



**QUEEN'S
UNIVERSITY
BELFAST**

CityZEN Strategy Plan # 6: Roeselare Belgium.

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City-zen 'Roeselare' Roadshow

Een Duurzame Stadsvisie



MIROM
MILIEUZORG ROESELARE EN MENEN

inagro
ONDERZOEK & ADVIES IN LAND- & TUINBOUW

vrp
Flemish Association for
Space and Planning

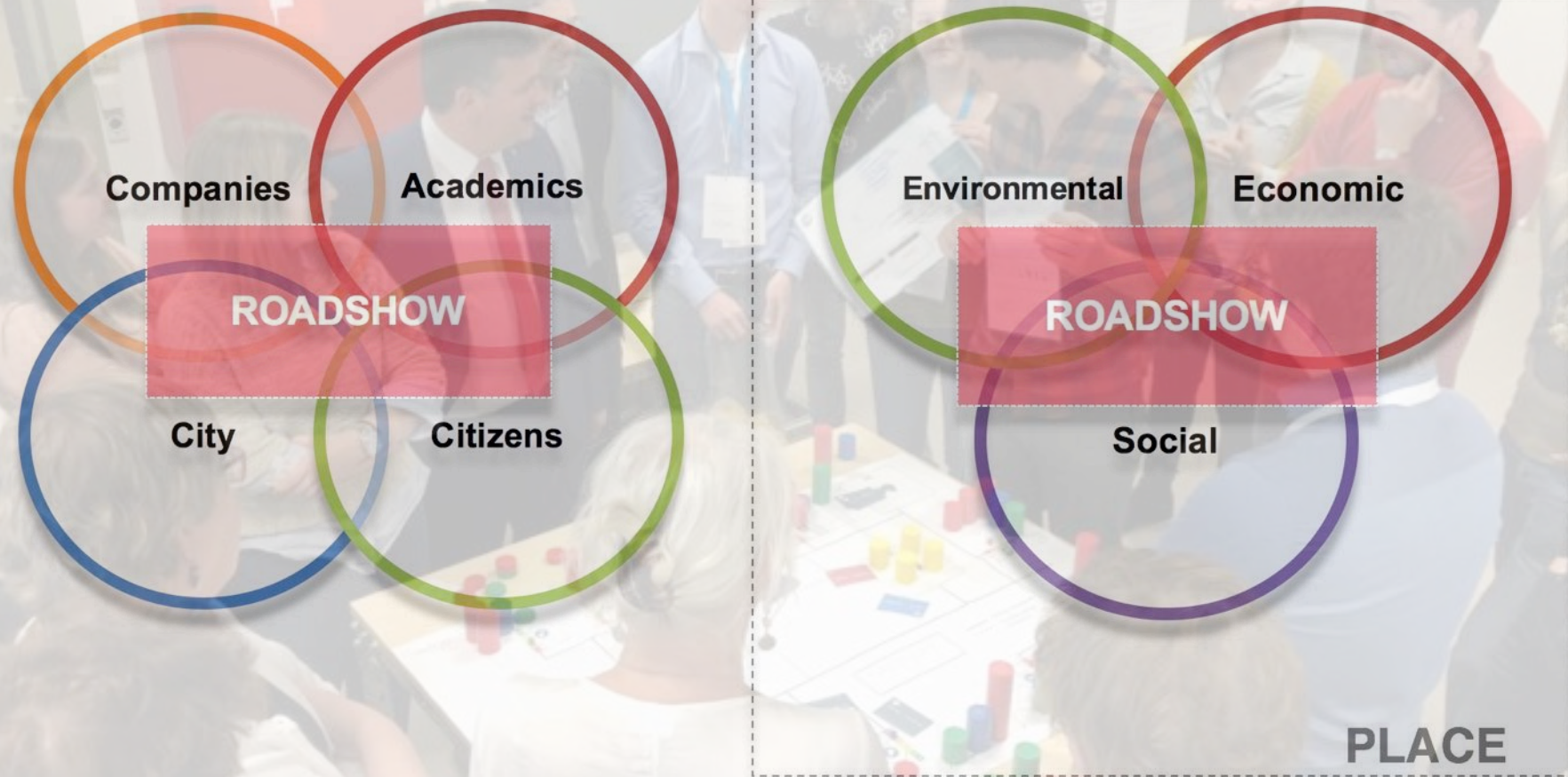
VUB VRIJE
UNIVERSITEIT
BRUSSEL

vvsg

katholieke hogeschool
associatie KU Leuven **vives**



'Co-creation' & 'Synergy of Solutions'



Aim: Zero-Energy

Heart of process

Co-creation

Fun / Reachable



What went on ...



Maandag 23 april |
Introductie
9.30 u. - 11.30 u.:
'Het loopt op
wiel'tjes'-fietstocht*



What went on ...



Maandag 23 april |
Introductie
9.30 u. - 11.30 u.:
'Het loopt op
wiel'tjes'-fietstocht*



What went on ...



Maandag 23 april |
Introductie
13.30 u. - 15.30 u.:
Inspirerende
presentaties
#VANRSL



What went on ...



Dinsdag 24 april |
Toekomstbeelden
Fun-shops 'Buurten
van de Toekomst' &
'Energie'



What went on ...



Donderdag 25 april |
Evaluëren
Fun-shops 'Buurten
van de Toekomst' &
'Energie'



What went on ...



Woensdag 25 april |
Design
9 u. - 12.30 u.:
Serious Game
'Go2Zero'



What went on ...

Carbon Footprint					
	ENERGY	MOBILITY	WASTE	WATER	TOT kg CO2-eq/yr
John					
Bert	3,739	2,981	278	57	7,055
Janne	2,812	426	476	97	3,810
Timo	3,018	0	476	97	3,591
Sybil	1,914	213	476	97	2,700
	2,131	852	594	122	3,699
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0



Woensdag 25 april | Design
13 u. - 14.30 u.: Mini-masterclass CO2-voetafdruk en de stappen die we moeten zetten



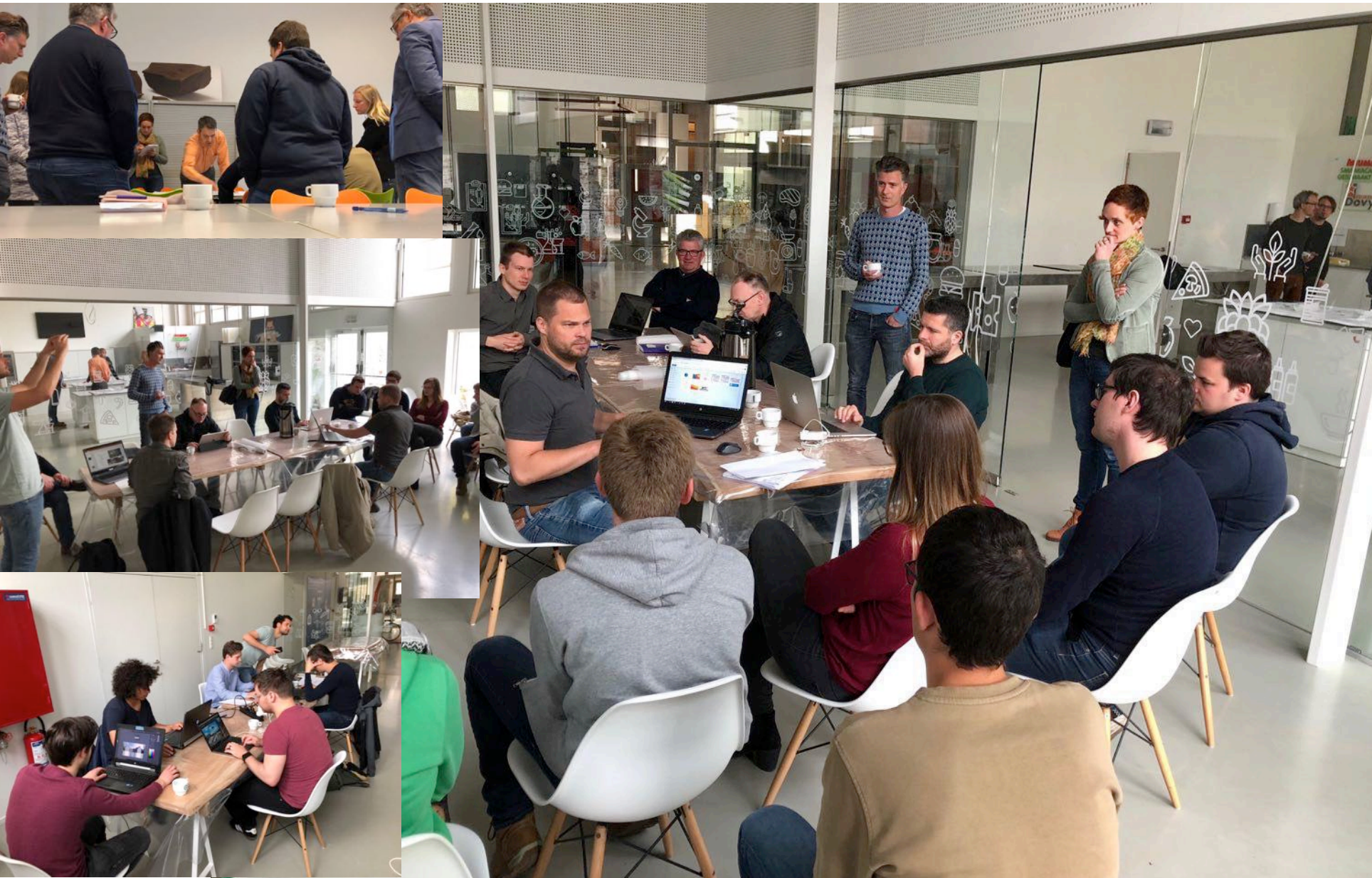
What went on ...



Woensdag 25 april |
Design
14.30 u – 17.00.:
VRP Urban Design
Session - Vlaamse
Vereniging voor
Ruimte en Planning:
VRP



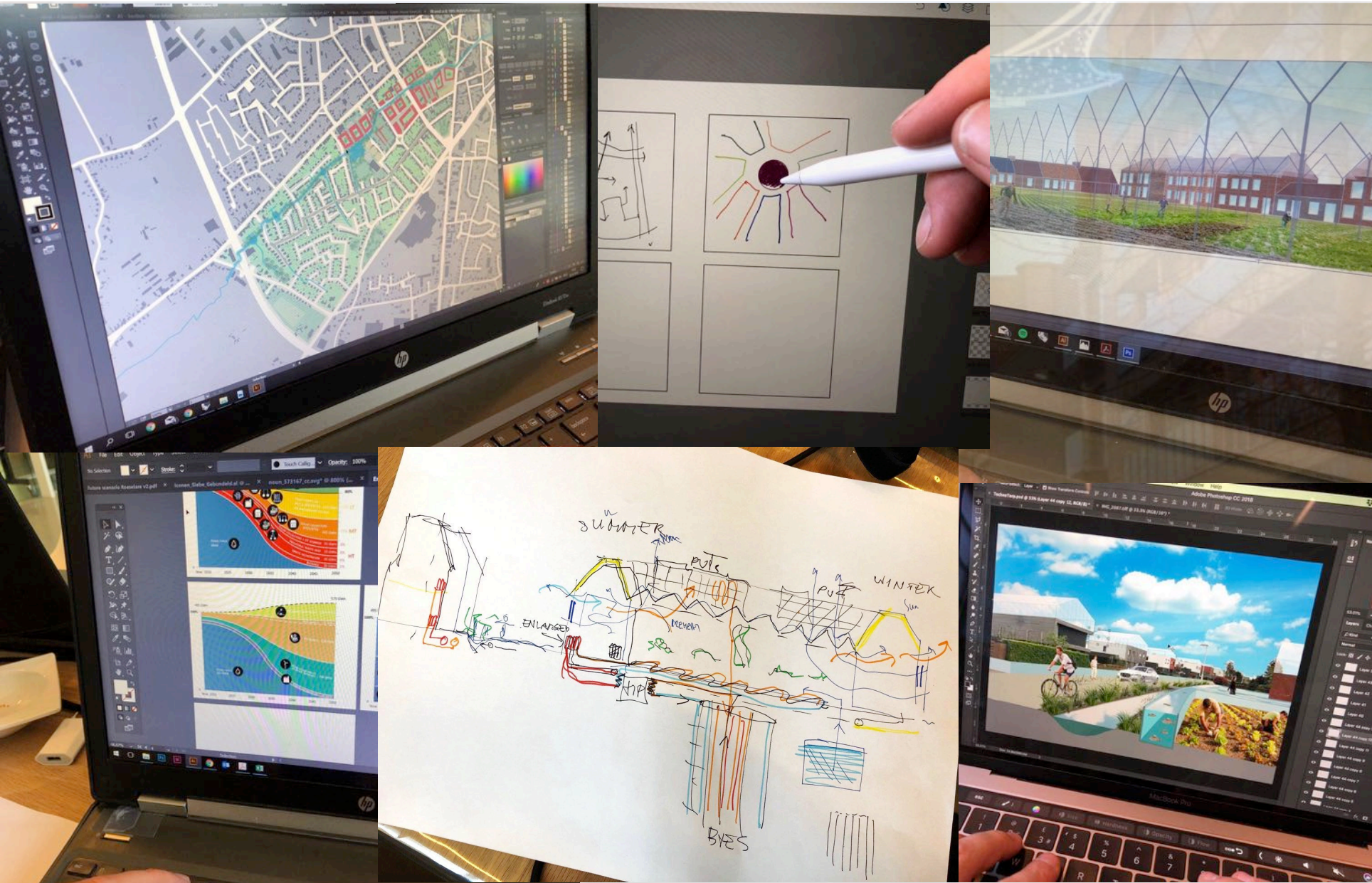
What went on ...



Donderdag 26 april |
Evalueren
fun-shops 'Buurten
van de Toekomst' &
'Energie'



What went on ...



Donderdag 26 april |
Evalueren
fun-shops 'Buurten
van de Toekomst' &
'Energie'



Vrijdag 27 april | Outro

10 u. - 11 u.:

Een duurzame stadsvisie #VANRSL met de Roadies

11 u. - 12 u.:

Roadshow discussie & Food for thought





CO₂-eq

UNIT kg CO₂-eq

GWP CO₂ = 1

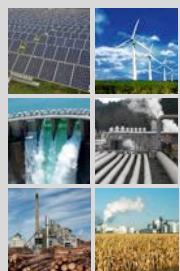
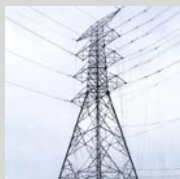
GWP CH₄ = 34

GWP N₂O = 298

EMISSION FACTOR

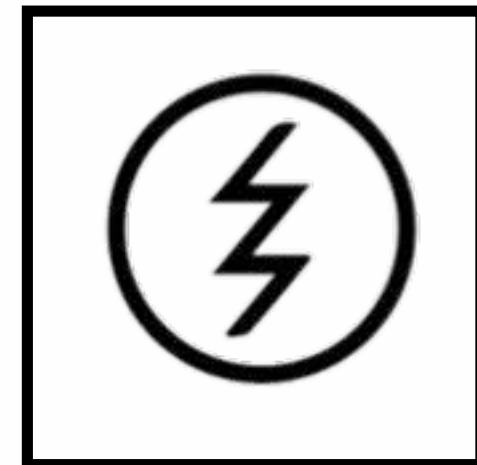


Emission Factor of Electricity Grid Mix in Belgium



BELGIUM 2016

	LCA based EF	DATA	%	GHG EMISSION
GENERAL DATA	kgCO2/kWh	kWh	%	kt CO2-eq/yr
ELECTRICITY DEMAND	-	8.35E+10		
ELECTRICITY PRODUCTION	-	7.98E+10		
INPORT	0.46	3.65E+09	4.4%	1.68E+09
TERMO-ELECTRICITY		2.31E+10	29.0%	1.03E+10
natural gas	0.443	2.31E+10	29.0%	1.03E+10
petroleum products	0.778			0.00E+00
coal	1.050			0.00E+00
RENEWABLES		1.43E+10	17.9%	2.14E+08
solar thermal				
Solar PV	0.032	2.95E+09	3.7%	9.45E+07
wind	0.010	5.11E+09	6.4%	5.11E+07
hydro	0.012	3.19E+08	0.4%	3.83E+06
geothermal				
biomass				
biogas	0.011	5.91E+09	7.4%	6.50E+07
hydrogen				
NUCLEAR		4.13E+10	51.7%	2.72E+09
nuclear	0.066	4.13E+10	51.7%	2.72E+09
TOTAL	0.181	8.23E+10		1.49E+10



Electricity EF (LCA based)



0.181 kg CO₂eq/kWh



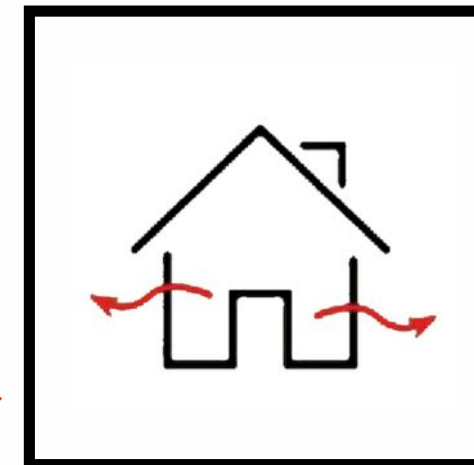
0.460 kg CO₂eq/kWh



ROESELARE CITY (BELGIUM) TYPICAL HOUSEHOLD PROFILING



ROESELARE		HOUSEHOLD PROFILE			
Emission sources	unit	rawdata	%	kg CO2-eq	%
ENERGY	kWh	15840		3476	51.3%
LIGHTING&APPLIANC.	kWh	3563	100%	643	9.5%
electricity	kWh	3563	100%	643	9.5%
HEAT+DHW+cooking	kWh	12277	100%	2833	41.8%
Nat gas	kWh	10021	82%	2522	37.2%
LGP	kWh	460	4%	121	1.8%
Biomass	kWh	1662	14%	189	2.8%
Solar thermal	kWh	43	0.3%	0	0.0%
Geothermal	kWh	91	1%	0	0.0%
MOBILITY	kWh	10858	100%	2972	43.8%
Electric car	kWh	2	0.0%	0	0.0%
LGP+Gas	kWh	28	0.3%	7	0.1%
Diesel	kWh	8945	82%	2550	37.6%
Gosoline	kWh	1554	14%	414	6.1%
Bio-fuel	kWh	328	3%	0	0.0%
WASTE	kg	1076	100%	276	4.1%
% waste-to-energy	kg	312	29%	204	3.0%
% organic	kg	230	21%	21	0.3%
% landfill	kg	44	4%	51	0.8%
% recycling	kg	490	46%	0	0.0%
WATER	m³	96	100%	56	0.8%
m3 per yr (house)	m ³ /yr	96	100%	56	0.8%
TOTAL				6779	100%



HOUSEHOLD profile

People: 2.34 inhab./house

Electricity: 3500 kWh/yr

Natural gas: 12300 kWh/yr

Mobility: 18000 km/yr

Waste: 467 kg/cap yr

Water: 114 L/cap day



ROESELARE CITY (BELGIUM)
TYPICAL HOUSEHOLD PROFILING



HOUSEHOLD IN ROESELARE



CARBON FOOTPRINT

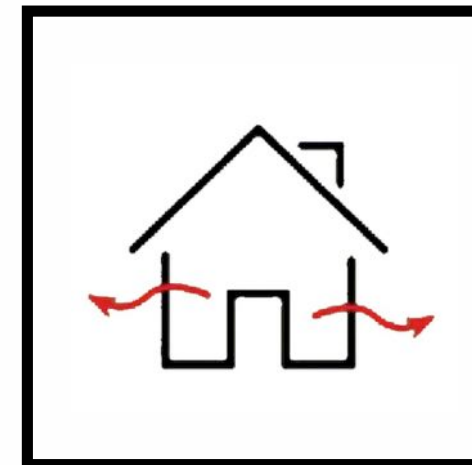
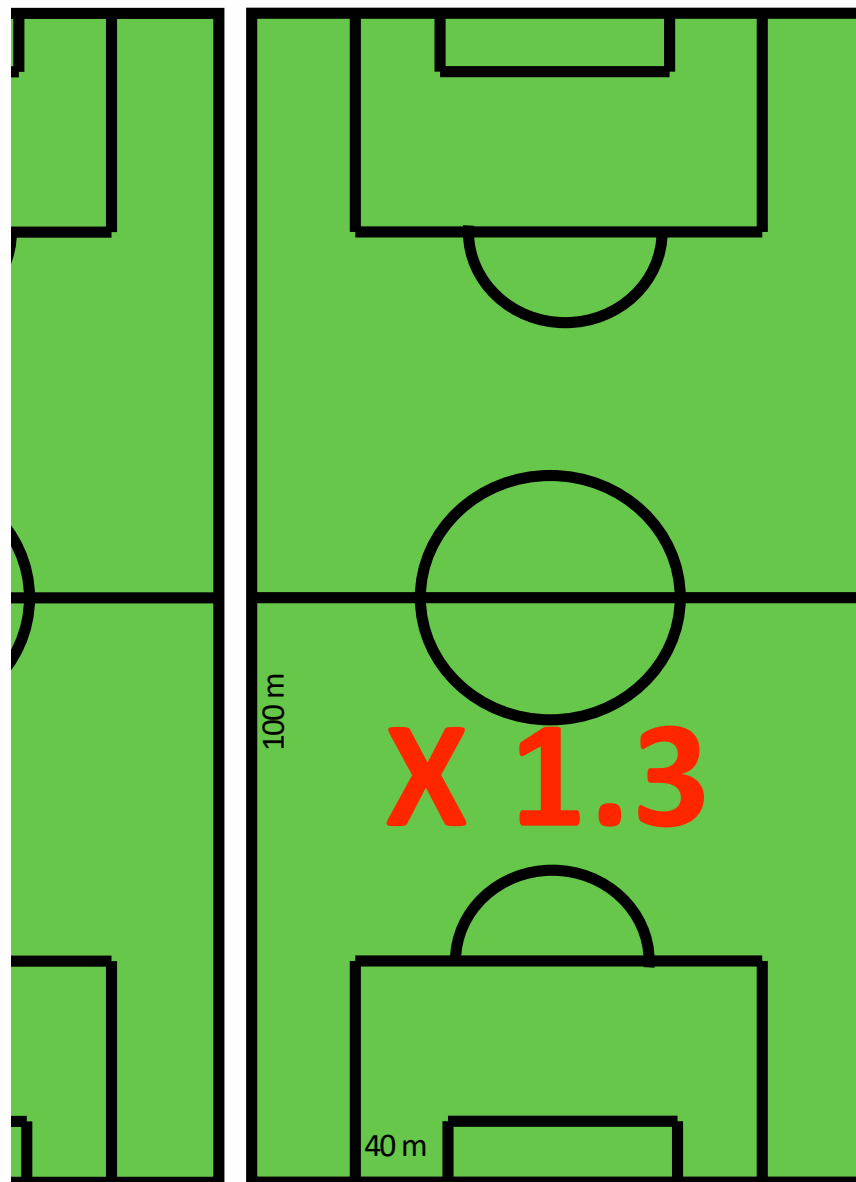
6.78 t CO₂eq/yr



7.72 t CO₂eq/yr



Carbon Footprint Offset
per household
0.50 ha forestland



HOUSEHOLD profile

People: 2.34 inhab./house

Electricity: 3500 kWh/yr

Natural gas: 12300 kWh/yr

Mobility: 18000 km/yr

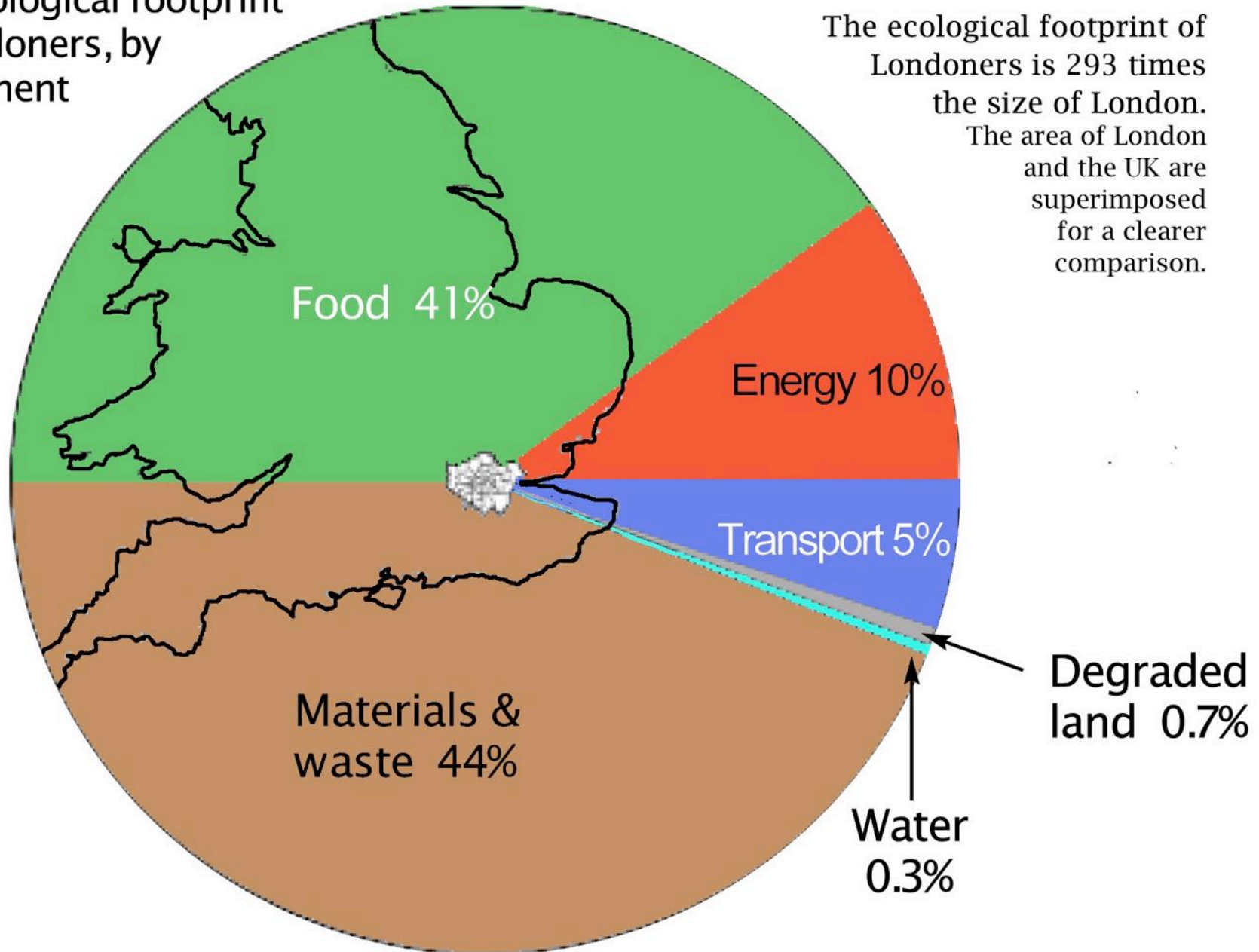
Waste: 467 kg/cap yr

Water: 114 L/cap day

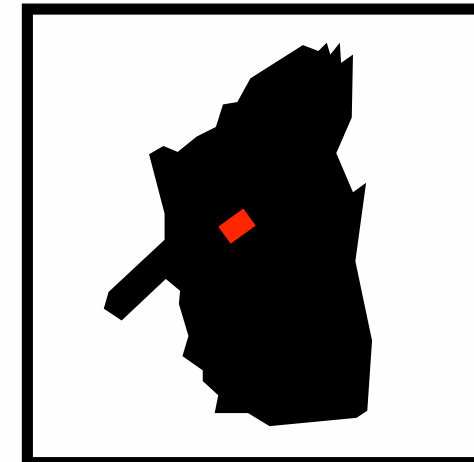
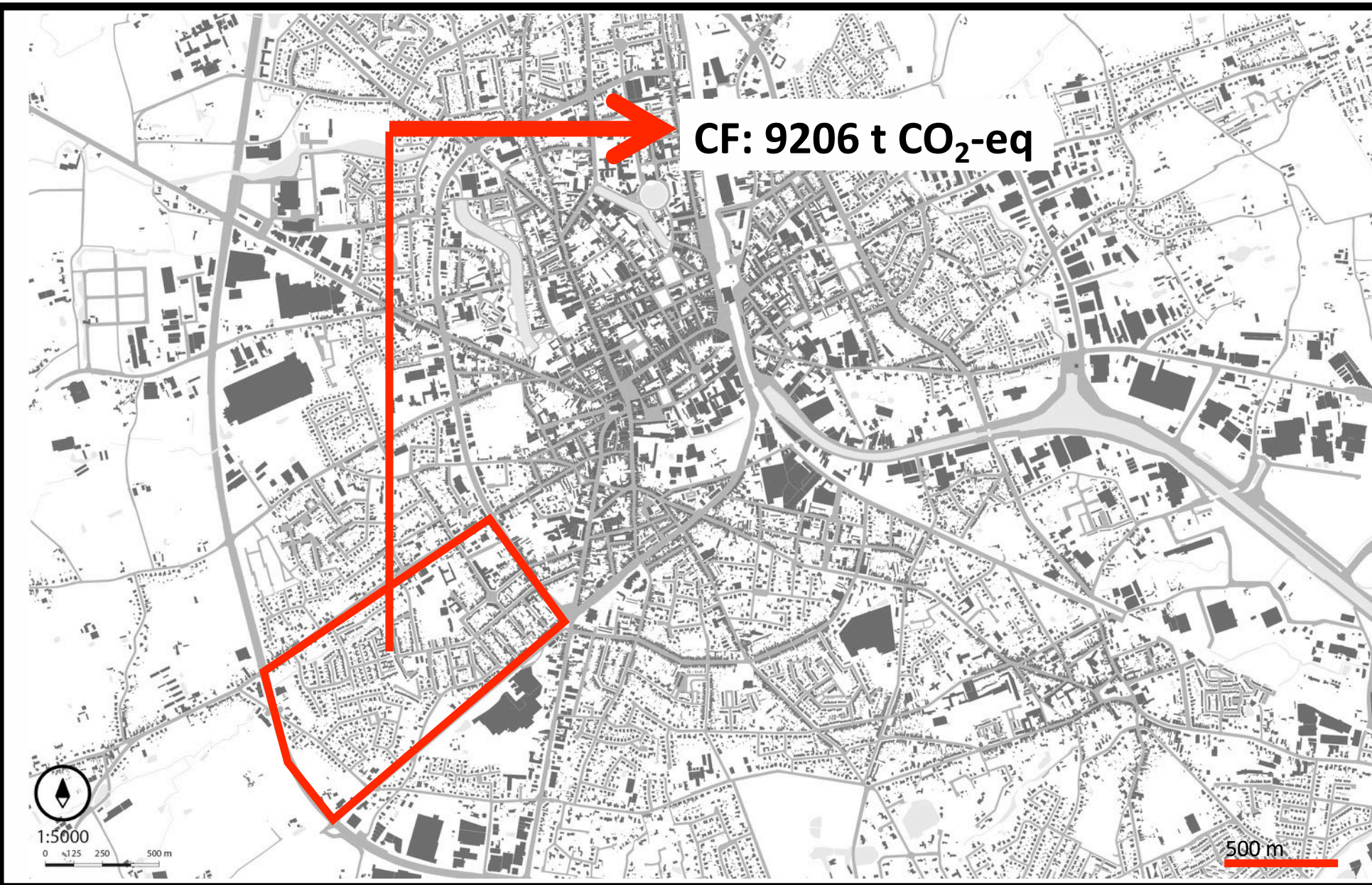


....Around 293.....

