Dare to switch off

The transformative urban Energy Landscape of Oud-Crooswijk

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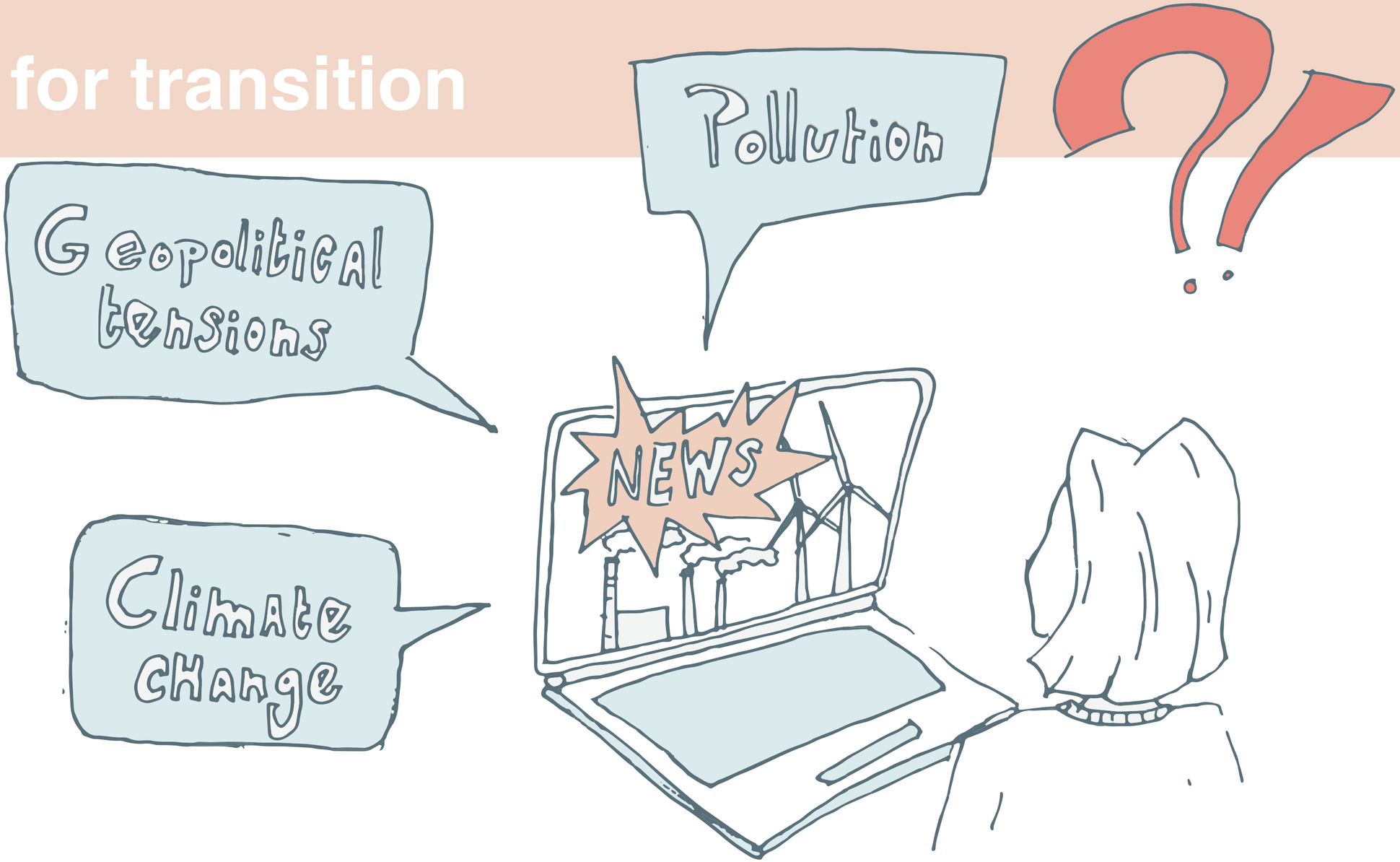
5167787
20th of January 2023

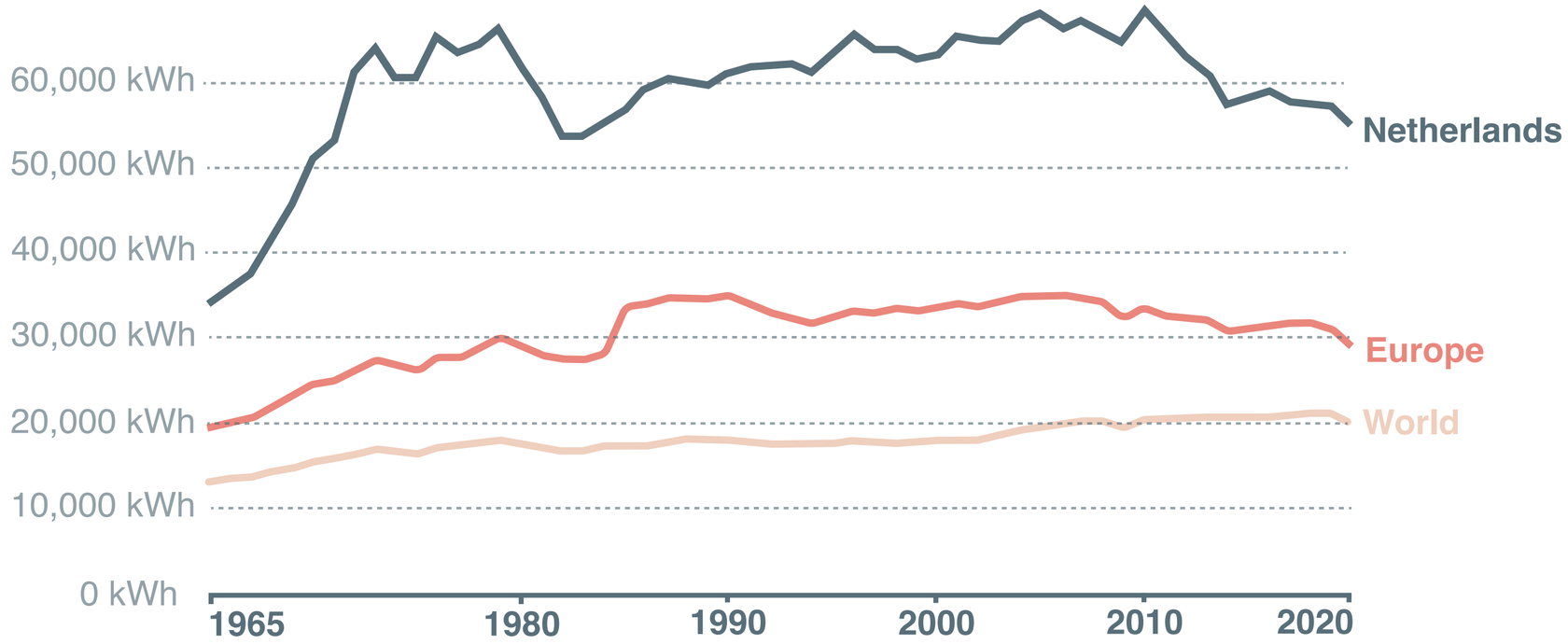
Need for transition



A personal quest to find hope in the midst of this crisis and
To confront myself and hold myself accountable for my part in the problem

What is the problem?

Energy demand in the Netherlands

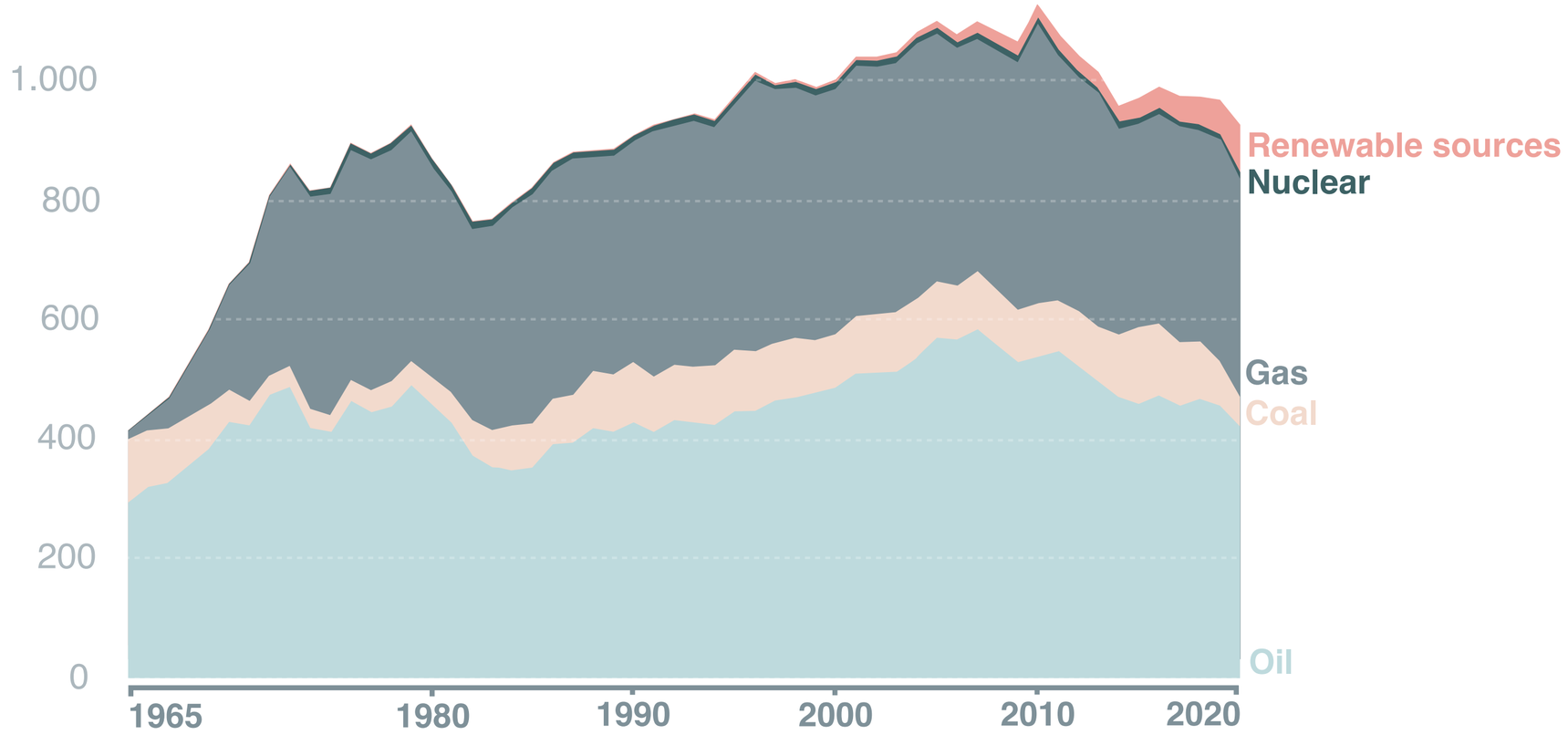


Energy use per person

Energy use not only includes electricity, but also other areas of consumption including transport, heating and cooking. Source: Our World in Data, 2021

What is the problem?

Fossil fuels

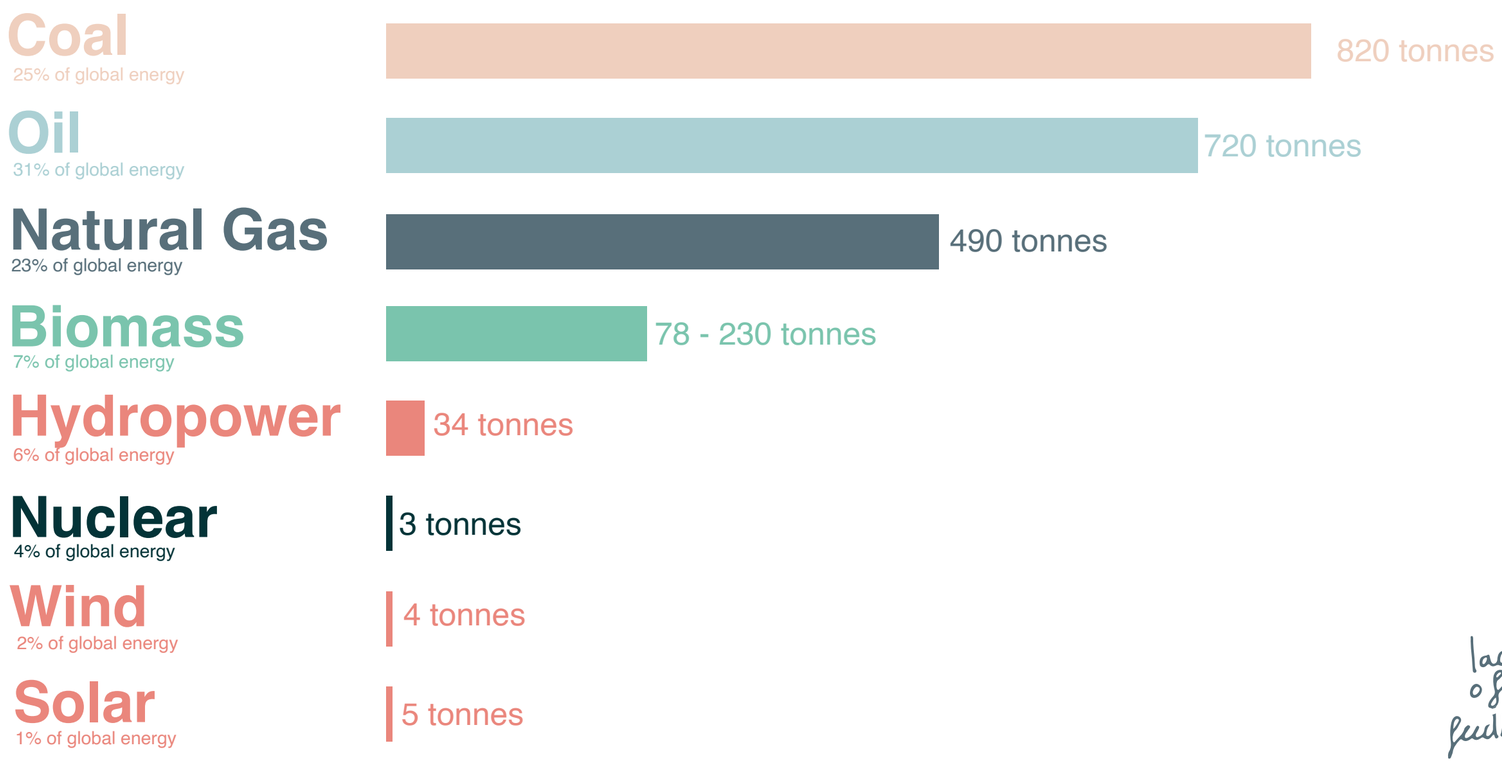


Energy consumption by source

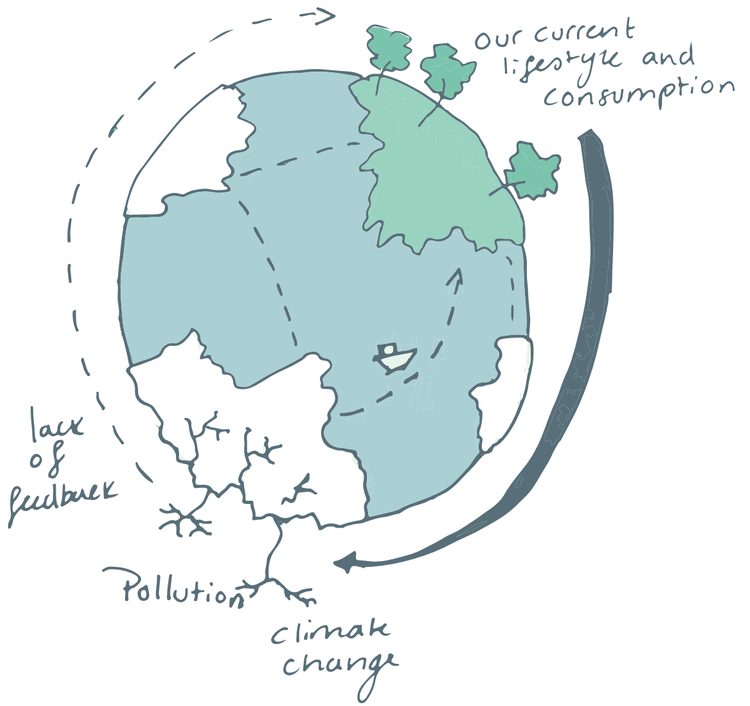
Primary energy consumption is measured in terawatt-hours (TWh). Source: Our World in Data, 2021

Global effects

Pollution

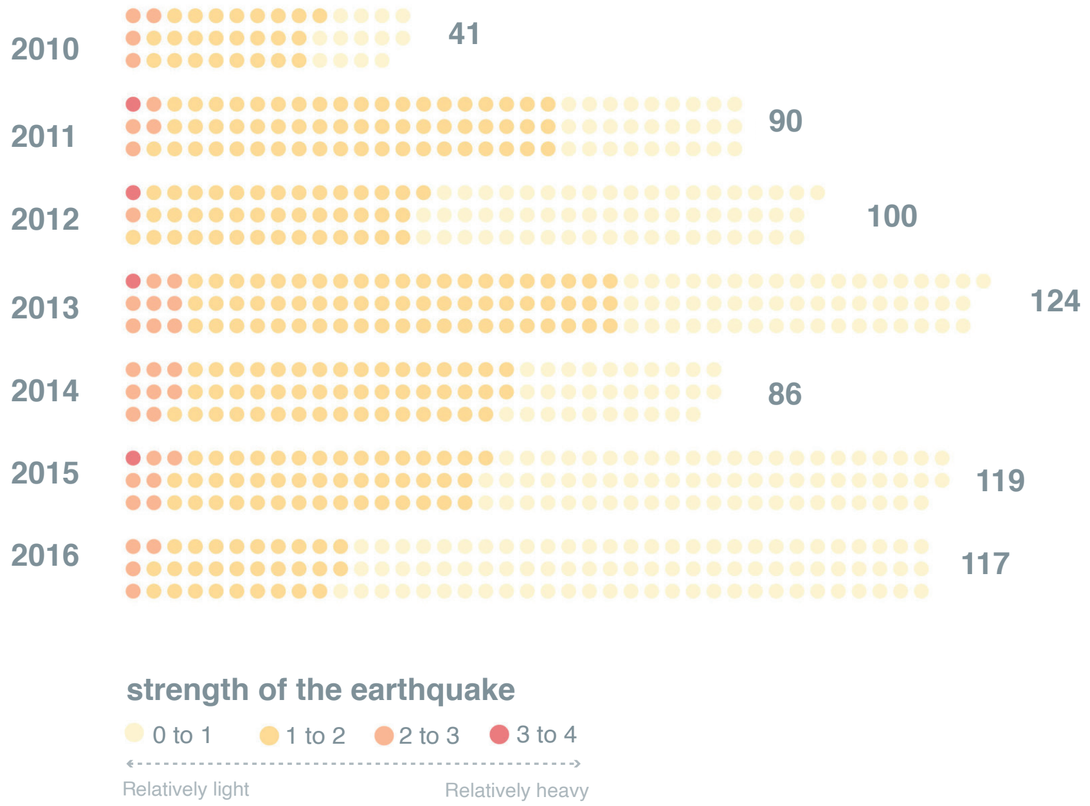


Greenhouse gas emissions
Source: Our World in Data, 2020



Local effects

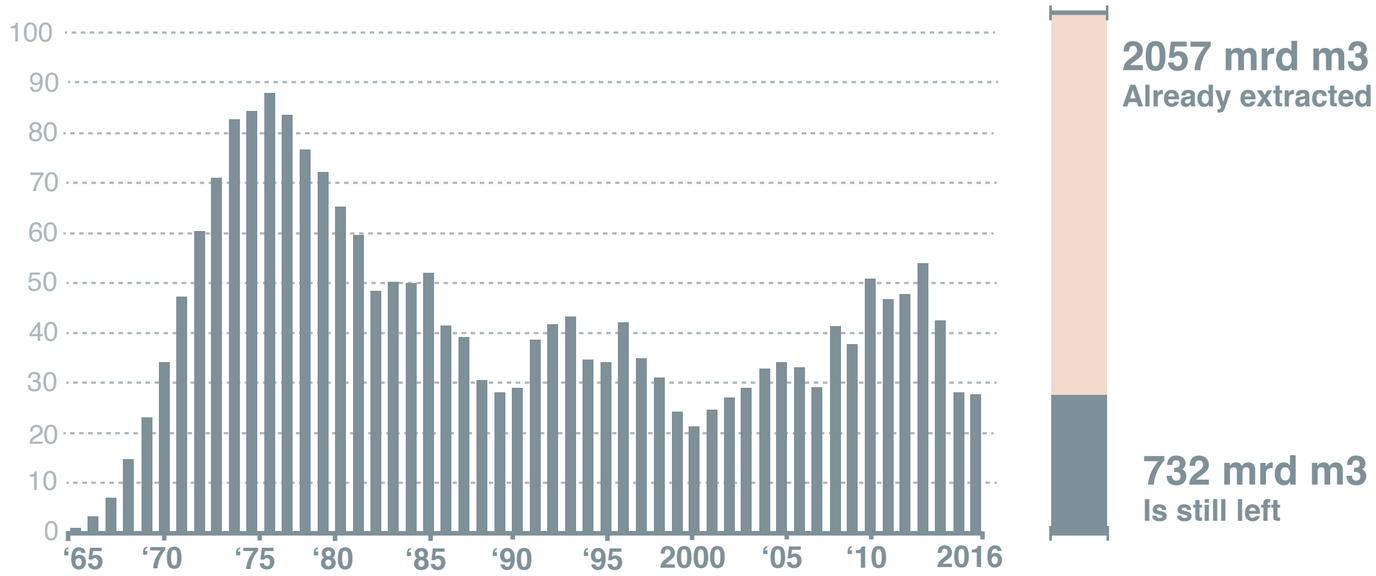
Earthquakes due to gas extraction



Number of earthquakes in the north of the Netherlands
in and around the province of Groningen as a direct result of natural gas extraction (KNMI, 2020) (NOS, 2017).

Local effects

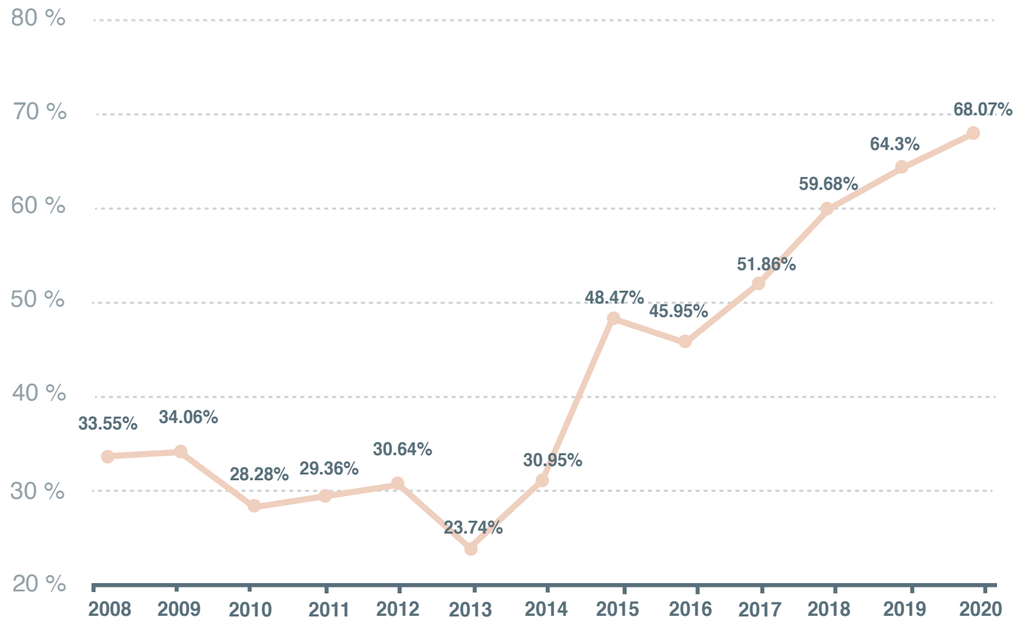
The gas is running out



Total gas extracted from the Groningen gas field
in billions of Nm3 (NAM, 2022) (NOS, 2017).

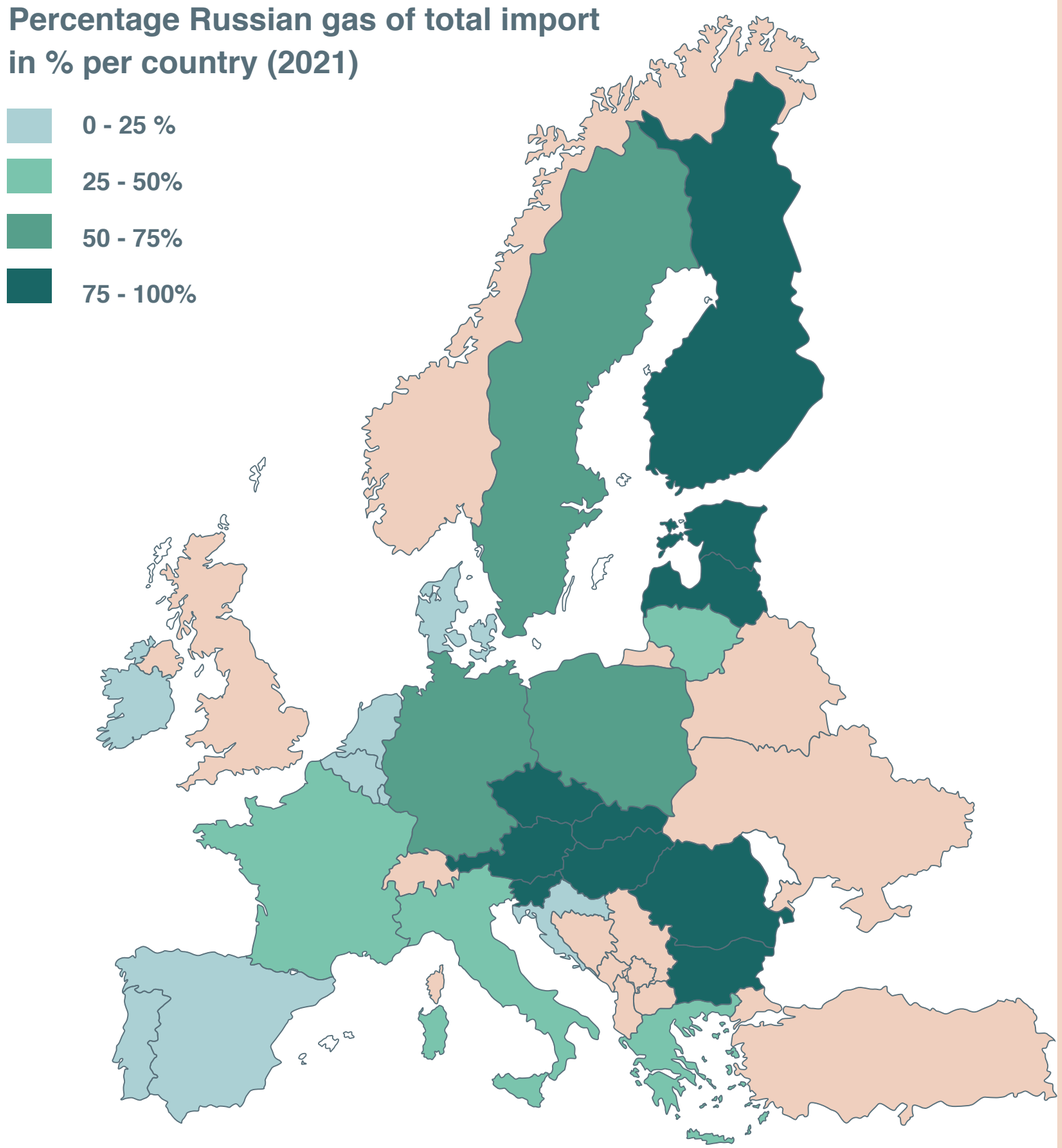
Local effects

Increasingly dependent



Dependency on Energy Imports in The Netherlands

Source: Statista



Dependence on Russian gas in EU

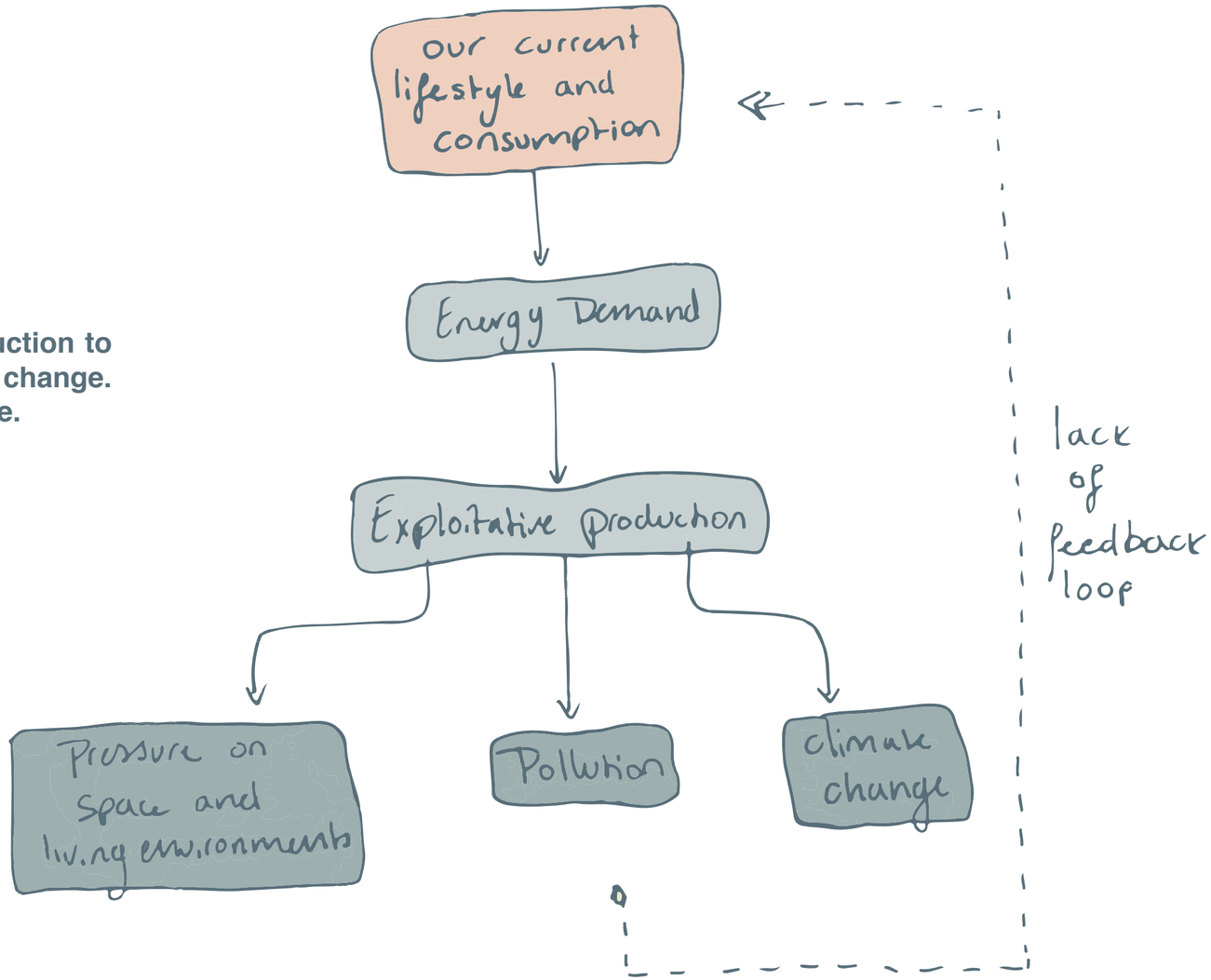
Percentage Russian gas of total gas import
European dependancies on Russian Gas (de Groot & Reijerman, 2022).

