelijke oplossing

R10

AGROFORESTRY



Het toepassen van agroforestry, om zodoende de grondwaterkwaliteit te verbeteren. Agroforestry zorgt onder andere voor minder uitspoeling van nutriënten en verhoogt de opnamecapaciteit van de bodem.

Concrete acties

(Evt.) Omgevingsplan veranderen om agroforestry mogelijk te maken

Optioneel: Financiële bijdrage leveren om transitie mogelijk te maken

Stakeholders

Provincie Utrecht

Gemeenten

Agrariërs

Natuurorganisaties

Lokaal

Stad

Regionaal

Interregionaal

Ruimtelijke oplossing

R11

GRONDWATERVRIENDELIJKE TEELTEN



Focus op teelten waarbij geen of nauwelijks pesticiden hoeven te worden gebruikt en geen tot weinig (kunst) meststoffen.

Concrete acties

Agrariërs educatie bieden voor toepassing van andere teelten (Provincie Utrecht)

Investeren in innovatie (Rijksoverheid)

Pilots faciliteren (Provincie Utrecht)

Stakeholders

Provincie Utrecht

Gemeenten

Agrariërs

Agrarische collectieven

Kennisinstituten

Lokaal

Stad

Regionaal

Interregionaal

Ruimtelijke oplossing

R13

BUFFERZONES



Het realiseren van bufferzones om directe afspoeling te voorkomen en een natuurlijke filter te creëren.

Concrete acties

Financiële middelen beschikbaar stellen

Het veranderen van wet- en regelgeving - omgevingsplan aanpassen

Stakeholders

Provincie Utrecht

Gemeenten

Agrariërs

Natuurorganisaties

Lokaal

Stad

Regionaal

Interregionaal

Organisatorische oplossing

02

SAMENWERKING IN CIRCULAIR WATERMANAGEMENT



Het creëren van een samenwerking in circulair watermanagement dat het mogelijk maakt om innovaties en ervaringen te delen en bedrijven met elkaar verbindt om de waterkringloop te sluiten.

Concrete acties

Partners identificeren in het desbetreffende gebied

Vergaderlocaties regelen

Stakeholders

Provincie Utrecht

Rijksoverheid

Waterschappen

Gemeenten

Drinkwaterbedrijven

Lokaal

Stad

Regionaal

Interregionaal

Recommendations

Make use of the pattern language method! Organise more workshops using this method to stimulate content-driven dialogue.

What future do you imagine for
drinking water?

Thank you!

Questions?