The ecological footprint of Londoners, by component



COLLIEVIJVER NEIGHBOURHOOD



COLLIEVIJVER NEIGHBOURHOOD

1358 households

2795 inhabitants

77 ha area

36 inhab./ha



COLLIEVIJVER NEIGHBOURHOOD

X 8.9

CF: 9206 t CO₂-eq

= 682 ha forestland

2.7 km

10 ha square

2.4 km

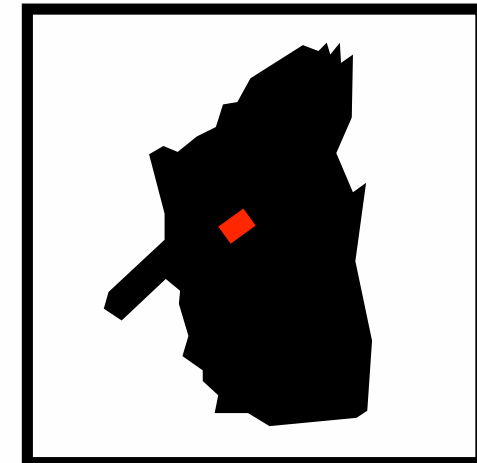
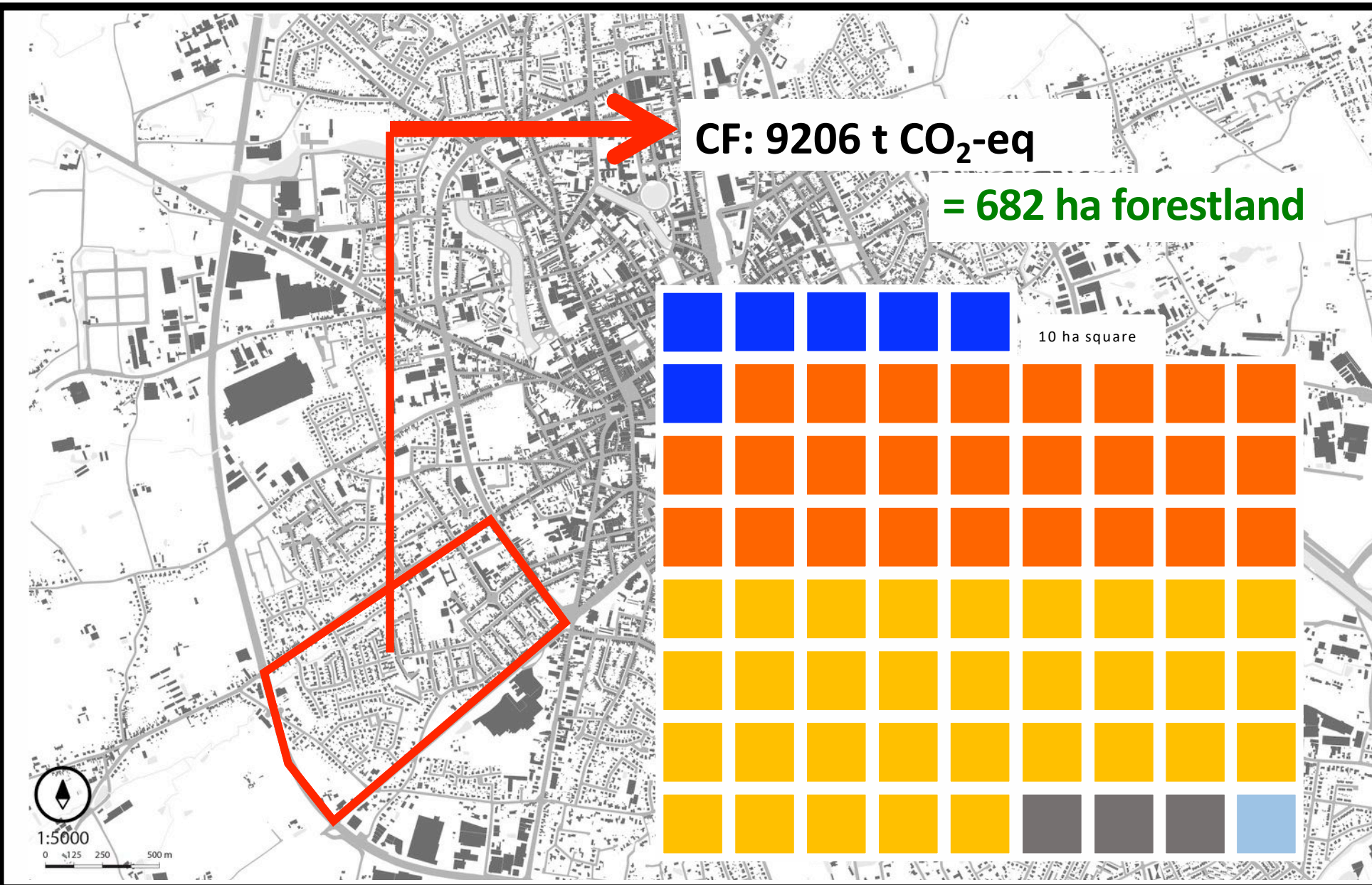


COLLIEVIJVER NEIGHBOURHOOD





- 1358 households
- 2795 inhabitants
- 77 ha area
- 36 inhab./ha



COLLIEVIJVER NEIGHBOURHOOD



COLLIEVIJVER NEIGHBOURHOOD

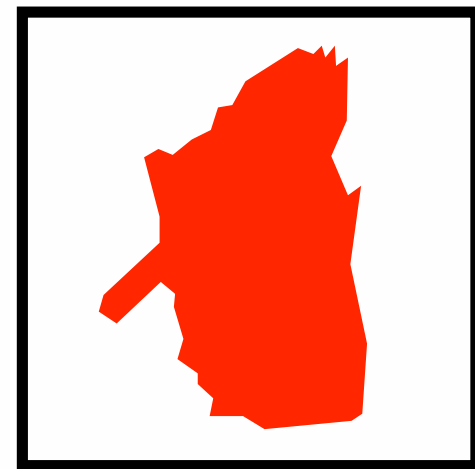
-  ELECTRICITY
-  NATURAL GAS
-  MOBILITY
-  WASTE



CARBON FOOTPRINT OF ROESELARE CITY



ROESELARE		MUNICIPALITY			
Emission sources	unit	rawdata	%	t CO2-eq	%
ENERGY	MWh	415222	-	91,118	22.1%
LIGHTING&APPLIANC.	MWh	93402	100%	16,867	4.1%
electricity	MWh	93402	100%	16,867	4.1%
HEAT+DHW+cooking	MWh	321820	100%	74,251	18.0%
Nat gas	MWh	262681	82%	66,115	16.0%
LGP	MWh	12071	4%	3,171	0.8%
Biomass	MWh	43560	14%	4,965	1.2%
Solar thermal	MWh	1124	0%	0	0.0%
Geothermal	MWh	2383	1%	0	0.0%
MOBILITY	MWh	284617	100%	77,894	18.9%
Electric car	MWh	63	0.0%	11	0.0%
LGP+Gas	MWh	731	0.3%	192	0.0%
Diesel	MWh	234482	82.4%	66,836	16.2%
Gosoline	MWh	40733	14.3%	10,855	2.6%
Bio-fuel	MWh	8608	3.0%	0	0.0%
WASTE	t	28345	100%	7,260	1.8%
% waste-to-energy	t	8231	29%	5,367	1.3%
% organic	t	6049	21%	548	0.1%
% landfill	t	1159	4%	1,345	0.3%
% recycling	t	12919	46%	0	0.0%
WATER	m³	2521692	100%	1,476	0.4%
m3 per yr (house)	m ³ / yr	2521692	100%	1,476	0.4%
RESIDENTIAL				177,748	43%
TERTIARY (private + public)	MWh	442647	-	99,898	24.2%
AGRICULTURE	MWh	28392	-	7,666	1.9%
INDUSTRY	MWh	639487	-	124,644	30.2%
public transport	MWh	5270	-	1,439	0.3%
public lighting	MWh	5546	-	1,002	0.2%
TOTAL				412,396	100%



Roeselare City

61,657 inhabitants

26,349 households

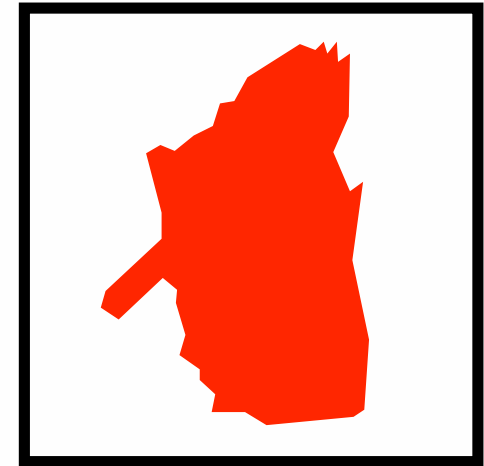
5979 ha area



CARBON FOOTPRINT
412 kt CO₂eq/yr



CARBON FOOTPRINT OF ROESELARE CITY



Roeselare City

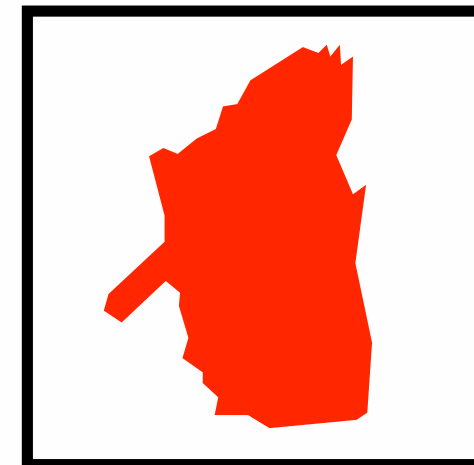
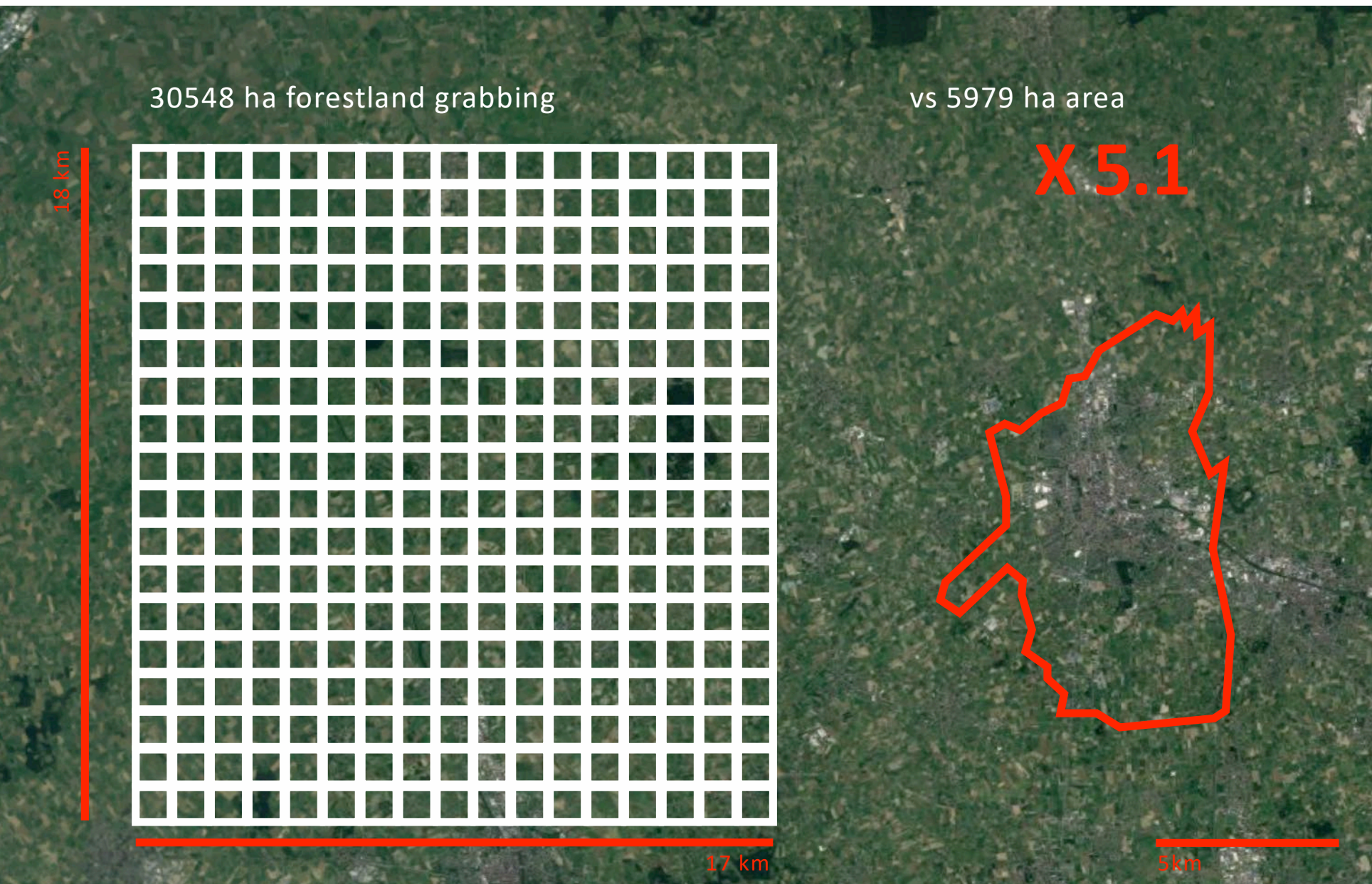
61,657 inhabitants

26,349 households

5979 ha area



CARBON FOOTPRINT OF ROESELARE CITY



Roeselare City

CARBON FOOTPRINT

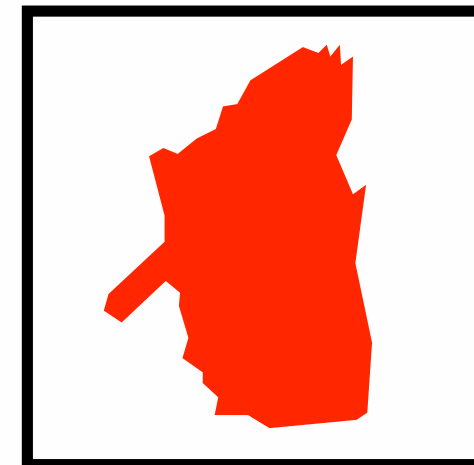
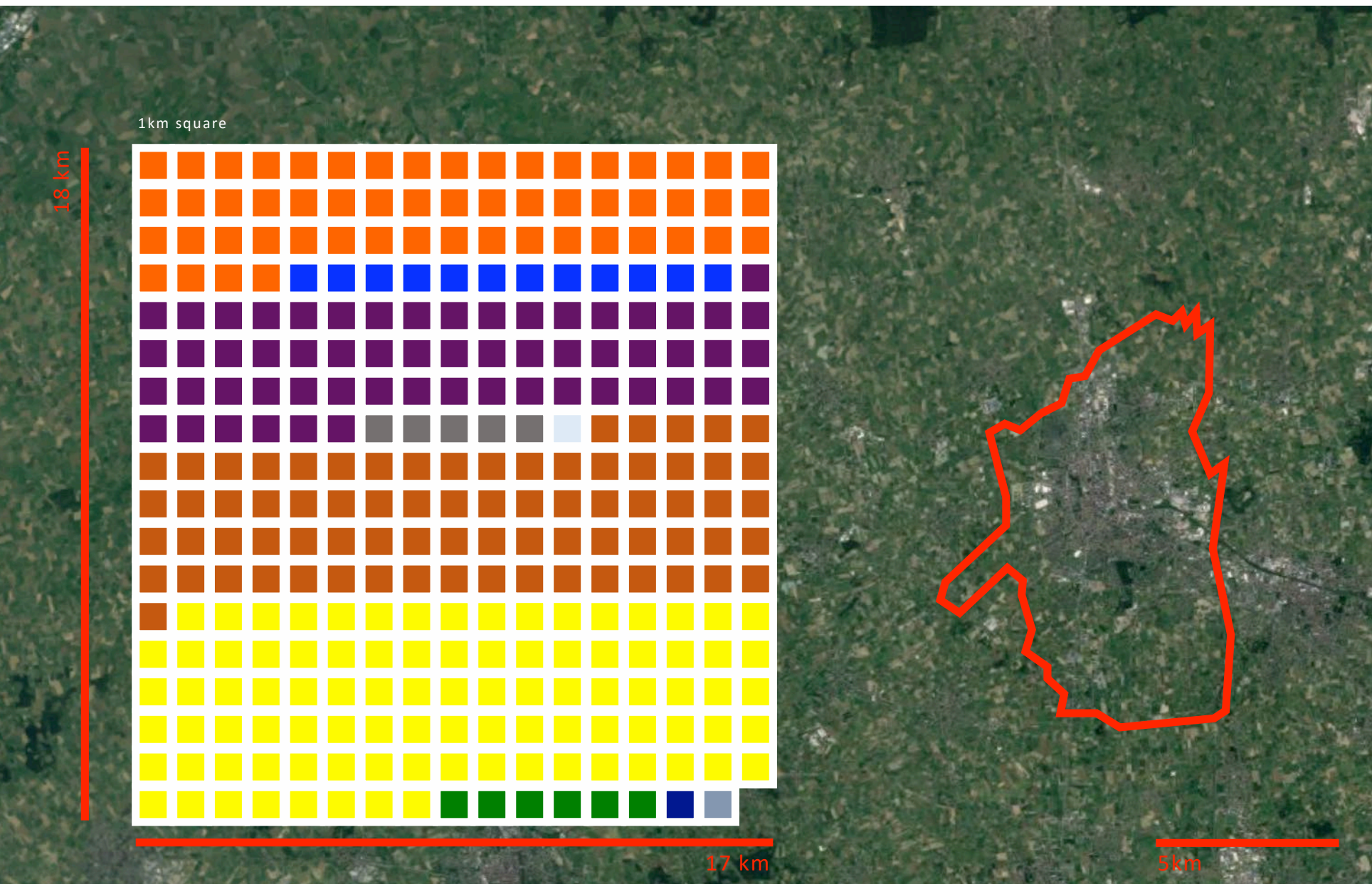
412,000 t CO2 eq

FORESTLAND GRABBING

30,548 ha



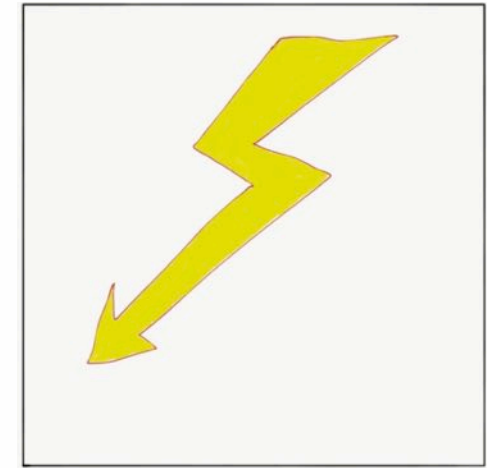
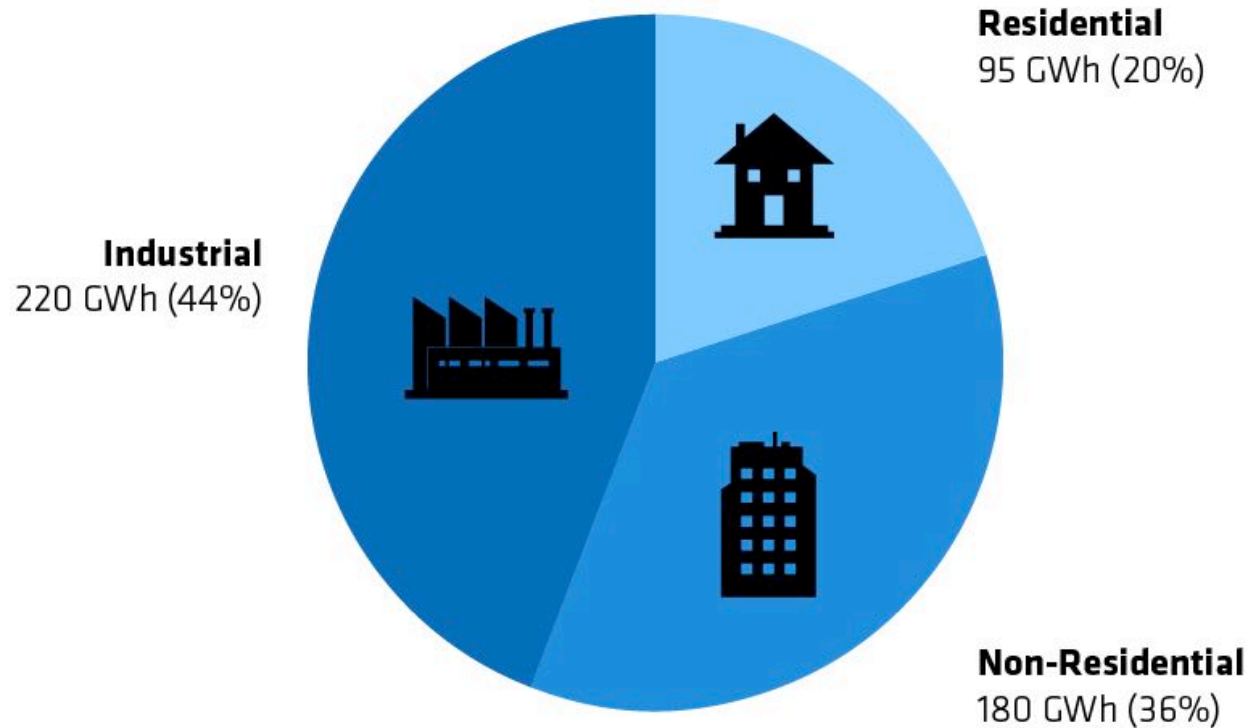
CARBON FOOTPRINT OF ROESELARE CITY



- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- WASTE (URBAN)
- WATER USE (HOUSING)
- TERTIARY
- INDUSTRY
- AGRICULTURE
- Public transport
- Public lighting



Electricity demand Roeselare 2015 (GWh)

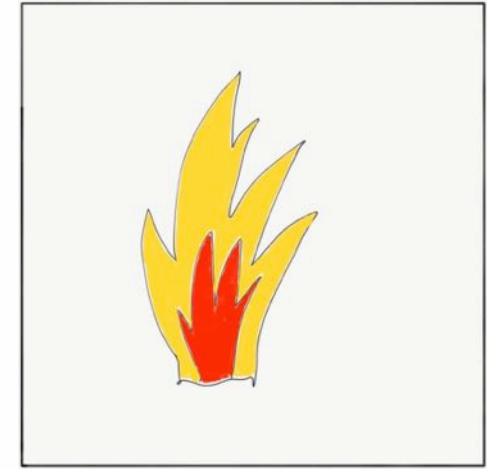
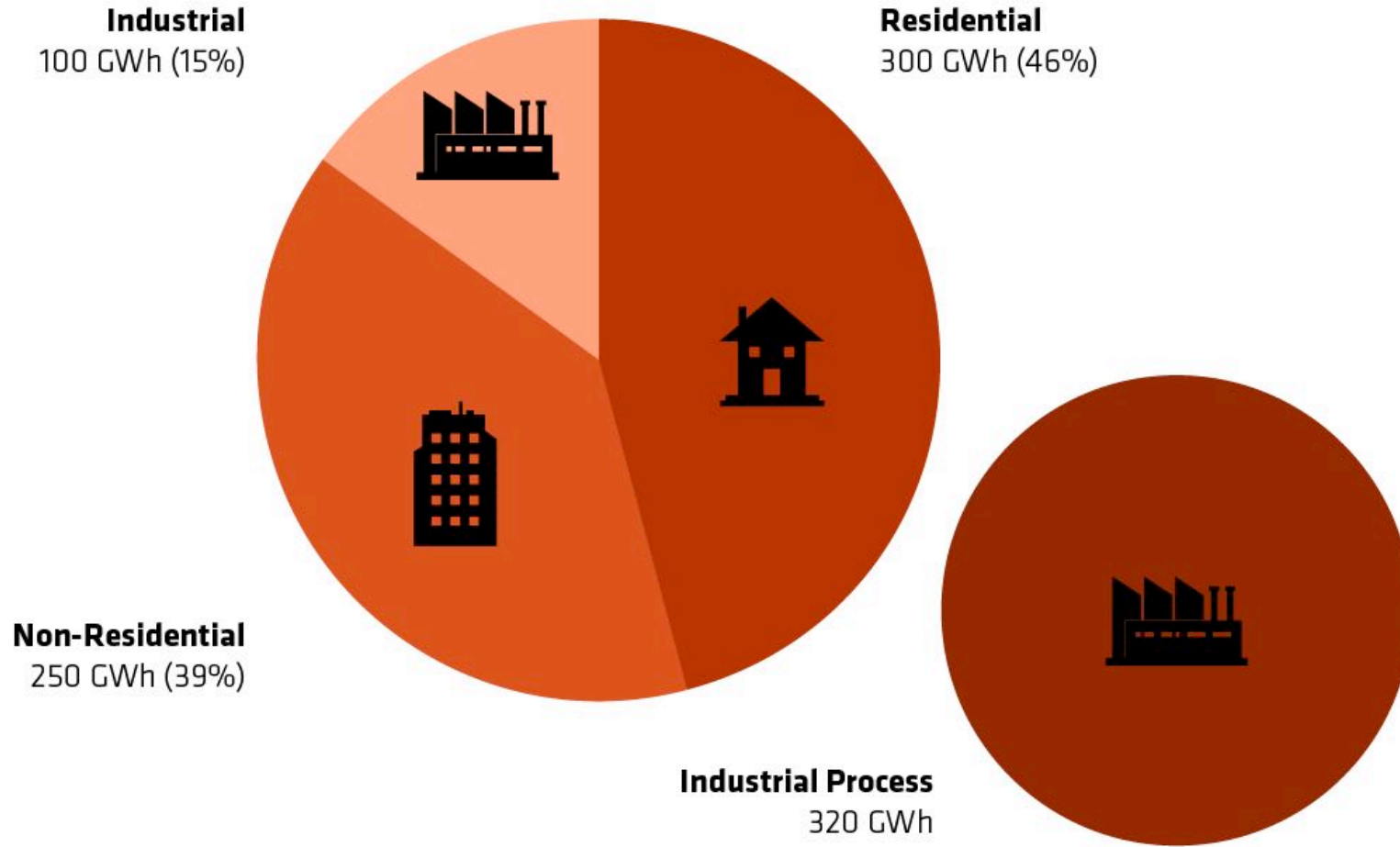