Problem statement

What is the problem with the current system?

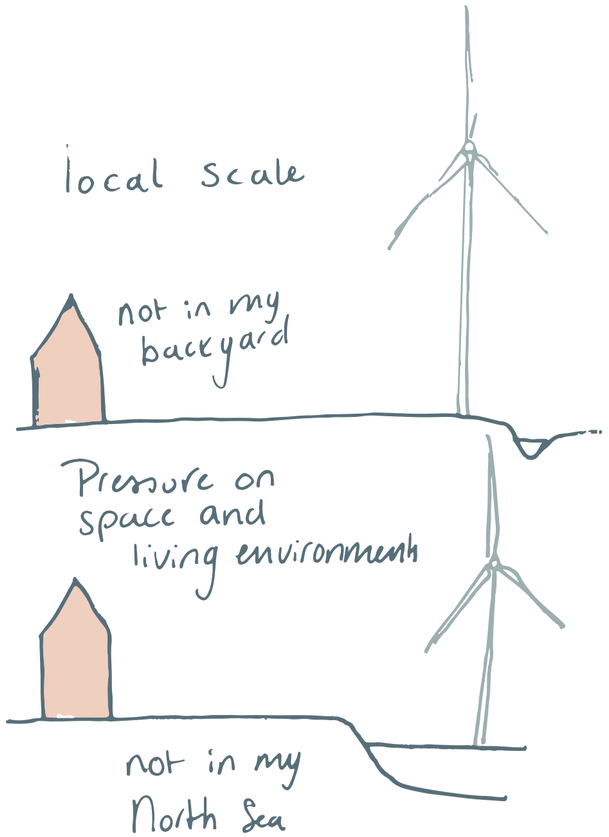
Problem statement

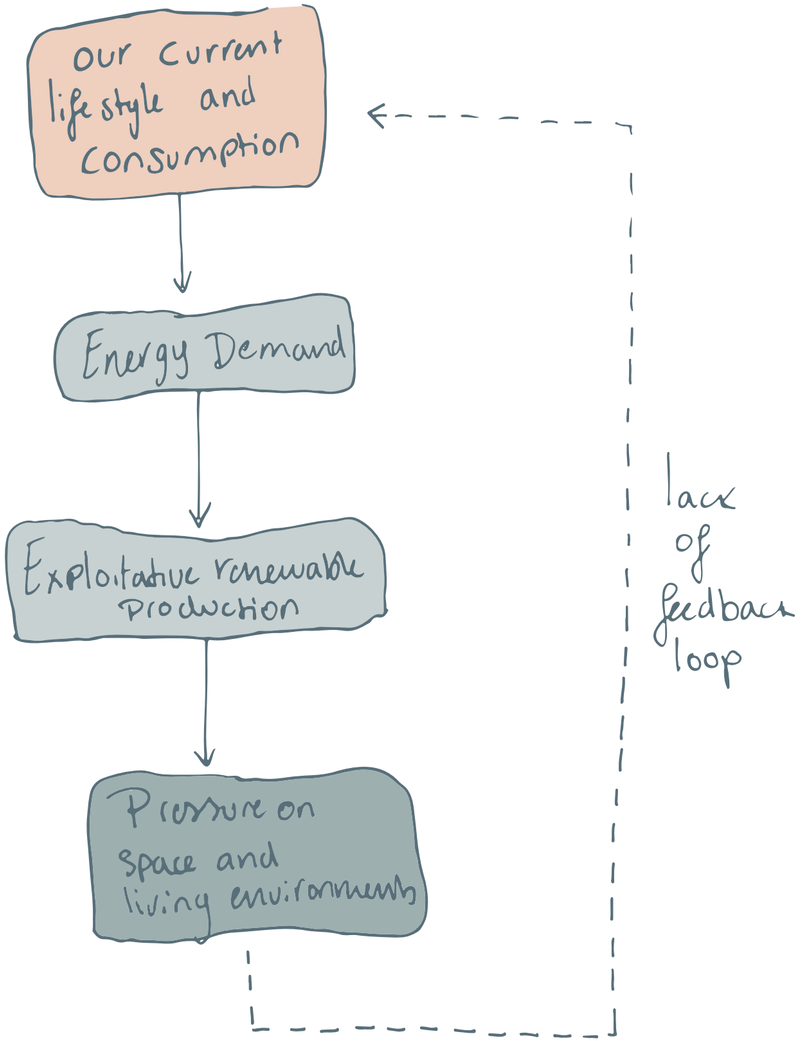
our uninhibited energy consumption forces exploitative energy production to meet our demand. Leading to pressure on space, pollution, and climate change. Showing a lost connection between us and our energy landscape.



Problem statement

What is the problem with the current transition?



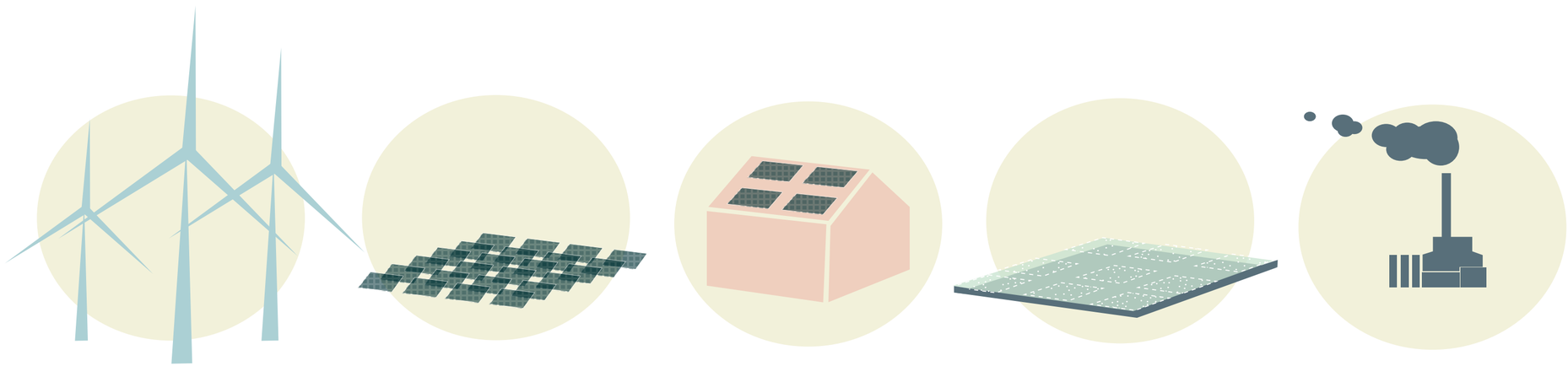


Energy and space

Energy needs space for:

- **Generation**
- **Processing**
- **Storage**
- **Transport**

1 PJ =



29 - 40
Windturbines

300 - 500 HA
Solarfields

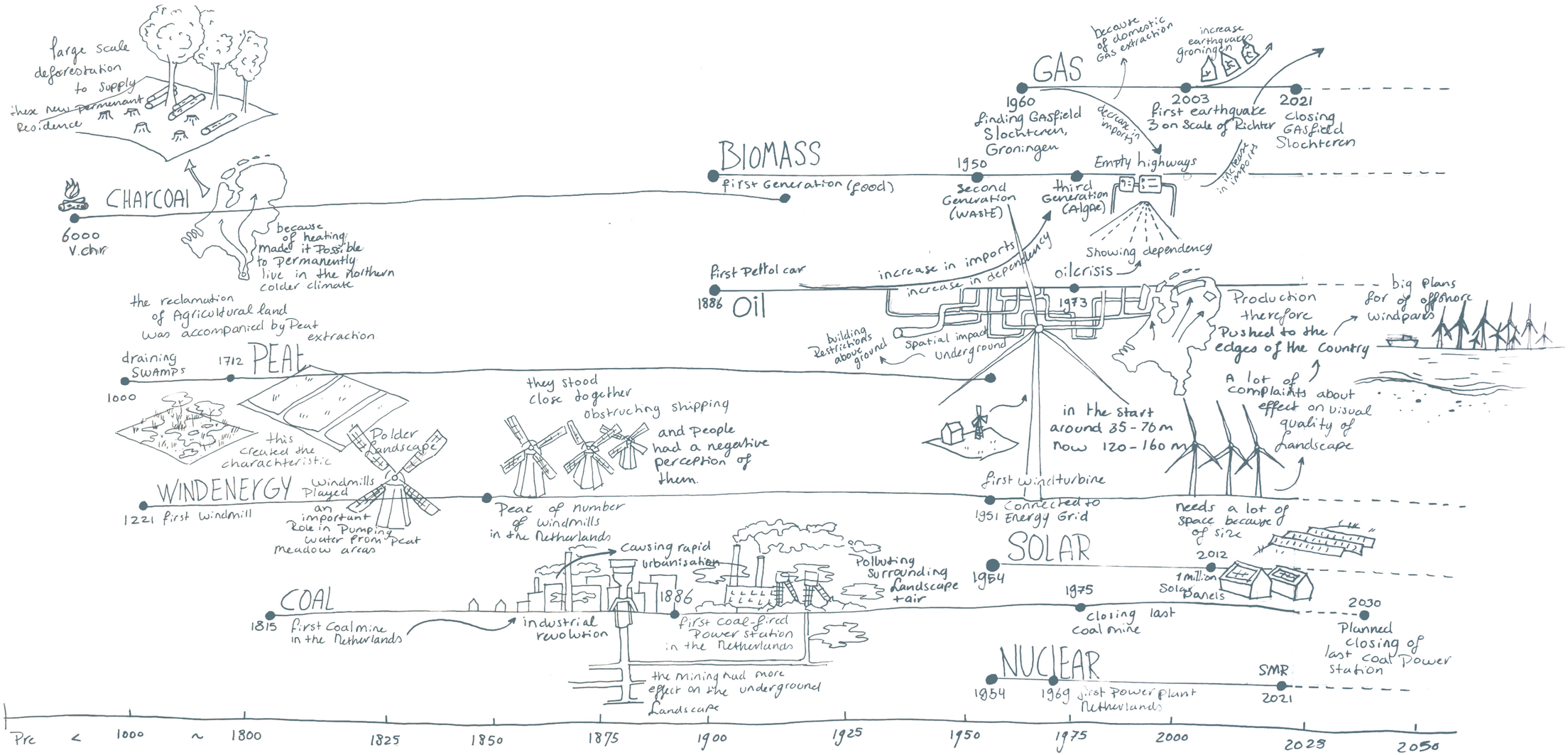
100.000
Solar rooftops

4.750 ha
Biomass cultivation

50 kg/s
Coal combustion

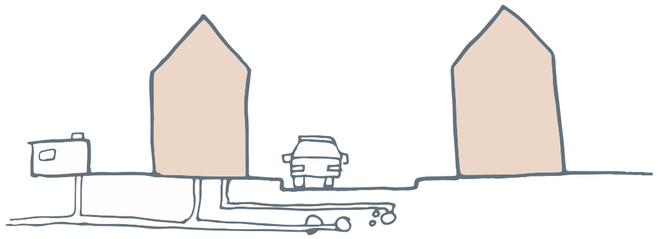
Energy and space

Throughout history

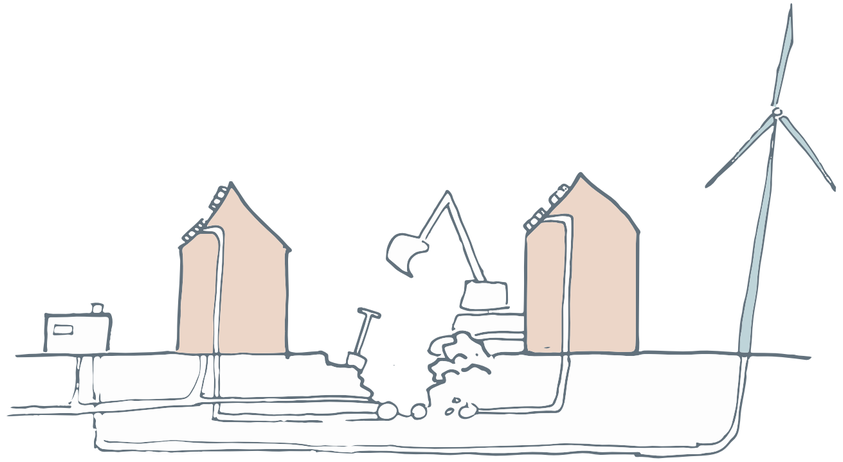


Energy and space

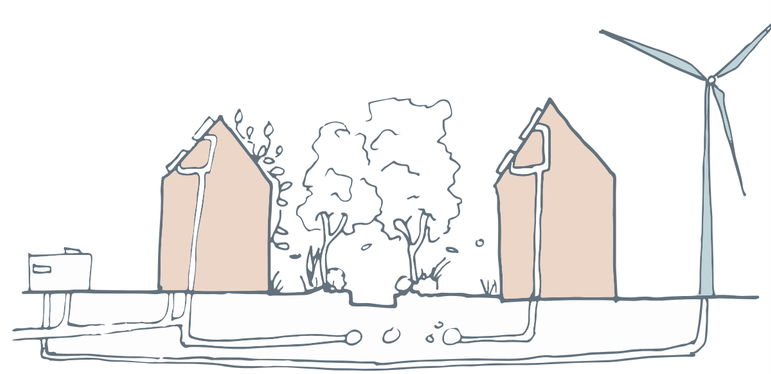
How energy potential can lead to spatial quality



The current system



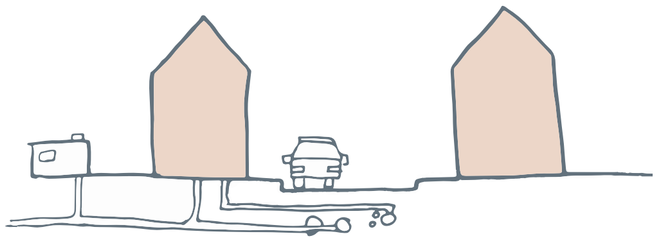
Possibilties for transition



Catalyst for spatial quality

Spatial quality in transition

How energy potential can lead to spatial quality



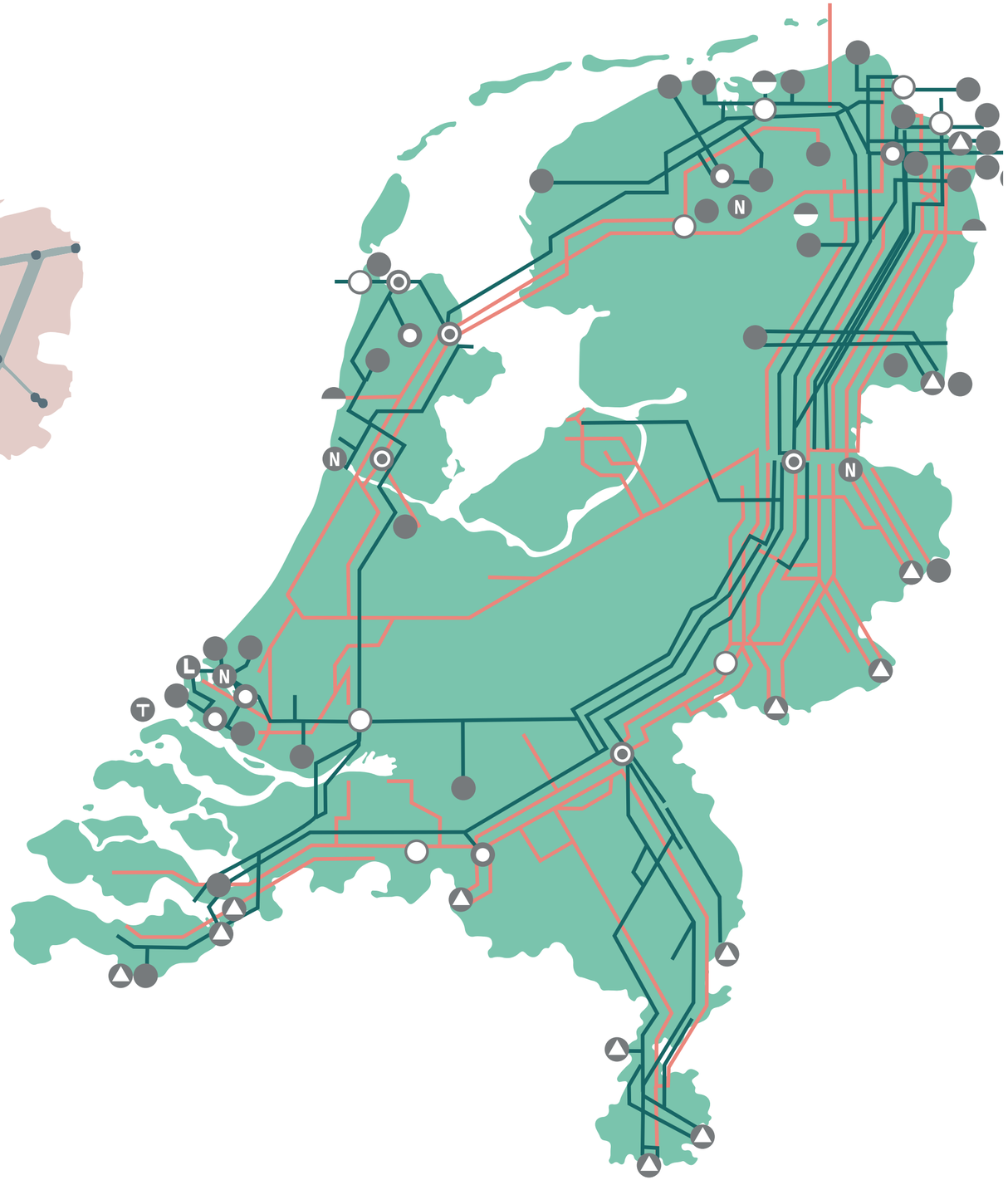
The current system

Possibilties for transition

Catalyst for spatial quality

Current flows

Gas system



- Entry points
- Compressor and mixing station
- Compressor station
- Mixing station
- Output station
- Installation underground storage
- Liquefied natural gas installation
- Nitrogen Injection
- LNG terminal
- Pipeline - Groningen gas
- Pipeline - High-calorific gas

Flows of the gas system on National scale
(Banken, 2020) (cbs, 2020).

Current flows

Electricity grid

380 kV Connection and station

220 kV Connection and station

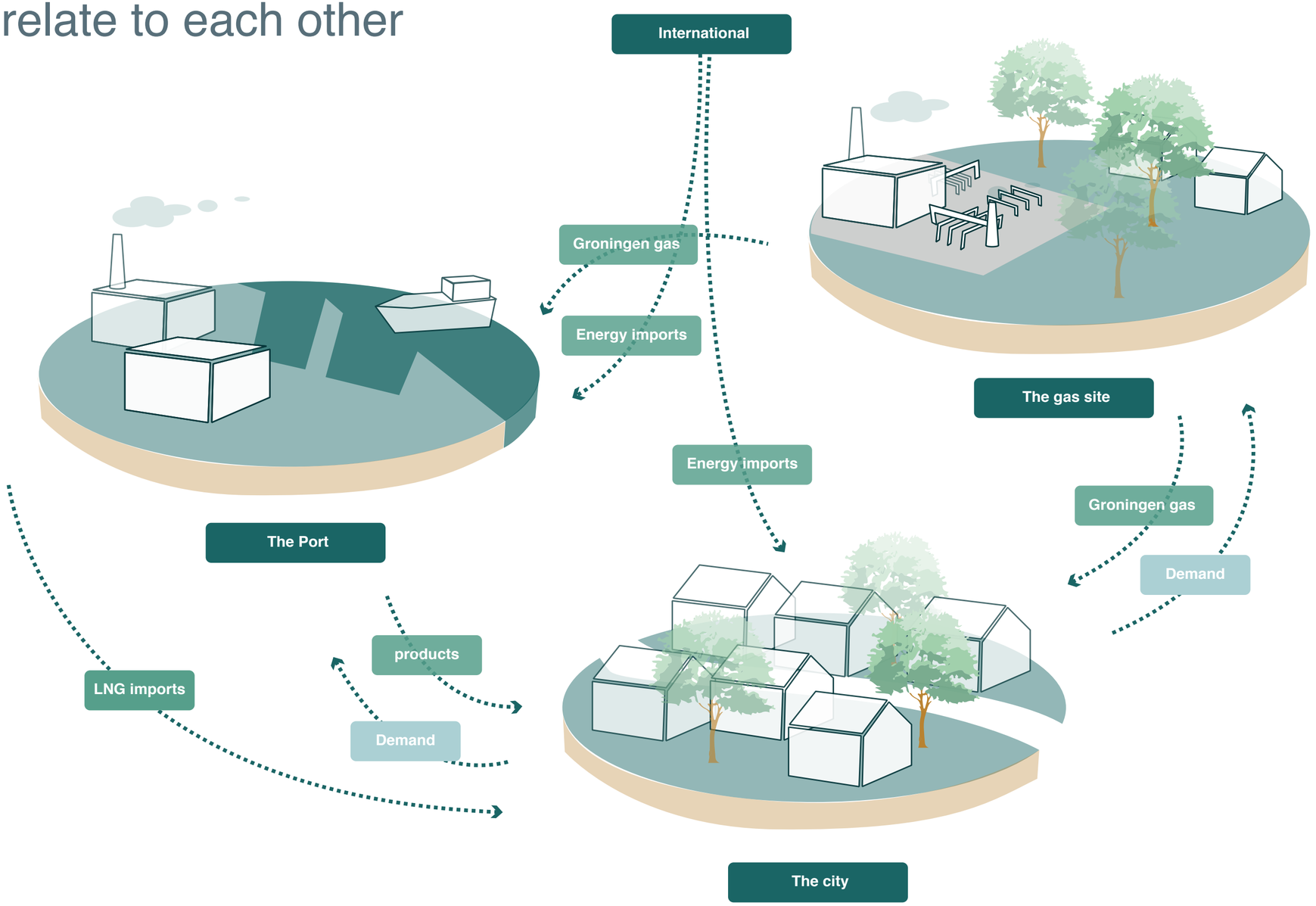
150 kV Connection and station

110 kV Connection and station

Flows of the electricity grid on National scale
(TenneT, 2022) (cbs, 2020)

Key locations in the current system

And how they relate to each other



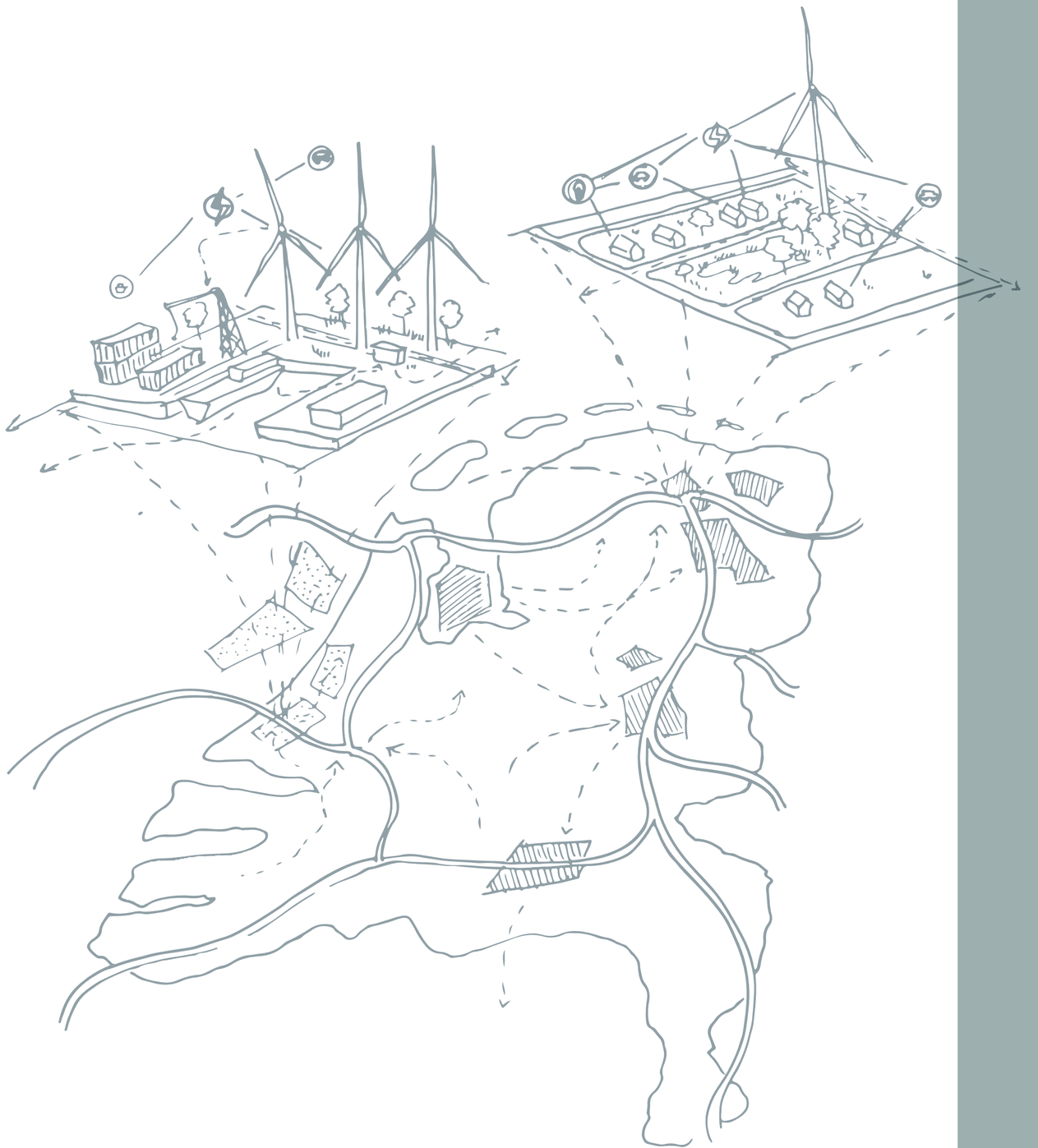
Where do we go from here?

Illustration of inclusive energy transition (Maria Fraaije, 2021)

Research questions

Main research question

What are the potentials of the shift towards a **decentralized energy system** to facilitate a **sustainable neighborhood design** while stimulating **community building** in the context of the **national energy transition**?



Key location Oud-Crooswijk

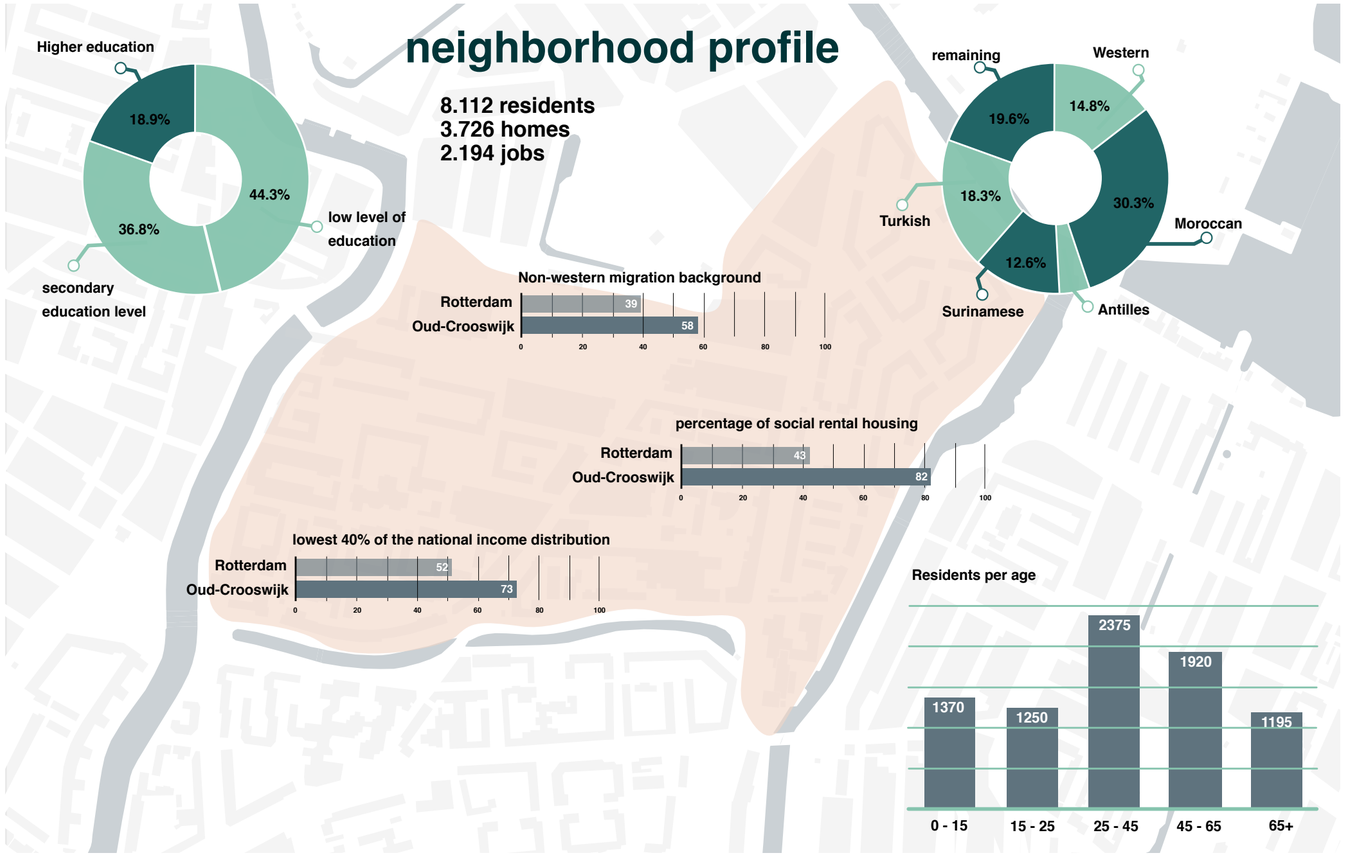
Oud-Crooswijk

Neighborhood analysis

Oud-Crooswijk

Neighborhood analysis

Neighborhood borders

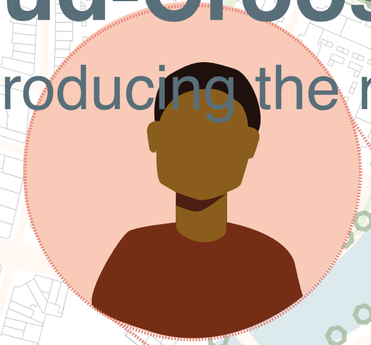


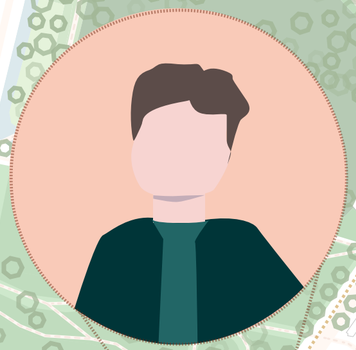
Social housing

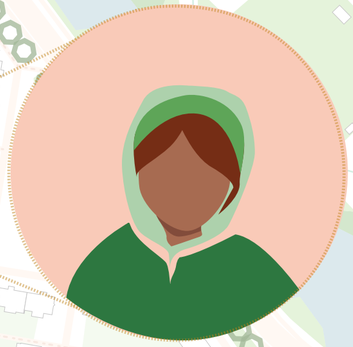
Construction year

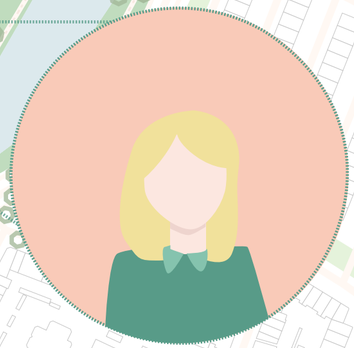
Oud-Crooswijk

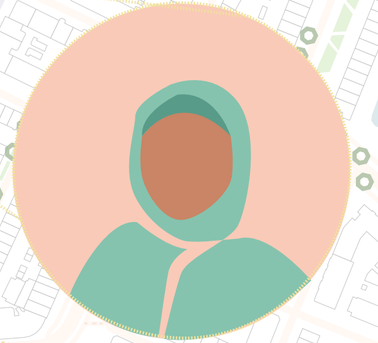
Introducing the residents











Oud-Crooswijk

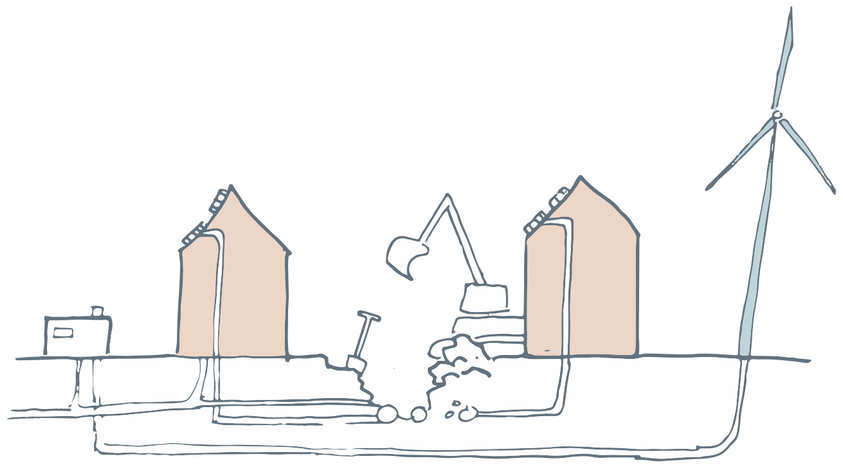
Challlenges

Oud-Crooswijk

Opportunities

Energy potential

The current system

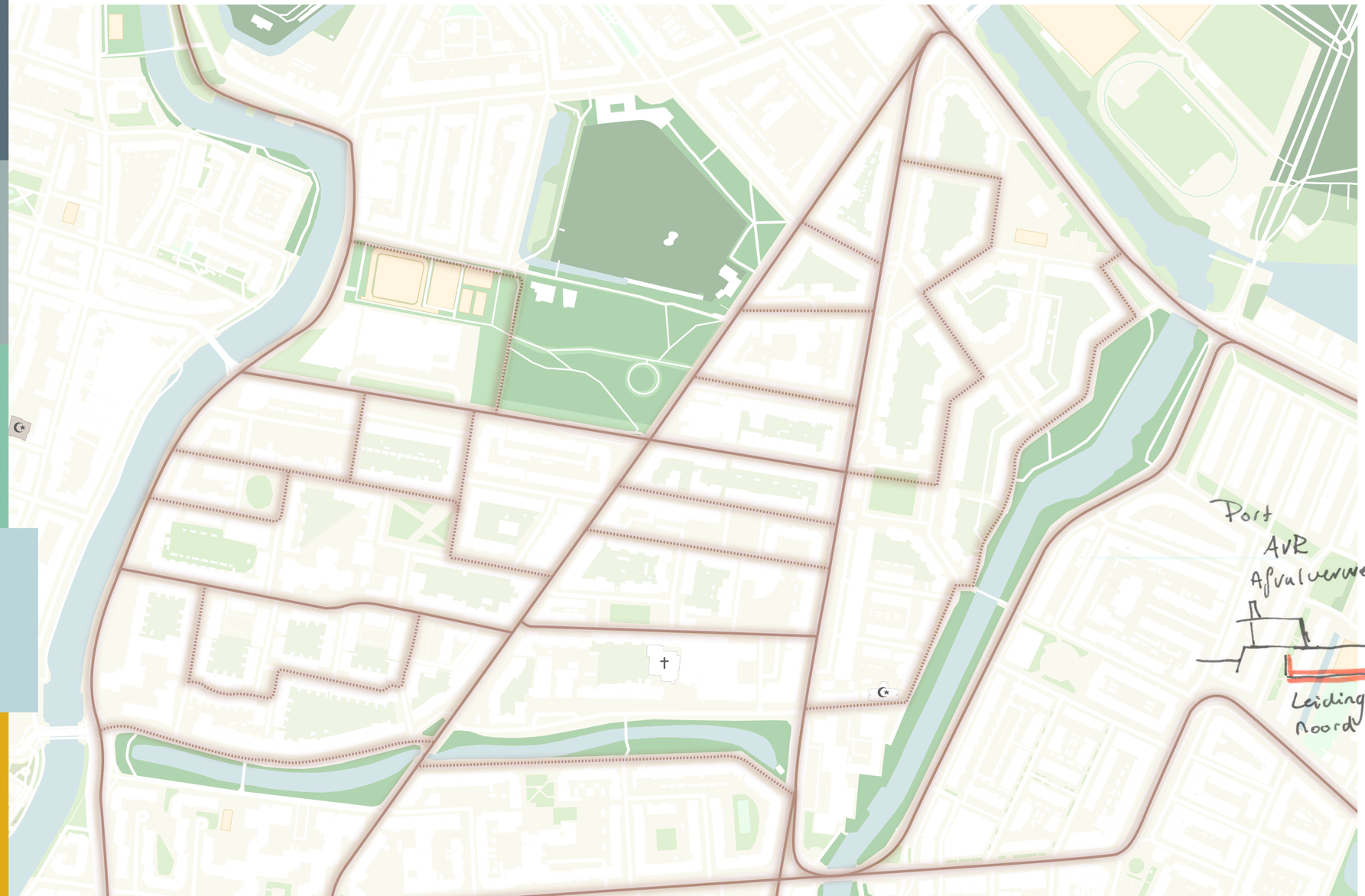


Possibilties for transition

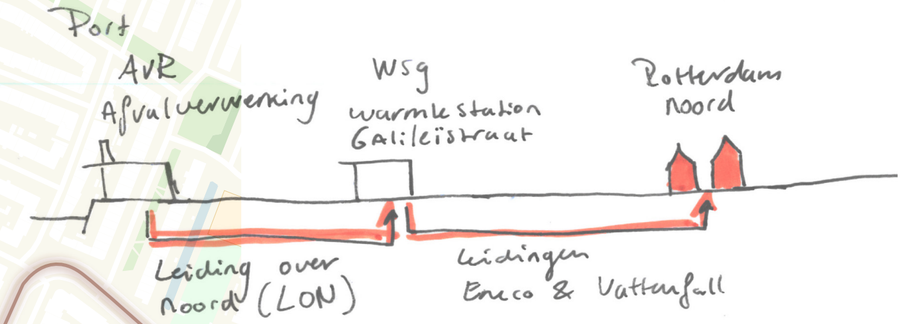
Catalyst for spatial quality

Residual heat network

Energy potential



Potential: 43.326 GJ/year
min: 26.681 GJ/Year
max: 62.040 GJ/Year

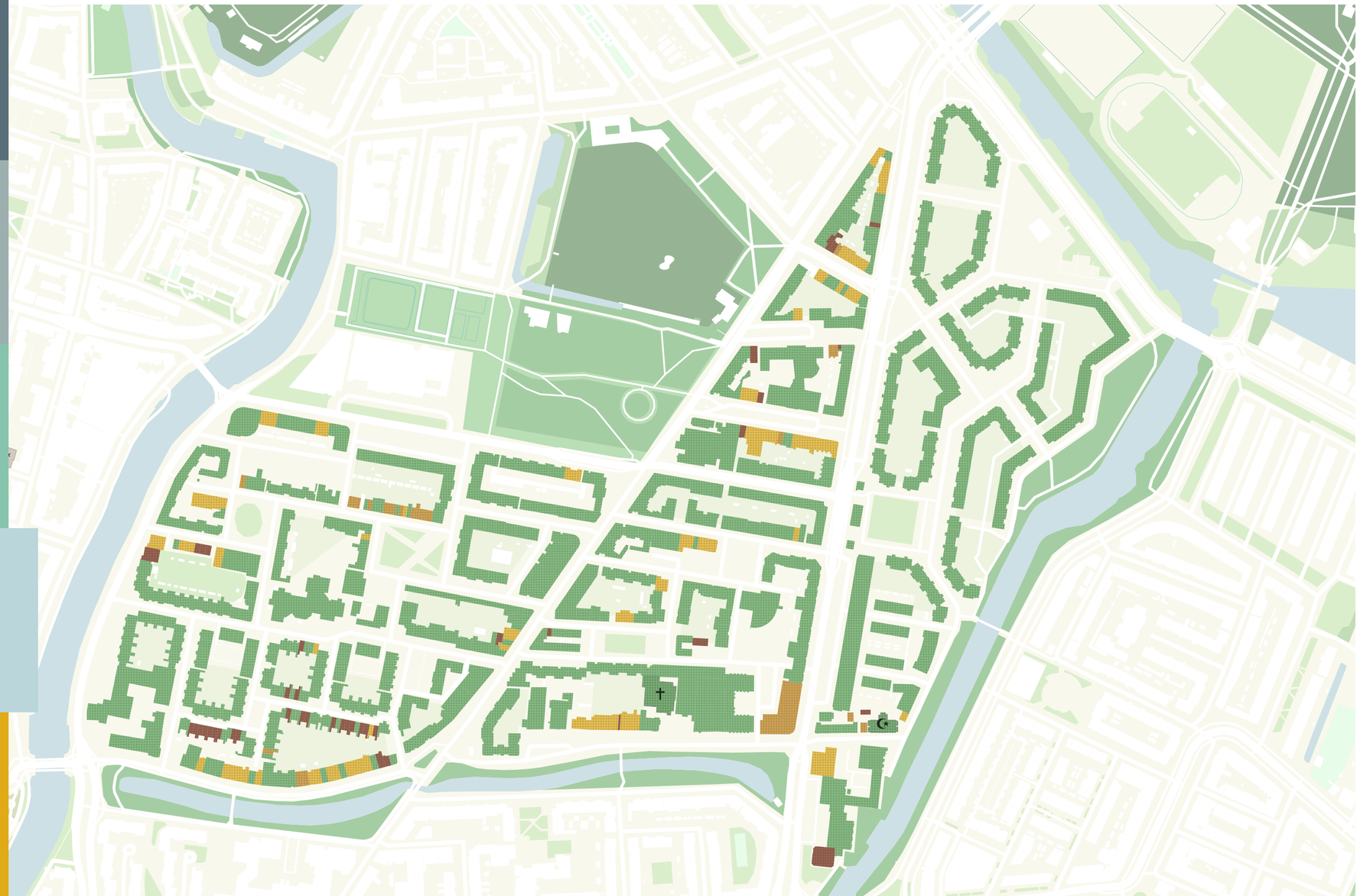


Residual heat network

Energy potential

Solar rooftops

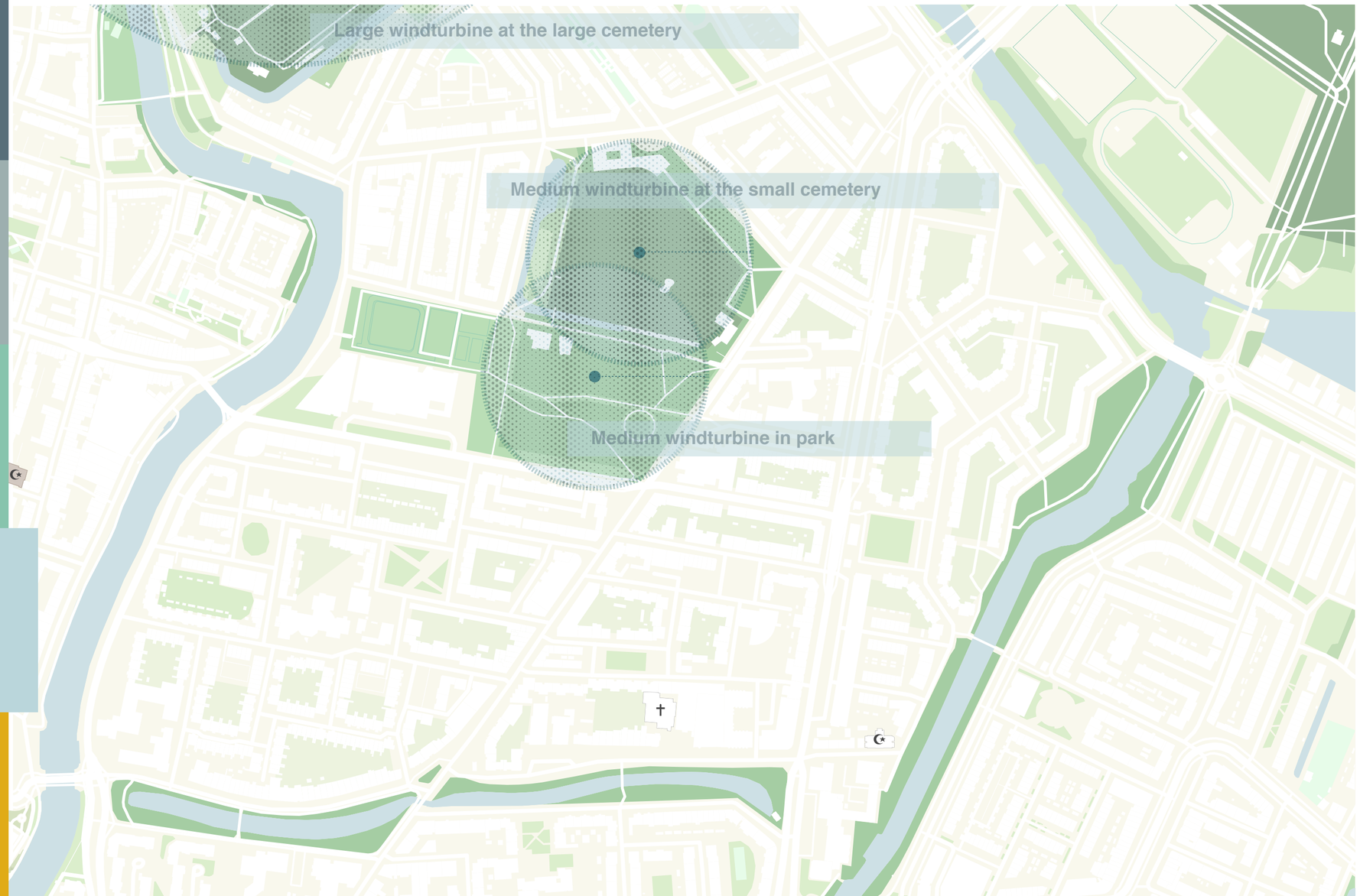
Energy potential



Potential:
7.598.315 KWH
max: 10.513.947,5 KWH

Wind energy

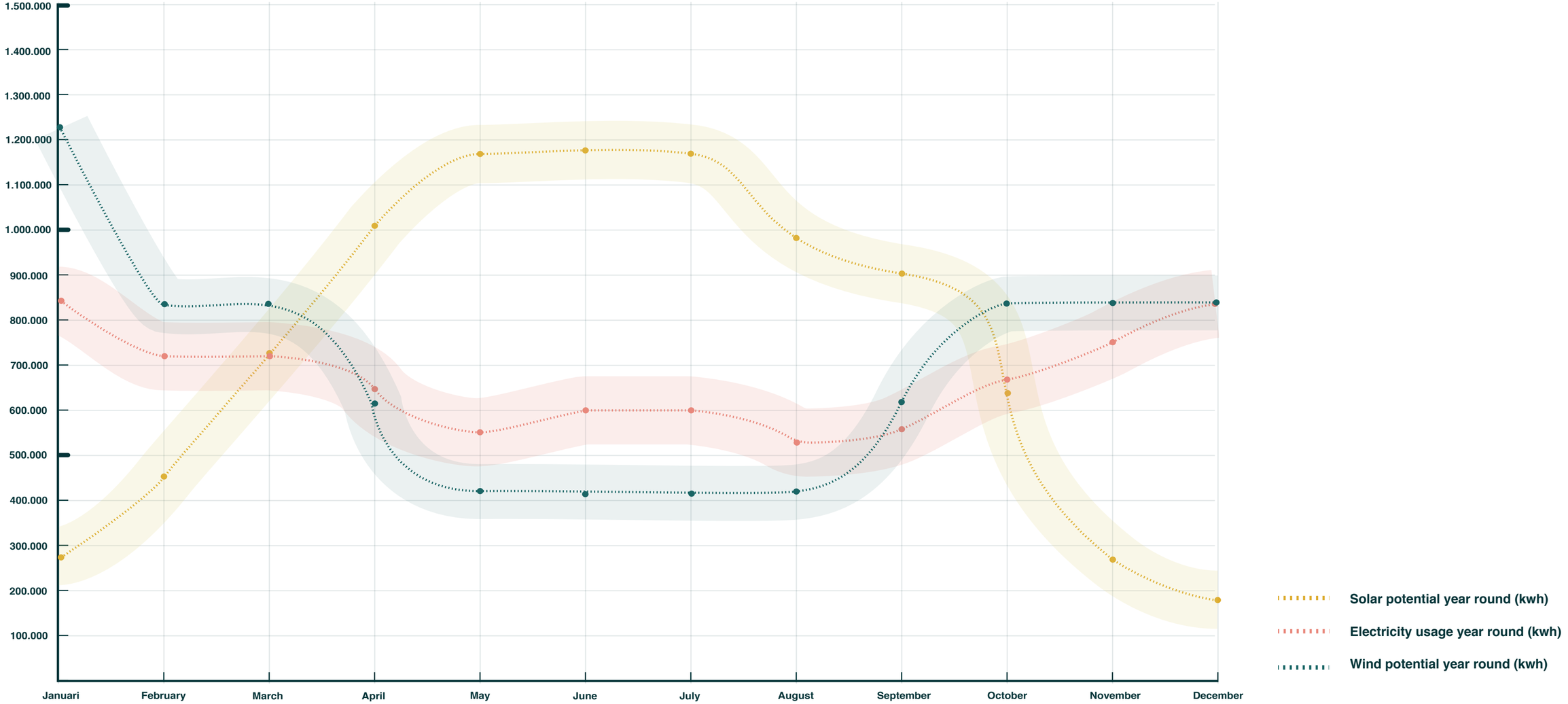
Energy potential wind turbines (medium and large)