Current Electricity Demand

495 GWh-e in 2015



Heat demand Roeselare 2015 (GWh)

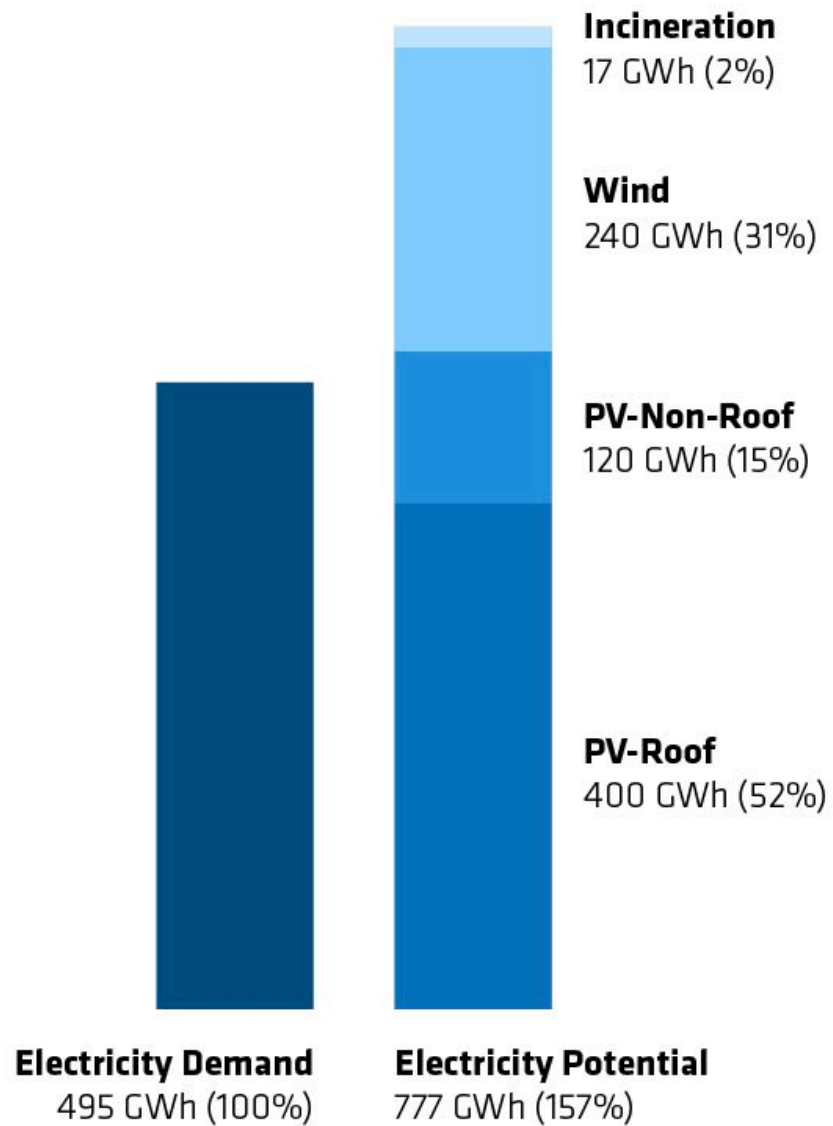


Current Heat Demand

620 GWh-th in 2015
+
320 GWh-pr



Electricity potentials in Roeselare

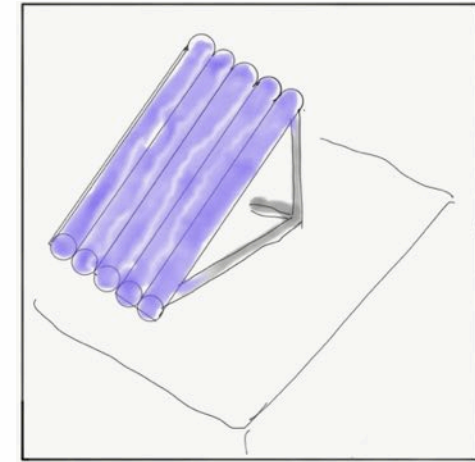
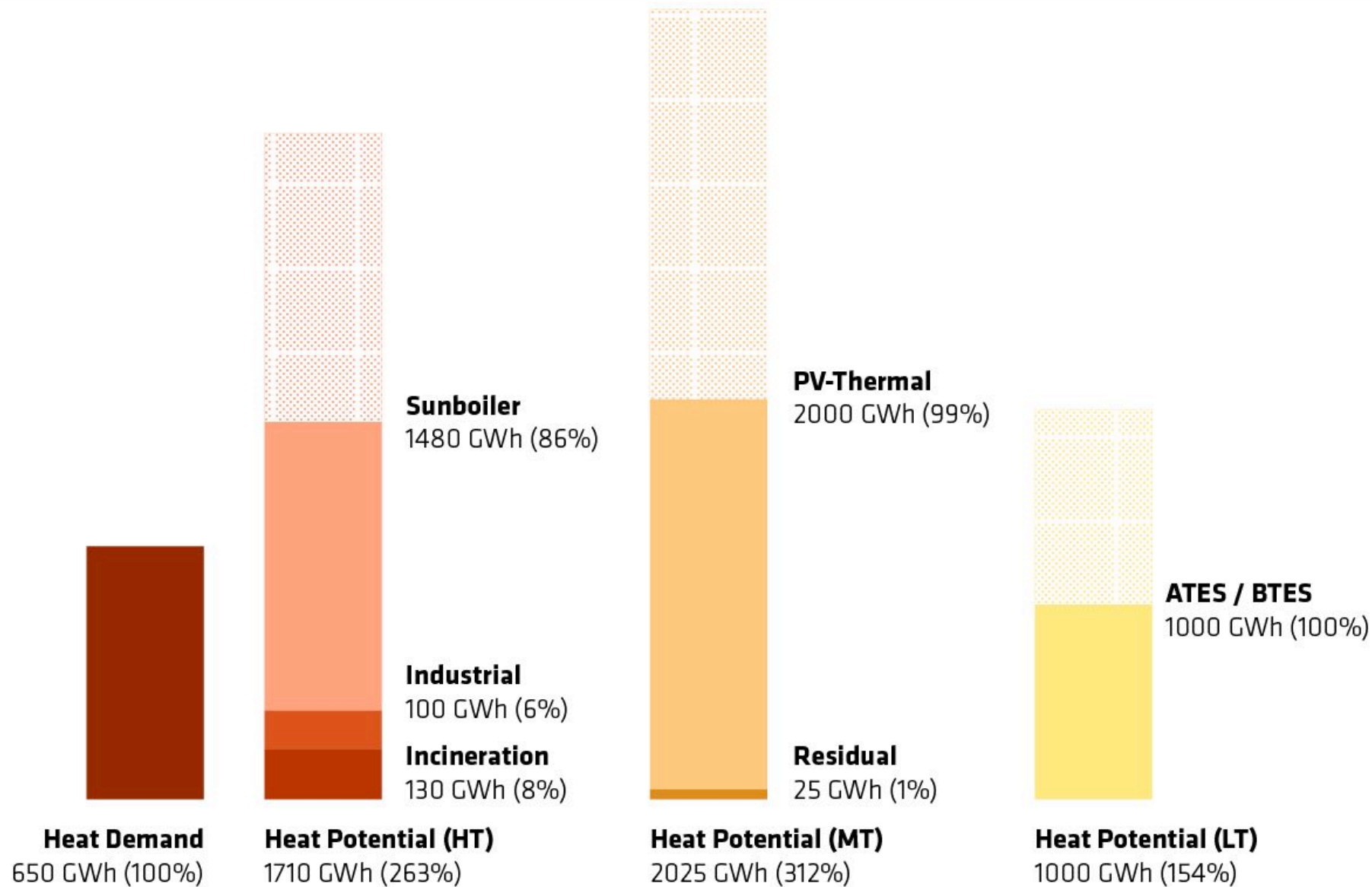


Space for production

- 40 Wind turbines
- 50% of all roofs (235 ha)
- 80 ha non-roof



Heat potentials in Roeselare



Temperature levels

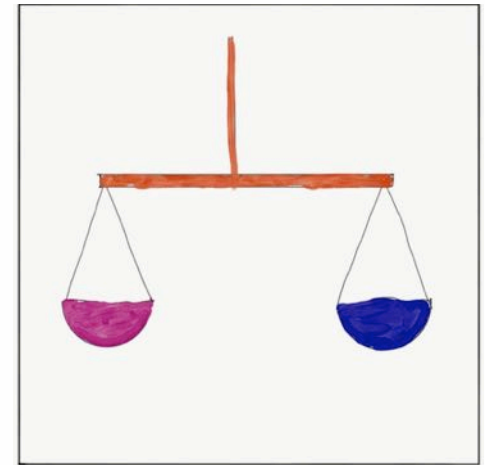
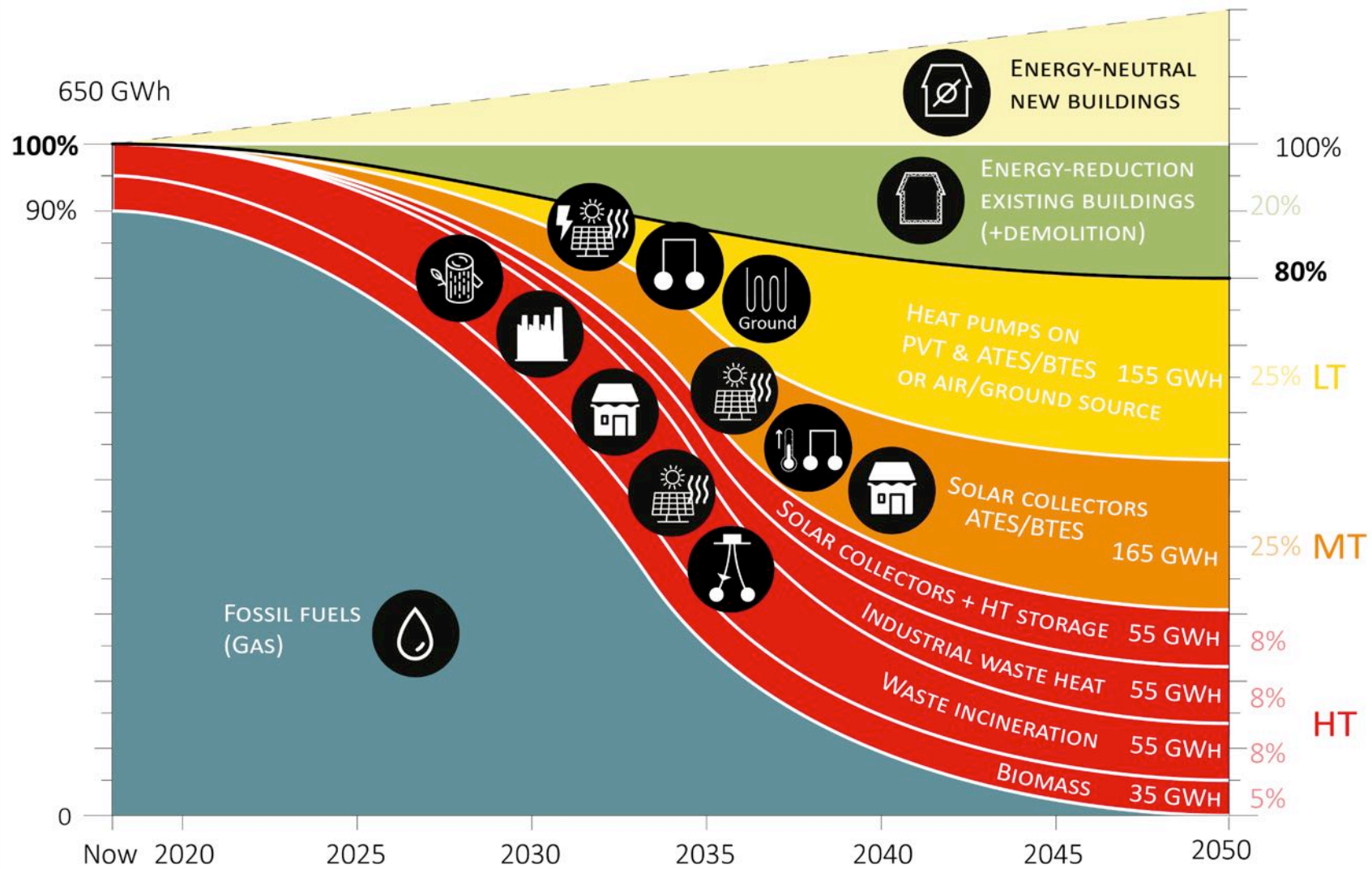
High-T for district heat network (DHN)

Mid-T needs energy renovation

Low-T needs heat pumps and energy renovation



Heat Balance towards 2050



Temperature levels

30% High-T for DHN

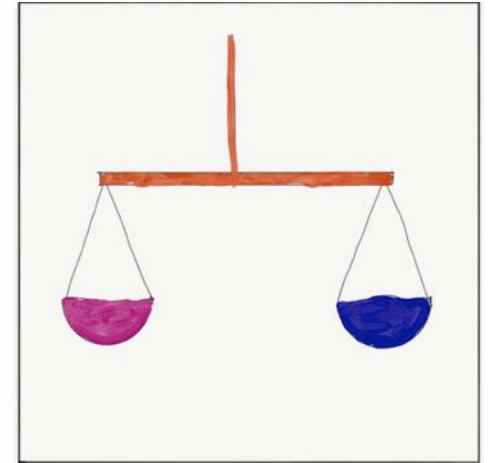
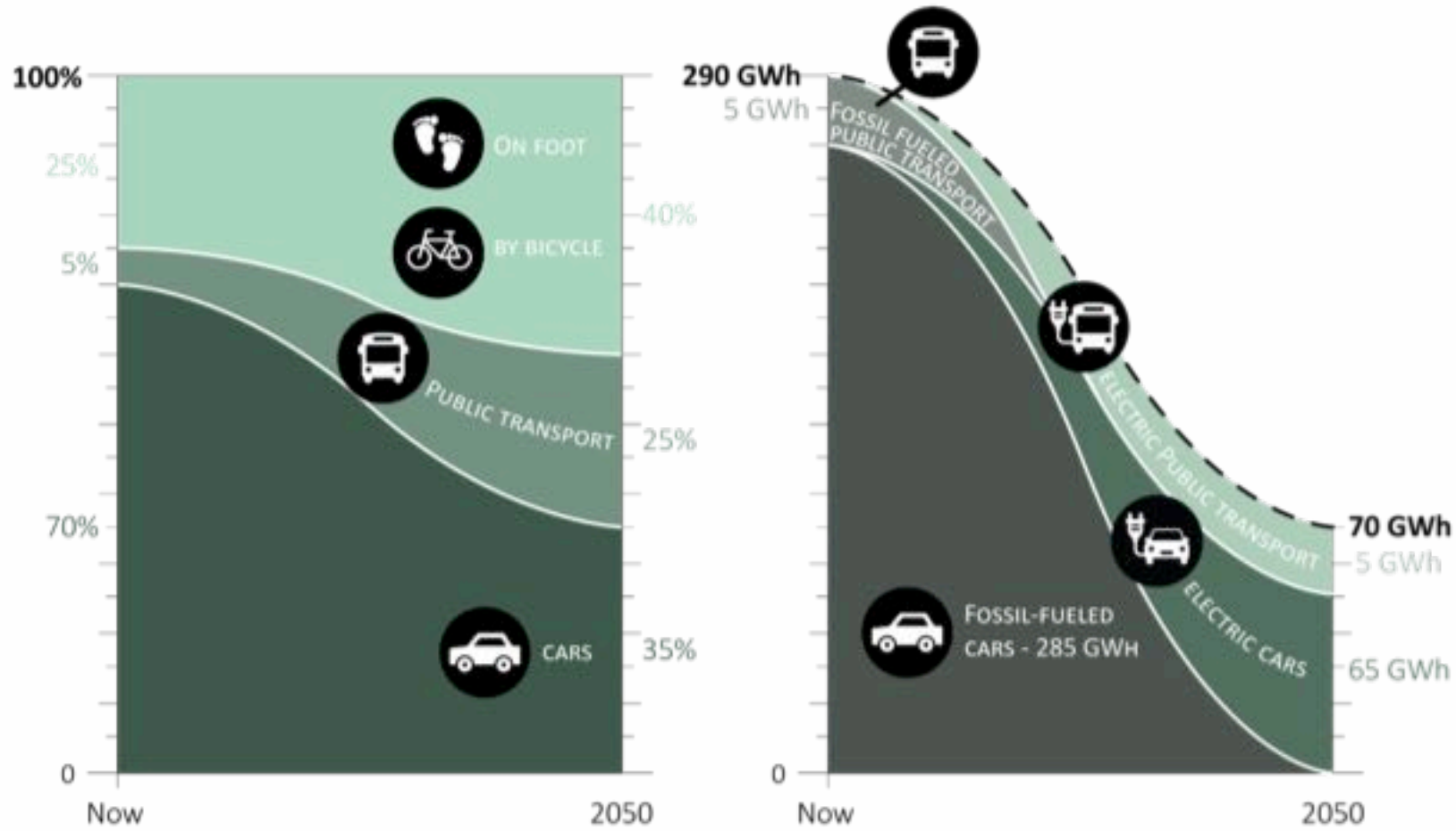
25% Mid-T

25% Low-T

20% reduction



Sustainable transport scenario



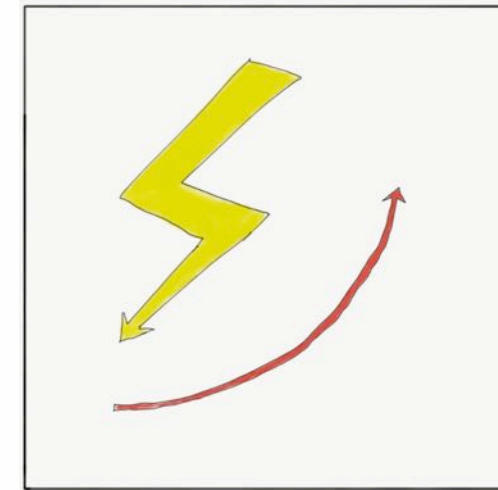
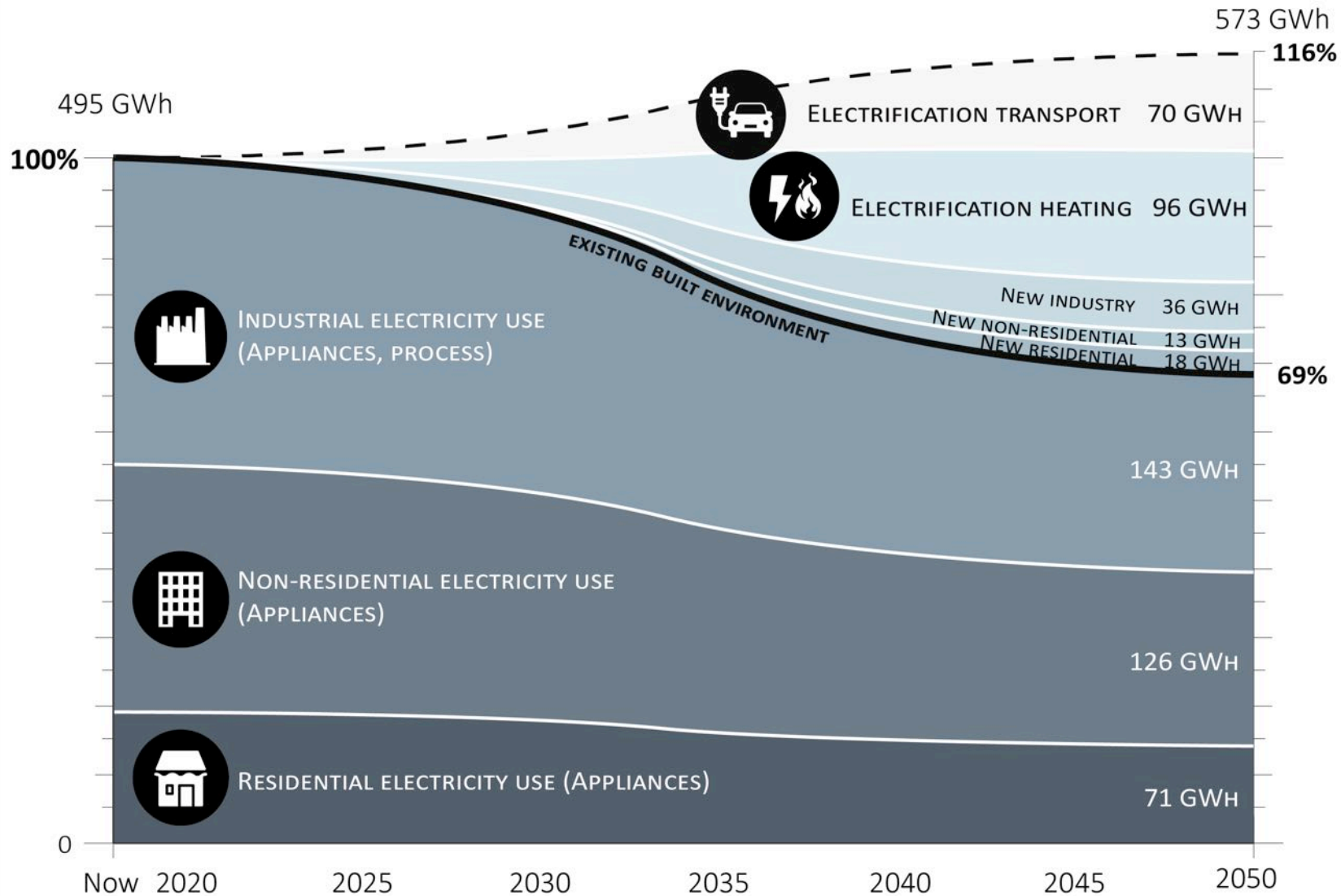
Main directions

Modal shift

Electrification



Electricity demand scenario towards 2050



Assumptions

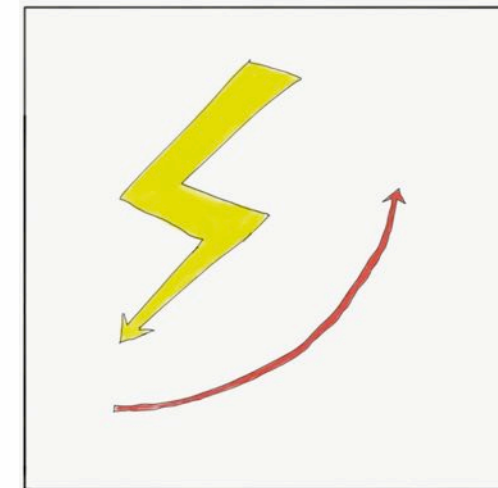
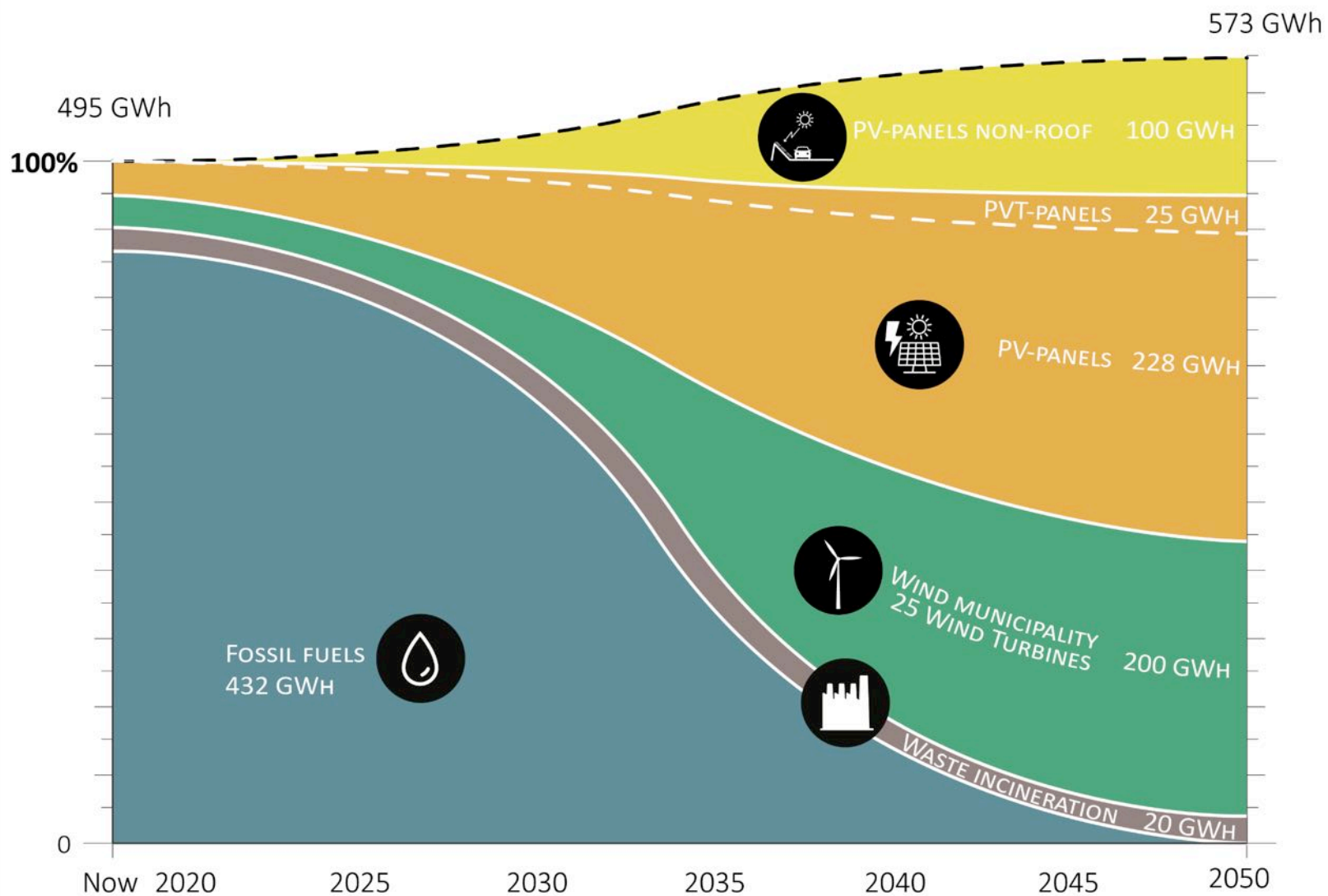
30% reduction of current demand for appliances