Potential:
8.200.000 KWH

Energy potential

Year round

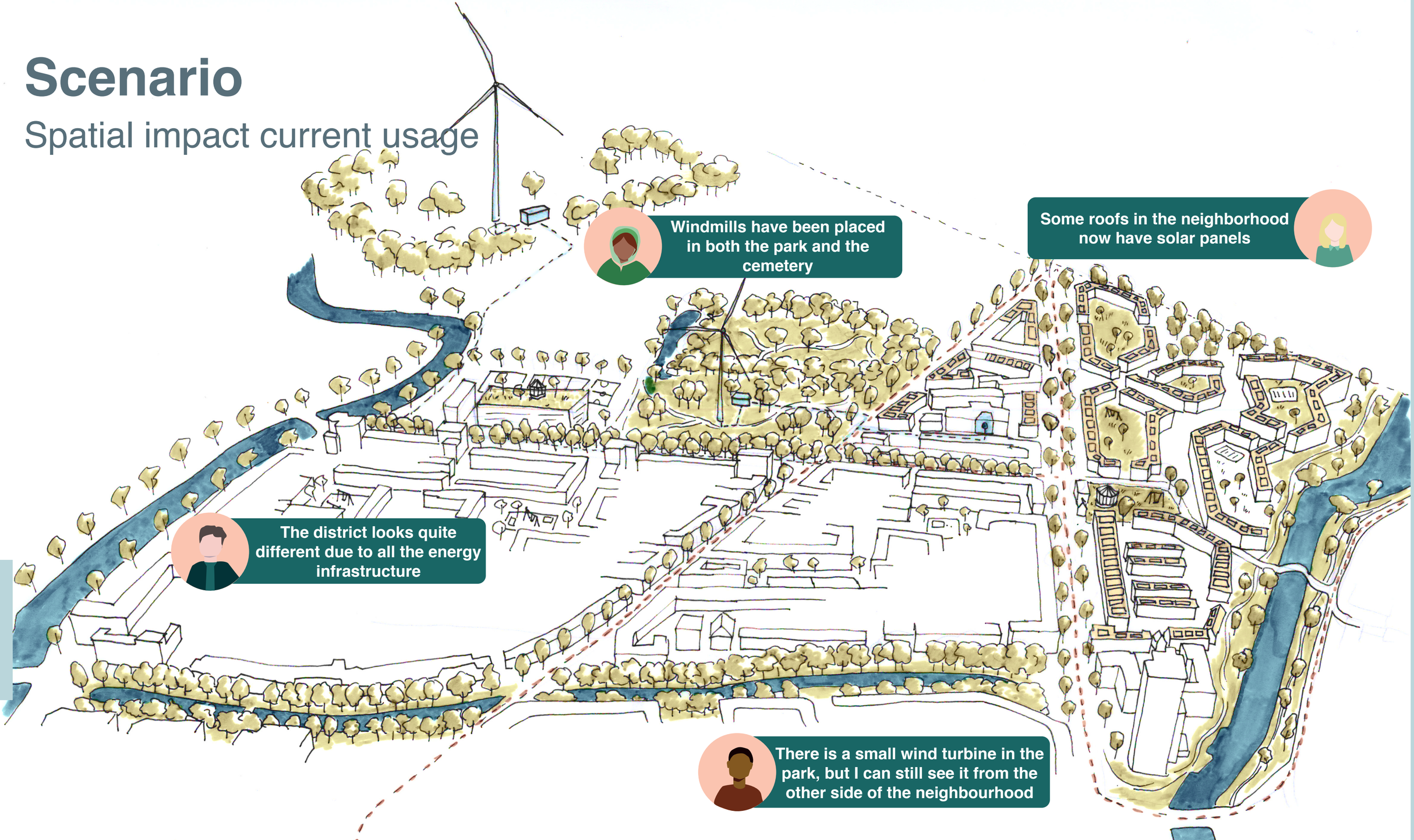


Scenario

Current usage

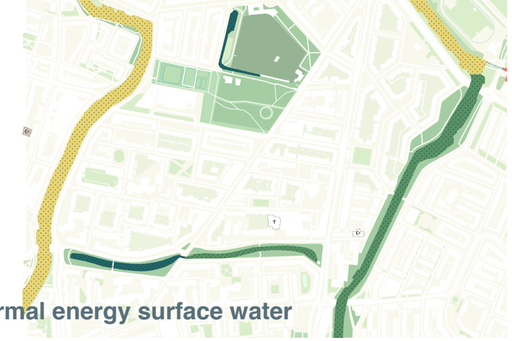
Scenario

Spatial impact current usage

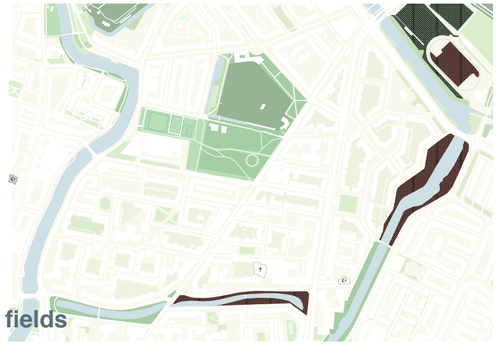


Scenario

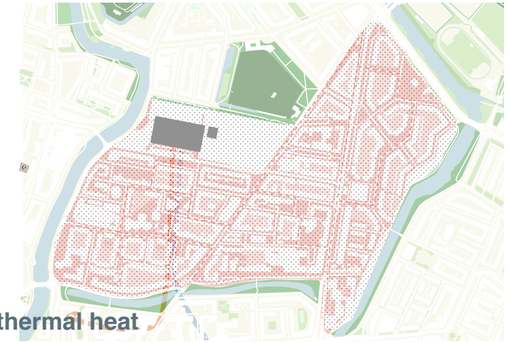
Maximum production



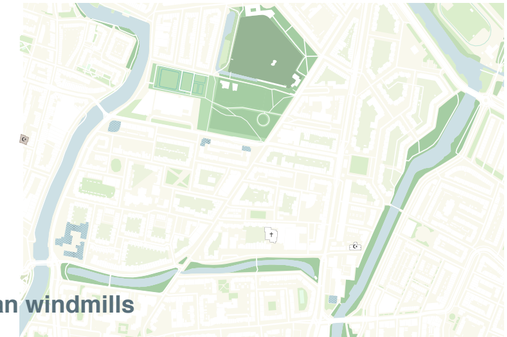
Thermal energy surface water



Solar fields



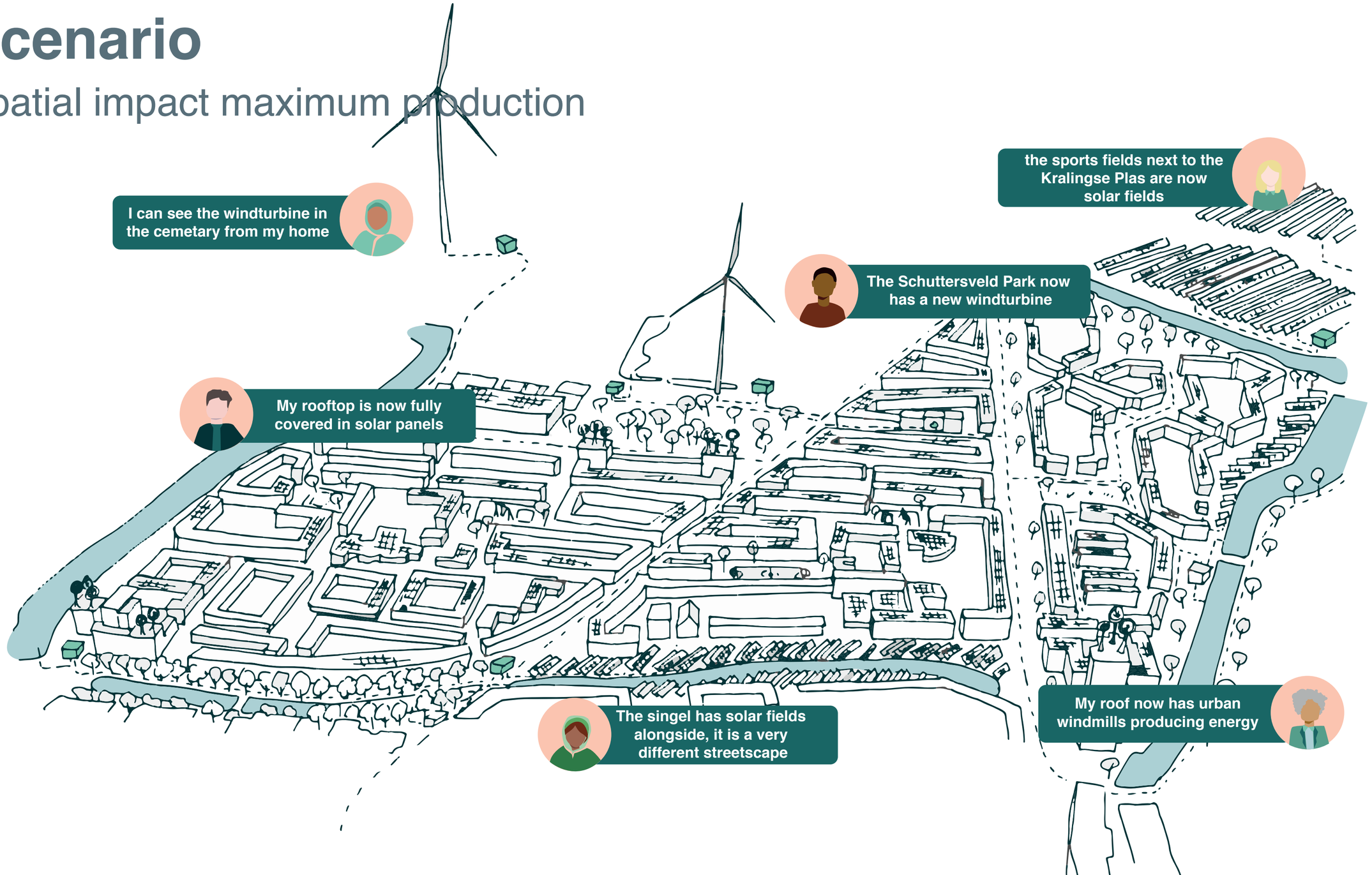
Geothermal heat



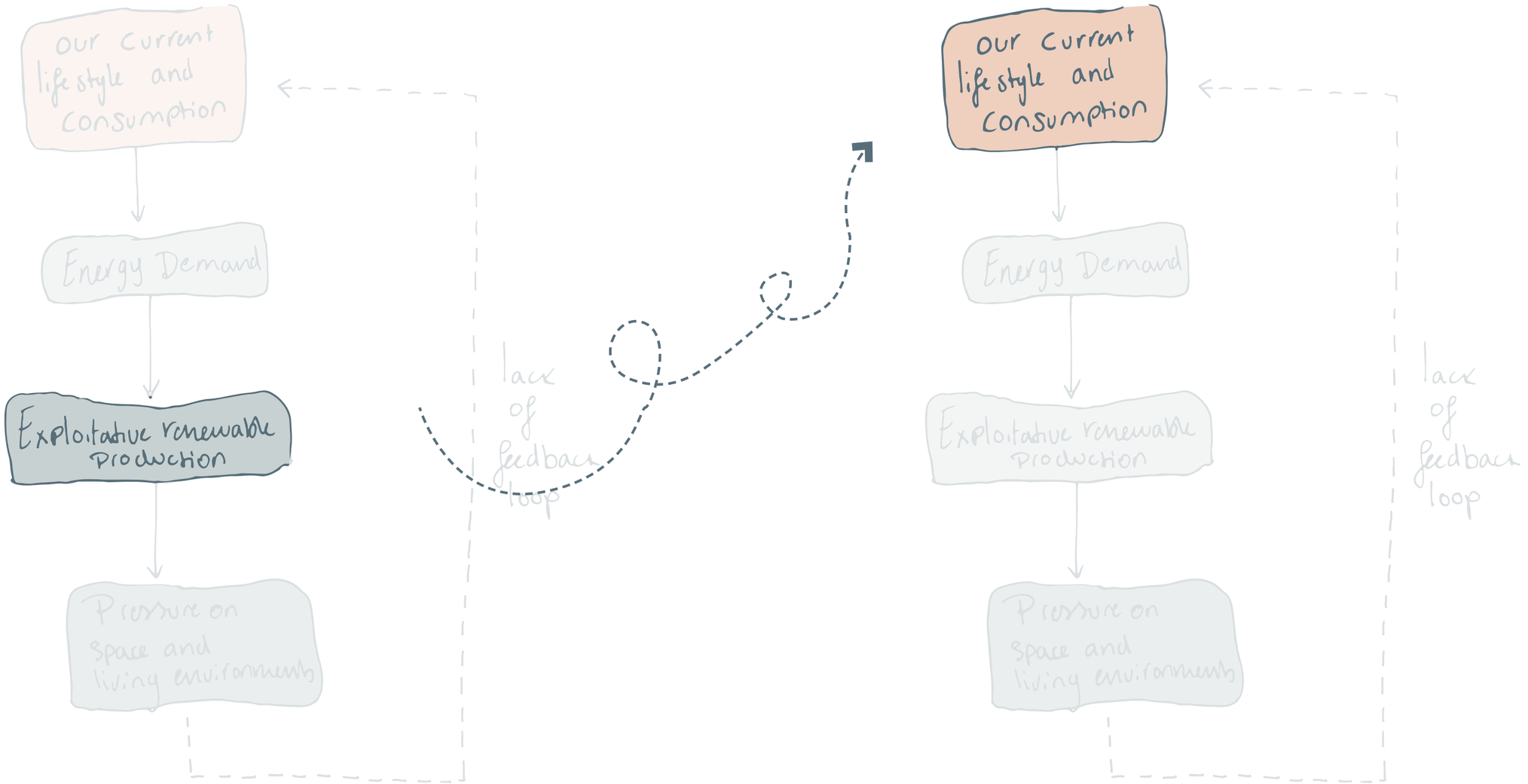
Urban windmills

Scenario

Spatial impact maximum production

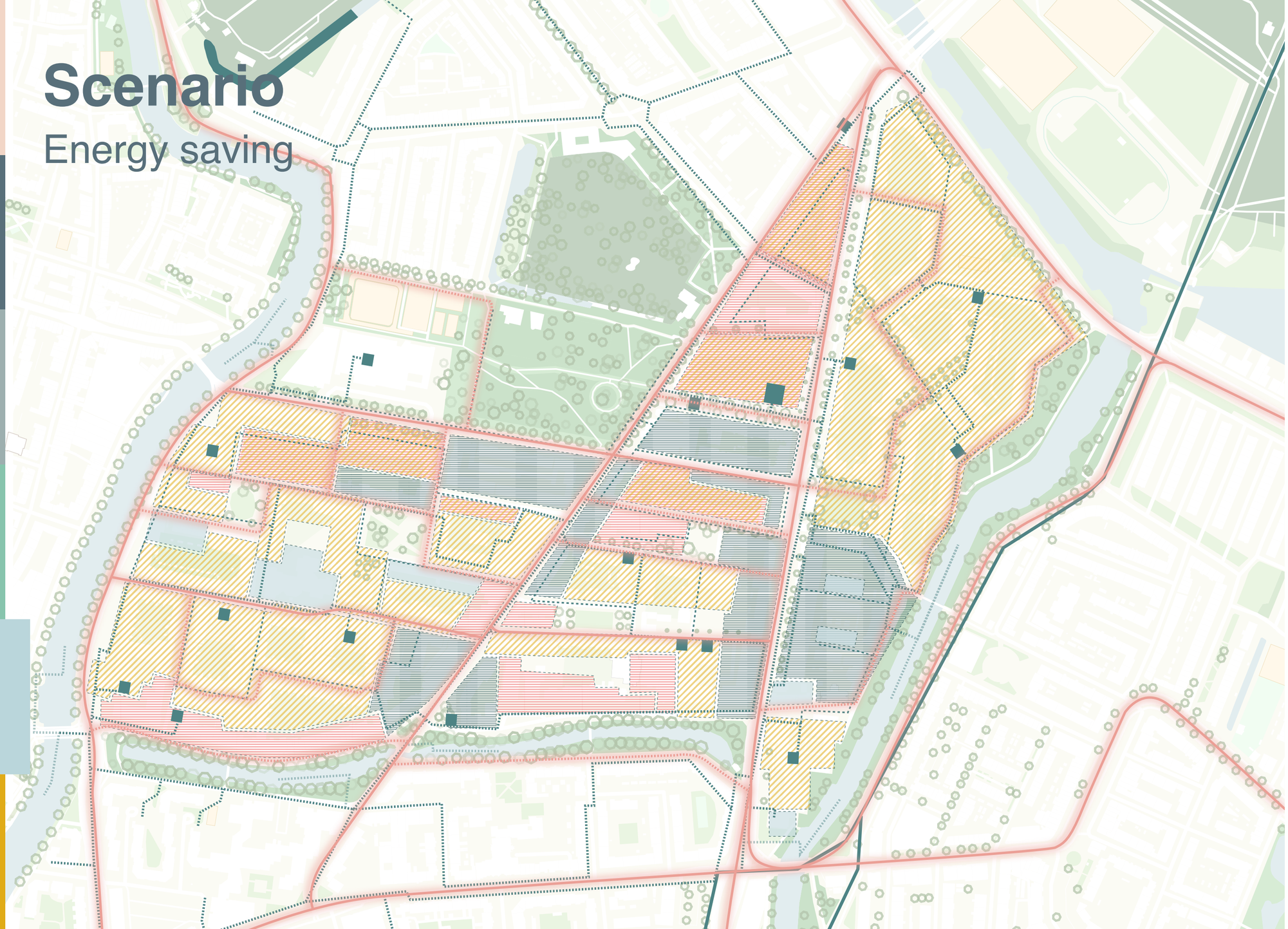


What problem is the scenario solving?



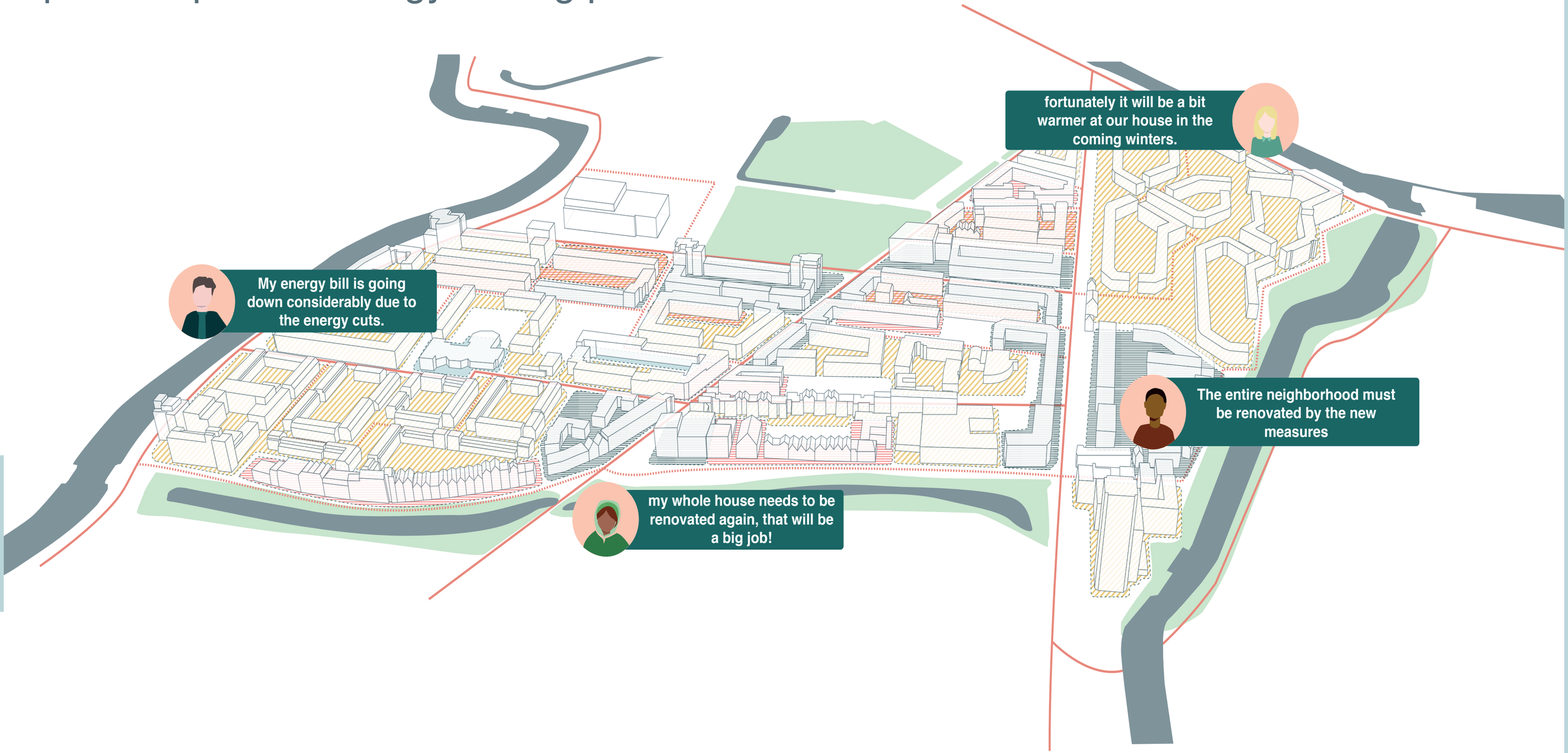
Scenario

Energy saving



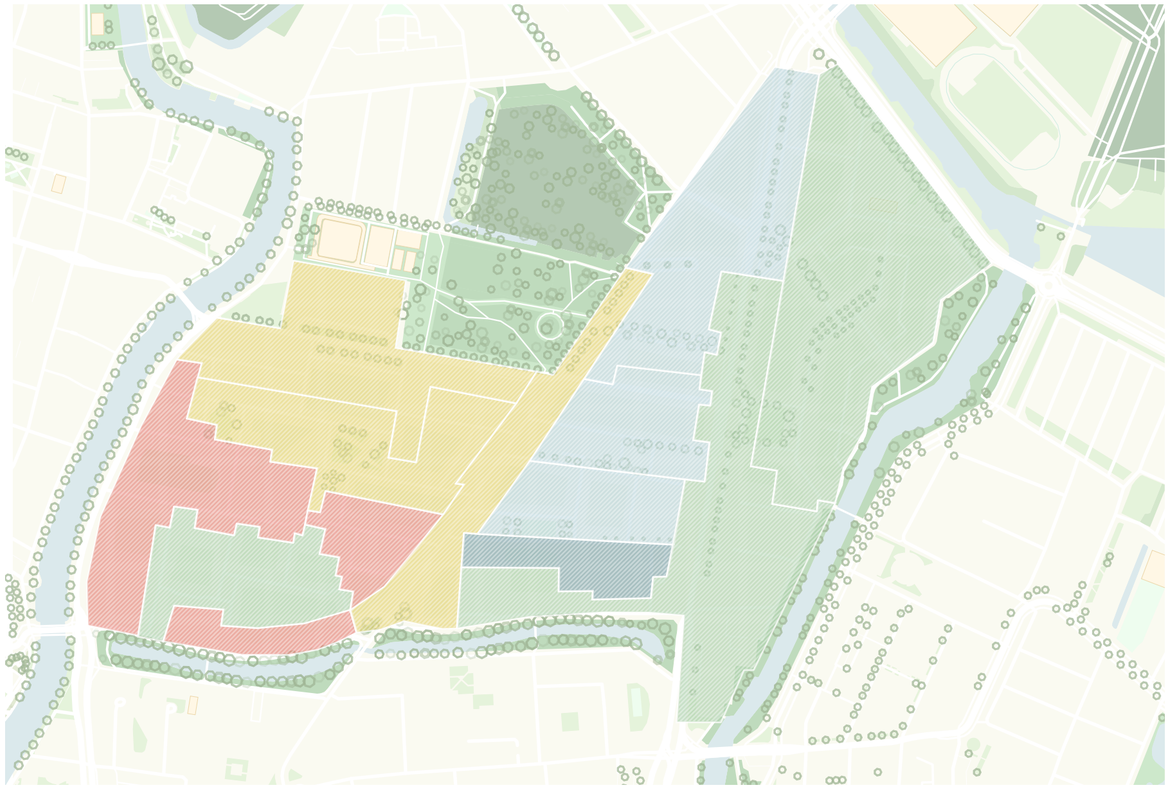
Scenario

Spatial impact of energy-saving plan

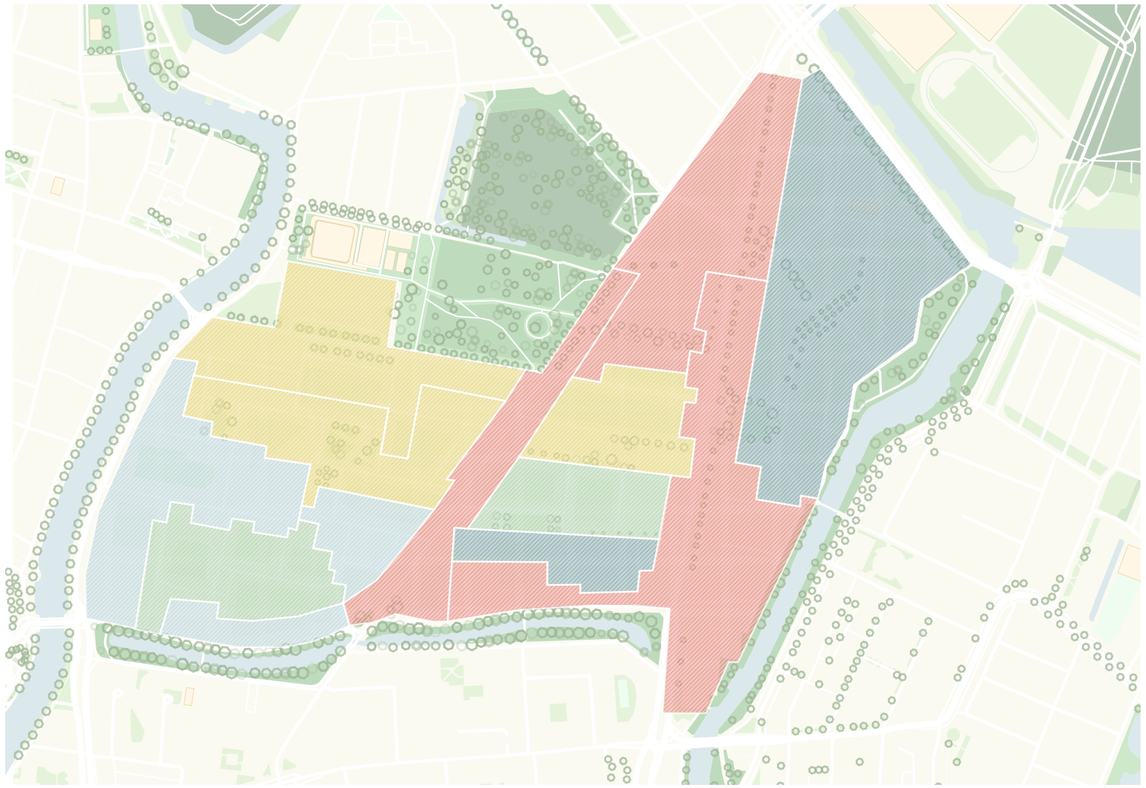


Energy saving

Current usage in the Neighborhood



Gas usage (m3/year)



Electricity usage (kWh/year)

Above average

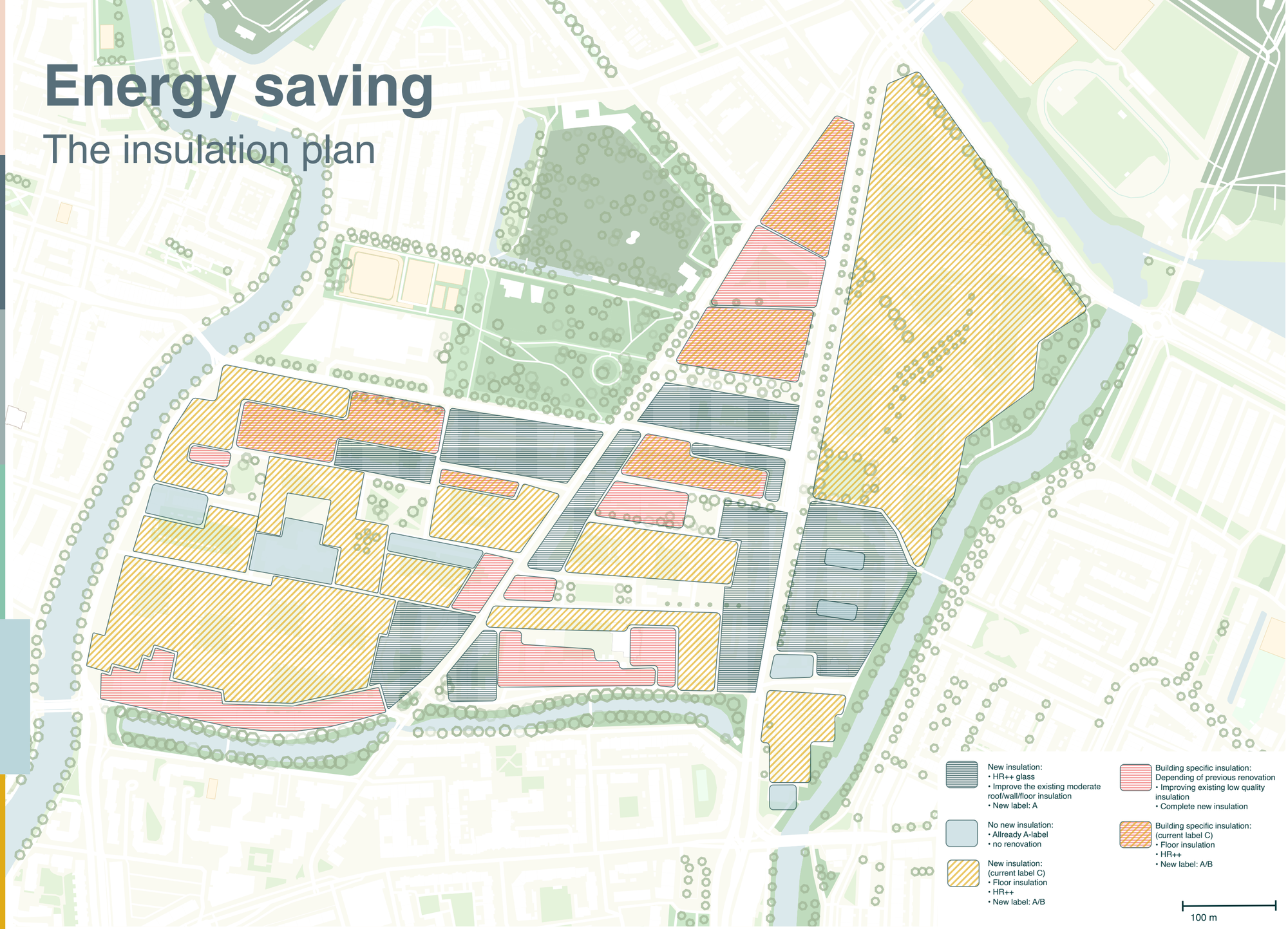
Below average

Energy saving

Current insulation in the Neighborhood

Energy saving

The insulation plan



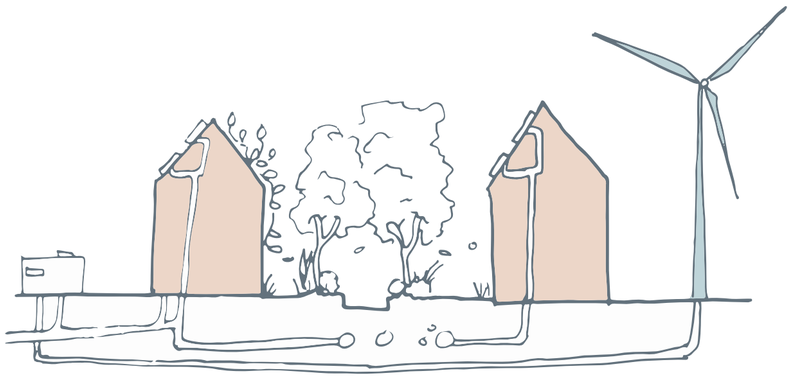
Energy saving

Rethinking energy usage

Spatial quality in transition

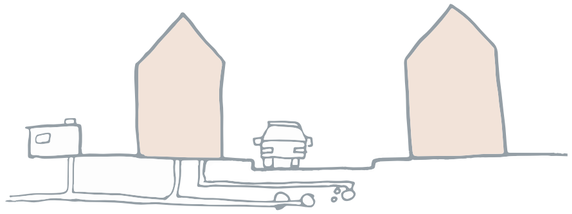
The current system

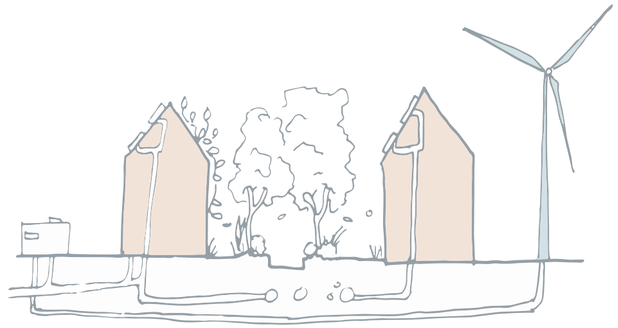
Possibilties for transition

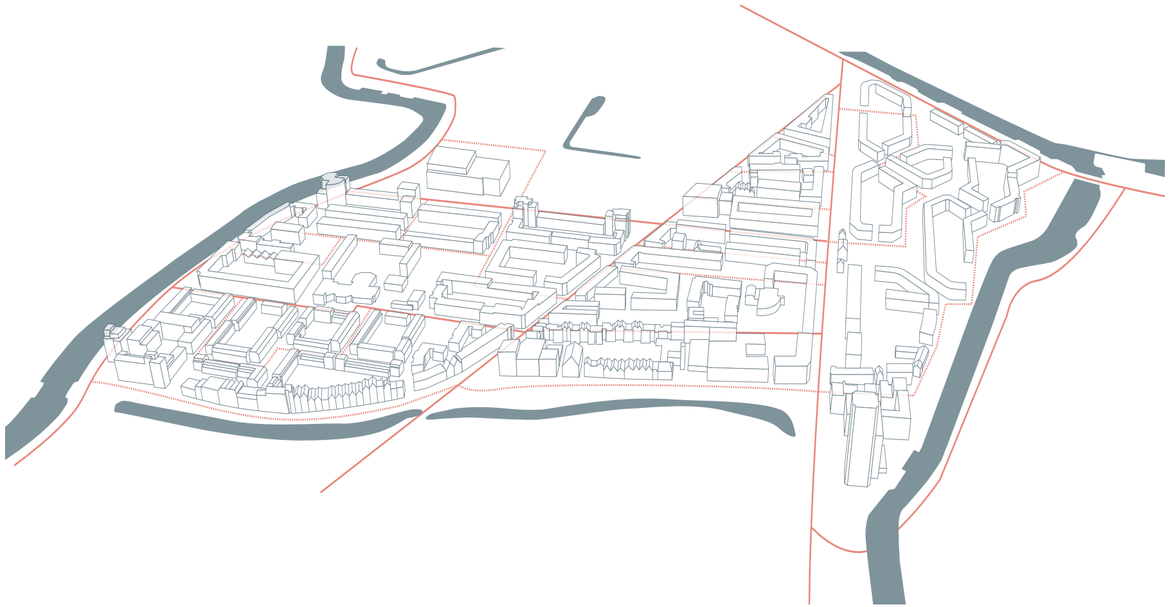


Catalyst for spatial quality

Catalyst for spatial quality



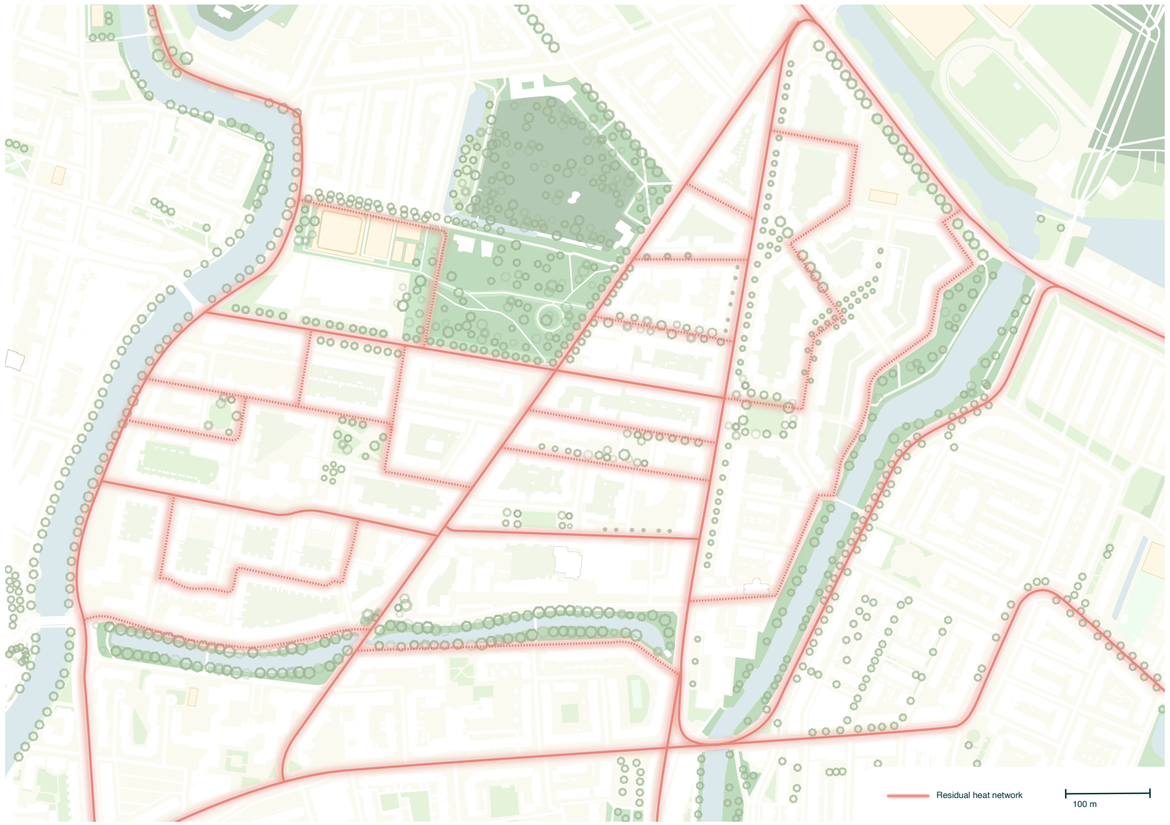




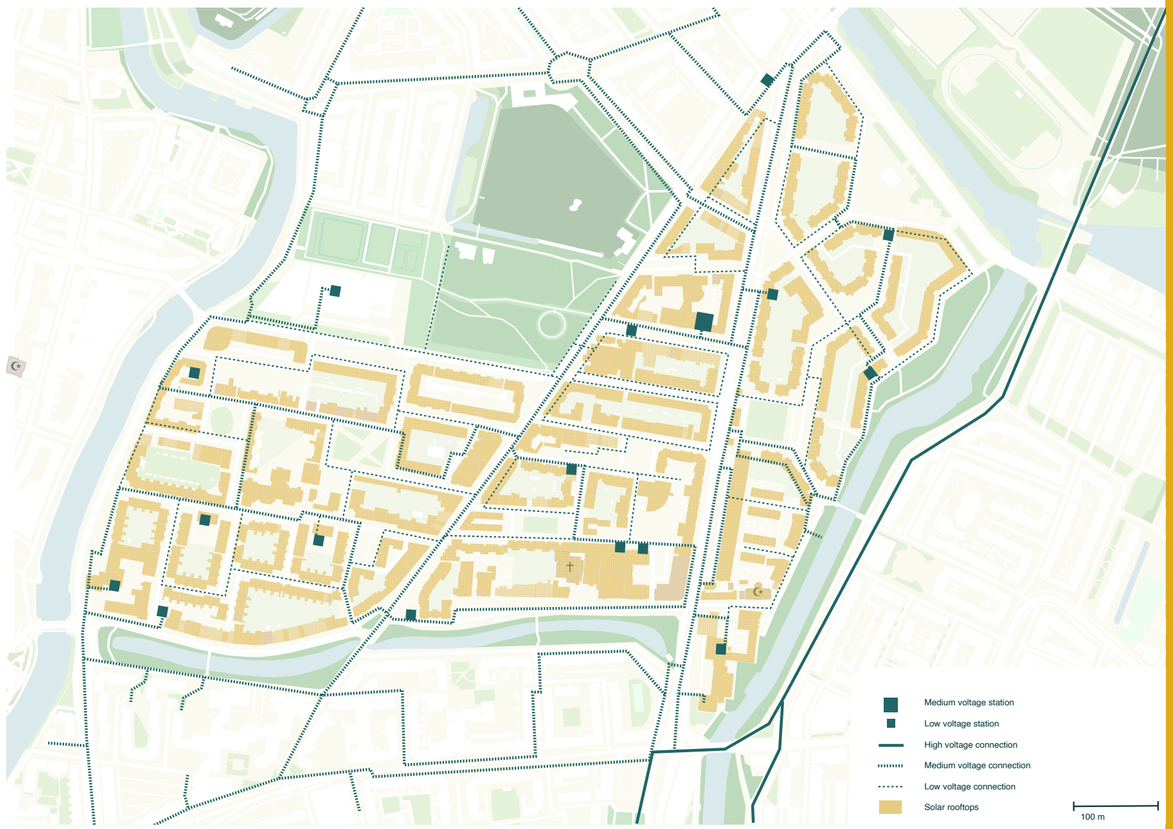
Contruction of residual heat network

Catalyst for greenifying the streetscape

Design in layers
Energy production potential

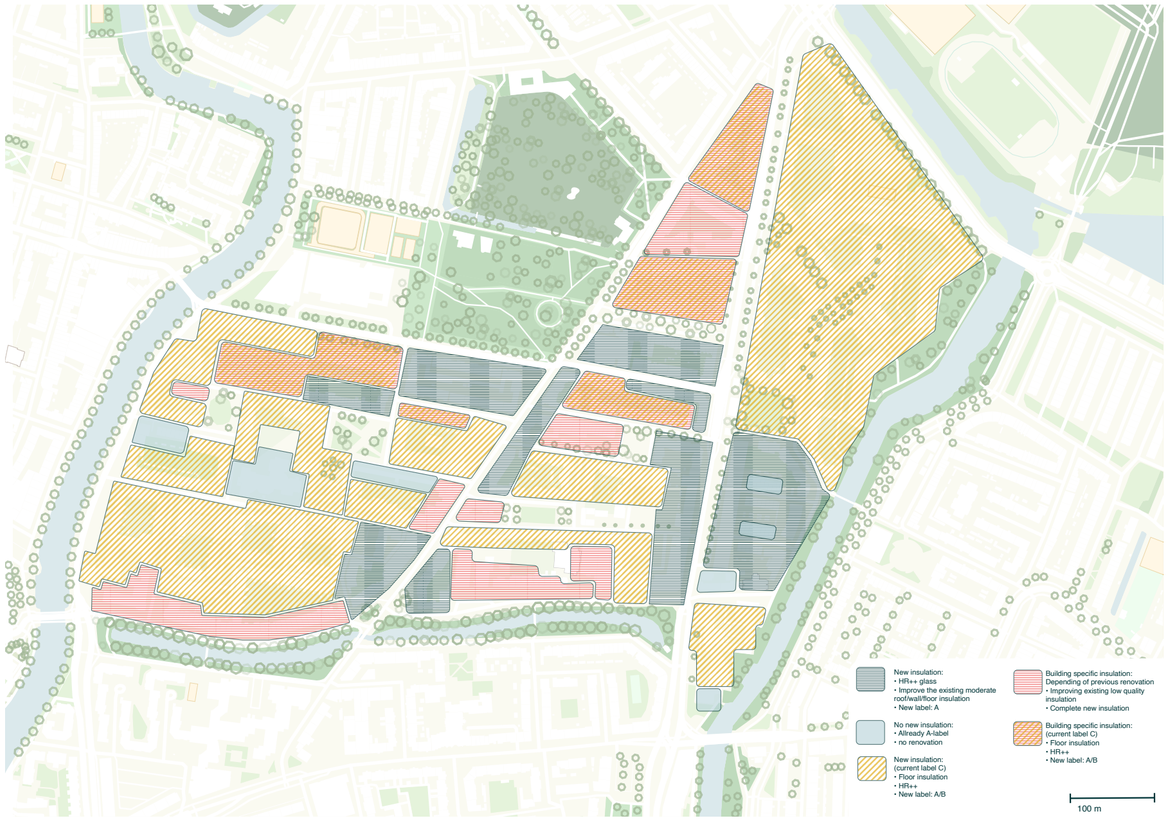


The residual heat network



Solar rooftops connected to electricity grid

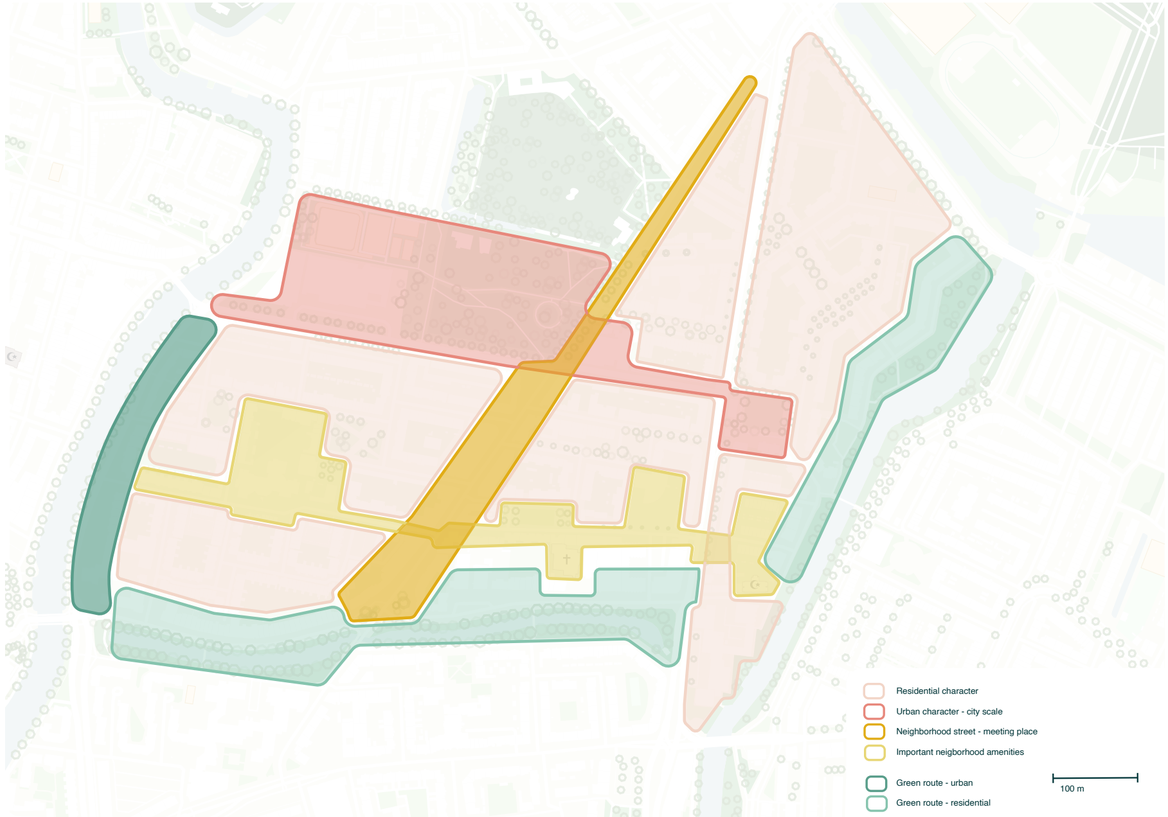
Design in layers
Energy saving potential