15% total increase due to Electrification of

Heating + transport



Electricity Balance towards 2050



Main measures

25 Wind Turbines

240 ha PV panels

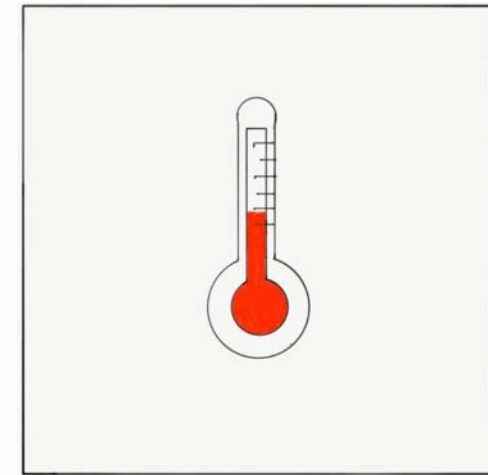
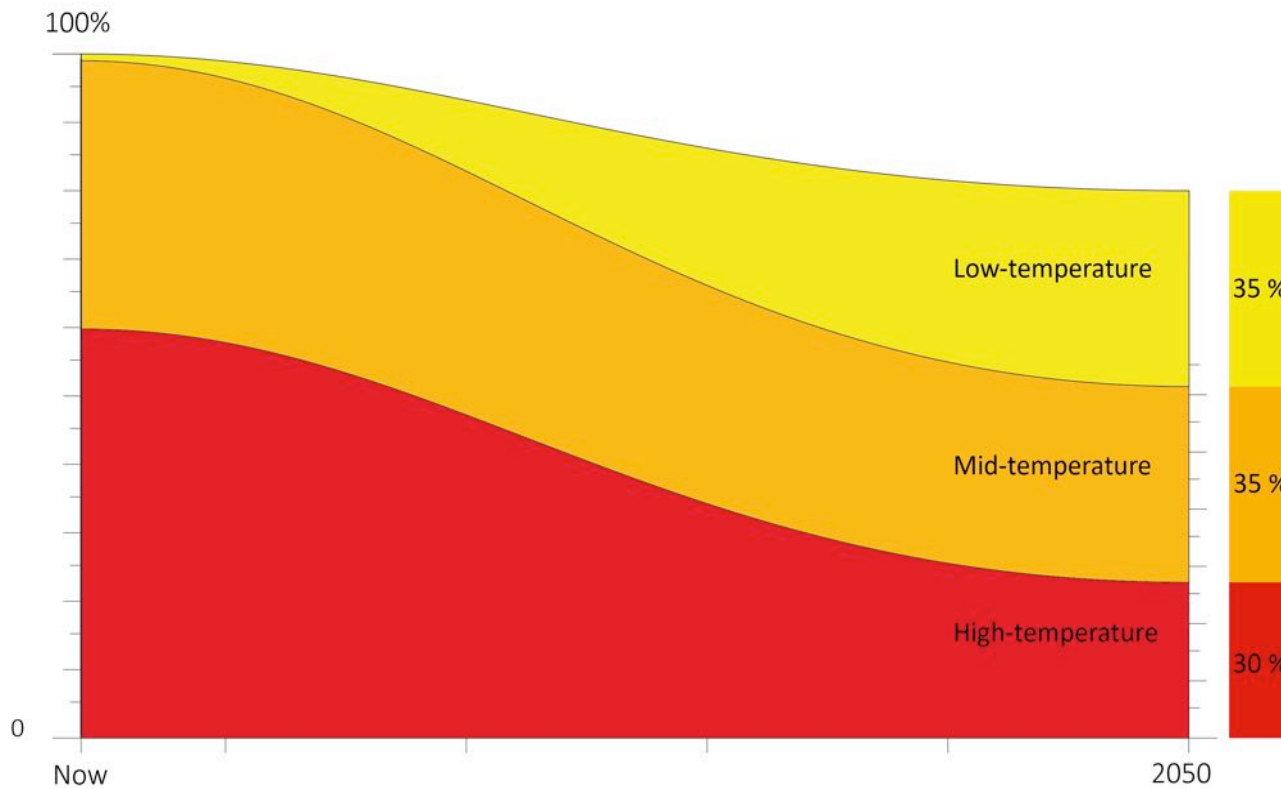
Co-generation of waste incineration



Temperature levels for heating of buildings towards 2050



Labels buildings Flanders



Required temperatures

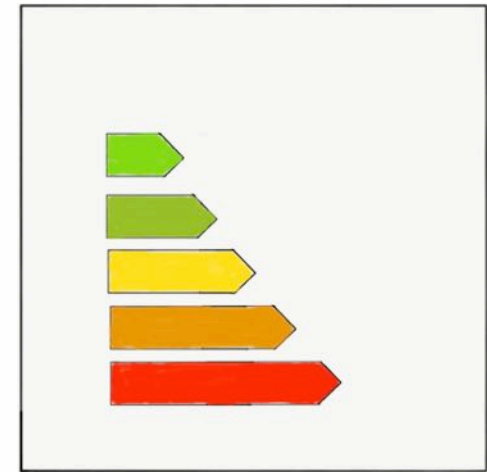
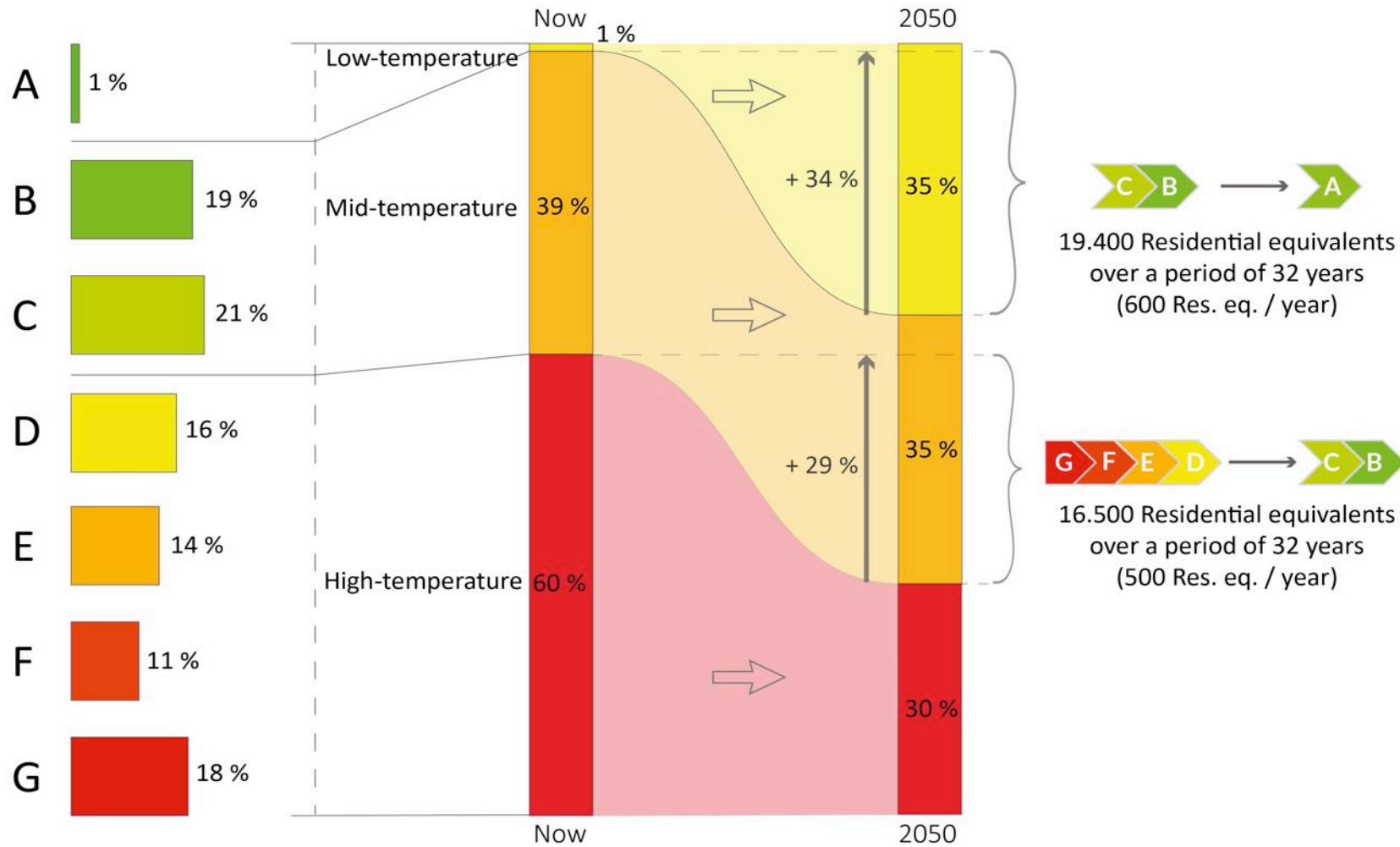
HT = > 65°C

MT = 40°C - 65°C

LT = < 45°C



Required energy renovations of building stock towards 2050



Building stock

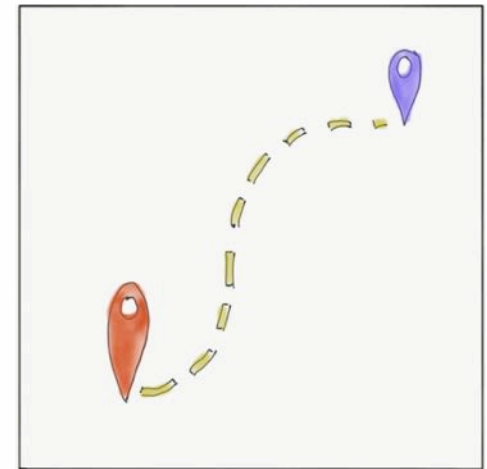
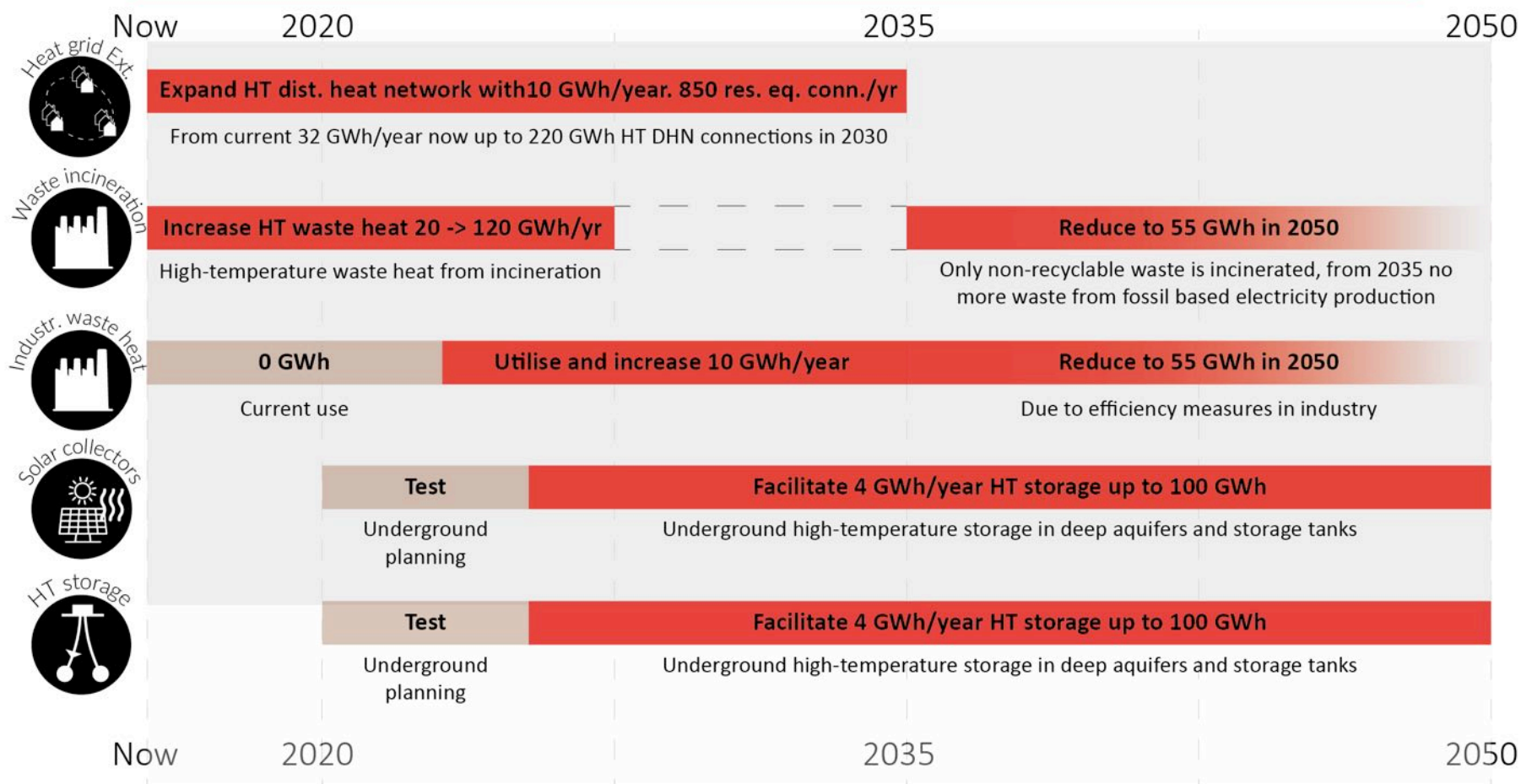
57000 residential unit equivalents of which:

26000 residential

31000 non-residential



Roadmap for sustainable heating (HT) of Roeselare's current building stock



Main measures

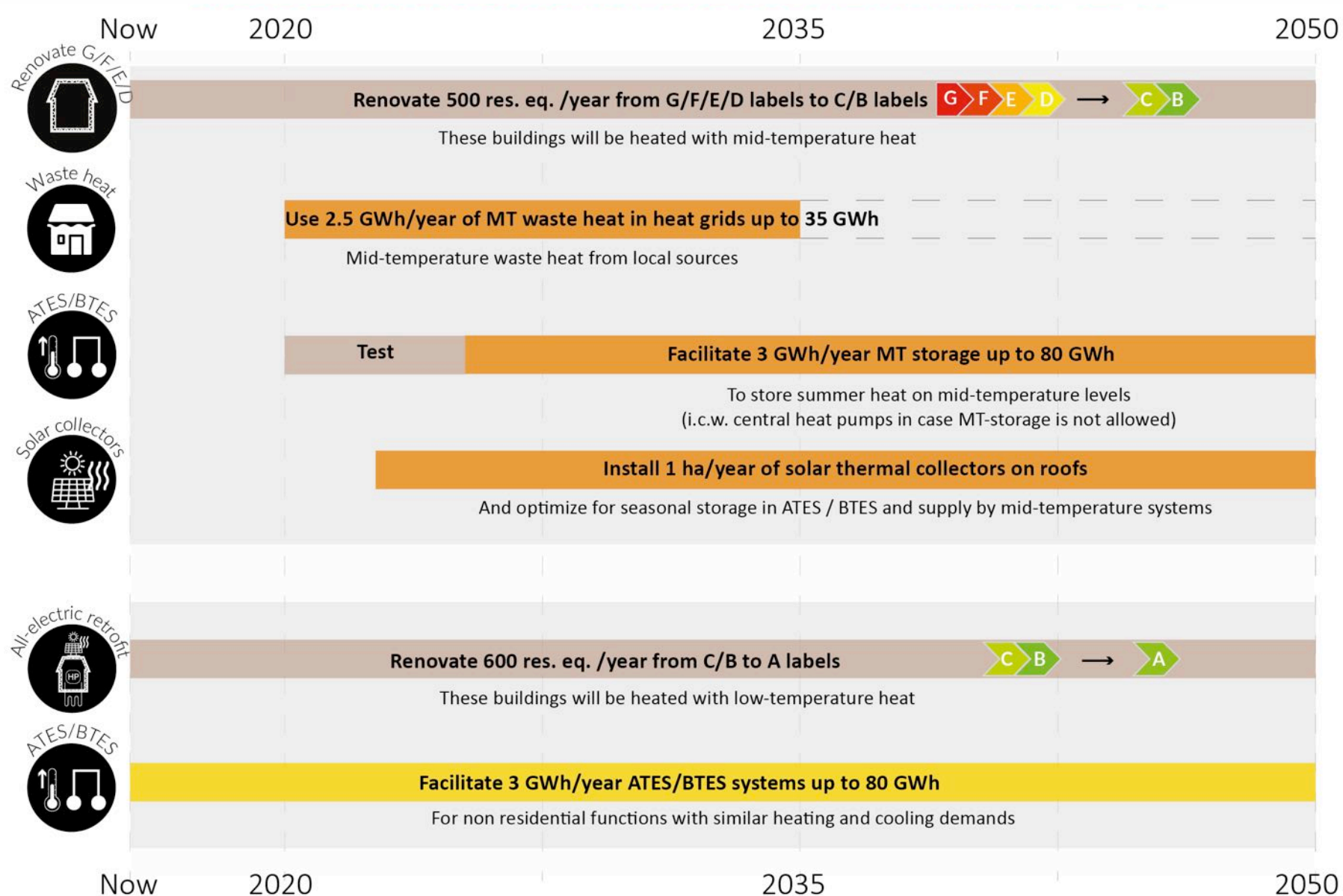
DHN extension

Maximize waste heat use of industrial waste by 2035

Partly reduced and replaced by solar heat and underground storage towards 2050



Roadmap for sustainable heating (MT + LT) of Roeselare's current building stock



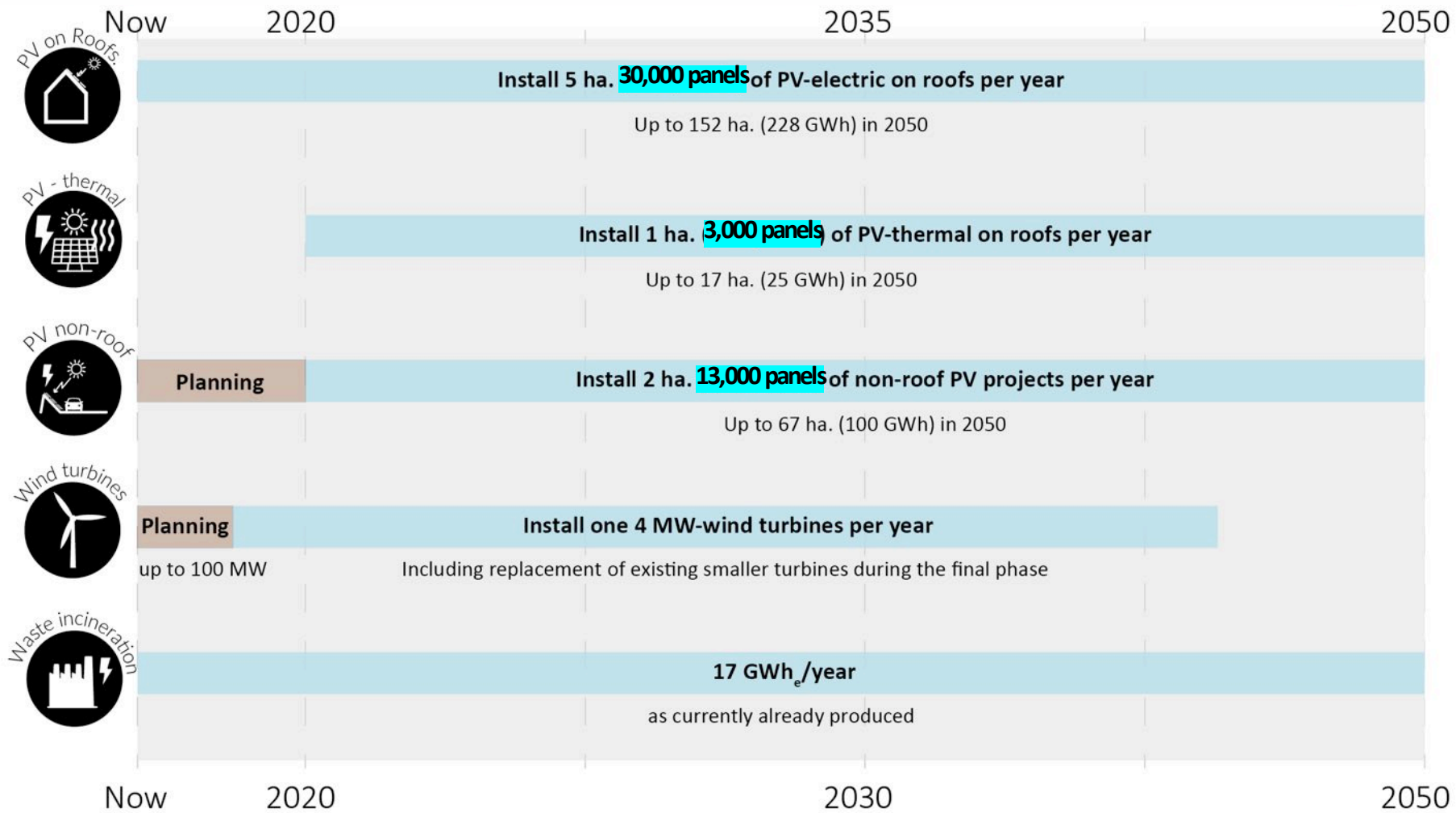
Main measures

60% of building stock moderately renovated by 2050

Solar collectors and MT-storage in underground



Roadmap for sustainable electricity production in Roeselare



Main measures

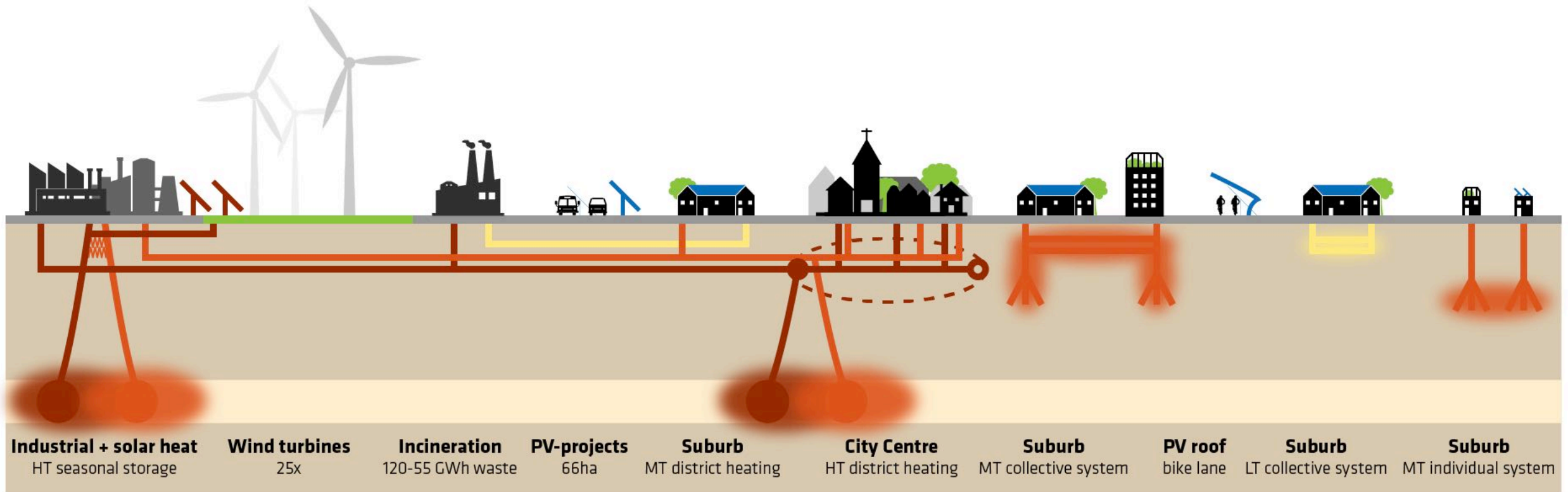
235 ha PV panels

25 4MW Wind Turbines

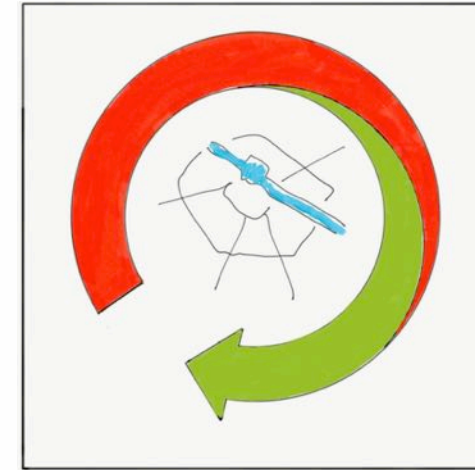
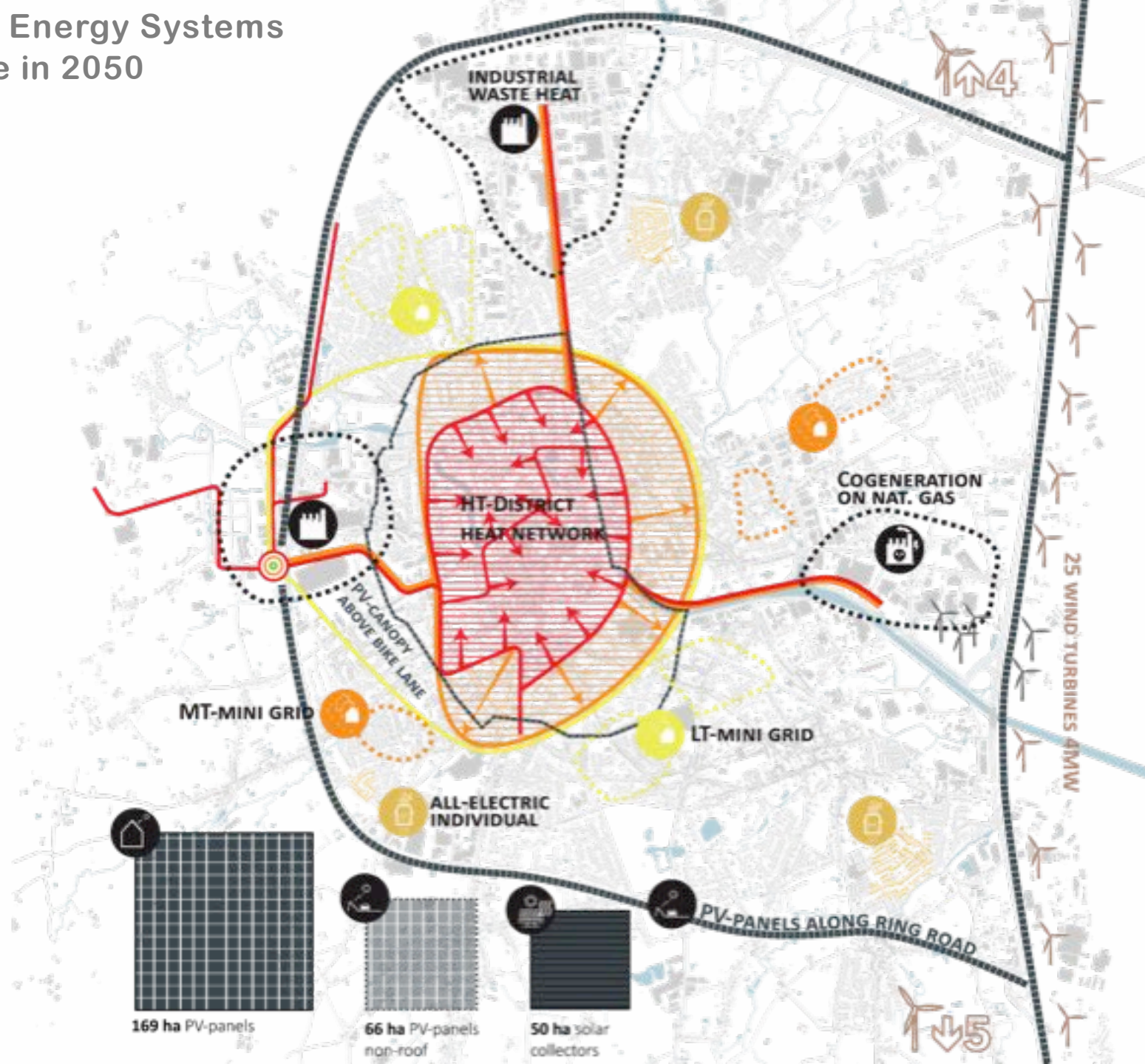
17 GWh-e from Waste Incineration