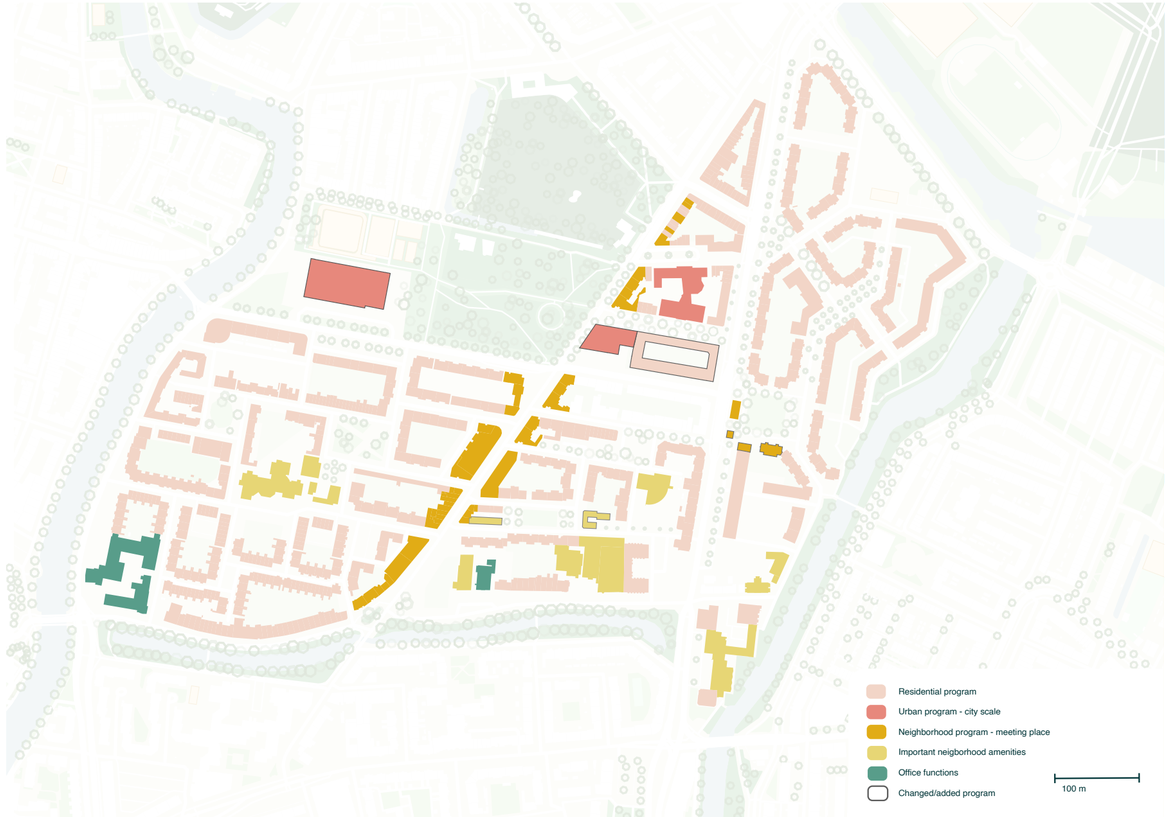
The insulation plan

The energy saving plan

Design in layers
Neighborhood atmospheres

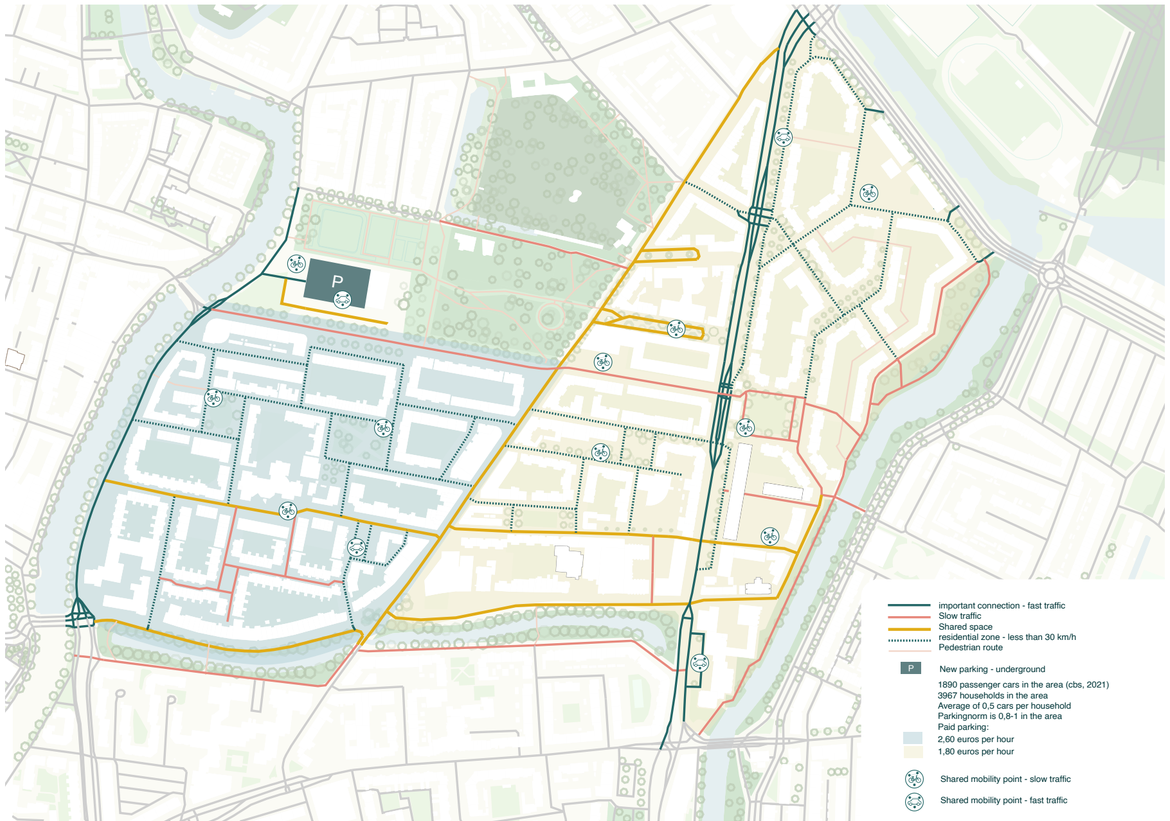


Stimulating atmospheres

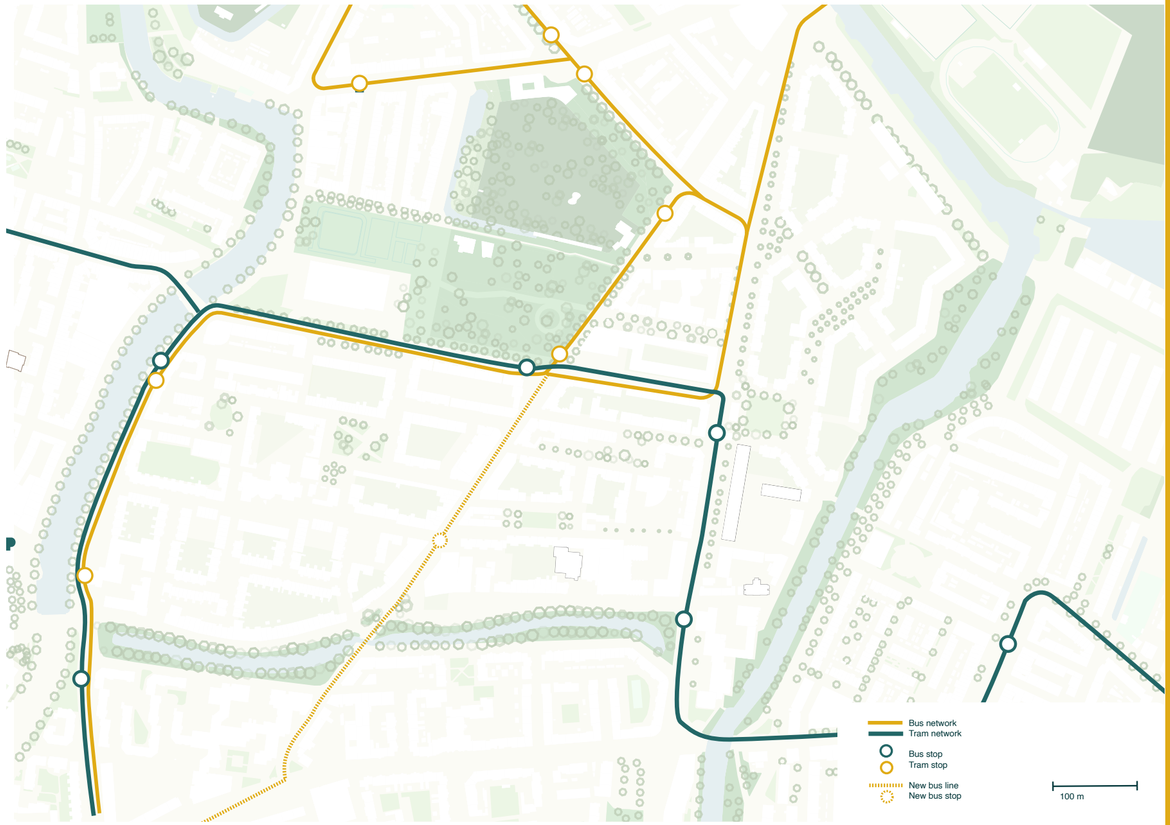


Current and additional program

Design in layers
New mobility



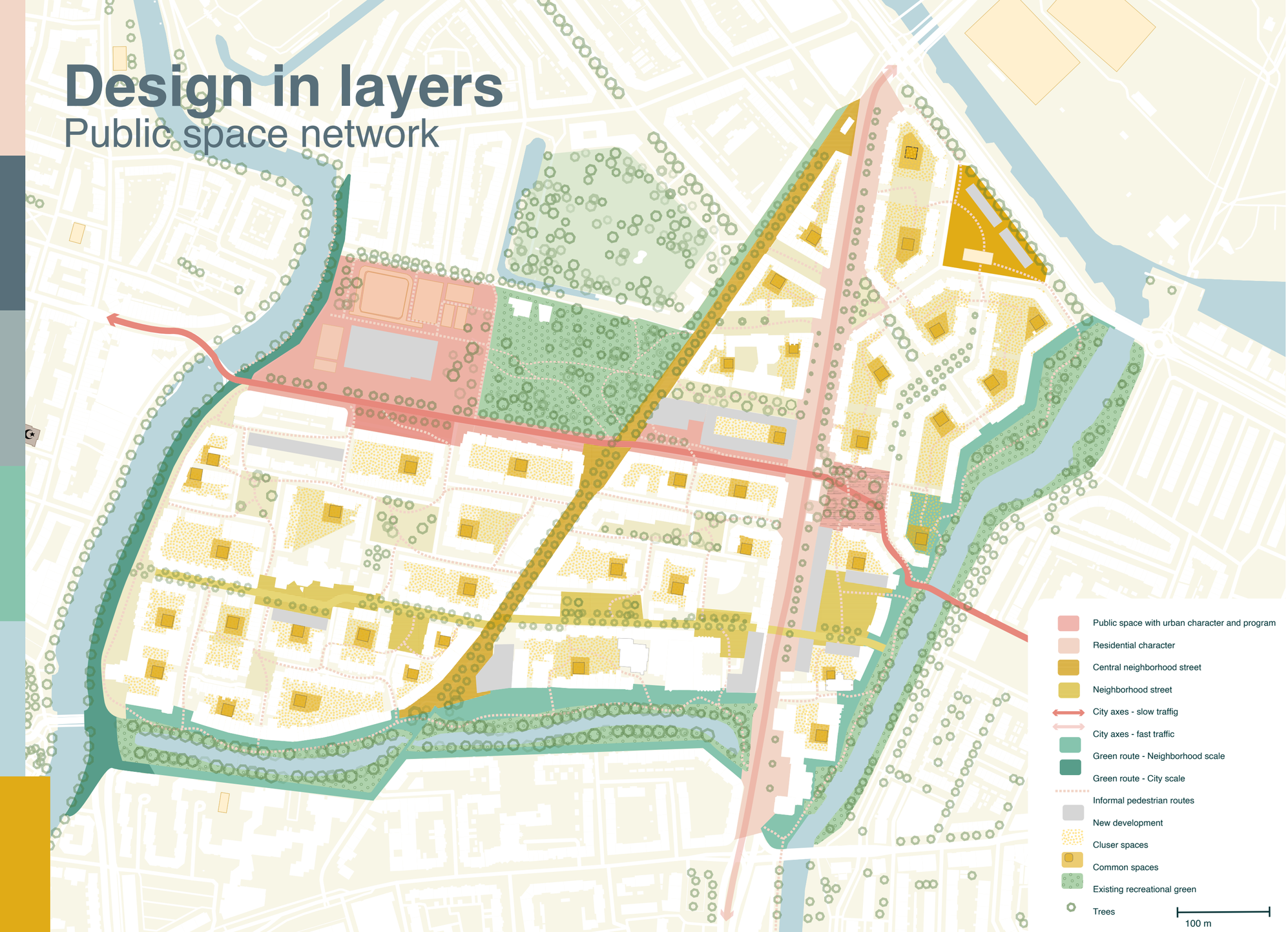
Mobility network

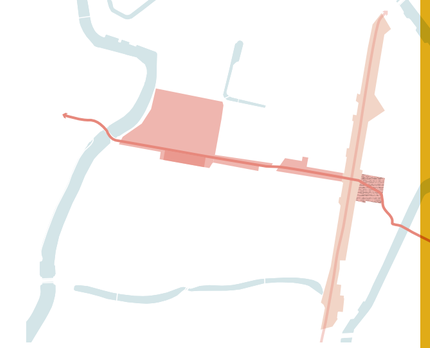


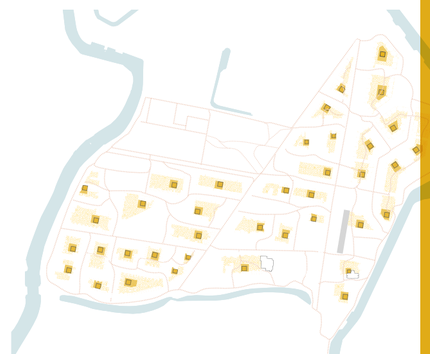
Public transport network

Design in layers

Public space network

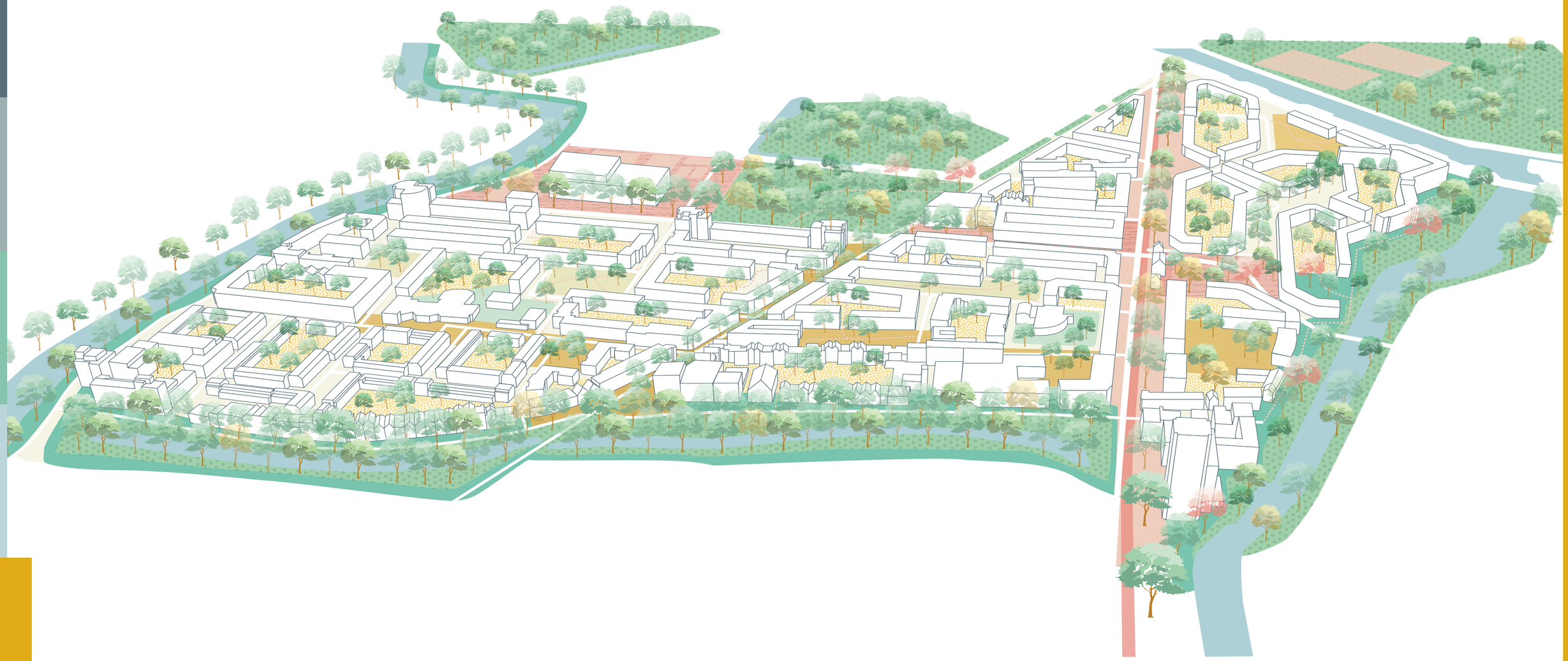






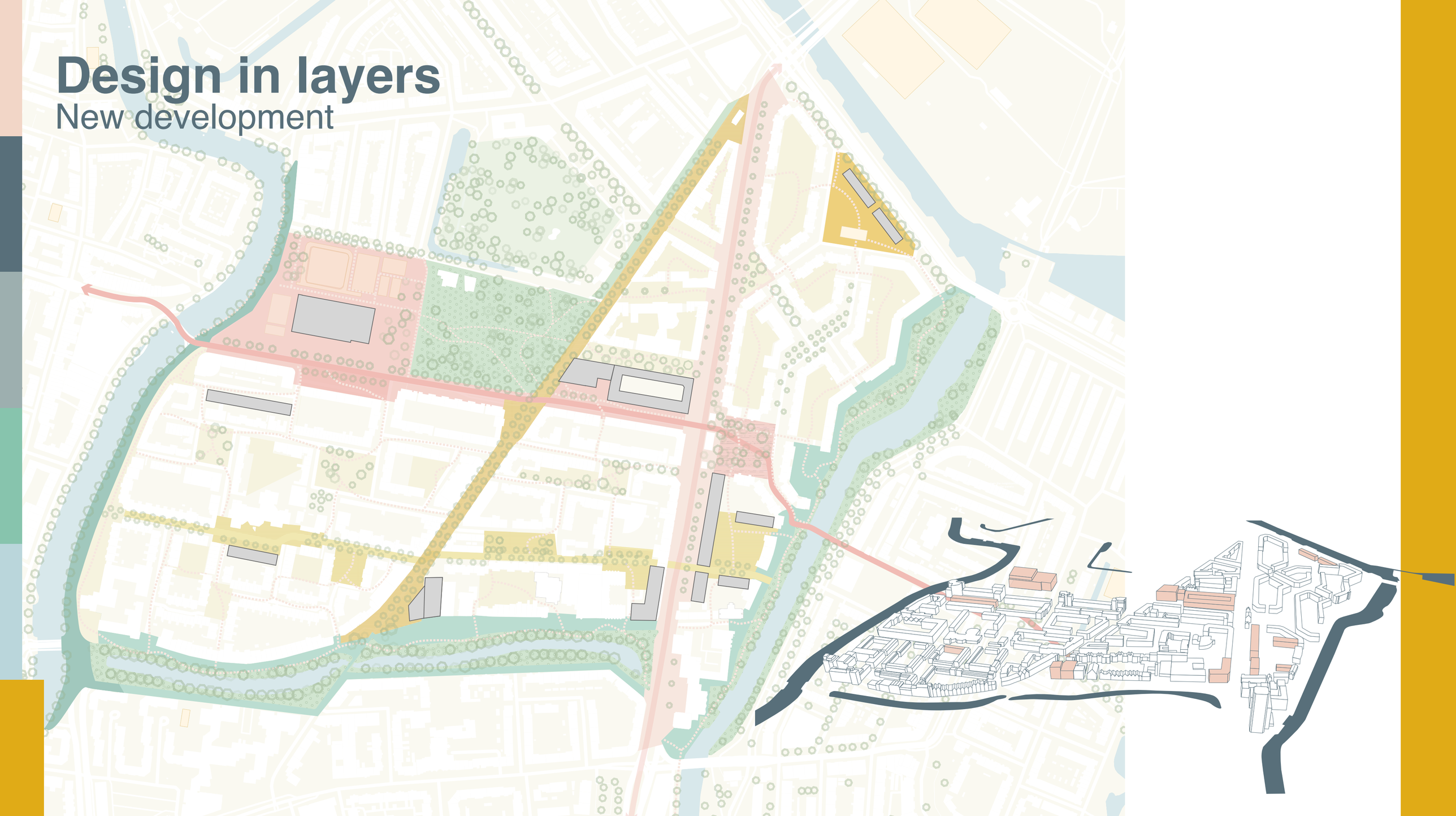
Design in layers

Public space network

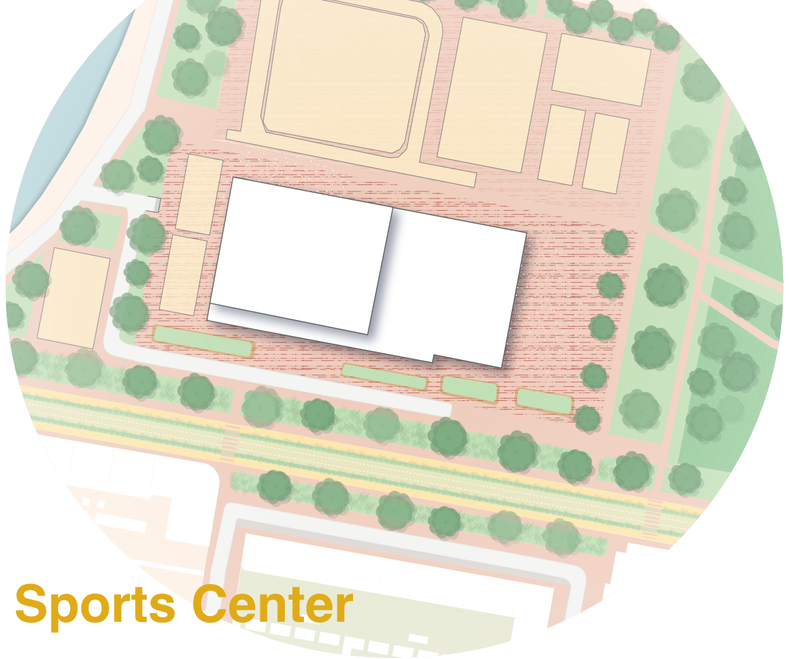


Design in layers

New development



Zooming in
On new developments



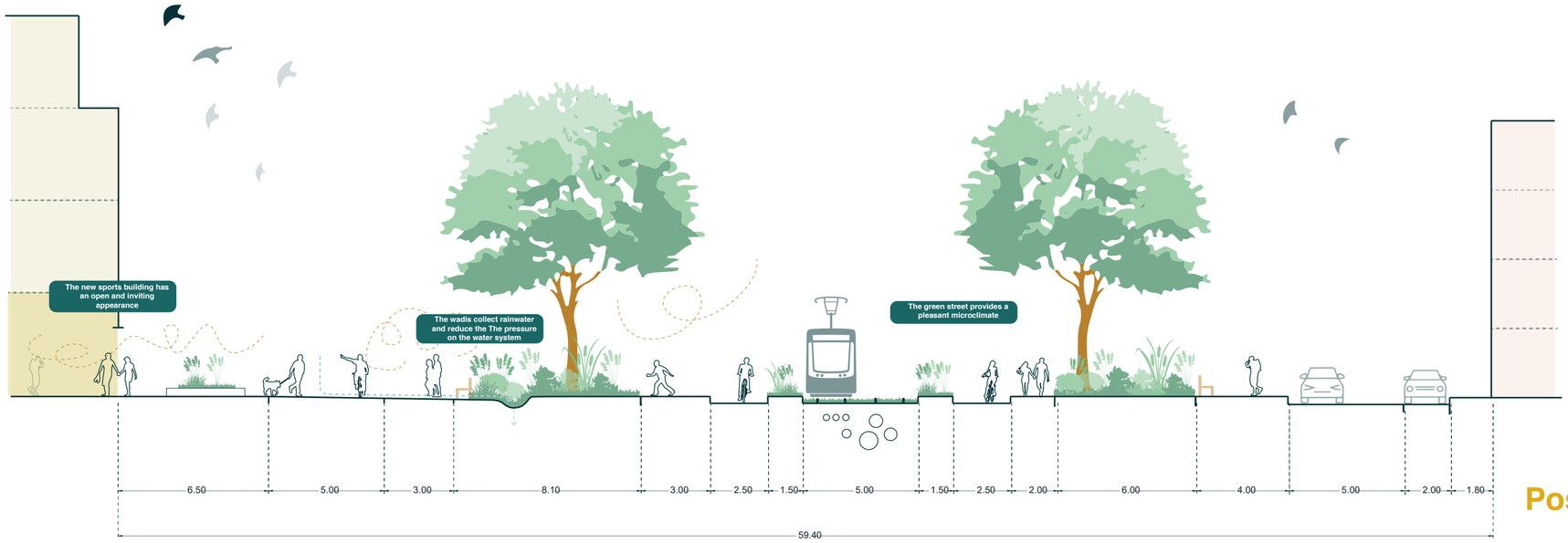
Sports Center

Community building block

Sports Center

Enhance existing qualities

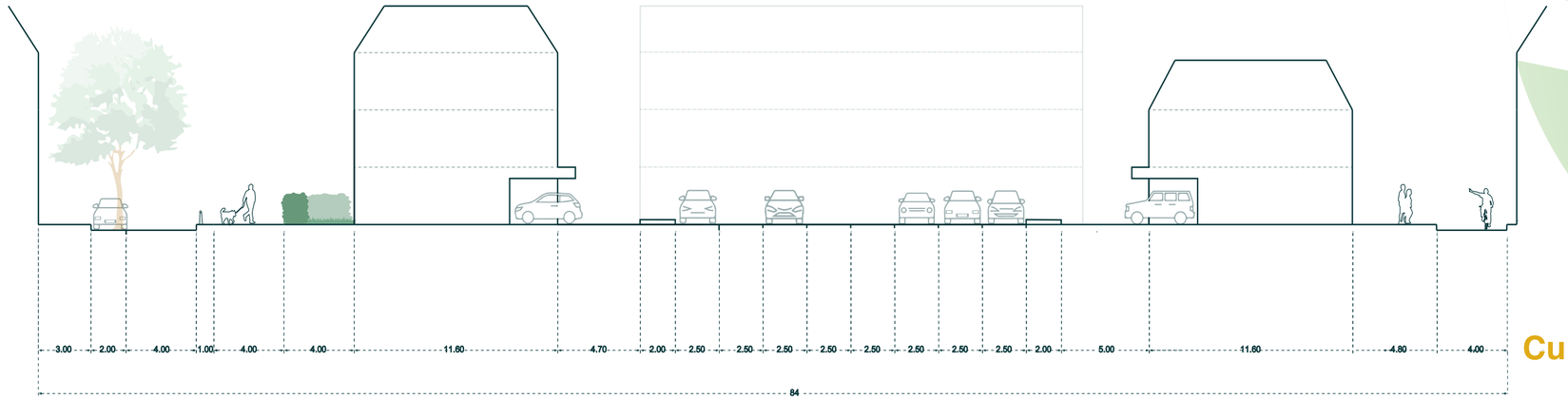
Current

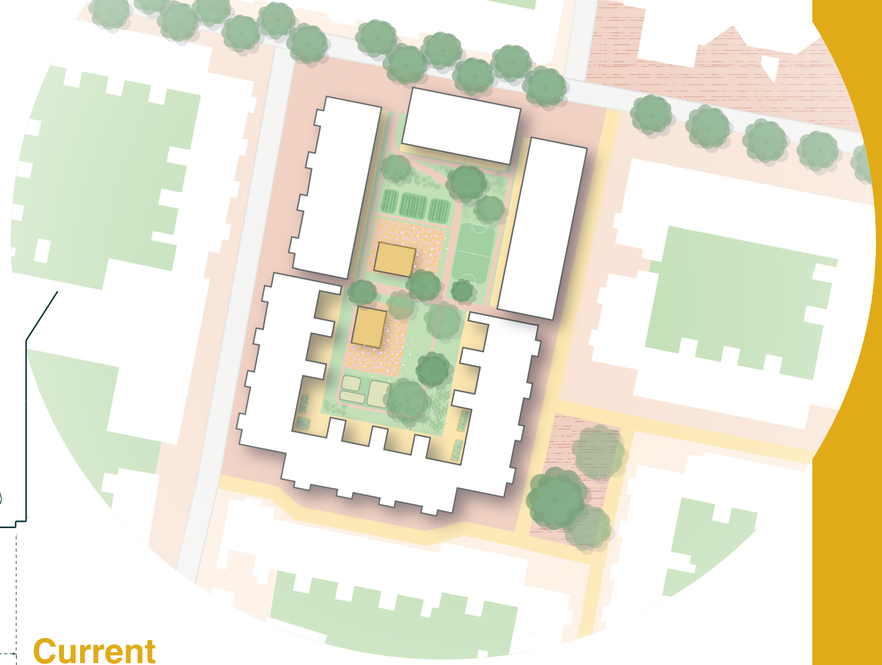


Possible future

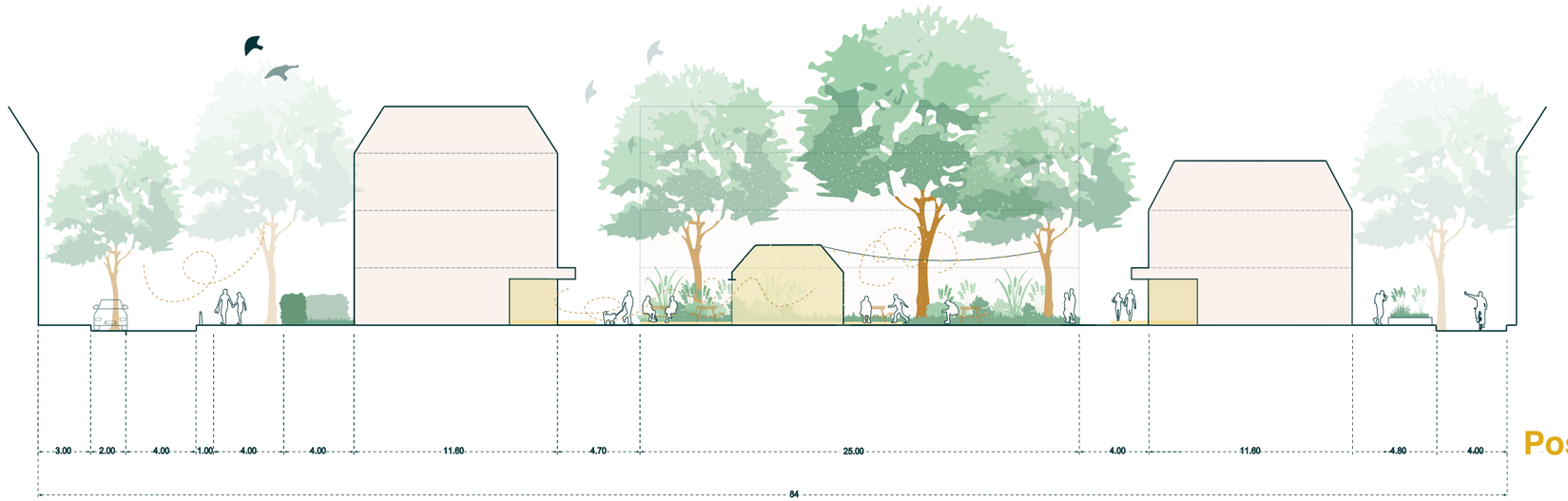
Community building block

Stimulating new qualities





Current

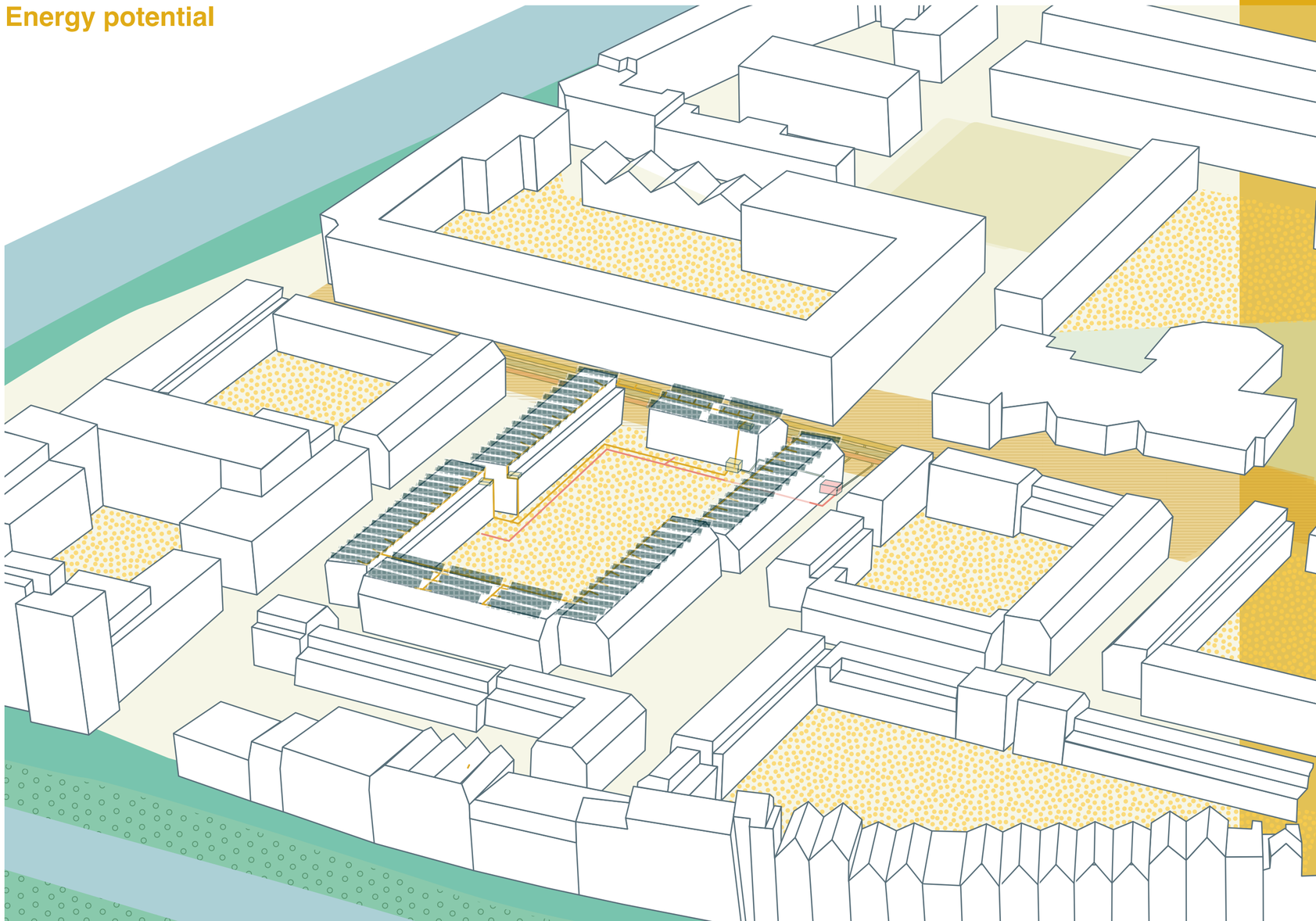


Possible future

Community building block

Stimulating new qualities

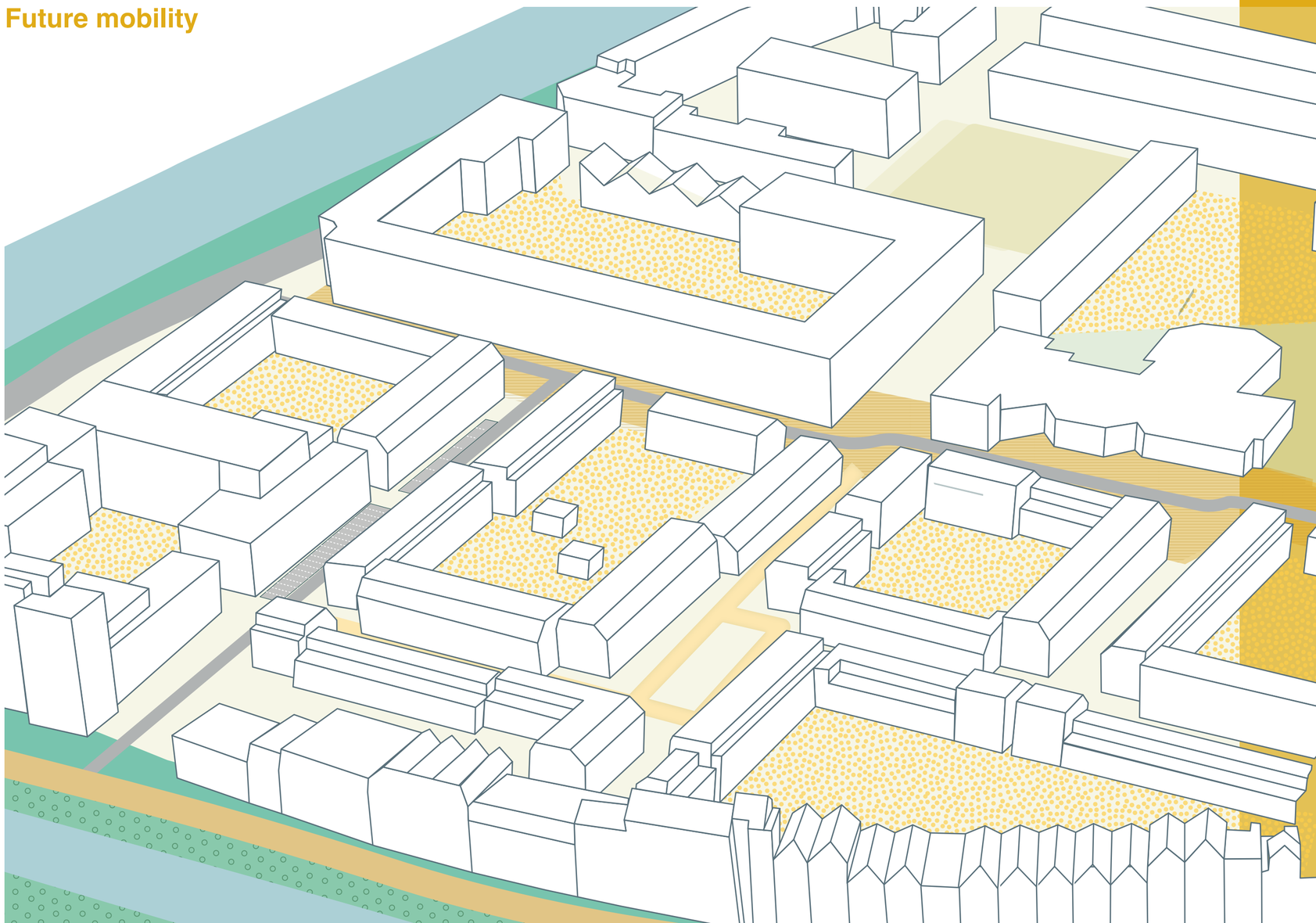
Energy potential



Community building block

Stimulating new qualities

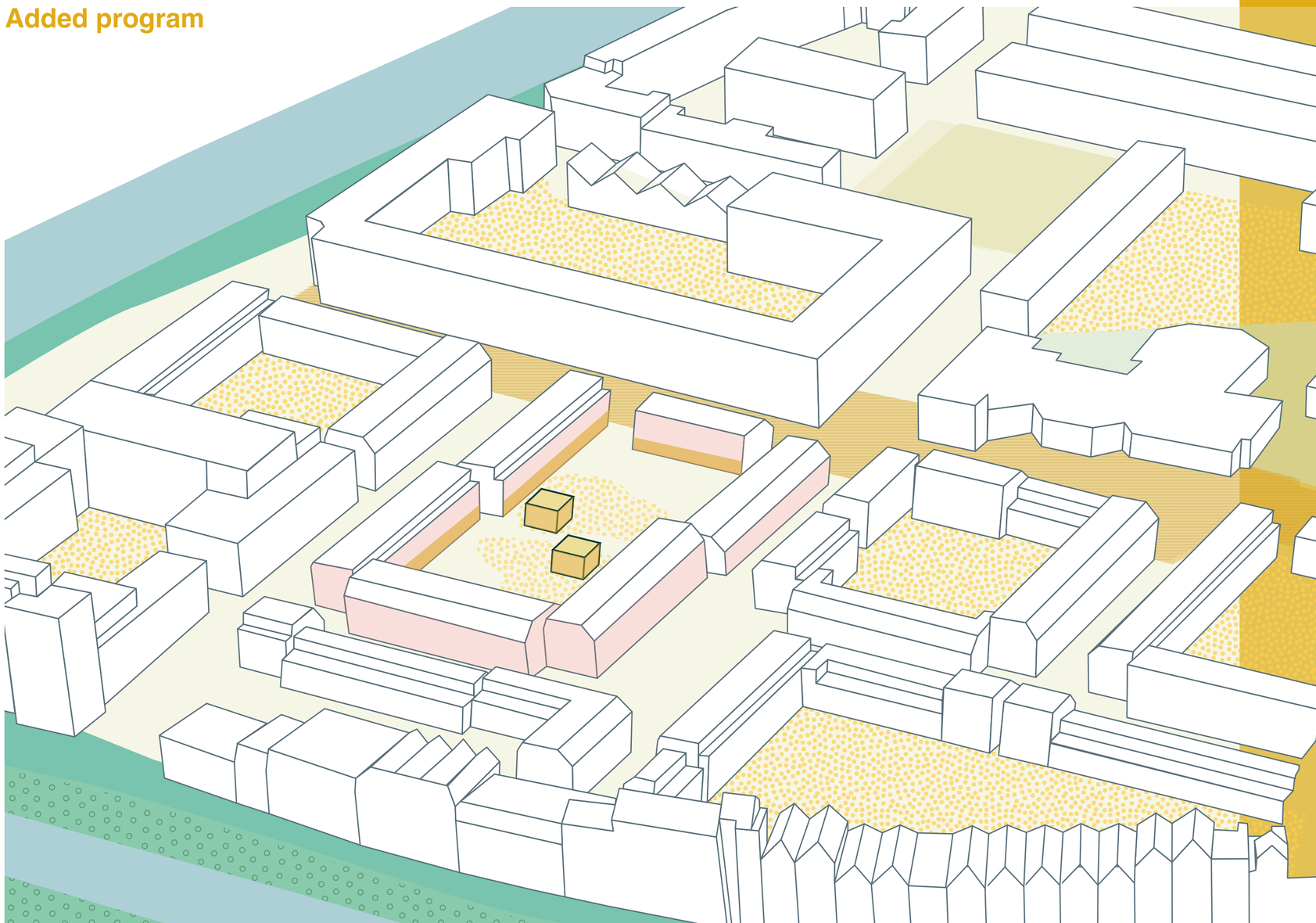
Future mobility



Community building block

Stimulating new qualities

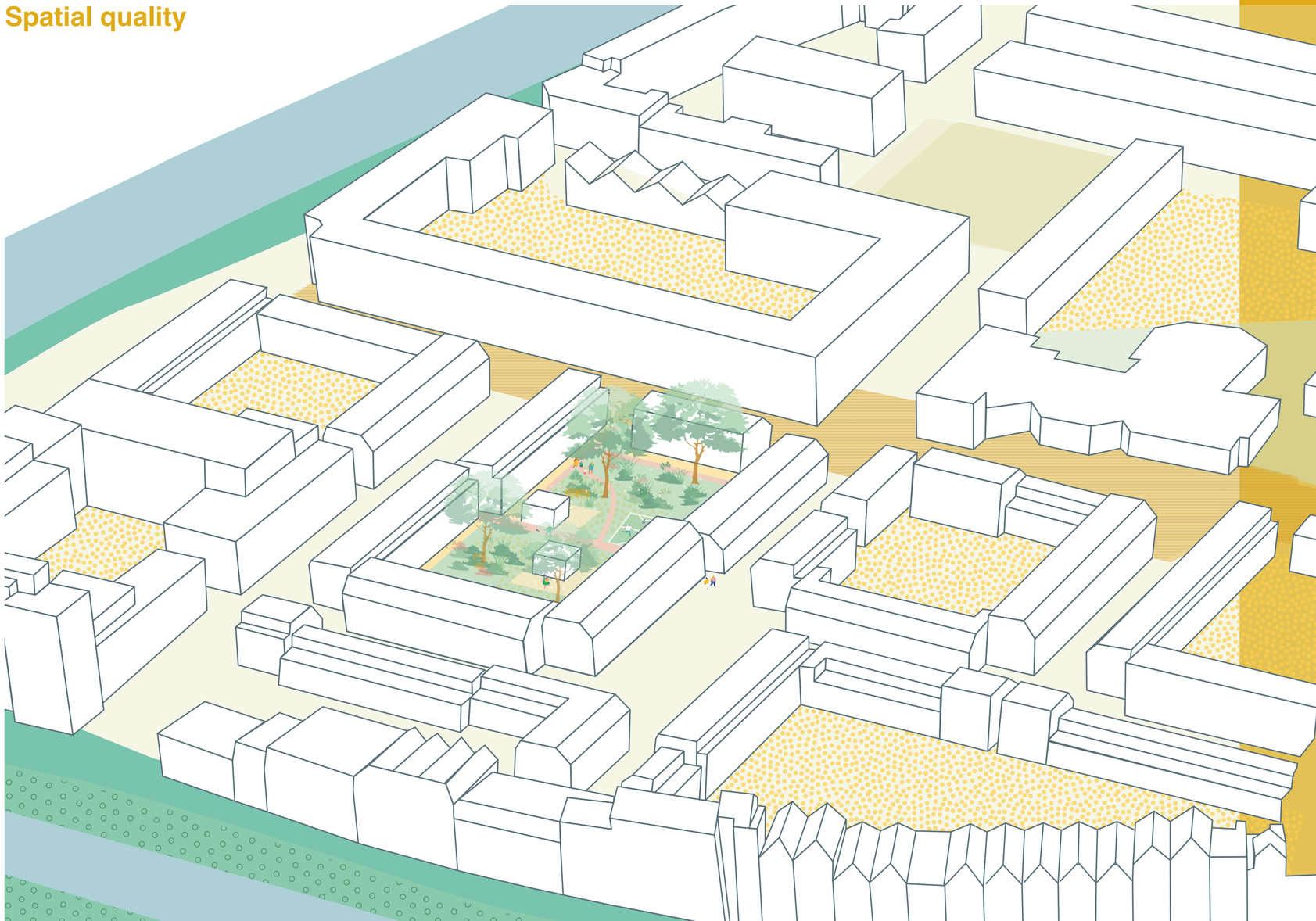
Added program



Community building block

Stimulating new qualities

Spatial quality



New habits

Stimulating behavioral change

Residual heat network

I will commute by car less often, and take the bike more regularly

Energy saving plan

Insulation plan

I need to insulate my house better, my whole house needs to be renovated for this

New electricity grid

Less car dependant

I have to be conscious about my energy consumption

I have solar panels installed on my roof on the basis of subsidies

Solar roofs

They are renovating my street, so my view from my window is a mess for a while

New development

Improved spatial quality

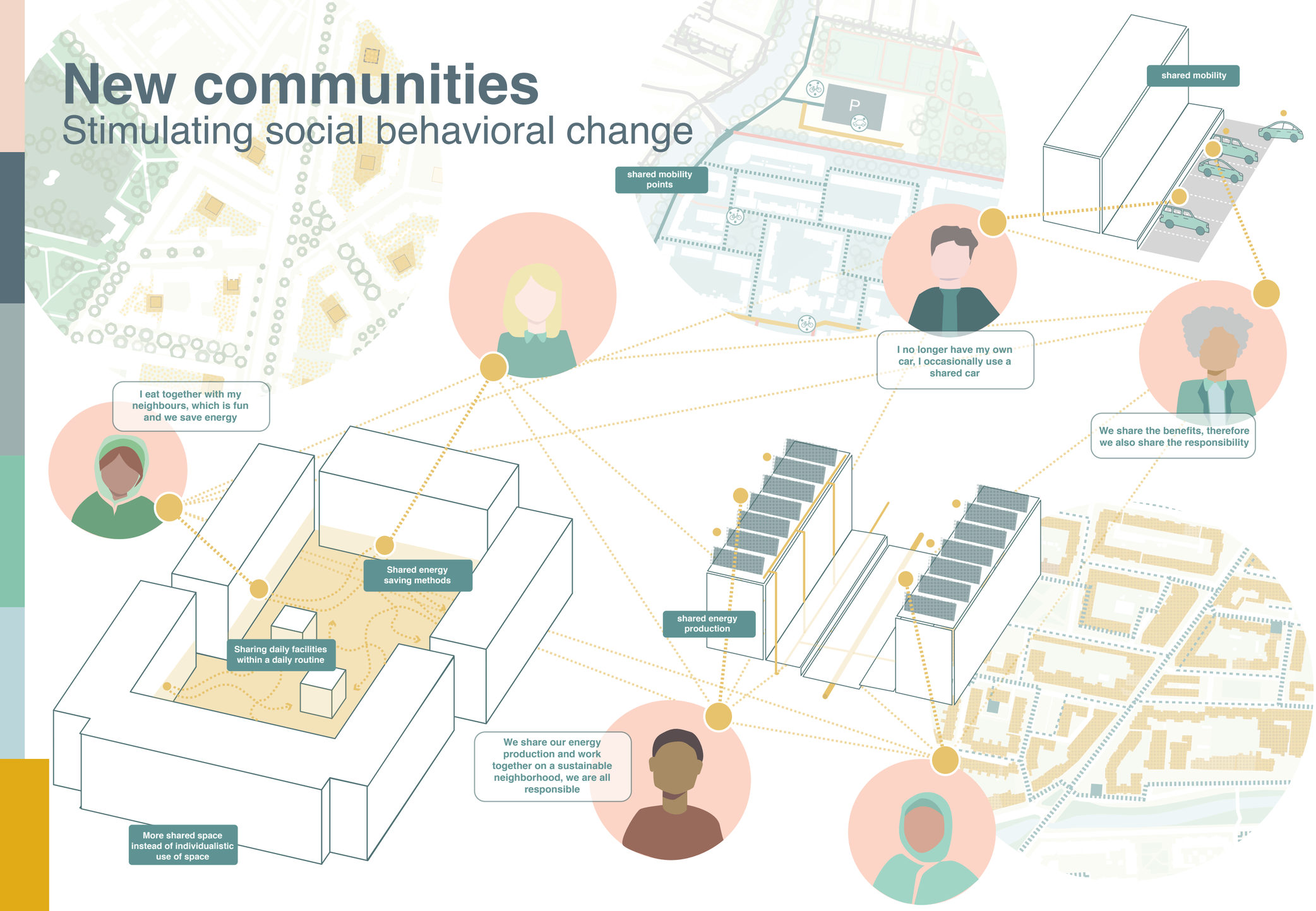
I enjoy the improved public space in the neighbourhood

Principles of applicability

- Transparency
- Feedback

New communities

Stimulating social behavioral change

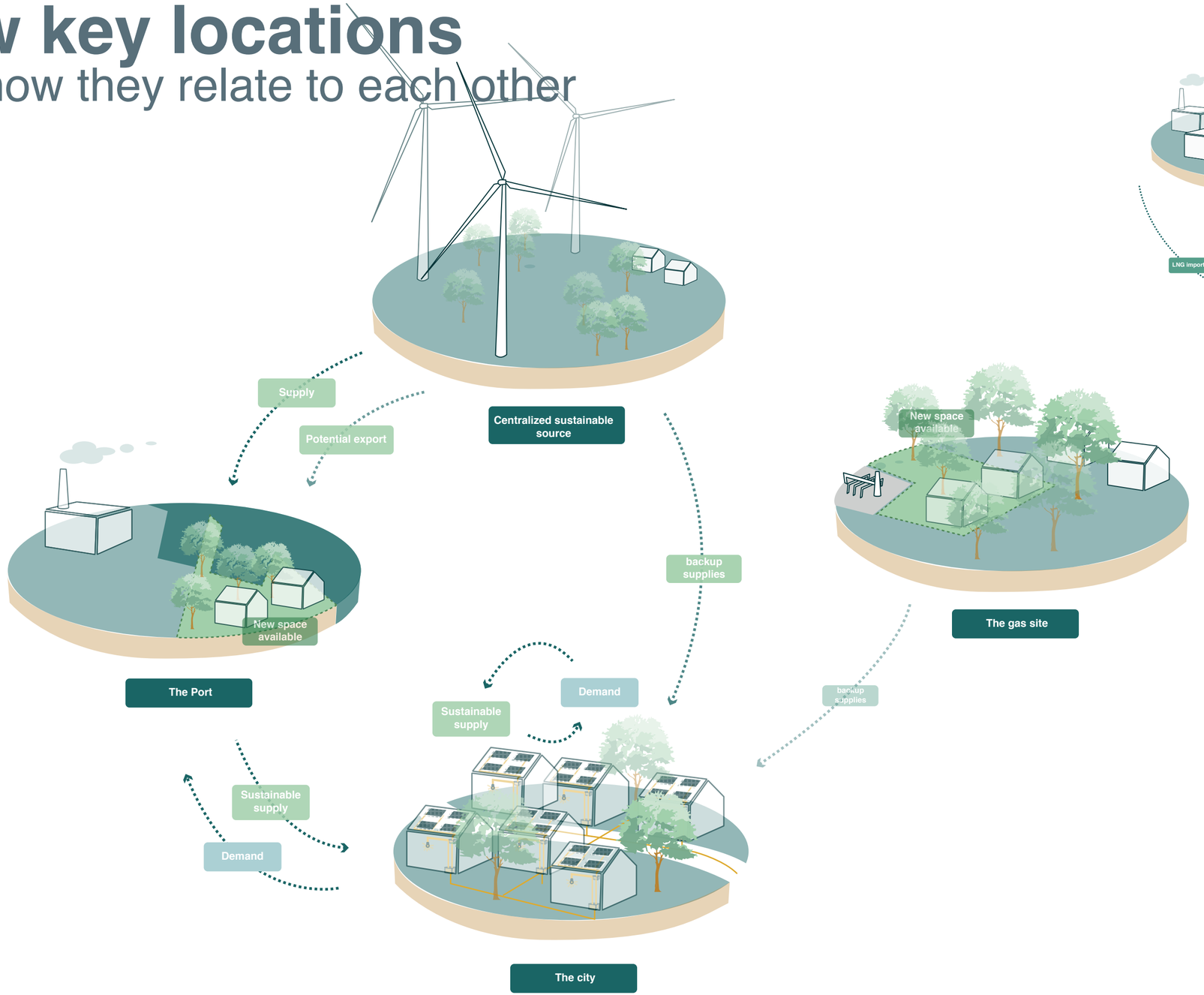


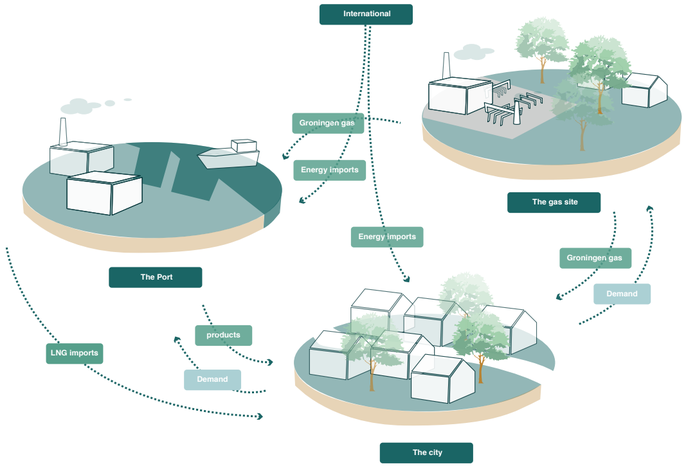
Principles of applicability

- Participation
- Timing
- Visible effects

New key locations

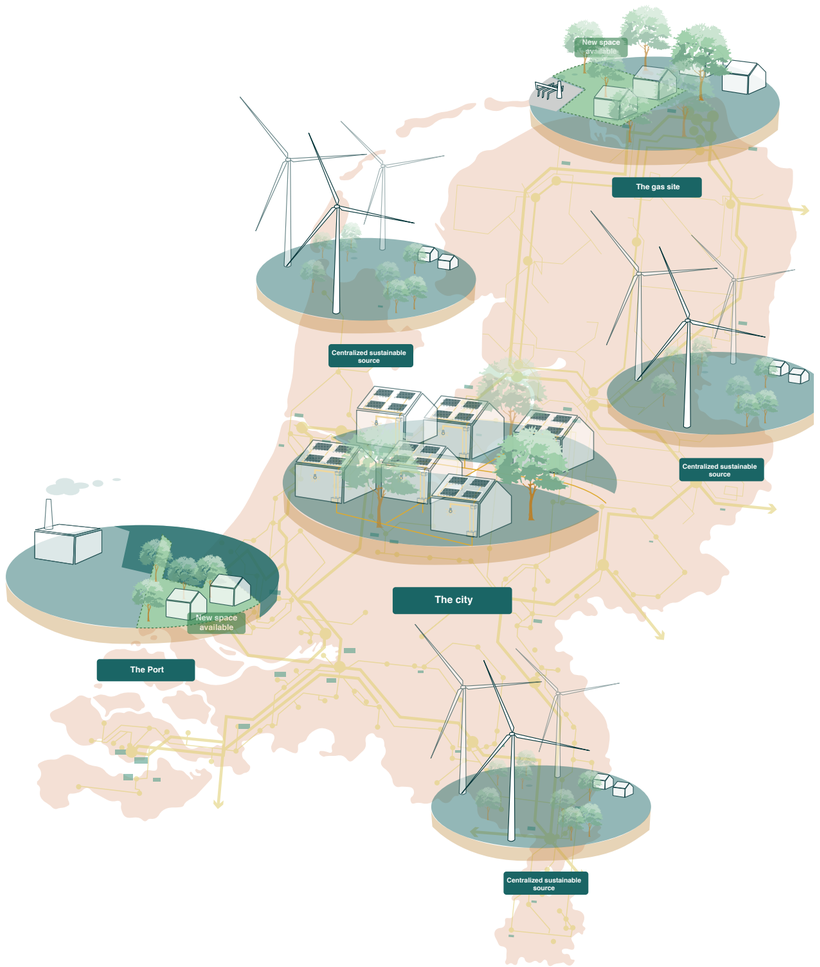
And how they relate to each other





Effect on the energy transition

Changed meaning of the key locations



Thank you for listening!

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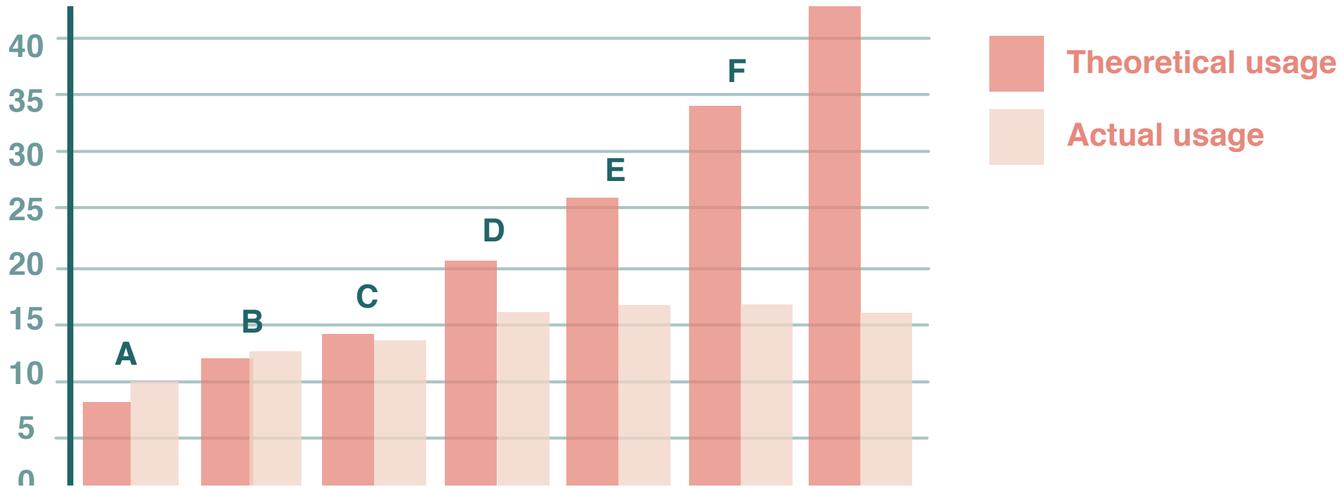
Energy saving

The insulation plan



Label A+++	0,01%
Label A++	0,001%
Label A+	0,005%
Label A	0,07%
Label B	0,13%
Label C	0,63%
Label D	0,10%
Label E	0,02%
Label F	0,01%
Label G	0,02%

Total usage is: 4.108.053,0 m3

G to A
total m2 of G label buildings = 12611 m2
Changing label will save (15.5-10) 5.5 m3/m2
Will save 5.5 m3/m2 * 12611 = 69.360.5 m3 per year

F to A
total m2 of F label buildings = 9236 m2
Changing label will save (16-10) 6 m3/m2
Will save 6 m3/m2 * 9236 = 55.416 m3 per year

E to A
total m2 of E label buildings = 15791 m2
Changing label will save (16-10) 6 m3/m2
Will save 6 m3/m2 * 9236 = 94.746 m3 per year

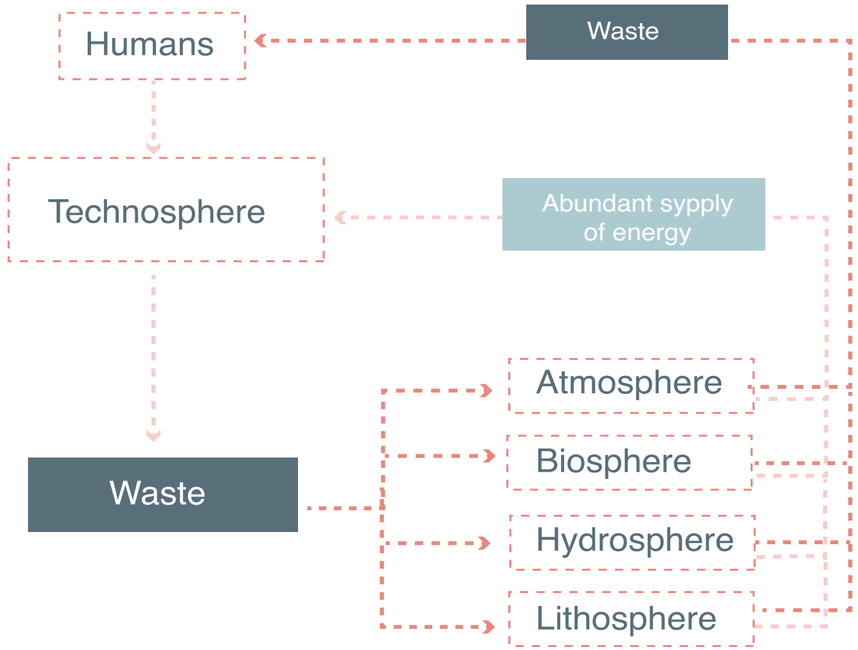
D to A
total m2 of D label buildings = 37677 m2
Changing label will save (15.5-10) 5.5 m3/m2
Will save 5.5 m3/m2 * 12611 = 207.223,5 m3 per year

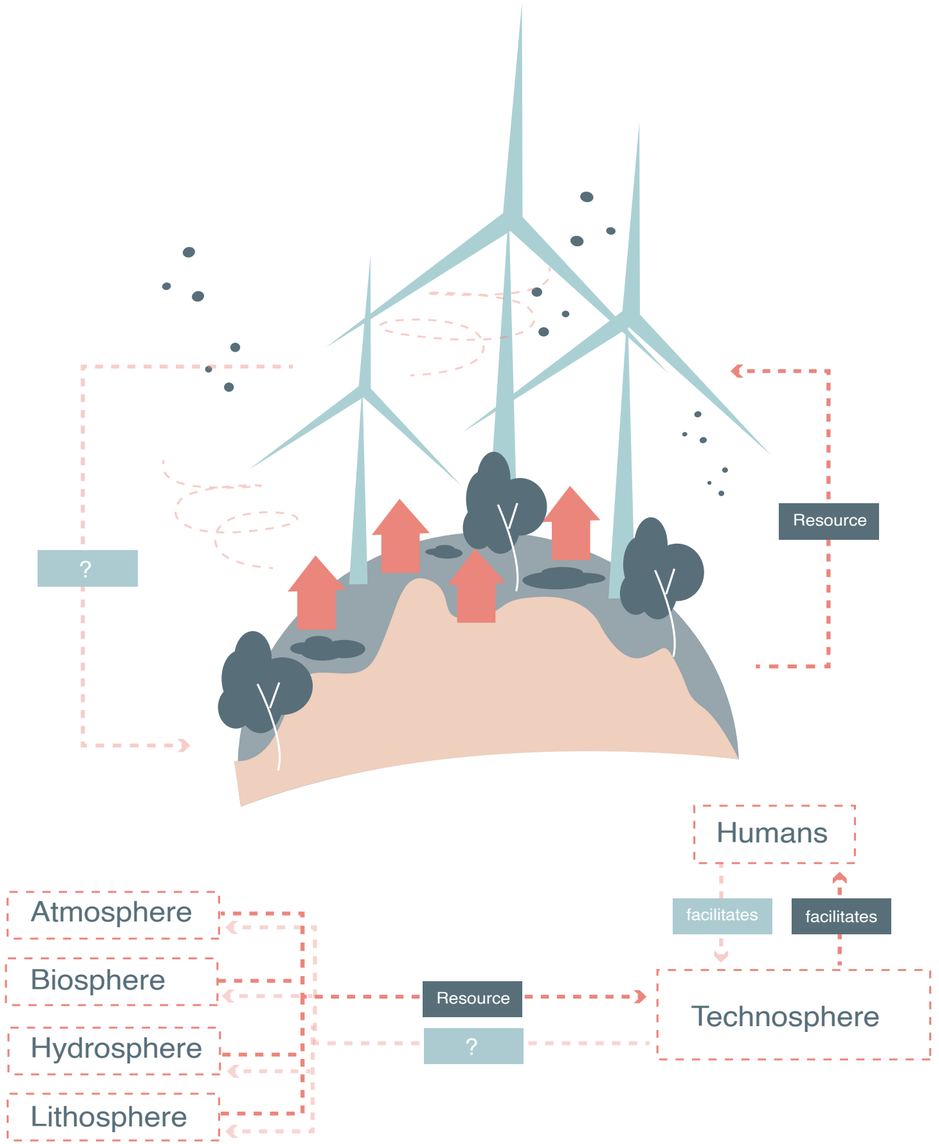
C to A
total m2 of C label buildings = 190780 m2
Changing label will save (14-10) 4 m3/m2
Will save 4 m3/m2 * 12611 = 763.120 m3 per year

B to A
total m2 of B label buildings = 41295 m2
Changing label will save (13,5-10) 3,5 m3/m2
Will save 3,5 m3/m2 * 12611 = 144.532,5 m3 per year

Total m3 gas possibly saved:
1.334.398 m3 annually

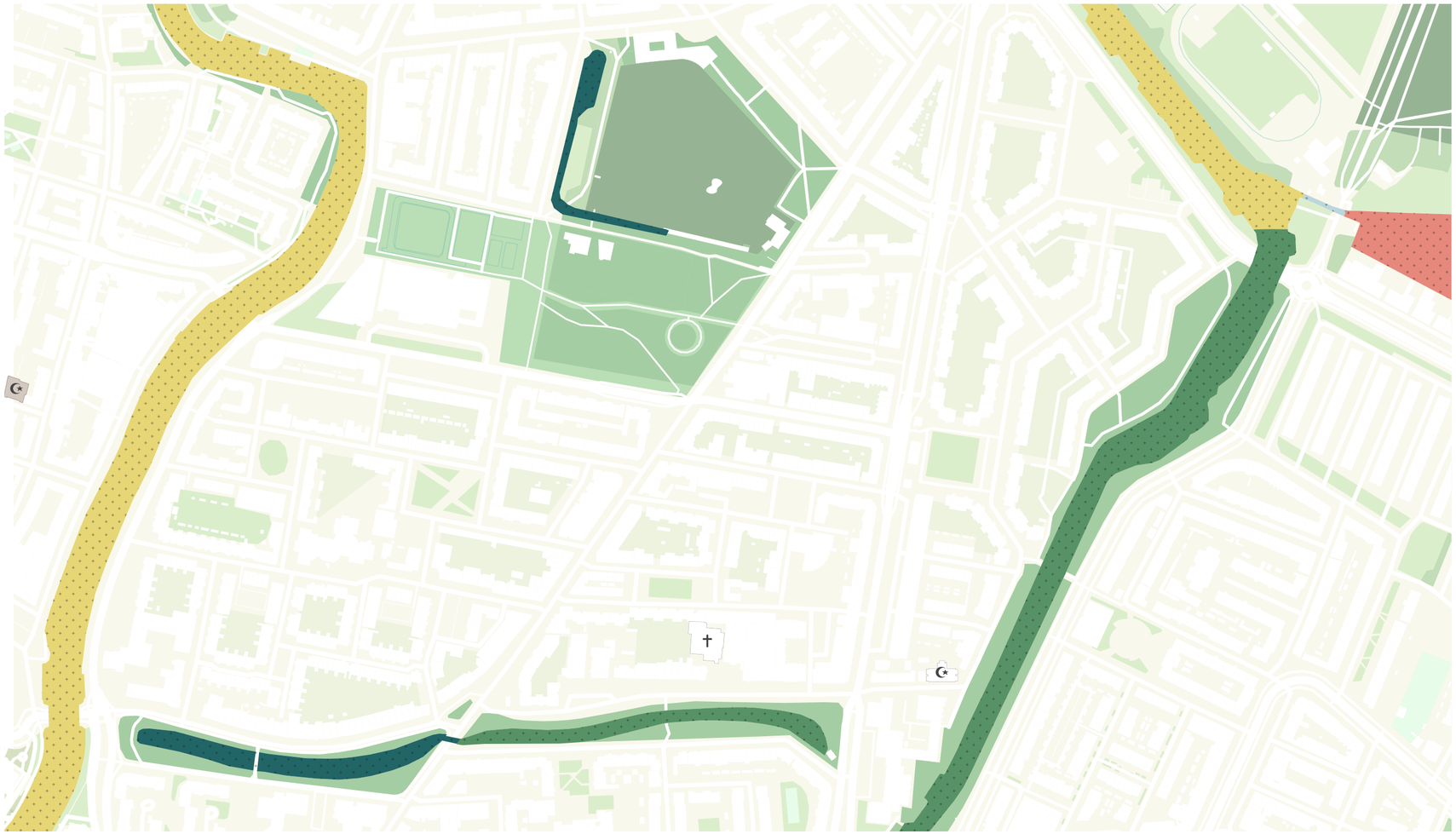
A mutualistic relationship
(Haff, 2014)