Schematic section of Roeselare's sustainable energy systems in 2050



Sustainable Energy Systems in Roeselare in 2050



Main directions

Central HT-DHN
Cascaded to

235 ha PV panels

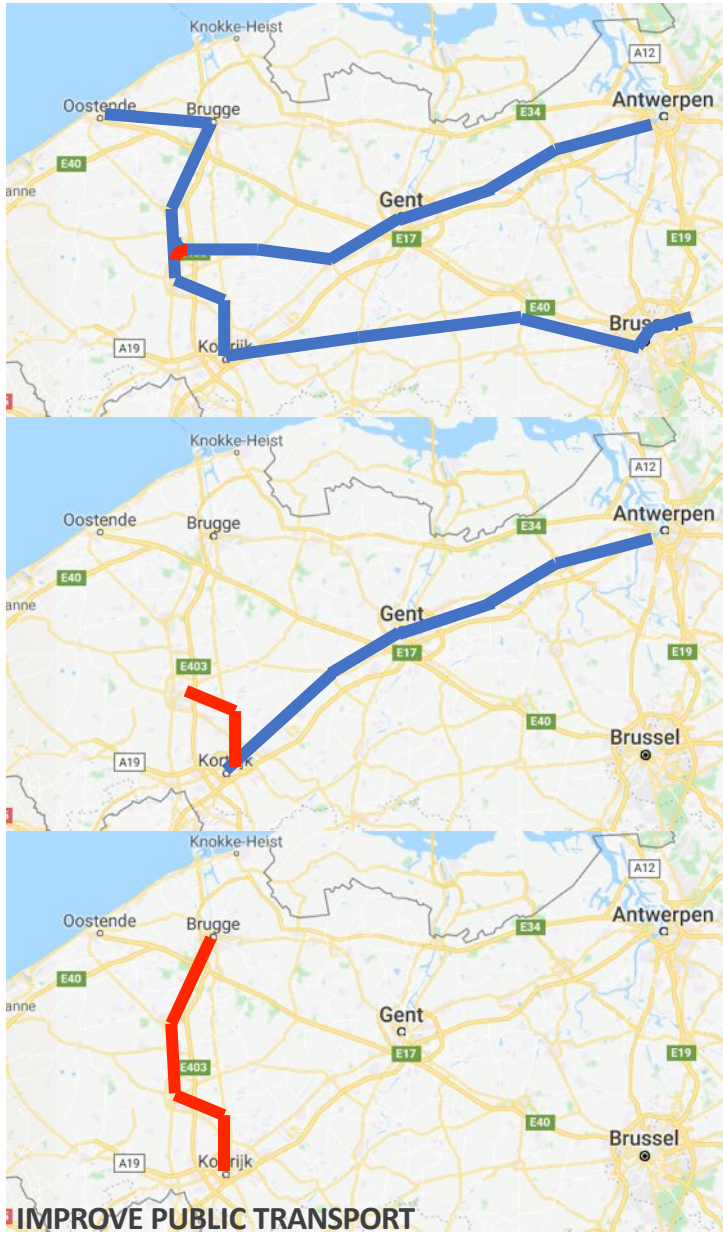
25 4MW Wind Turbines

17 GWh-e from Waste
Incineration

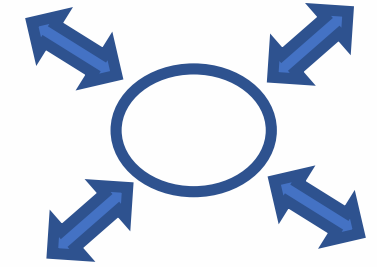
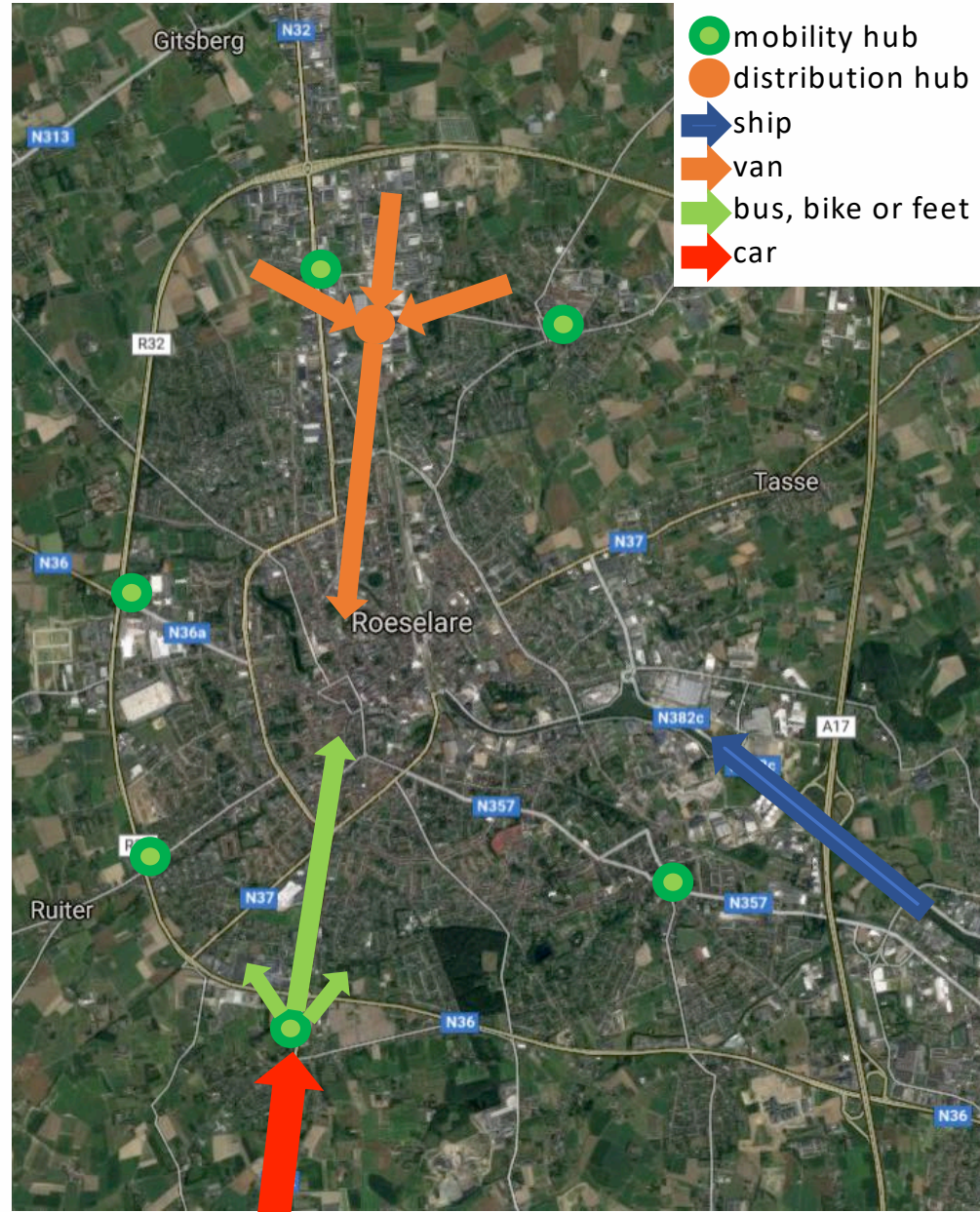


Roeselare, Belgium. April 2018

Sustainable transport and mobility



Energy strategy: Siebe Broersma MSc, Technical University, Delft.



Regional connectivity

People

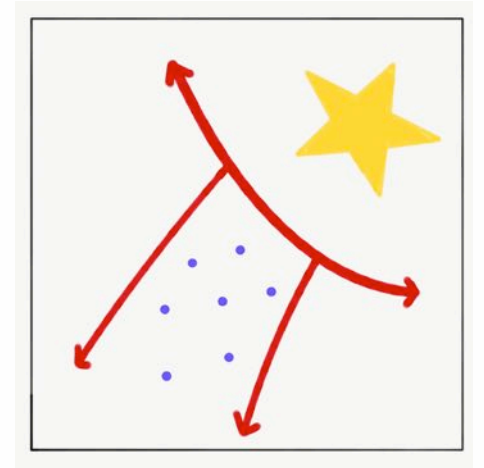
Packages

Heavy materials



Roeselare, Belgium. April 2018

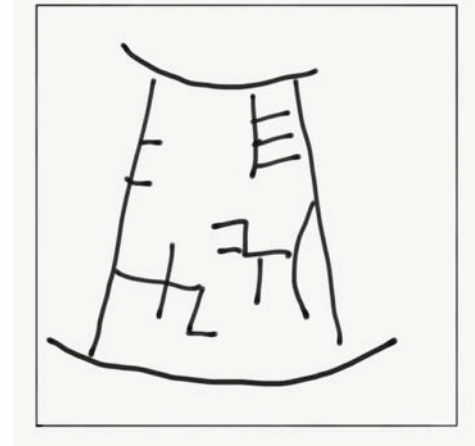
Urban Analysis



Urban
disconnection

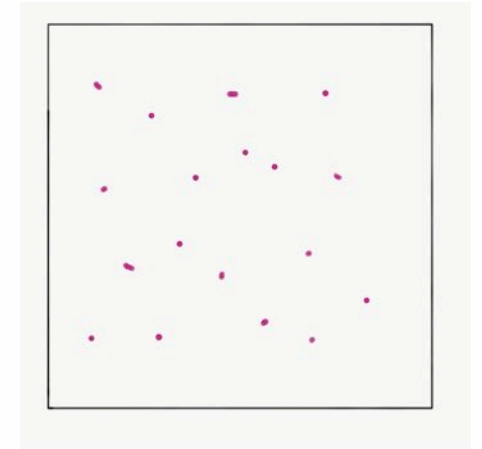


Urban Analysis



Neighbourhood
disconnection

Urban Analysis



Low Density

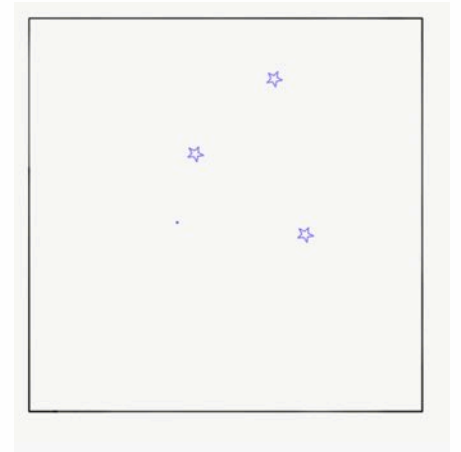
1300 Houses

85 Hectares

15 Homes/Ha



Urban Analysis



Low Intensity

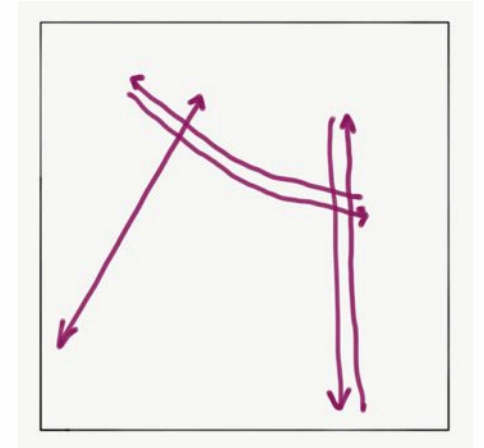
No bars

No cafes

No civic functions

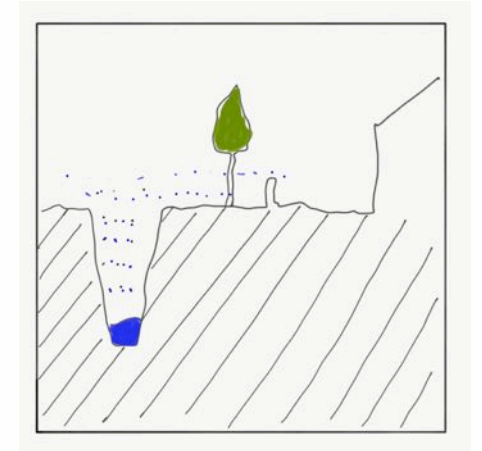


Urban Analysis



Over-engineered
Roads

Urban Analysis



Over-engineered
water ways

Flooding an issue

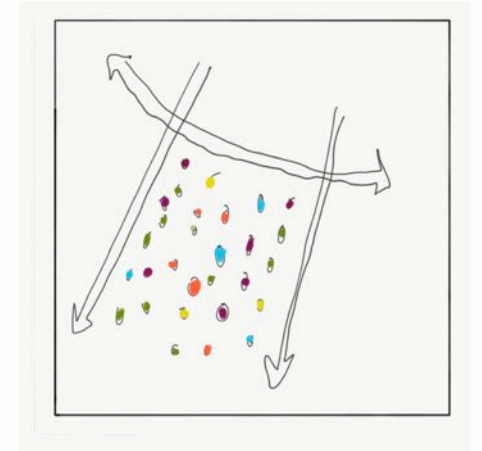


Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.



Roeselare, Belgium. April 2018

Urban Analysis



Empty but full

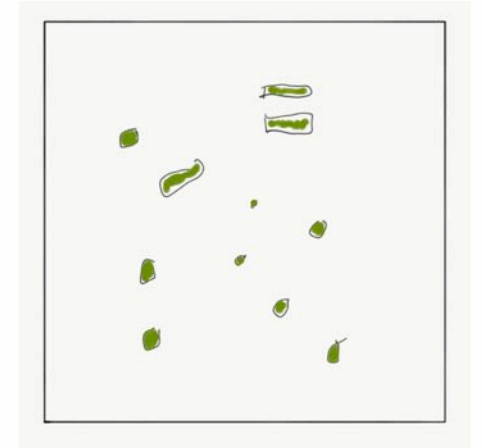
75 Homes/Ha

17 Hectares

68 Hectares empty



Urban Analysis



Small green spaces

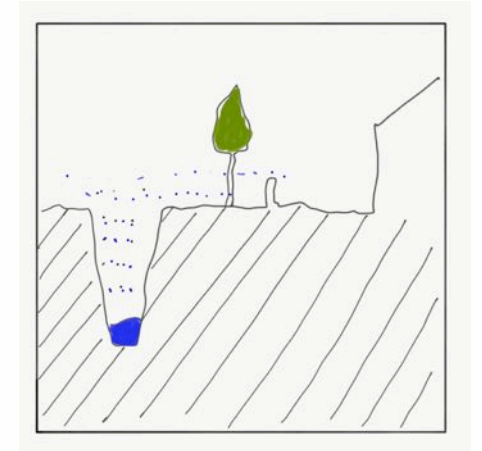
Individual gardens

Grass verges

Road infrastructure



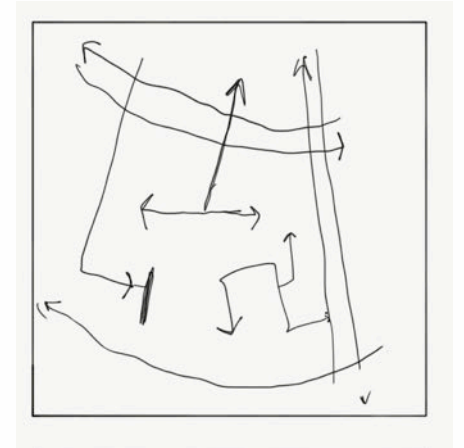
Urban Analysis



**Over-engineered
water ways**

Flooding issues

Urban Analysis

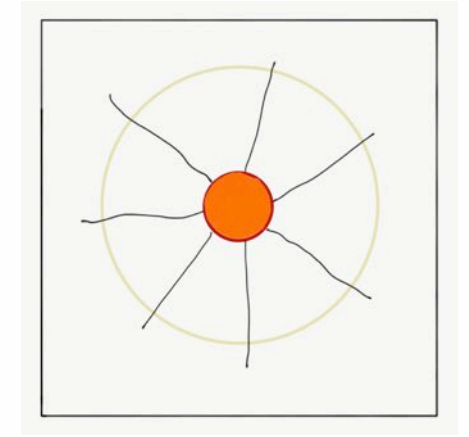
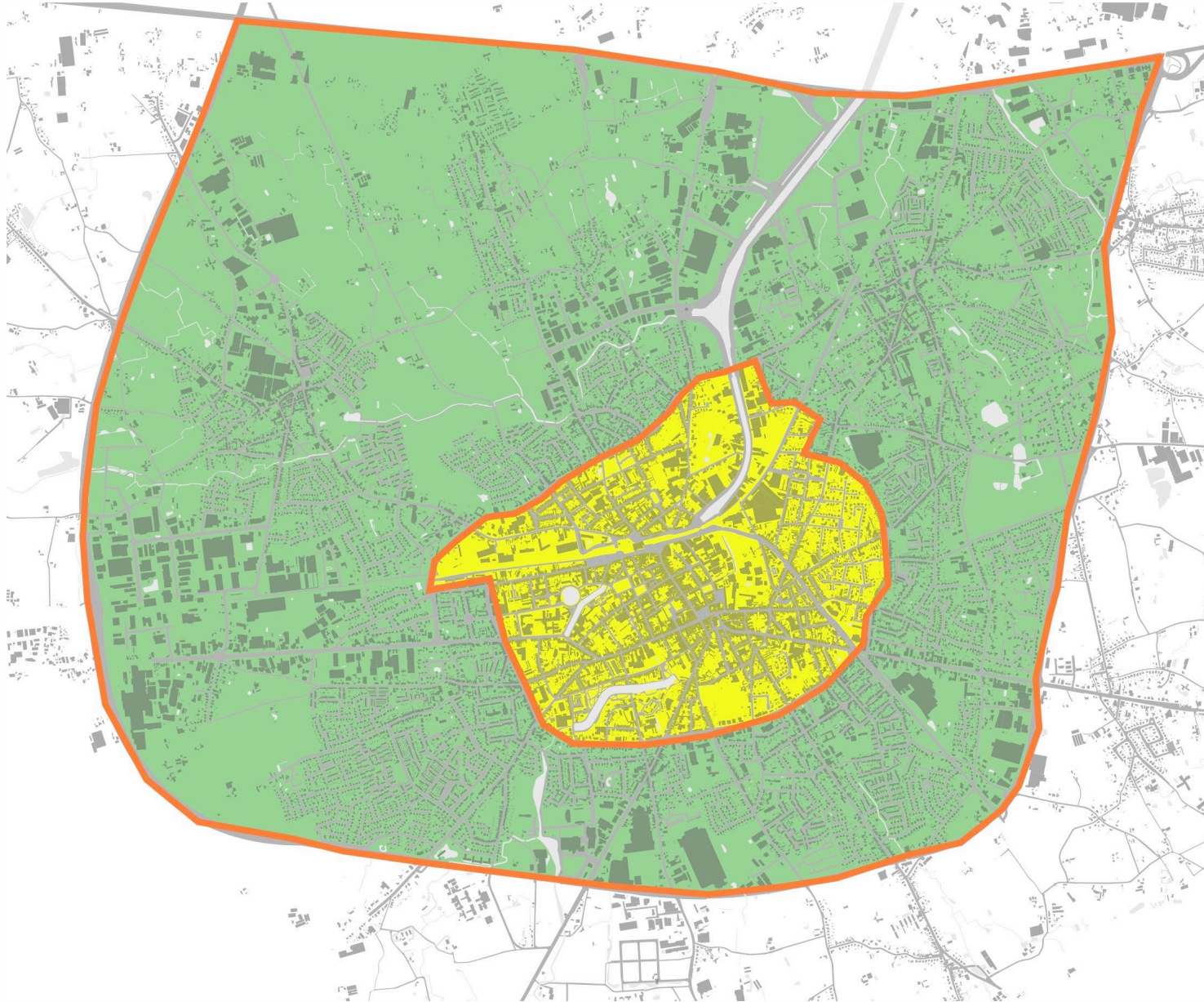


Car-orientated

Highest mobility impact



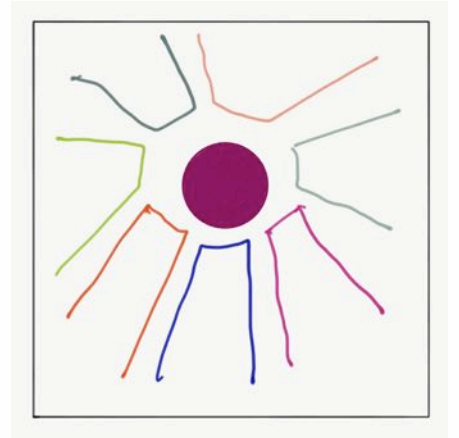
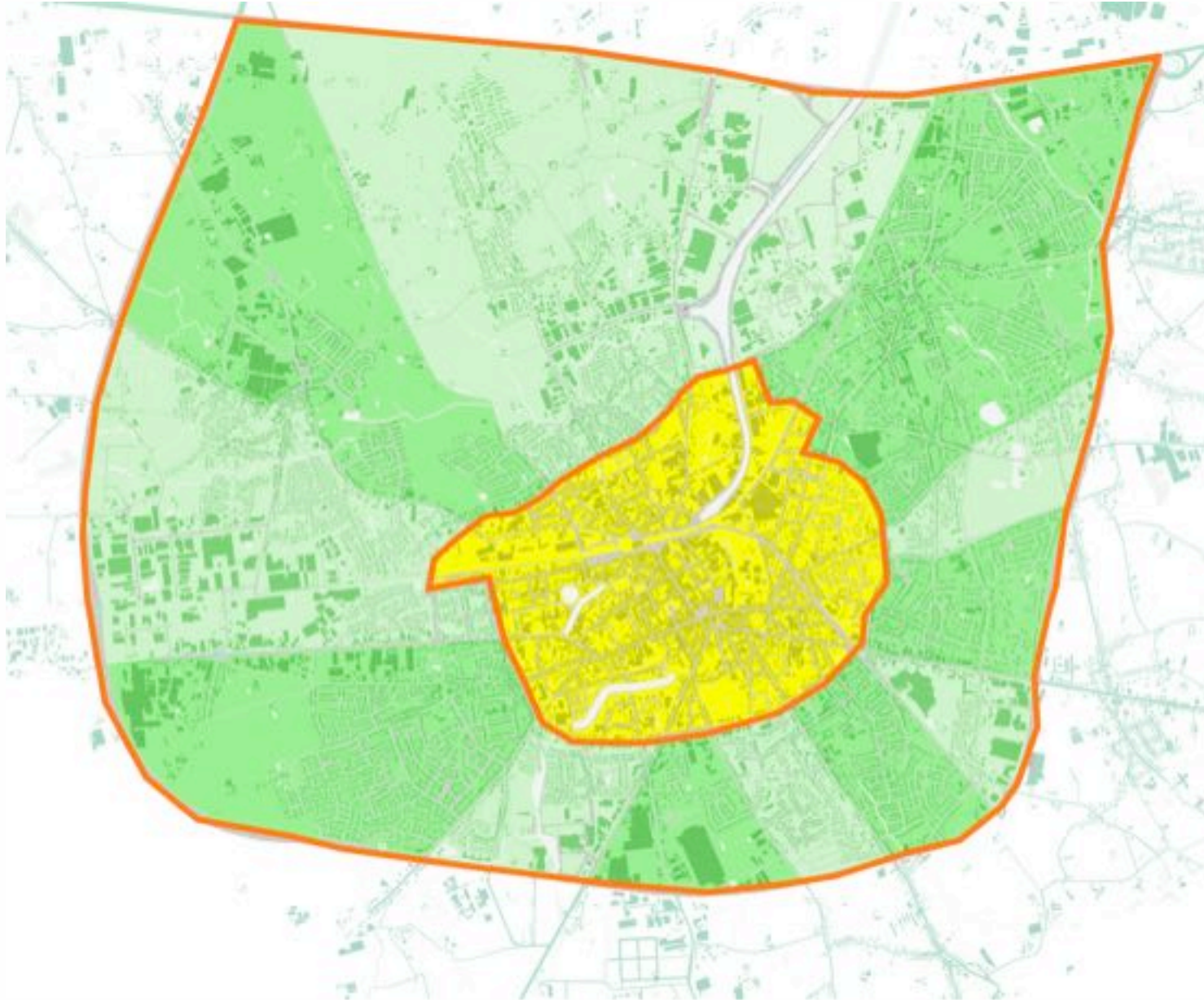
Urban Analysis



Egg-like structure

Neighbourhood is isolated, both from city and nature

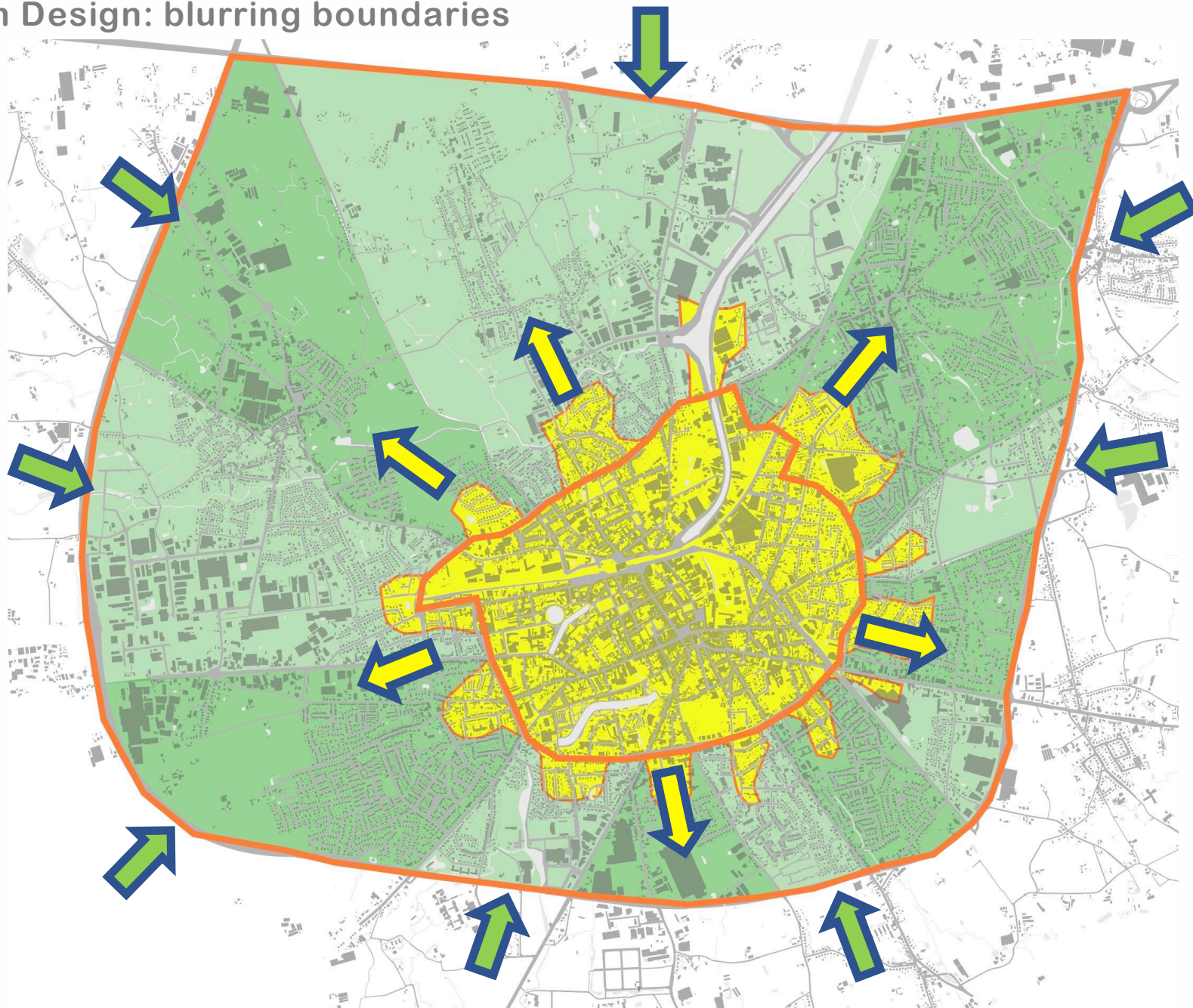
Urban Analysis



City of bits

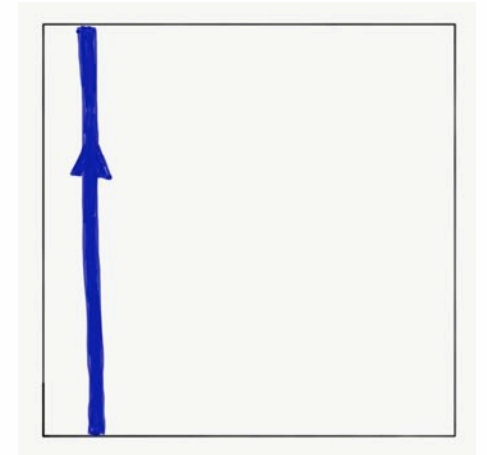
Very little contact
between
neighbourhoods

Urban Design: blurring boundaries



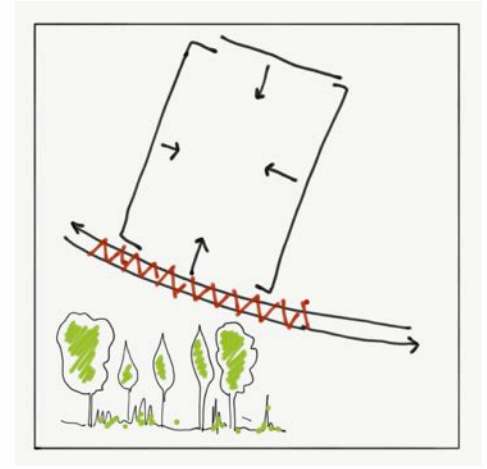
Star-city

Urban Analysis



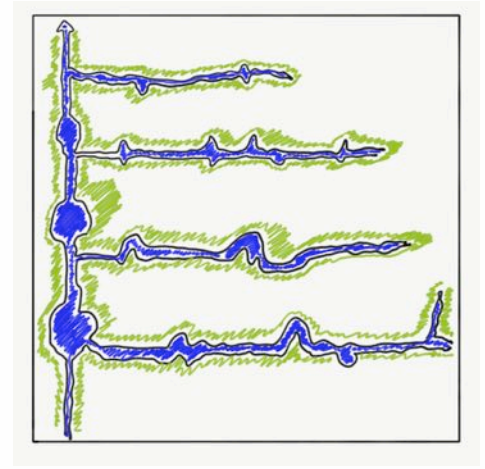
No nature

Urban Analysis



Isolated from nature

Urban Design: flood proofing naturally



Sustainable urban drainage

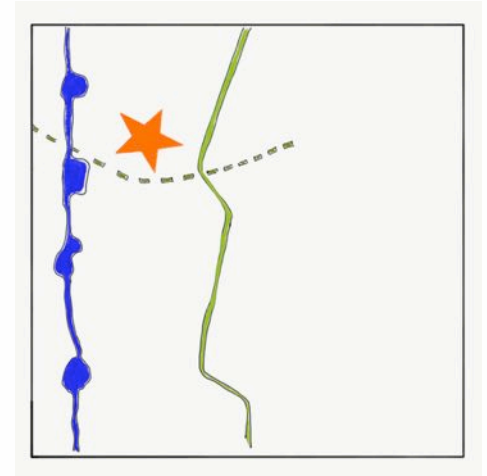
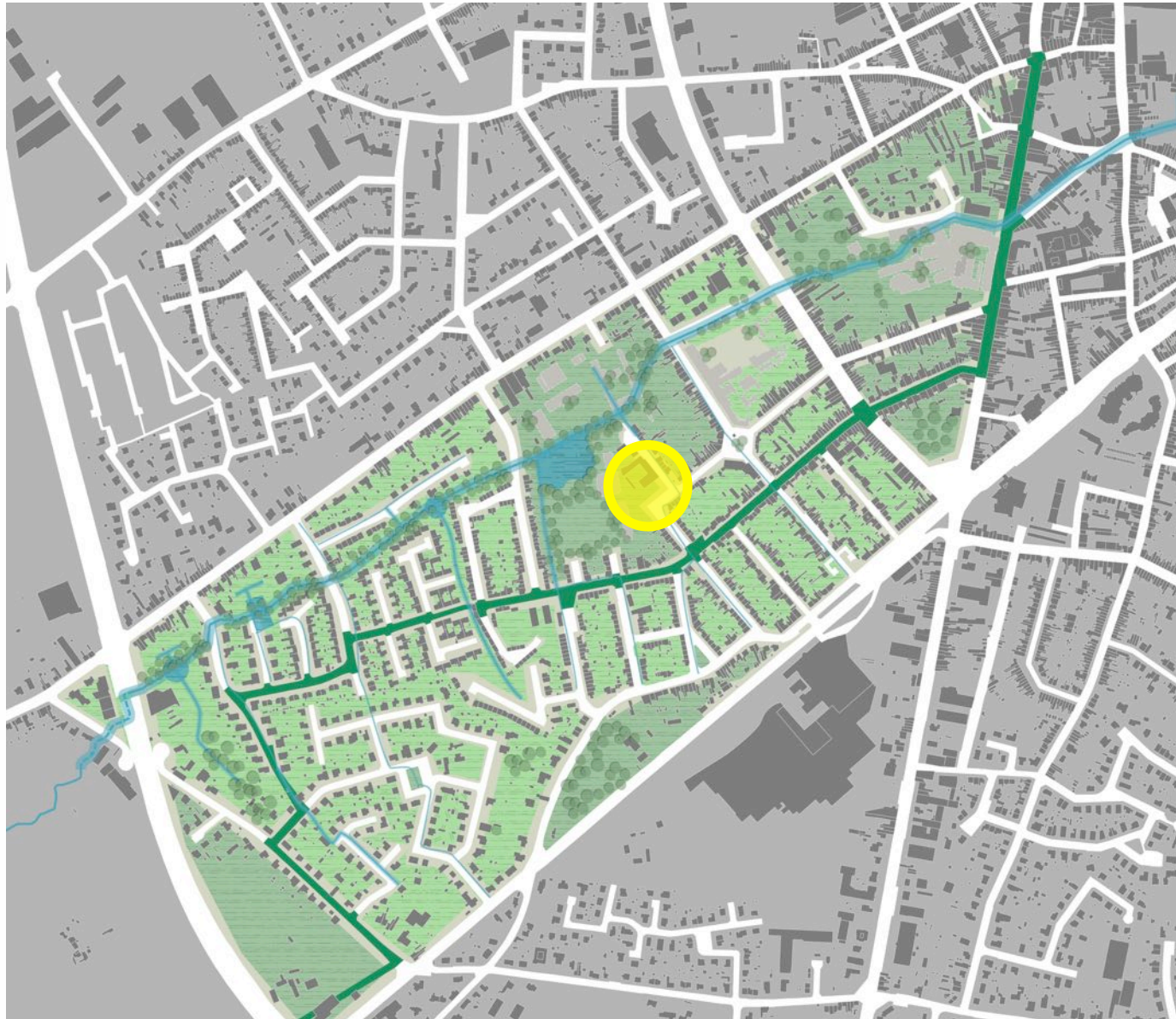
Cheap

Easy

Bio-diverse



Urban MOves



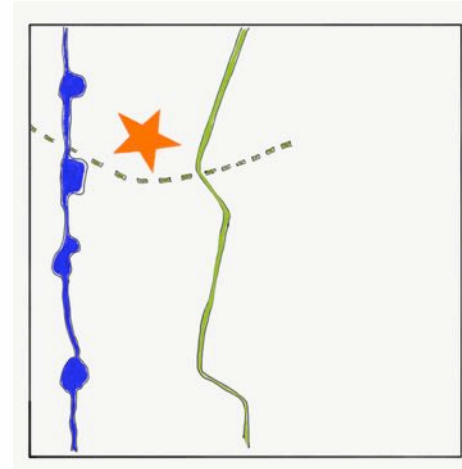
Interface between blue and green

Create blue route

Create Green cycle route

Connect in neighbourhood





Community Agora

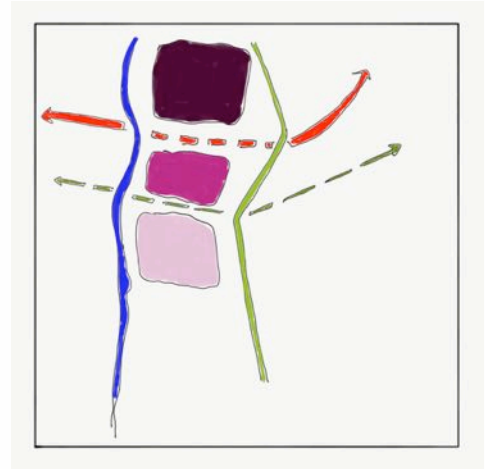
Food focussed
neighbourhood

Community food
trading

Paddy field



Urban Design



Blurred boundaries

Bring city to
neighbourhood

Bring
neighbourhood to
city

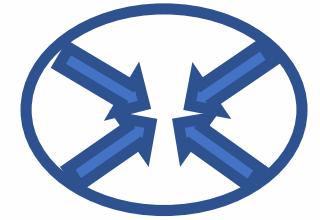
Increase density



Modal shift provides urban space



Source: www.verkehrswende-ev.de



Neighbourhood connectivity

Social

Safe

Healthy



Source: www.wegcode.be



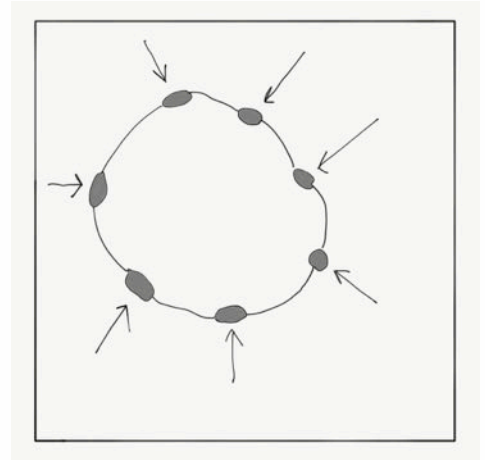
Source: <http://www.iedereengorilla.be/>



Urban Analysis



Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.



No need to visit

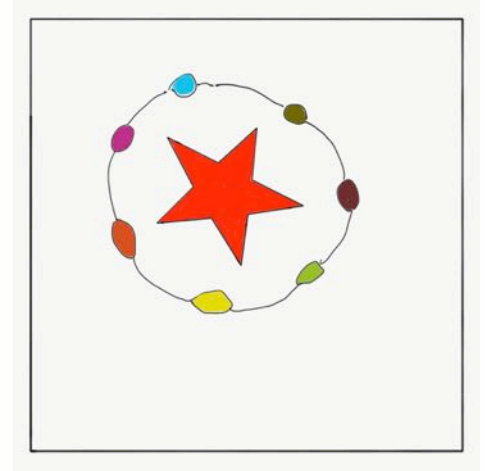
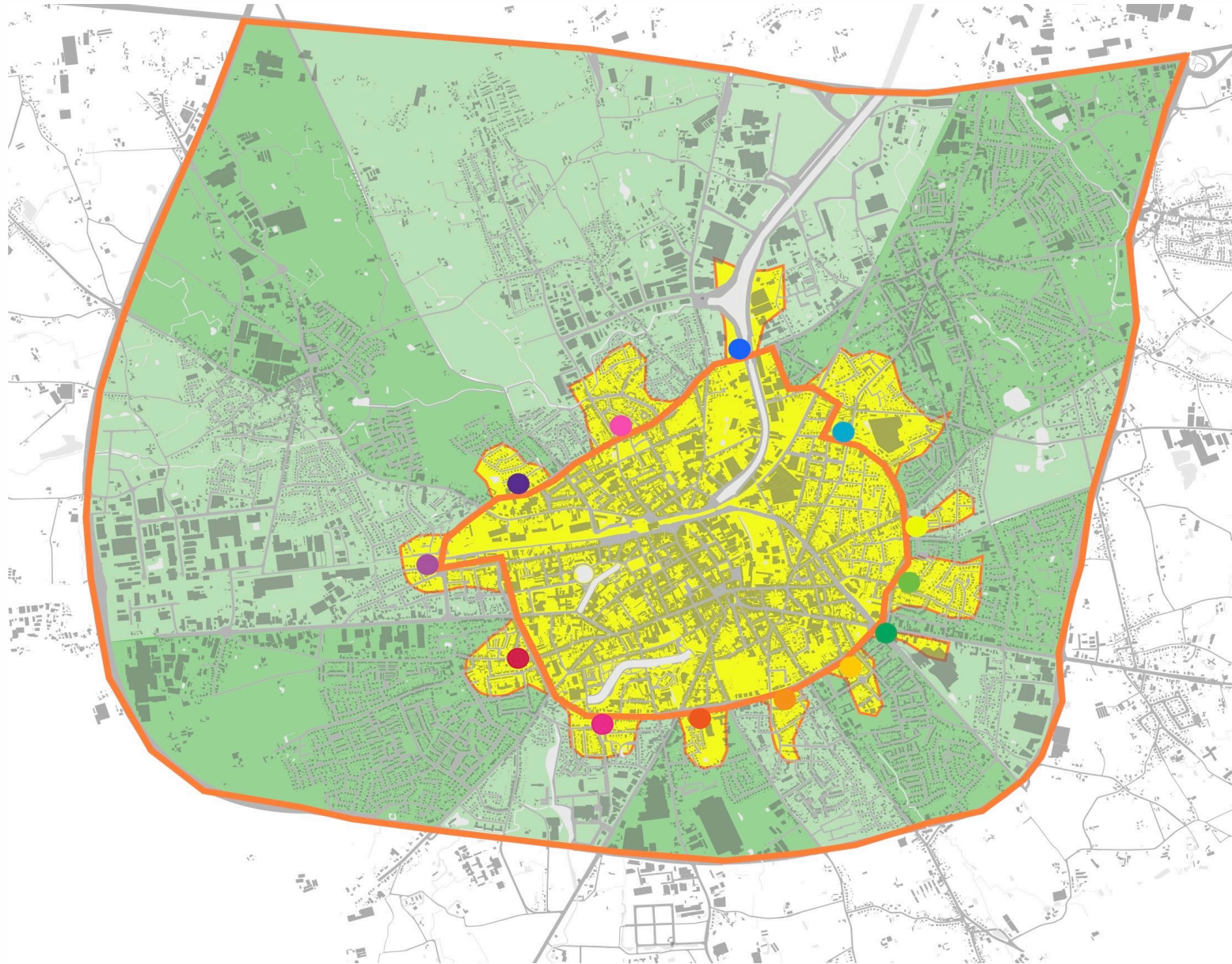
Very generic

No difference



Roeselare, Belgium. April 2018

Urban Design: New green ring of exciting neighbourhoods



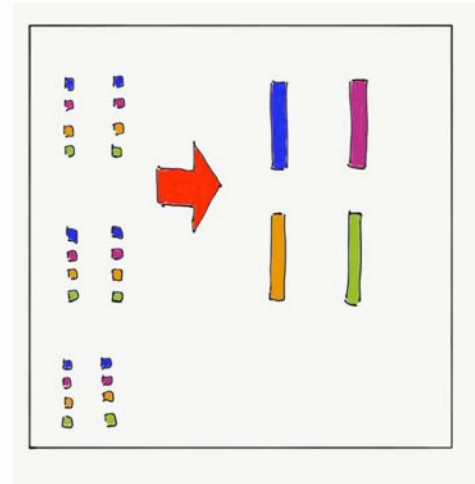
New green ring

Lots of reasons to visit!

Each neighbourhood is individual and productive!



Urban Proposal Super sharing, low impact, urban agriculture neighbourhood

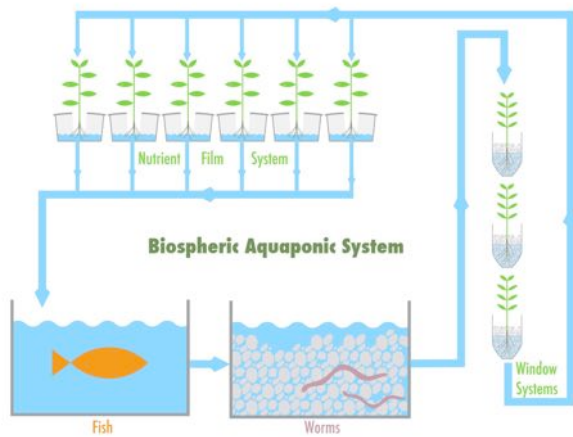


Shared surface

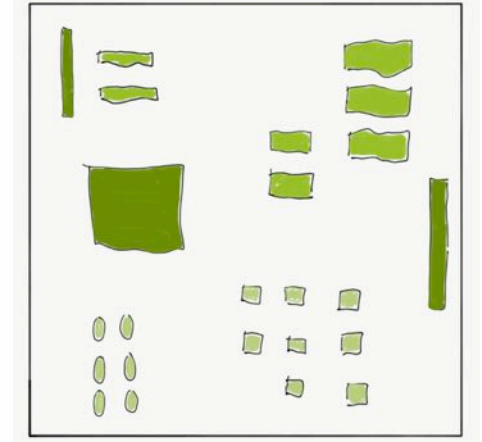
Productive

Flood proof

Community focussed



Urban agriculture: low impact with technical food systems



Productive Landscapes

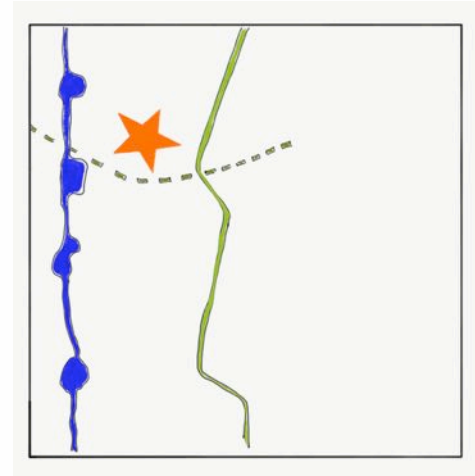
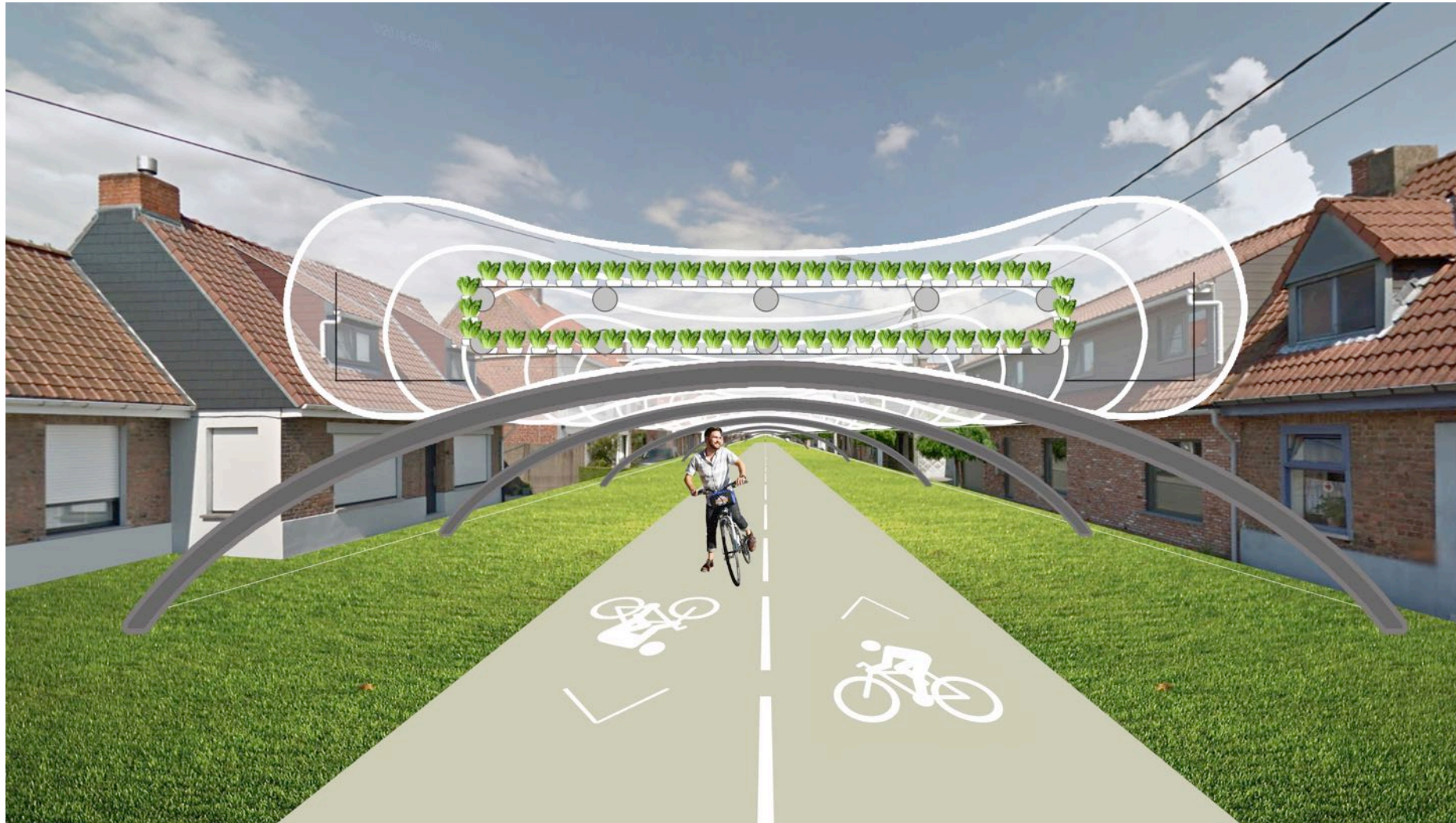
Urban Castles

Productive street systems

Techno terps



Urban Design. Aquaponic people first highways

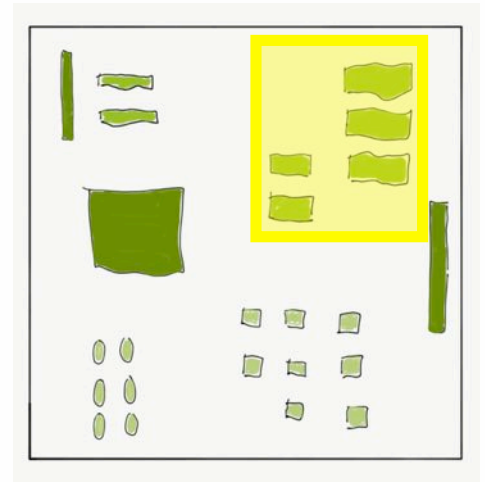


Urban Agriculture everywhere

Aquaponic cycleway



Urban Design - Blue Green castles



Consolidation of green space

Energy renovation

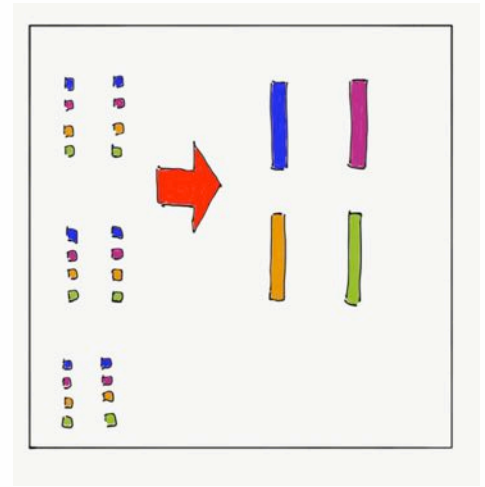
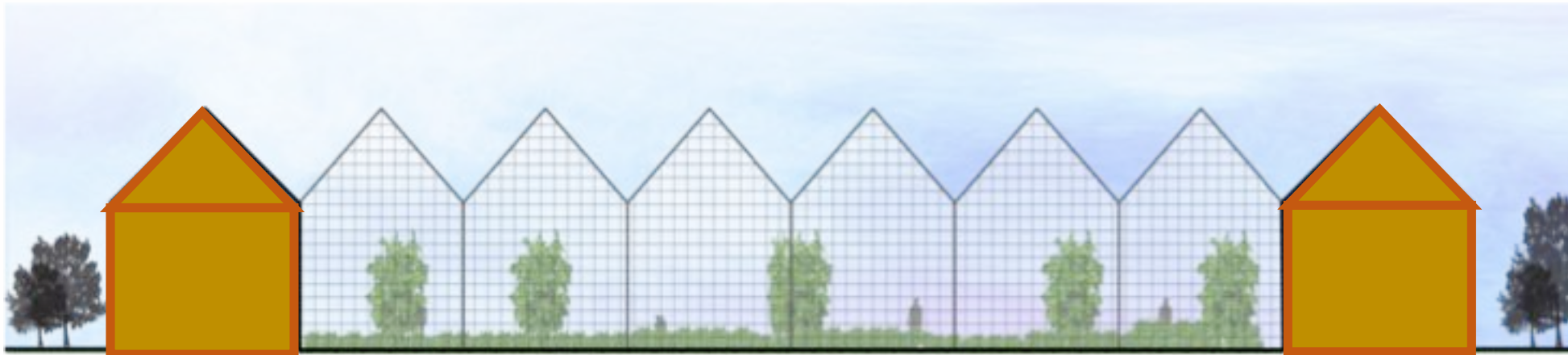
Urban Agriculture

Community focussed

Sharing



Urban Design - Blue Green castles



Sharing

Energy

Food

Community



All-electric self-sufficient renovation – *Green blue castle*

Main measures

PV-Thermal roof

Collective Heat pump

Triple glazing

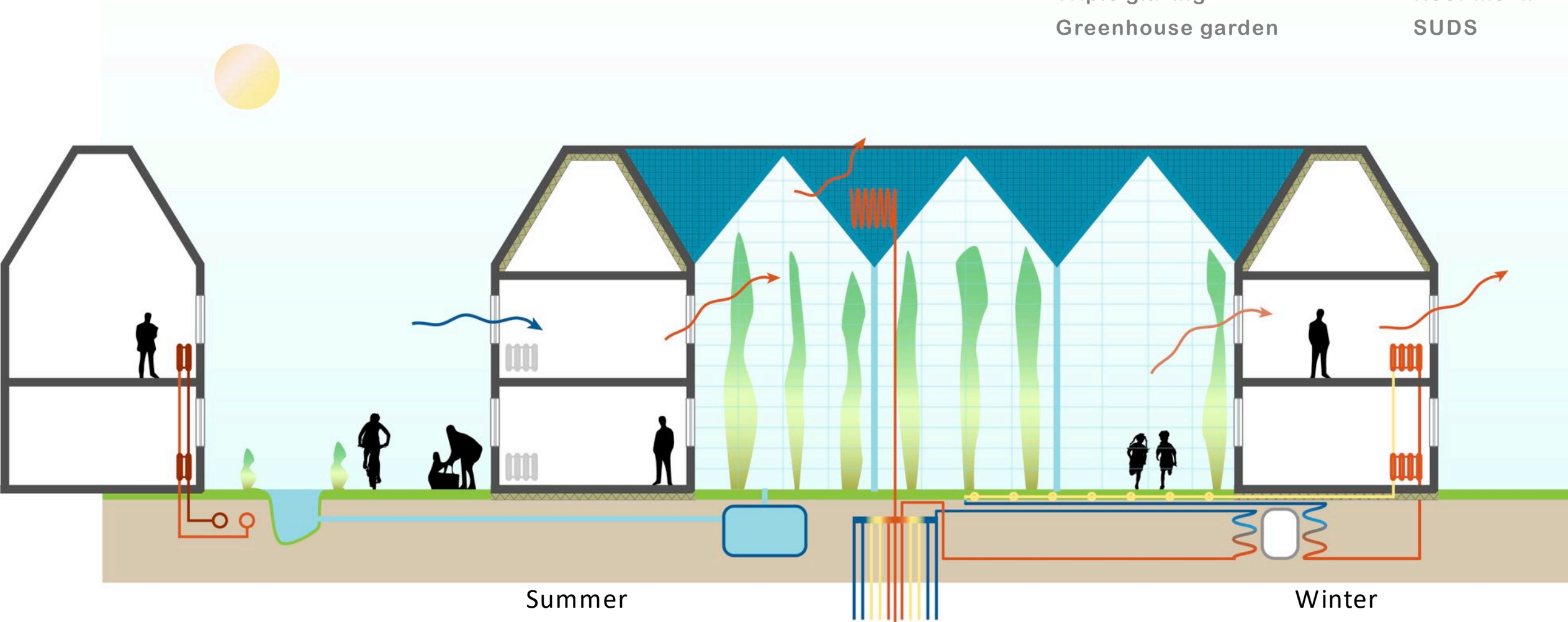
Greenhouse garden

BTES

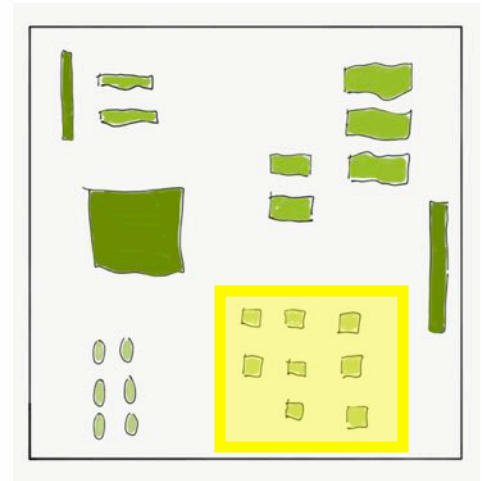
DHW booster

Roof insul.