Thermal energy surface water

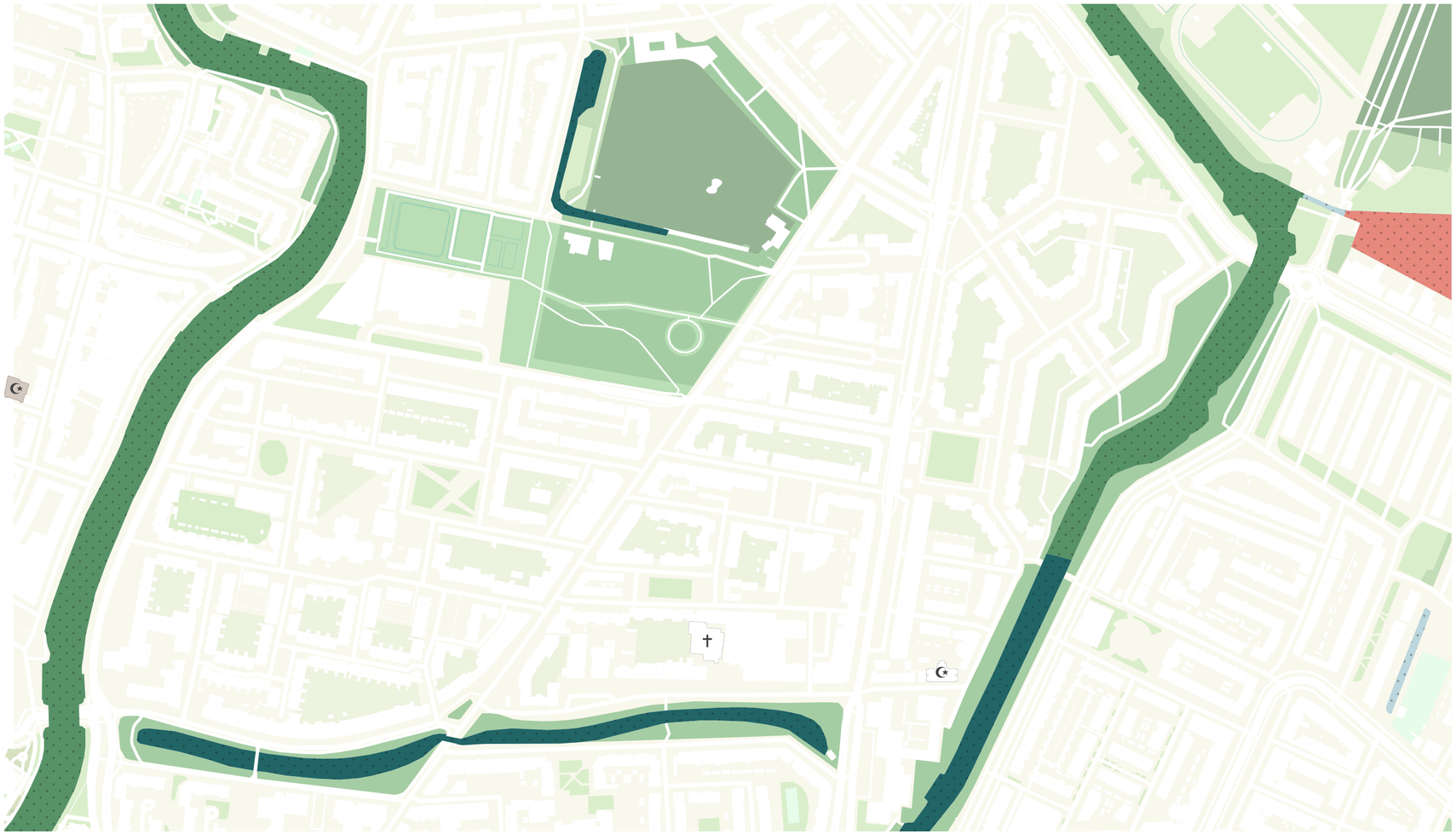
Standard



Potential: 114.688 GJ/year
min: 83.911 GJ/Year
max: 148.123 GJ/Year

Thermal energy surface water

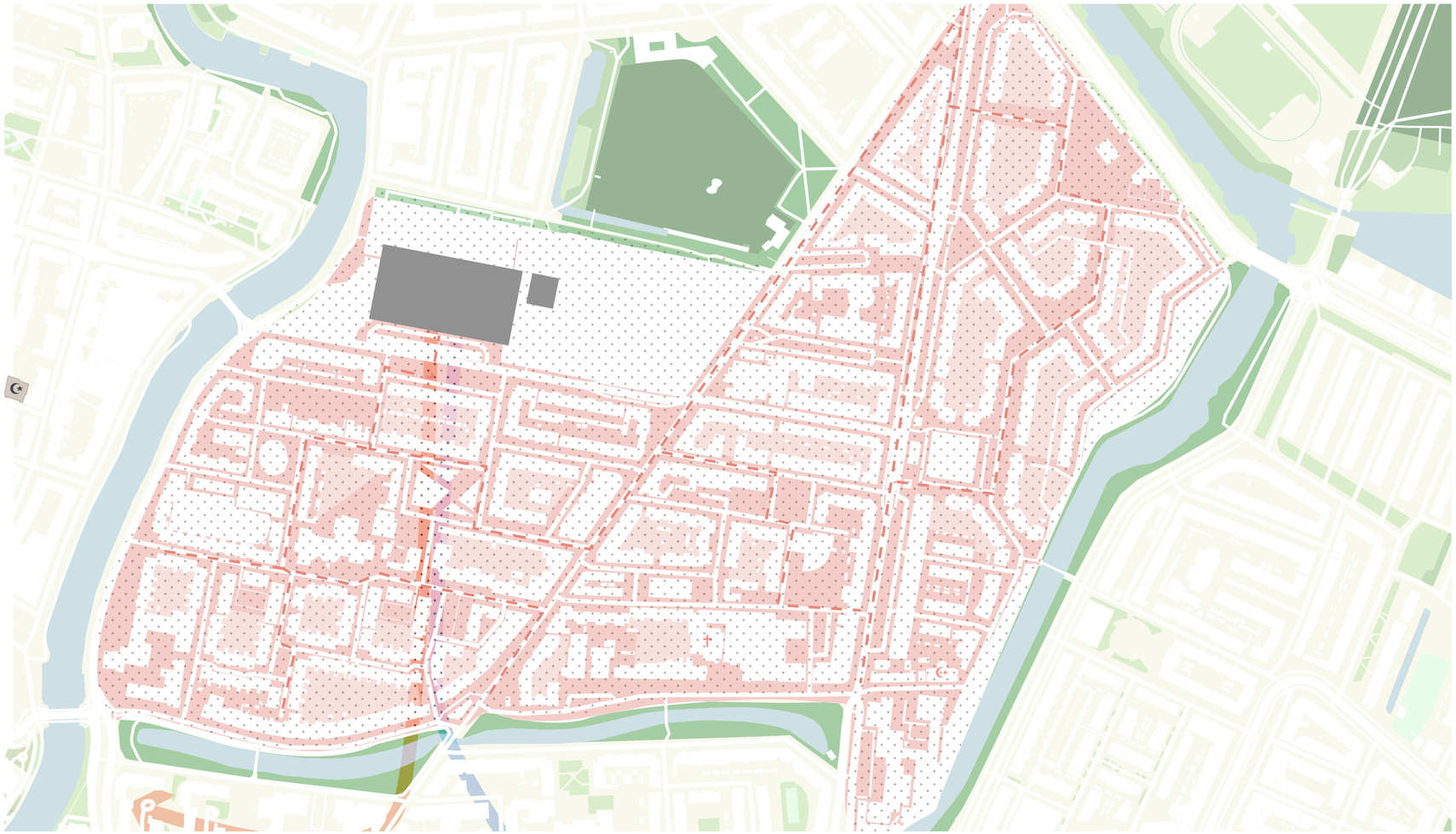
Year round

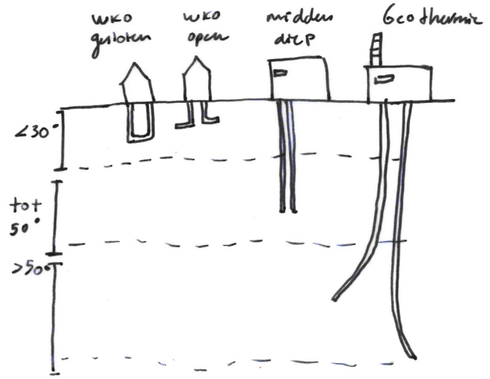


Potential: 43.326 GJ/year
min: 26.681 GJ/Year
max: 62.040 GJ/Year

Geothermal heat

Energy potential

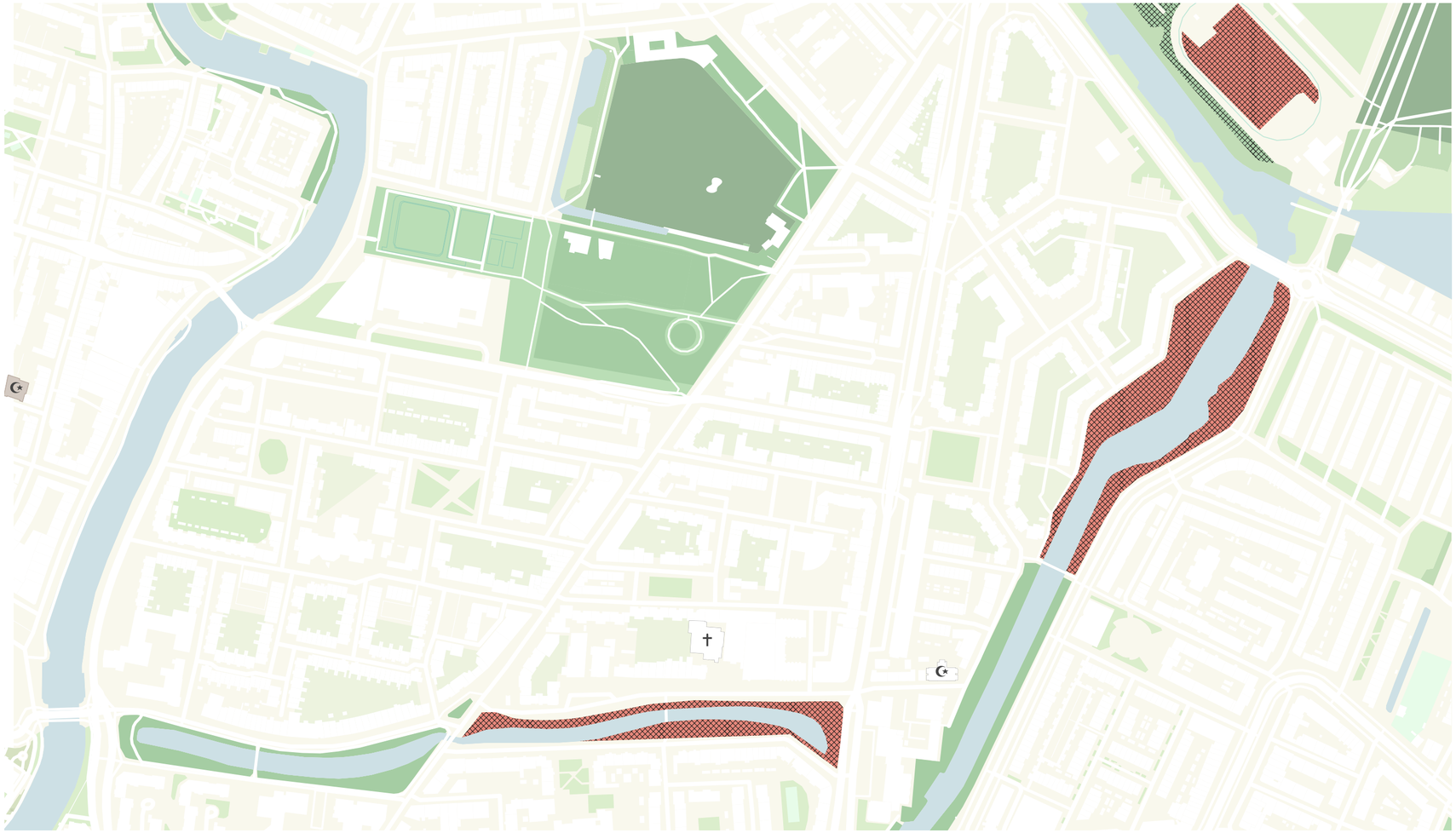




Potential:
194.553,99 GJ/Year

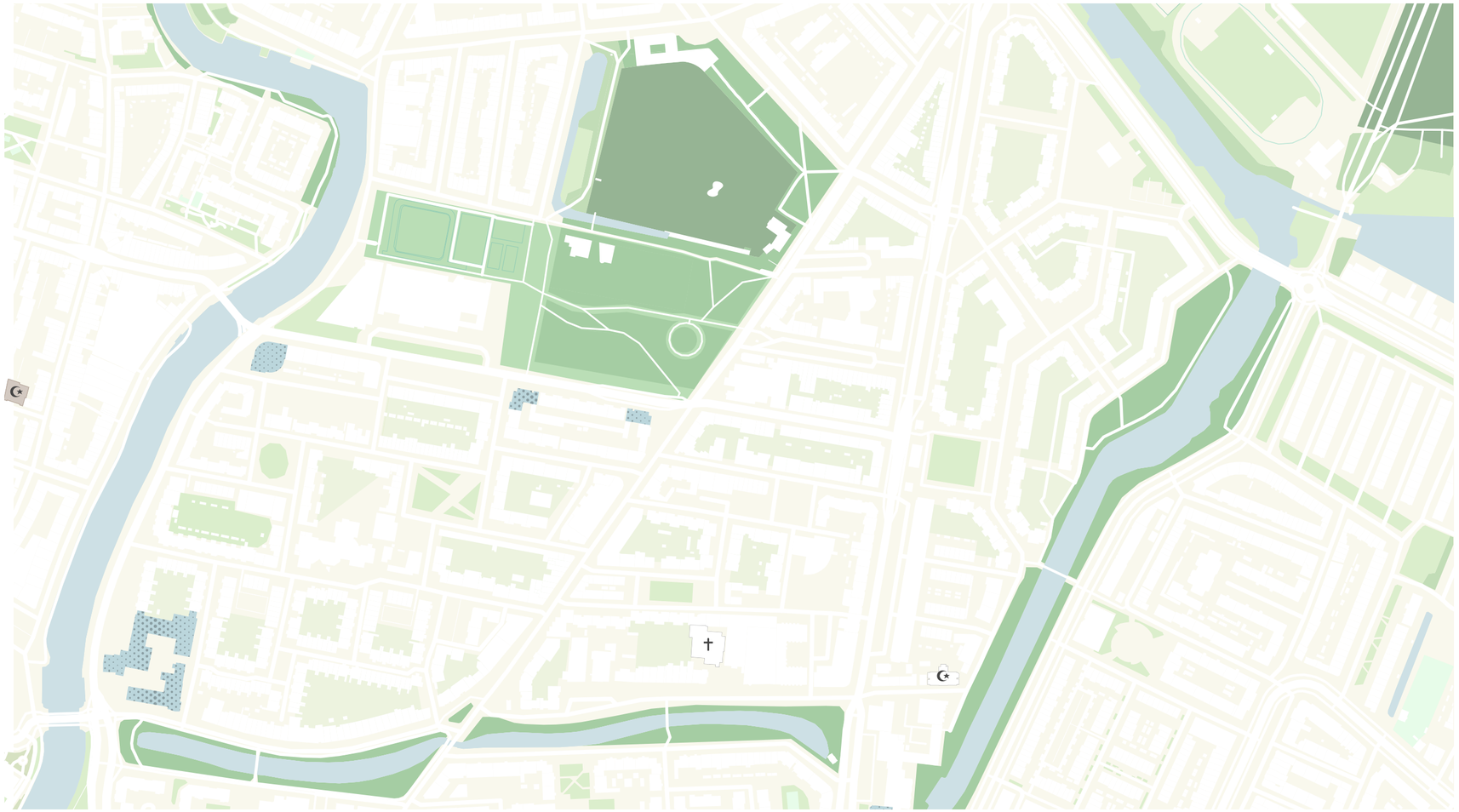
Solar fields

Energy potential



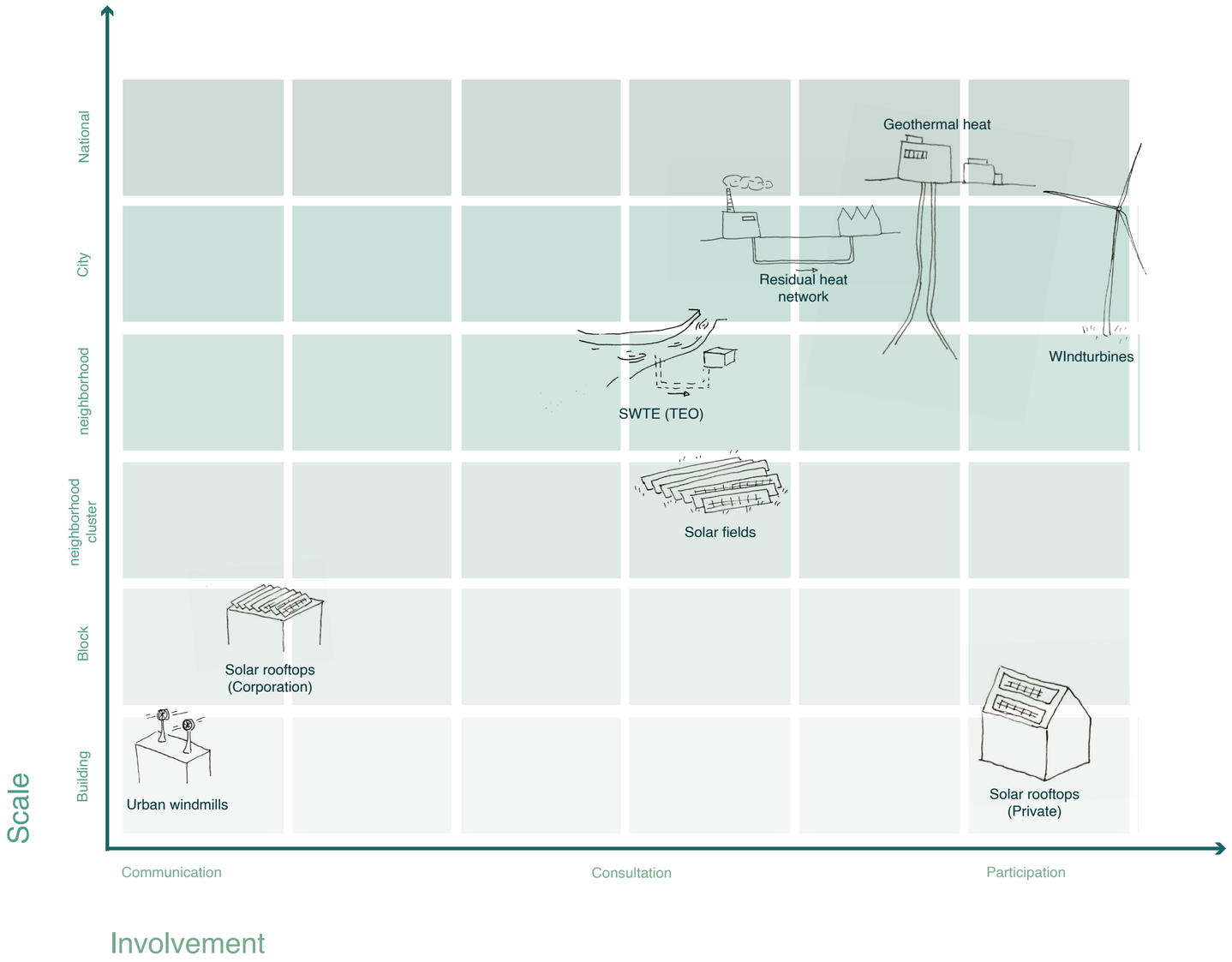
Potential:
4.275 KWH

Wind energy
Urban windmills

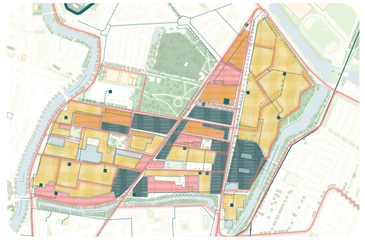


Potential: 65.600 KWH
max: 73.800 KWH
min: 57.400 KWH

Scale-involvement matrix



Comparing scenario’s



Space required	• Part of all rooftops • Parks and recreational green spaces • Cemetery	• All rooftops • Public spaces and green spaces • Cemetery	• All rooftops • Private courtyards
Redevelopment potential	• Main street axes • Parks and recreational green spaces • Cemetary	• Main street axes • Parks and recreational green spaces • Public spaces • Water bodies • Densifying • Energy mixed use (solar fields and urban farming) • Rooftops	• Main street axes • Private courtyards • Communal spaces
Mentality shift	• Accepting changed environment	• Accepting changed environment	• Change in way of using energy • Sharing energy production • Sharing space in communal courtyards • Sharing mobility
Location and scale of change	• Inside the neighborhood private spaces • Outside: Private space: cemetary • Outside neighborhood: Residual heat network	• Inside the neighborhood private spaces and public spaces • Outside: Private space: cemetary • Outside neighborhood: Residual heat network	• Inside the neigborhood: communal space • Outside neighborhood: Residual heat network

Phasing

Insulating homes

Solar panels on rooftops

Residual heat network

Connection to electricity grid

Community stimulation

Wishes and ideas of residents

Participation

Collaberation

Community blocks design collaboration

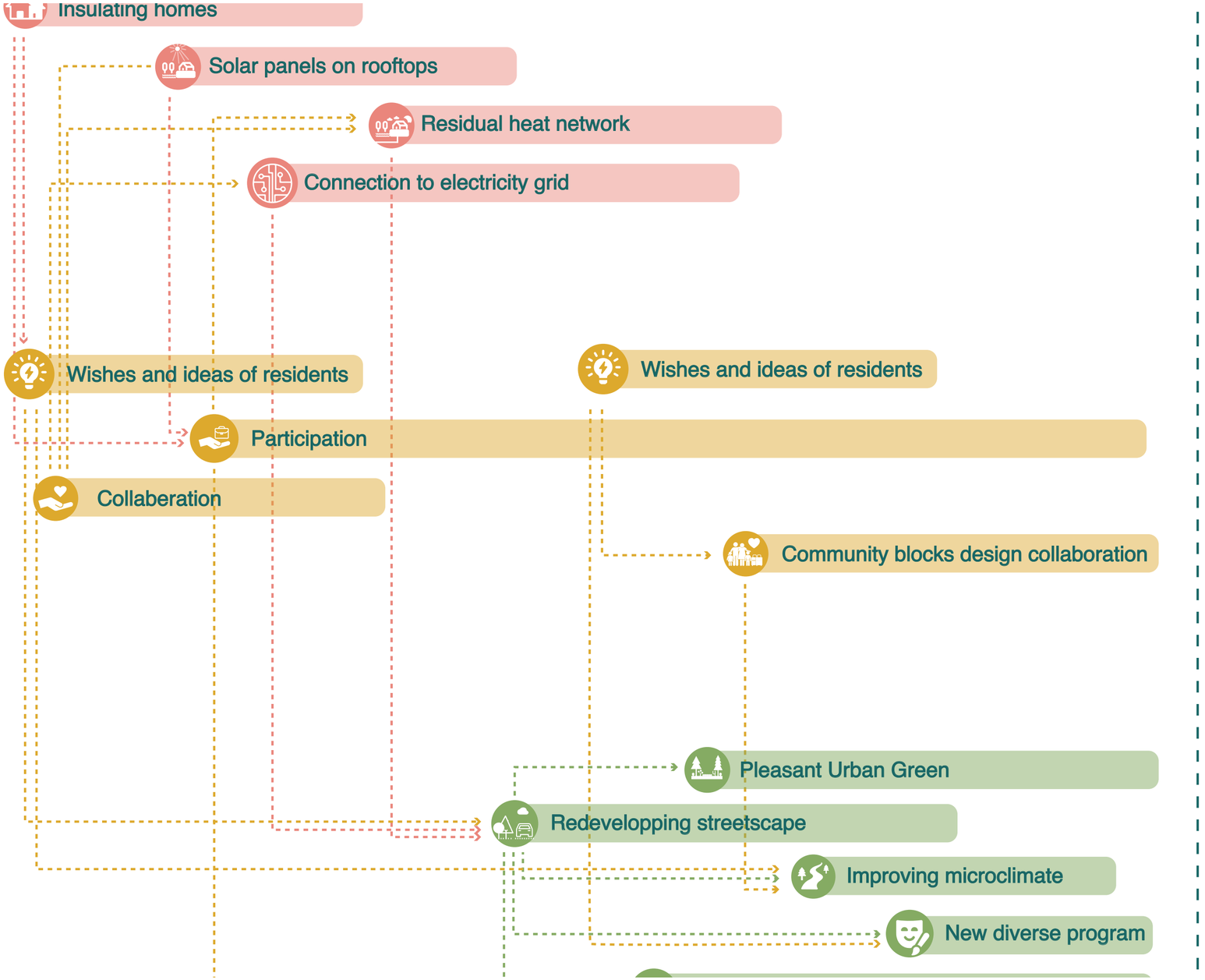
Improving spatial quality

Pleasant Urban Green

Redeveloping streetscape

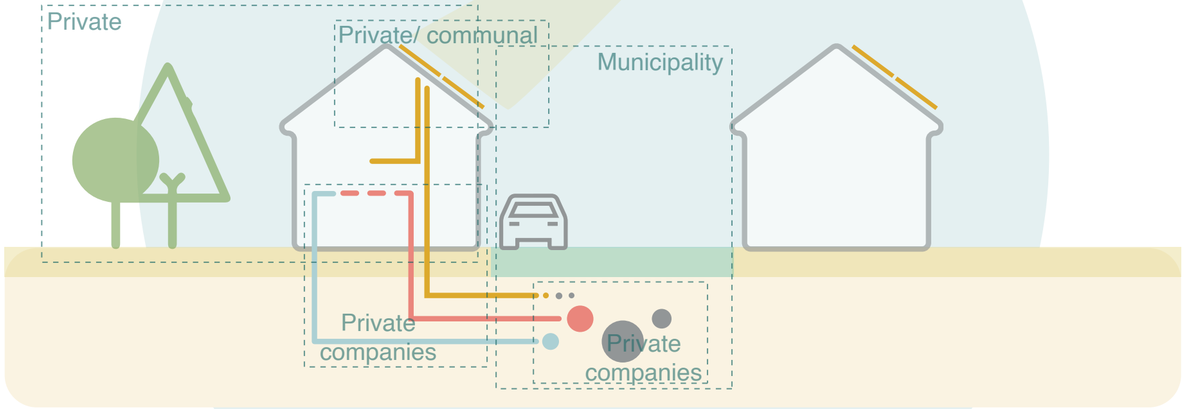
Improving microclimate

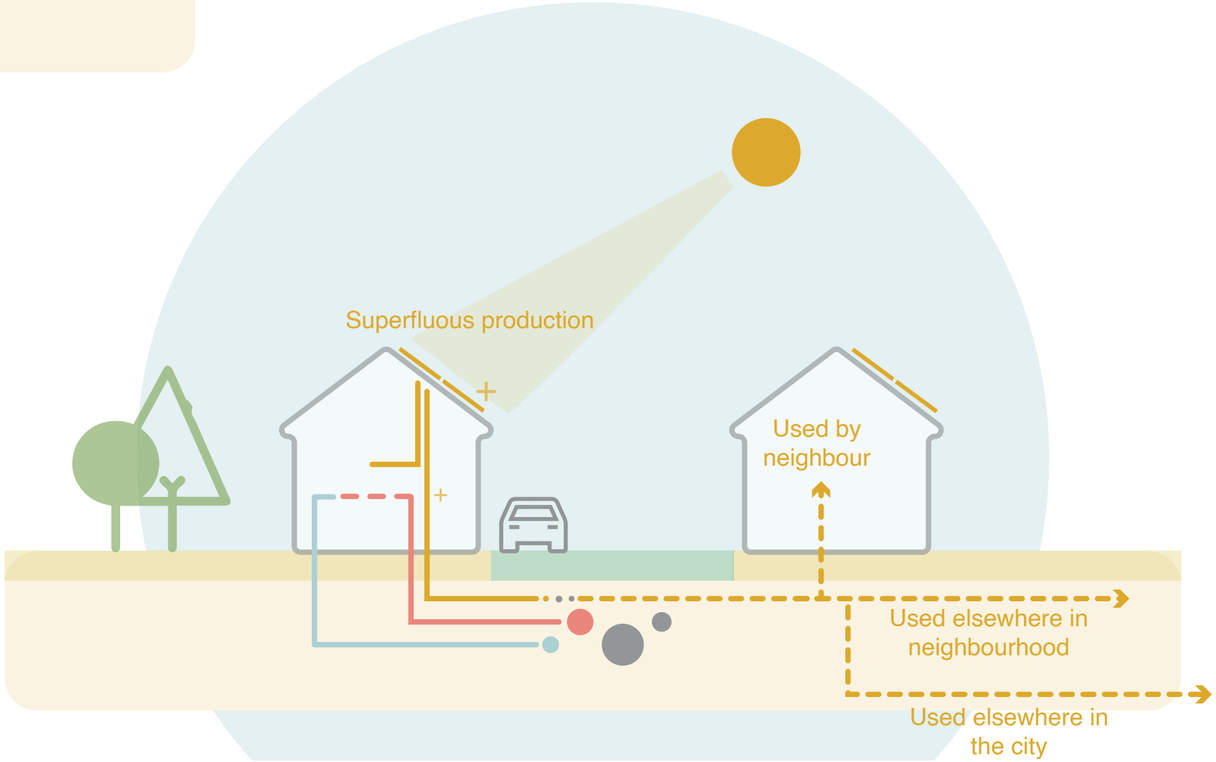
New diverse program



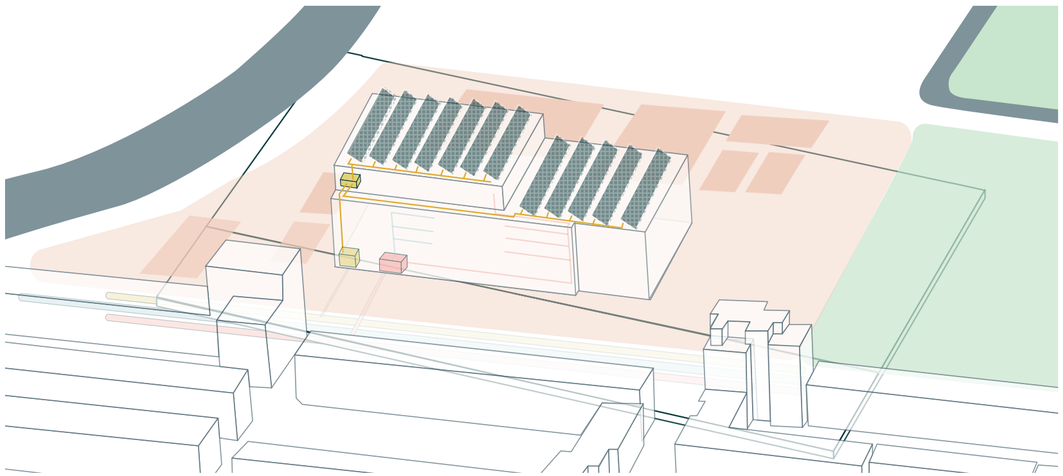
Complexity

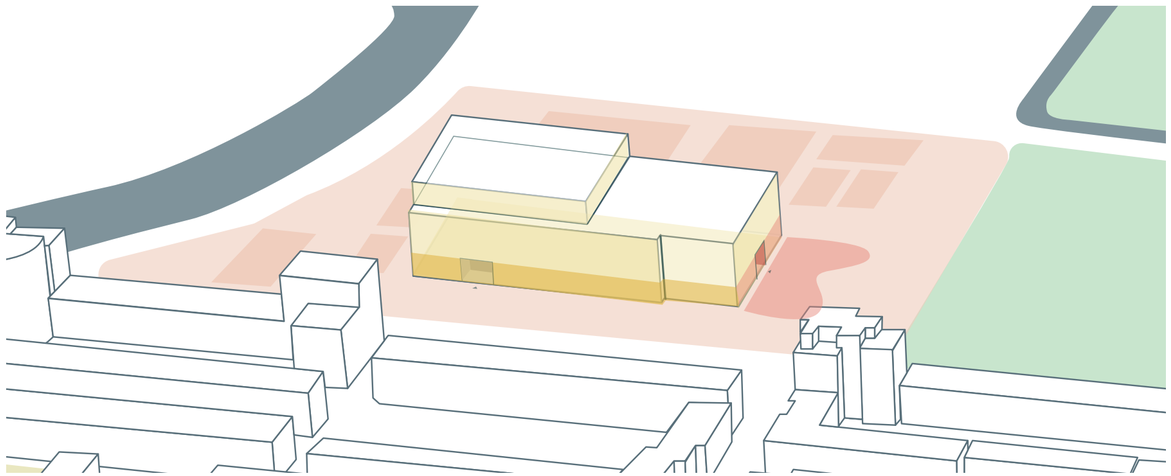
Of ownership and intergration

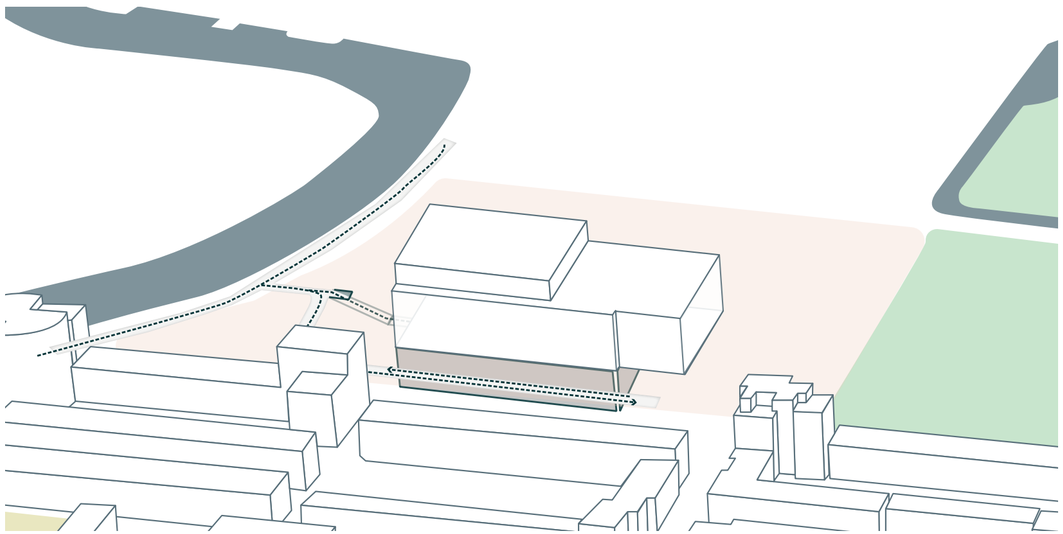


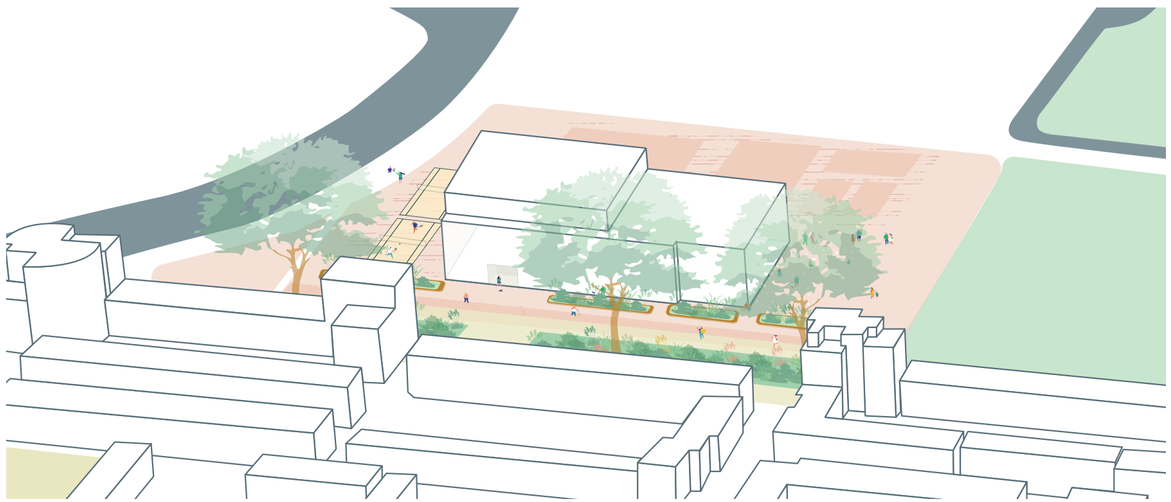


Sports Center
Zoom in



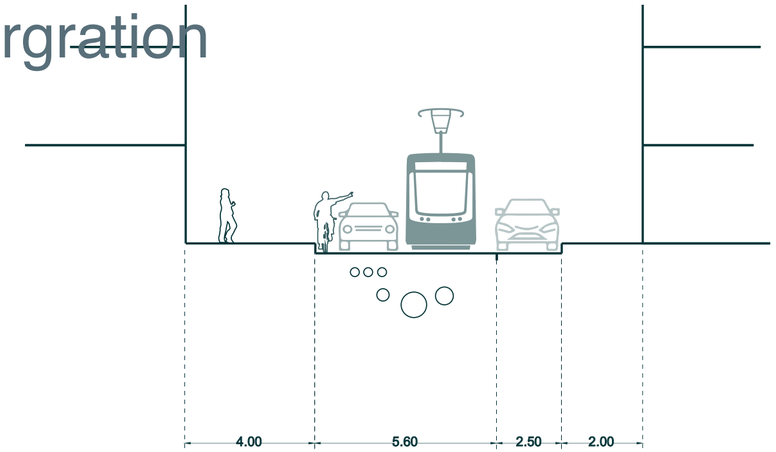


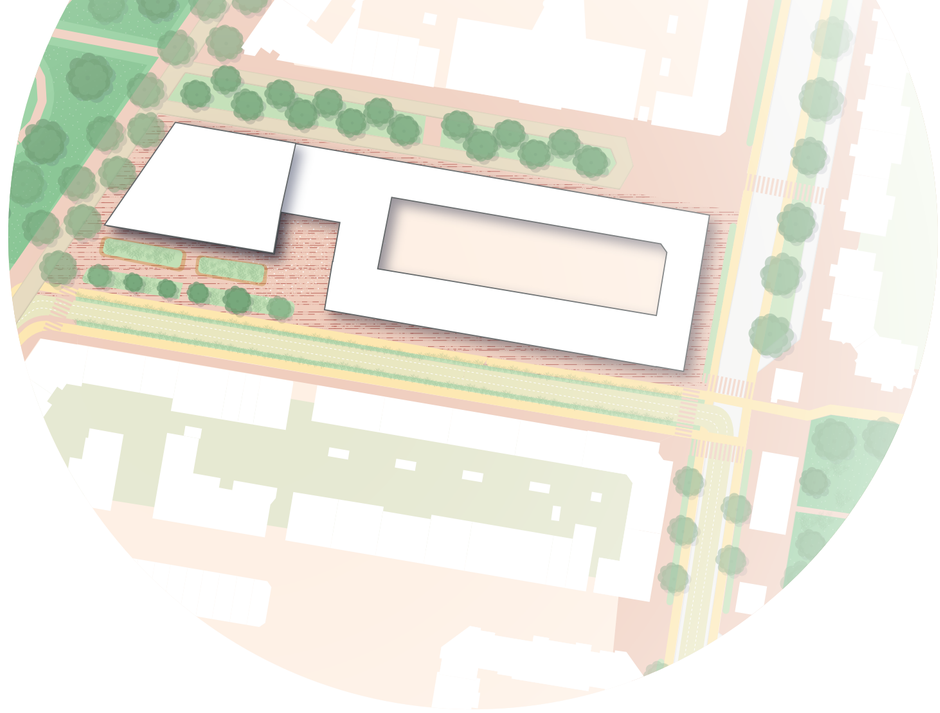




Complexity

Of ownership and intergration





Complexity
Of ownership and intergration