SUDS



All-electric self-sufficient renovation – *Techno terp*



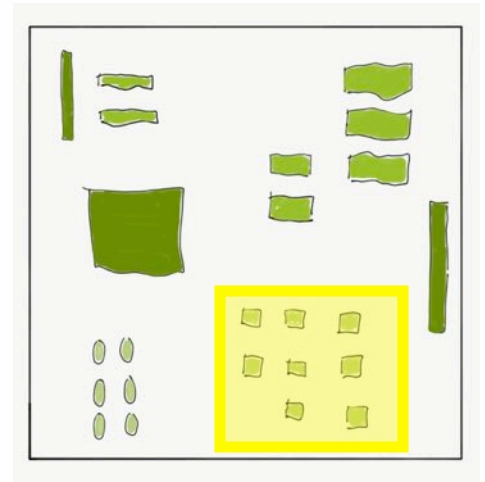
Consolidation of green space

List 1

List 2

List 3

All-electric self-sufficient renovation – *Techno terp*

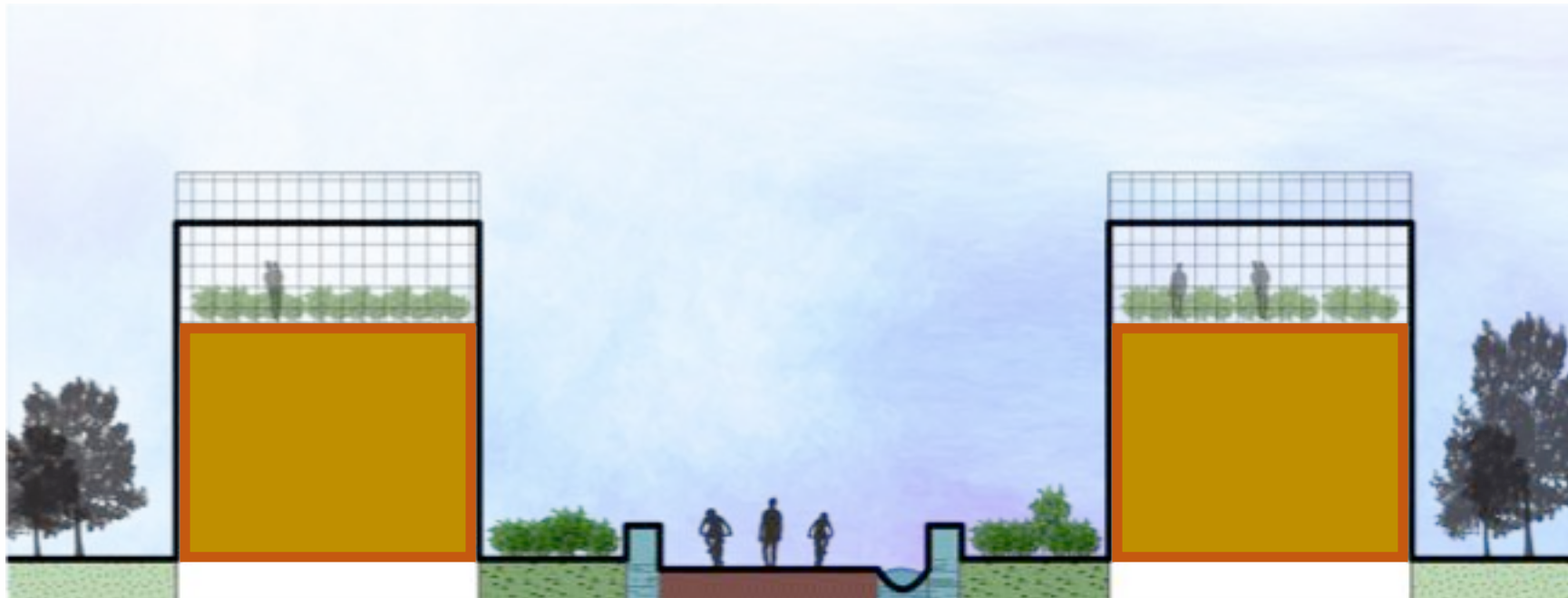


Techno terps

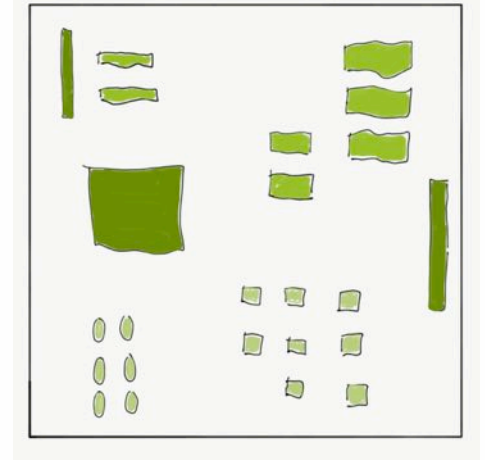
Technical food system with aquaponics

Fishtanks provide flood protection

Bio-swales in street



All-electric self-sufficient renovation – *Techno terp*



Techno terp

Independent energy

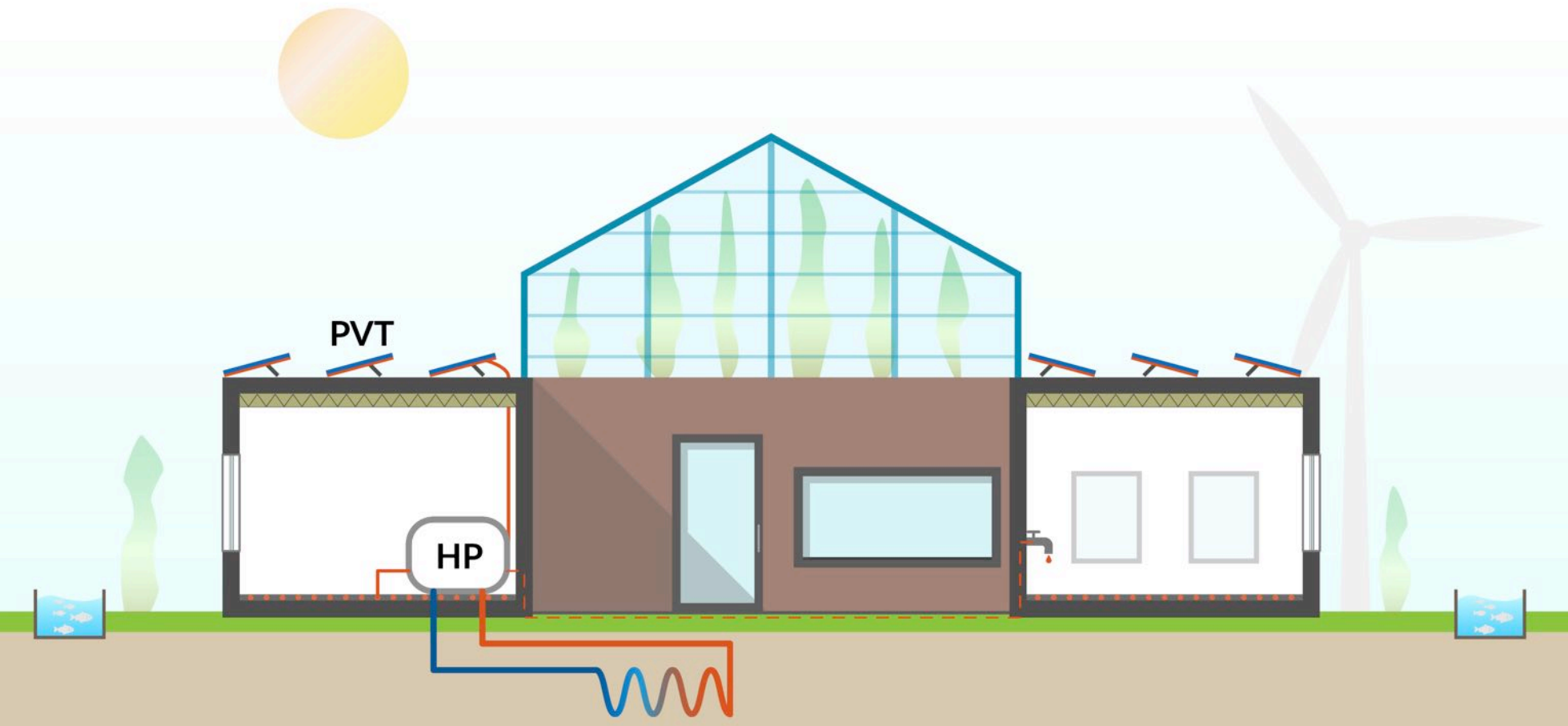
Aquaponic
greenhouse

Fish-tank flood barrier

SUDS



All-electric self-sufficient renovation – *Techno terp*



Main measures

PV-Thermal roof

Underground heat storage

Ground source HP

DHW booster

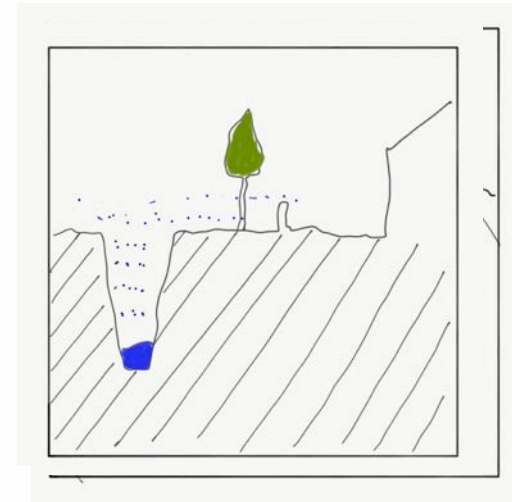
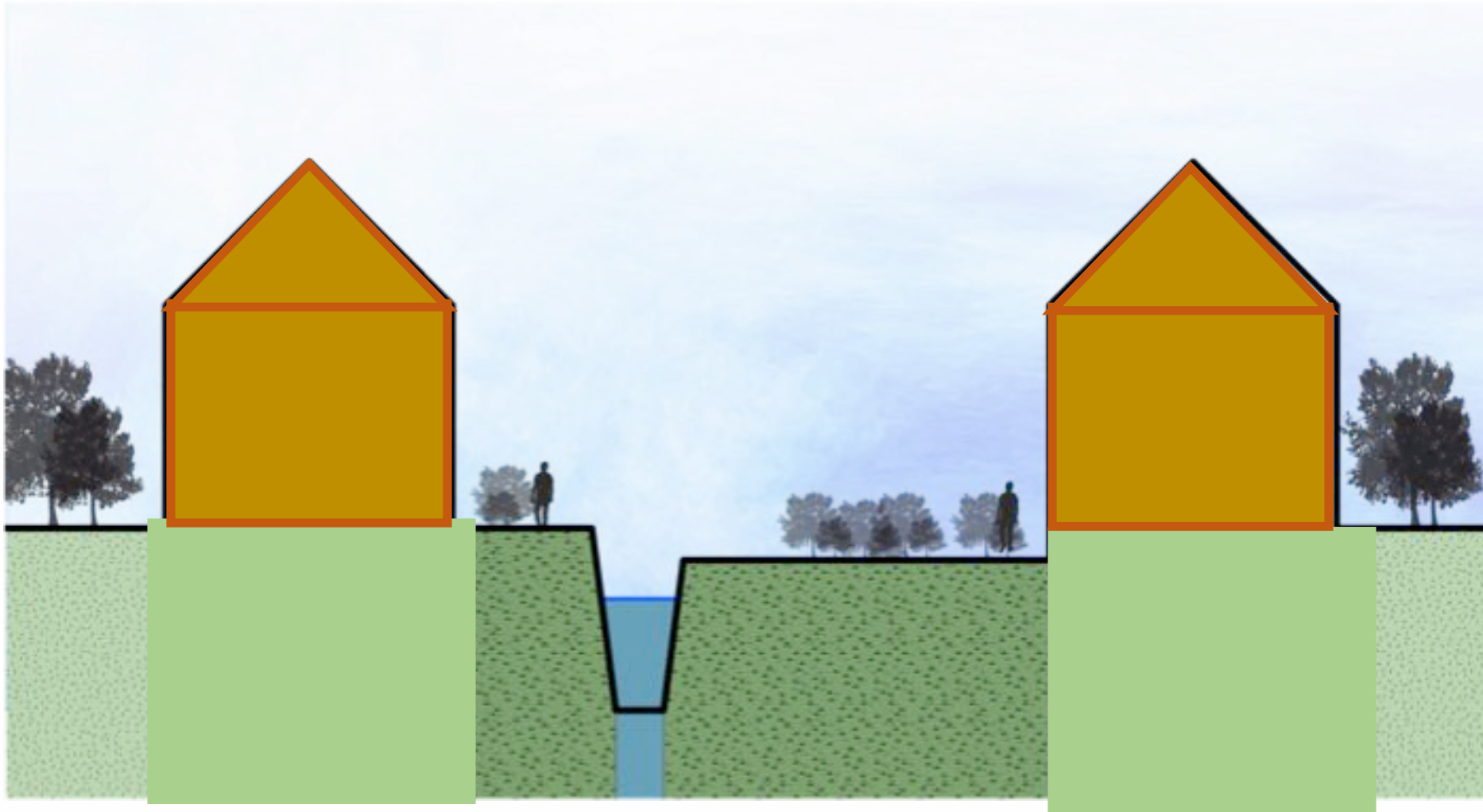
Greenhouse roof

Triple glazing + roof insul.

Aquaponics

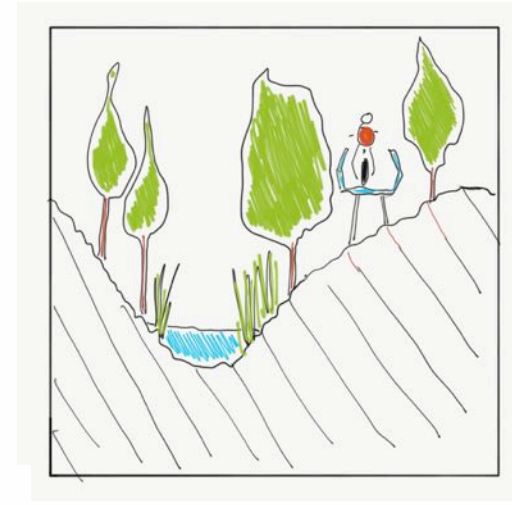
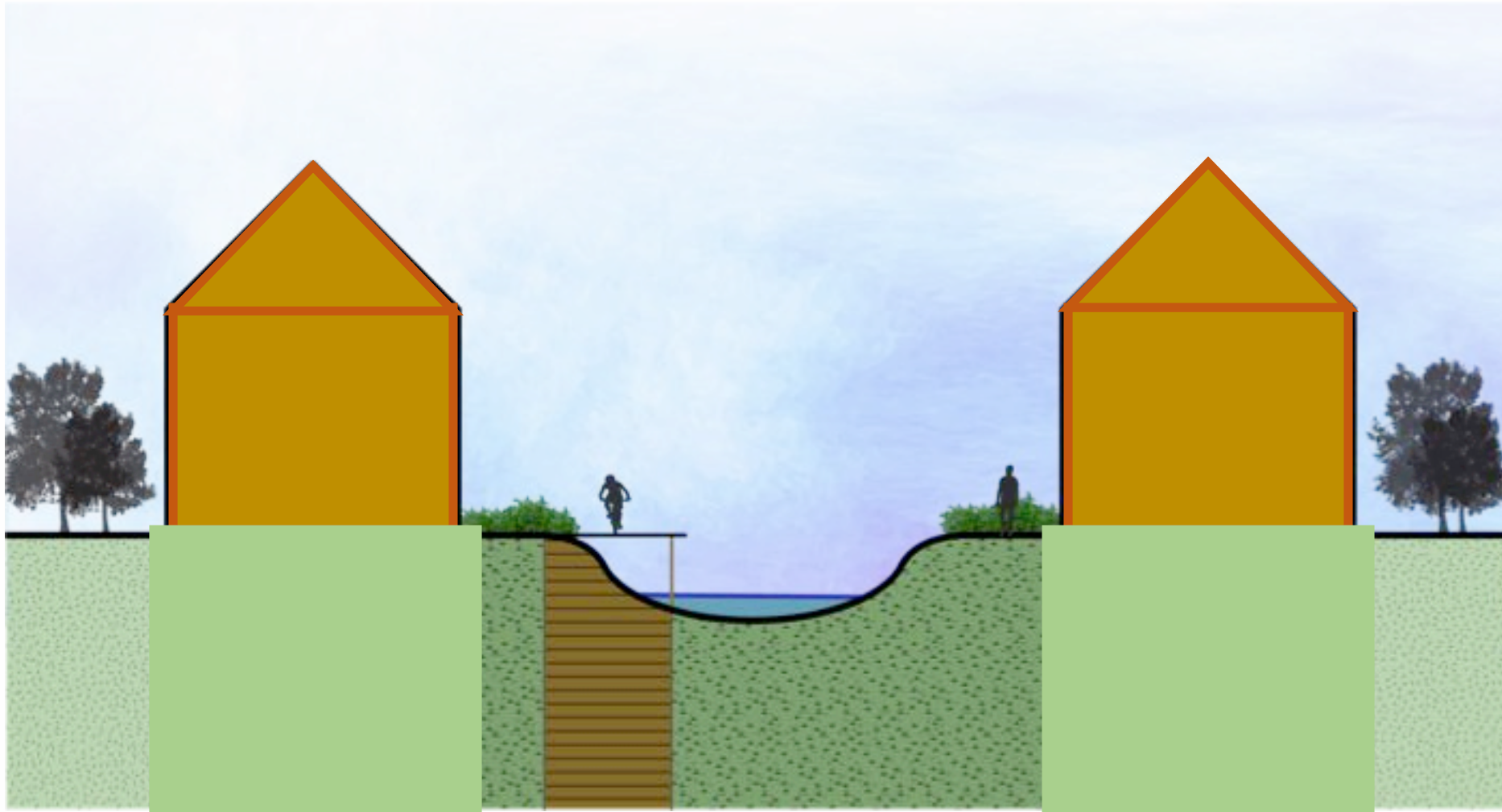


Urban Design



Unsafe and unnatural

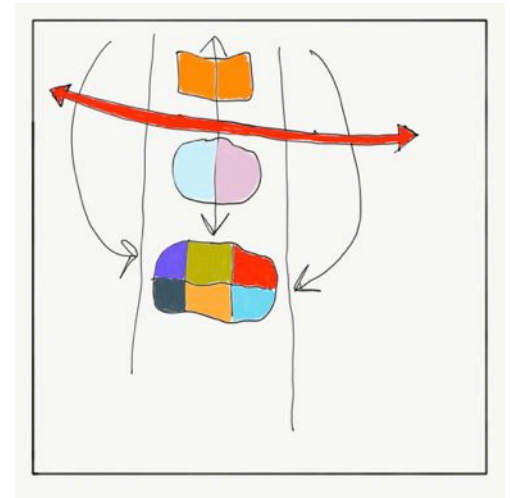
Urban Design



Safe and Natural



Urban Design



Unpacking the city into the neighbourhood

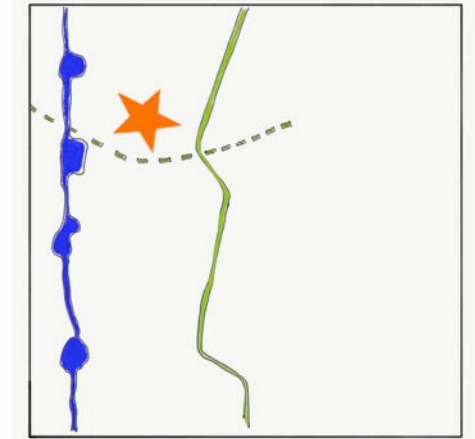
Increased intensity

Community services

Increased density

Reason to visit





Community Agora

Food focussed
neighbourhood

Community food
trading

Paddy fiels



All-electric self-sufficient renovation – *Collievijver agora*

Main measures

PV-Thermal roof

Waste heat from refrigeration

BTES

MT mini heat grid

Greenhouse roof

Water storage

Full PV-roof

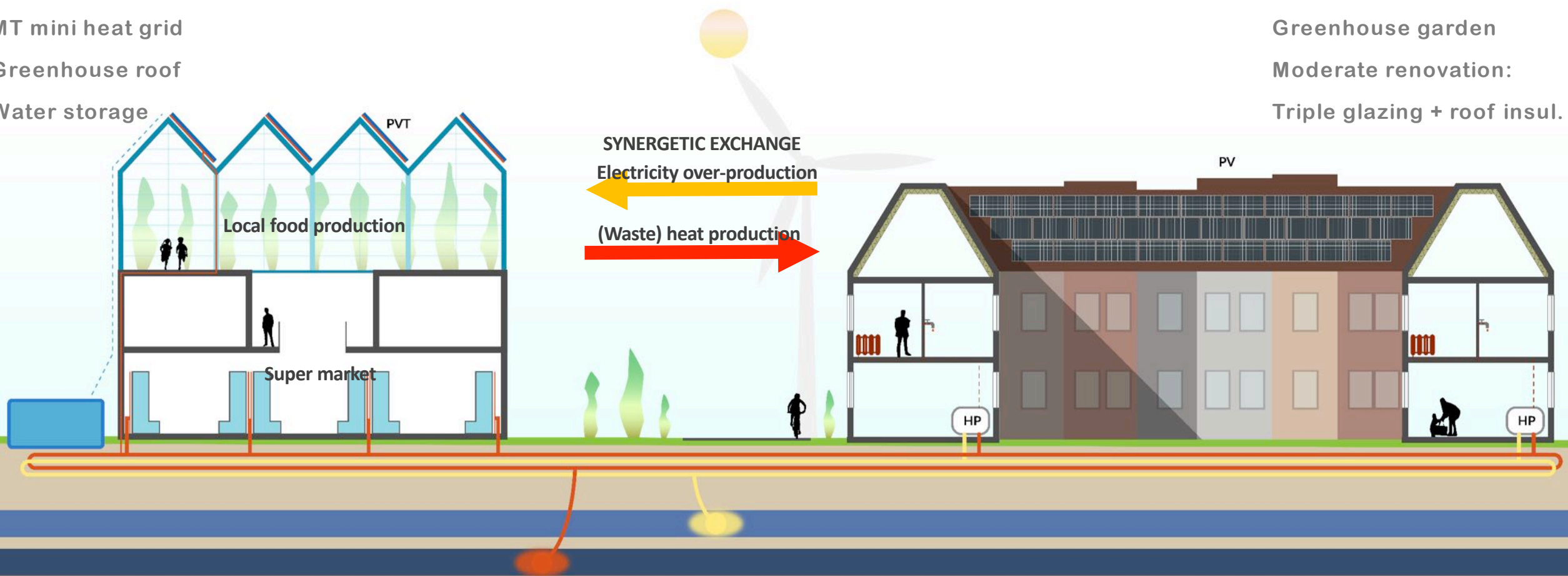
Collective Heat pump

DHW booster

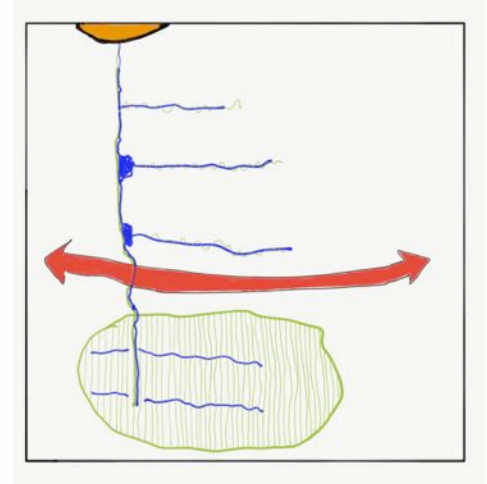
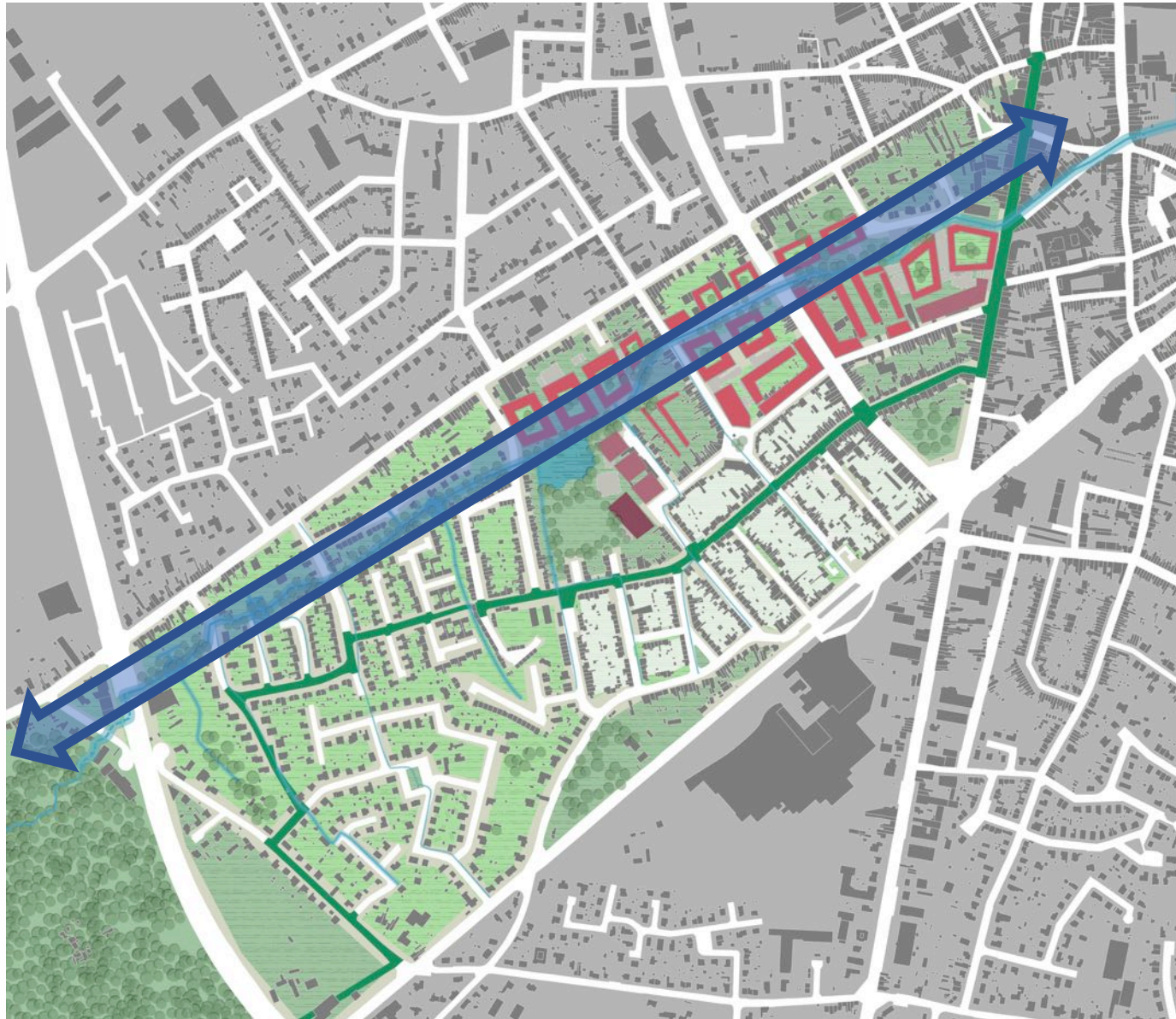
Greenhouse garden

Moderate renovation:

Triple glazing + roof insul.



Urban Design: nature reconnection



Enjoy the environmental tax!

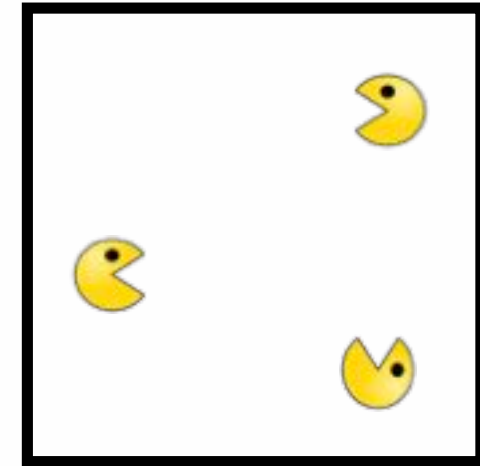
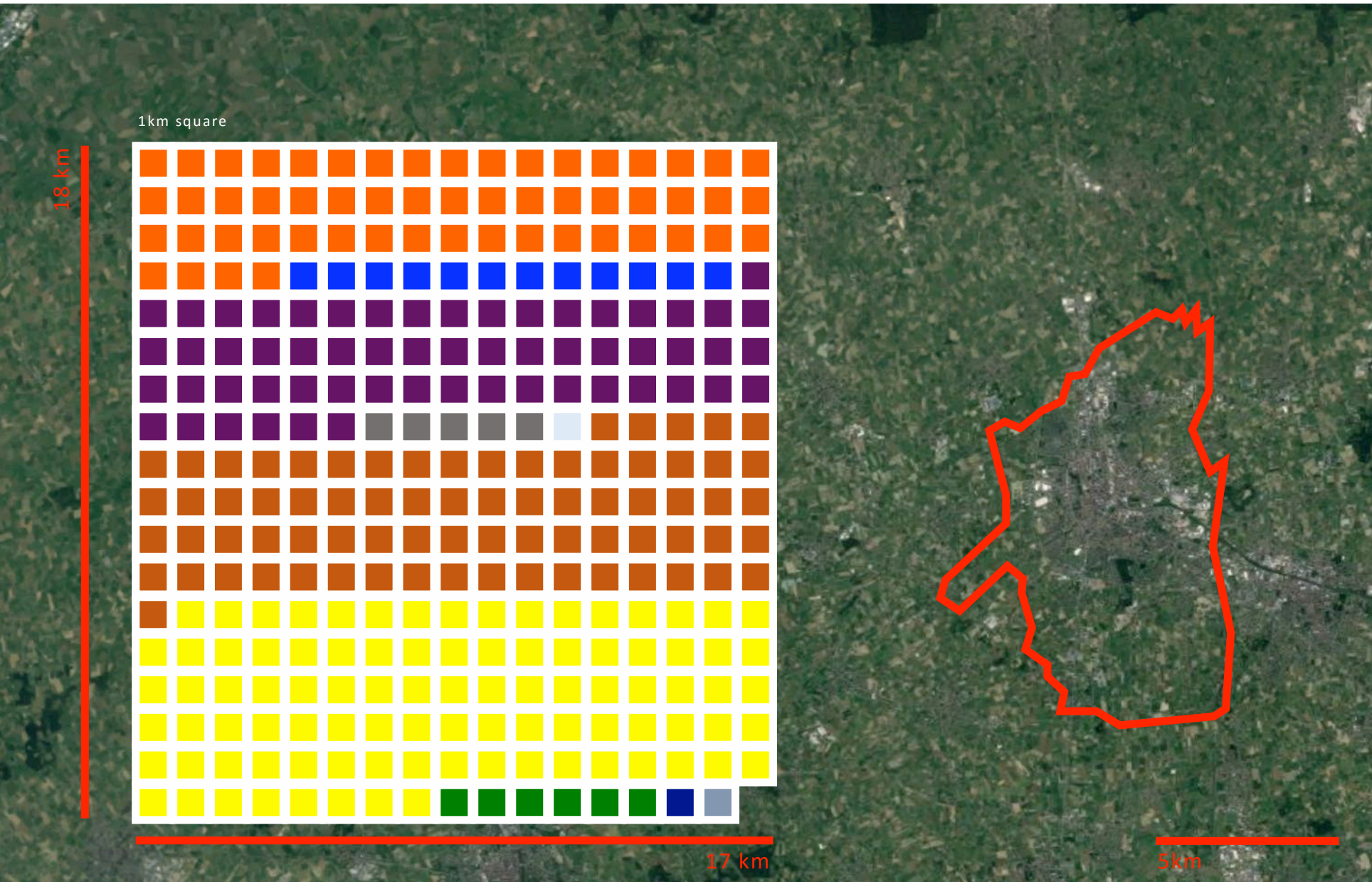
Short coppice willow provides carbon sink

Amenity space

bio-diversity



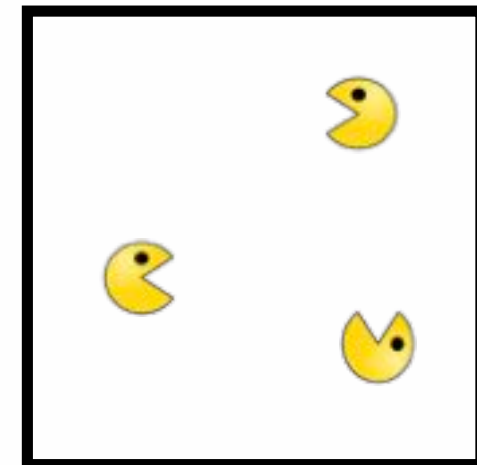
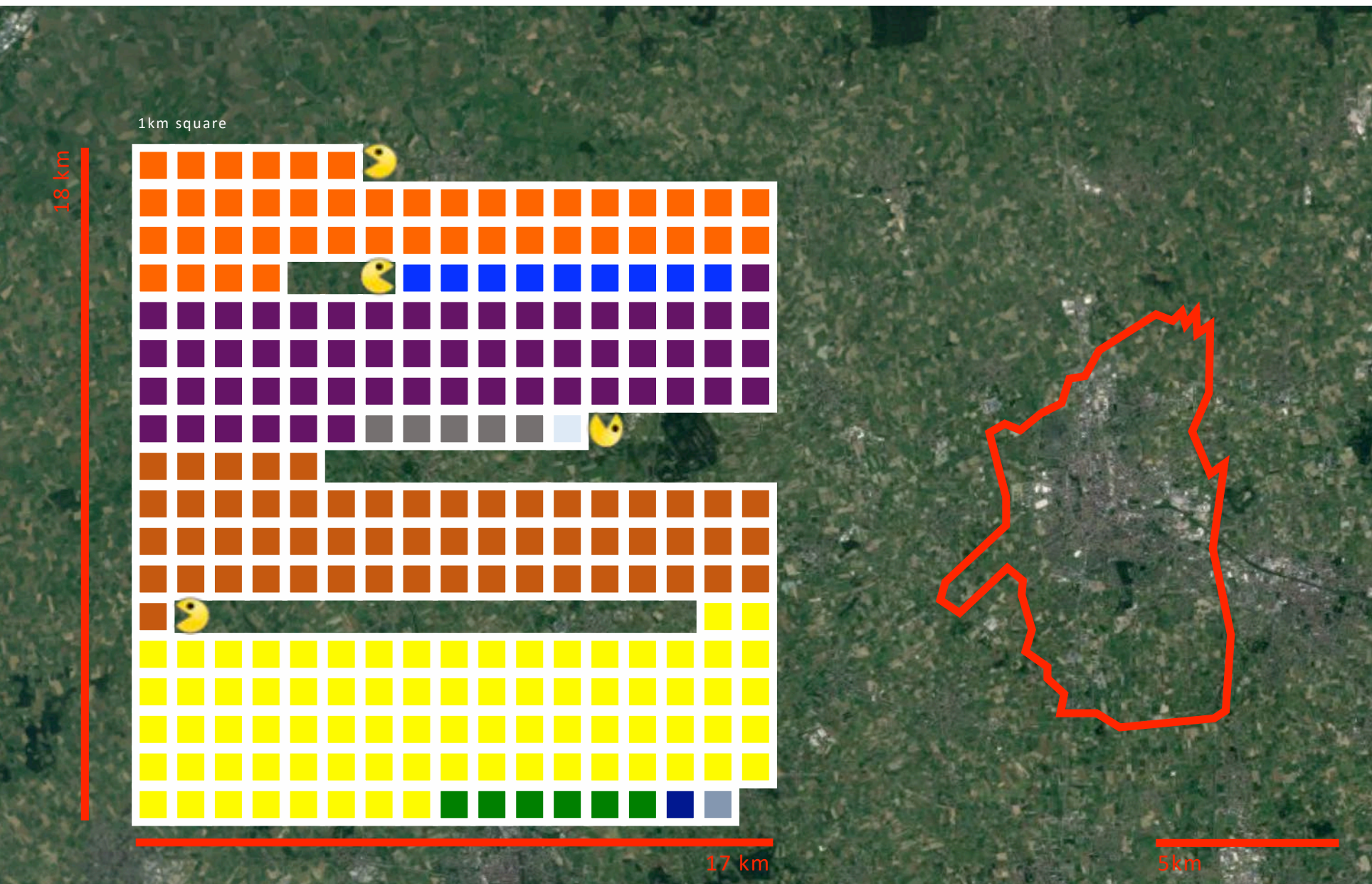
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE








- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- WASTE (URBAN)
- WATER USE (HOUSING)
- TERTIARY
- INDUSTRY
- AGRICULTURE
- Public transport
- Public lighting



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

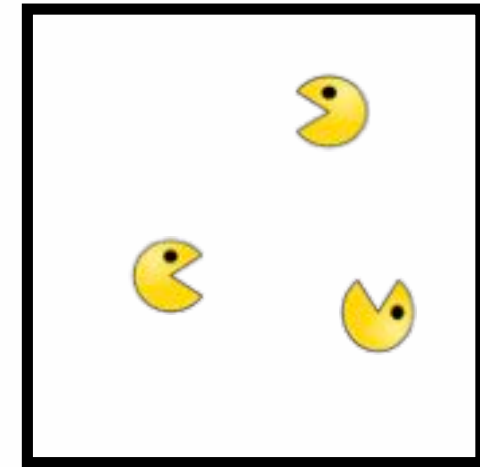
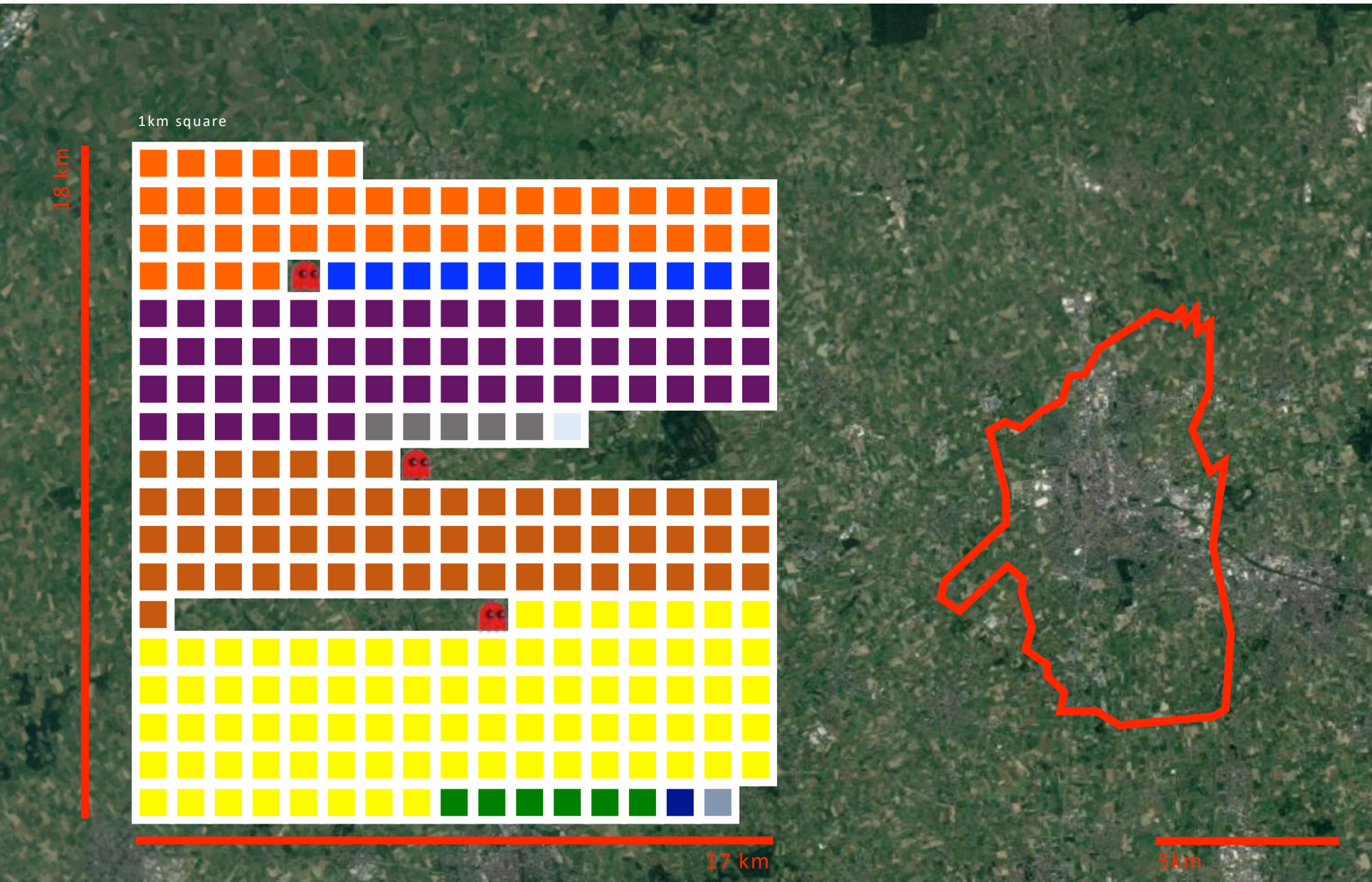


MEASURE #1 ENERGY SAVING Building energy retrofitting

-  ELECTRICITY (HOUSING)
-  HEAT (HOUSING)
-  MOBILITY (PRIVATE CARS)
-  TERTIARY
-  INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

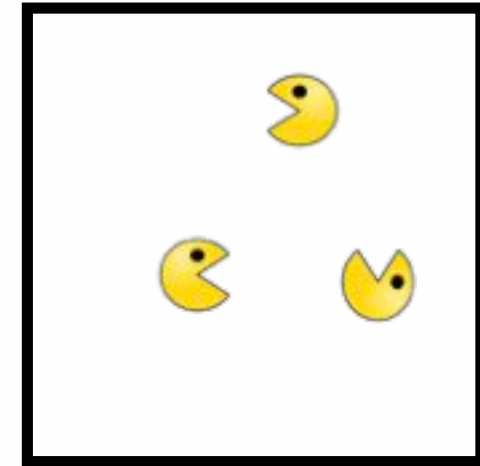
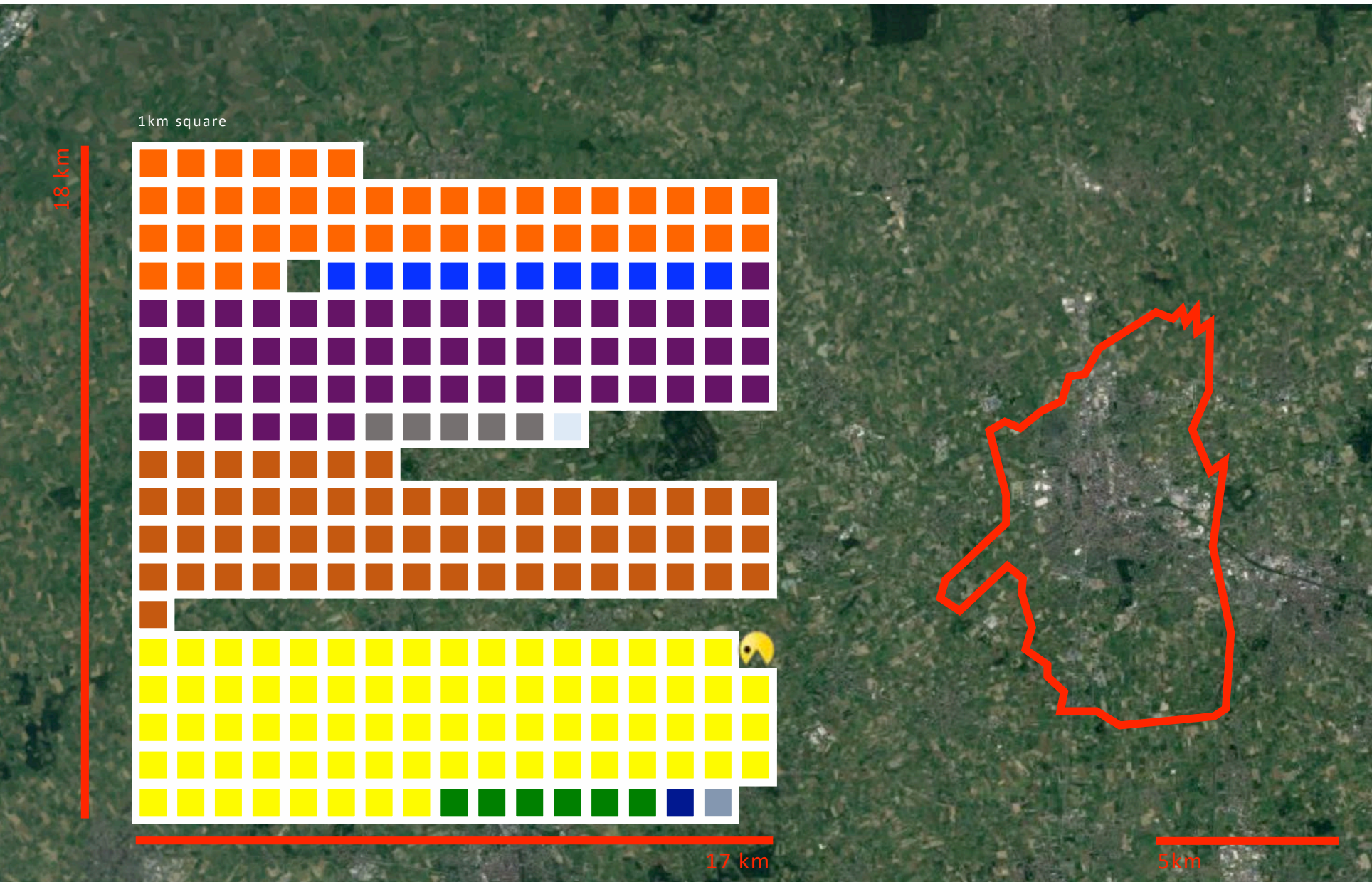


GROWTH
2050 forecast

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

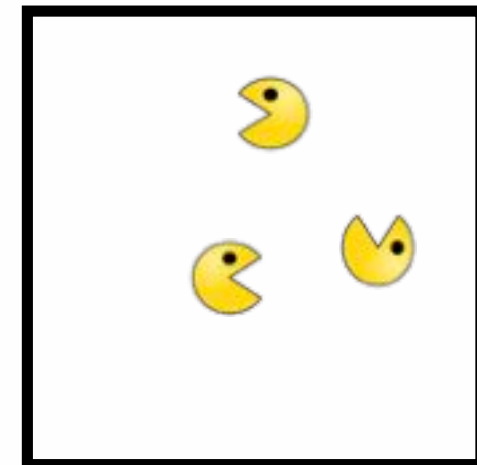
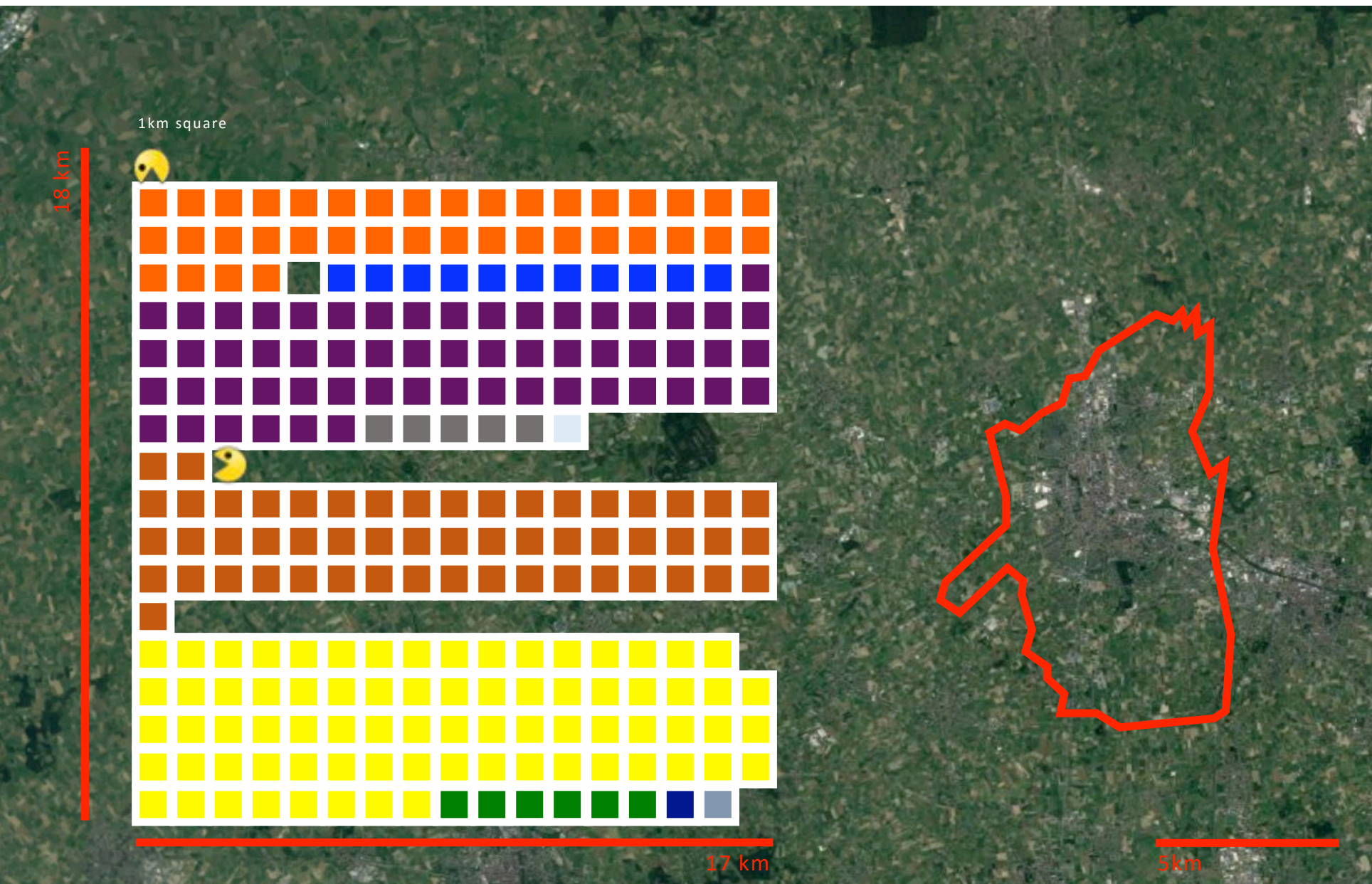


MEASURE #2 BIOMASS Industrial use

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

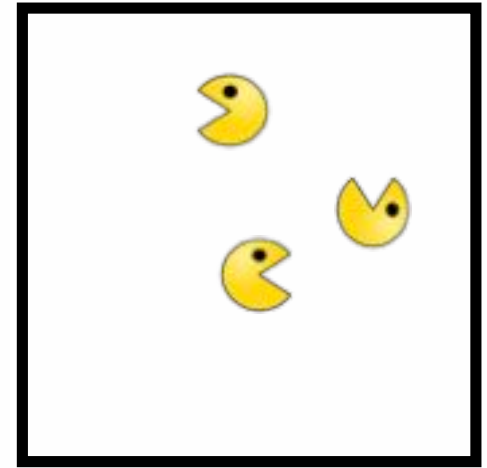
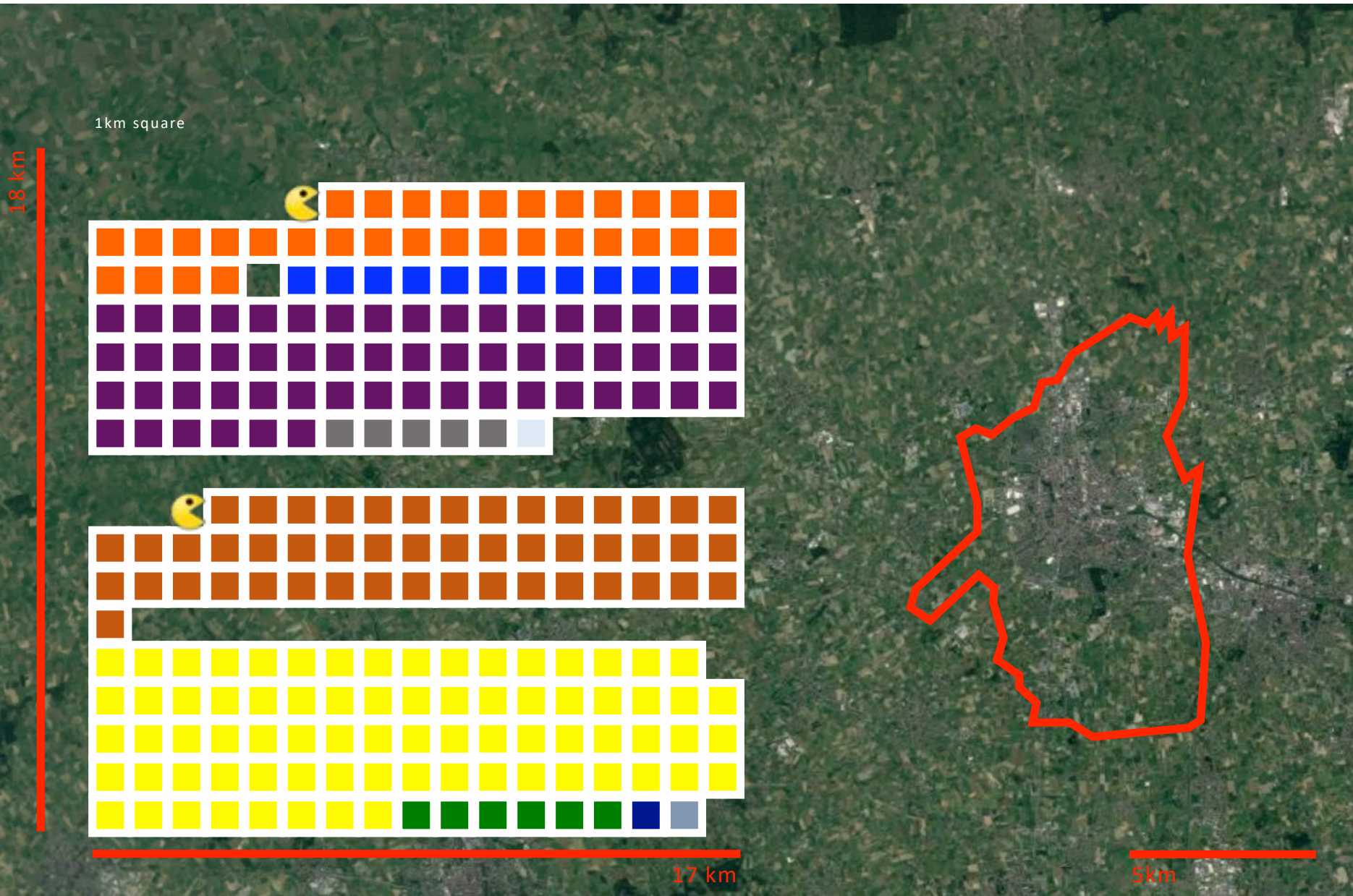


MEASURE #3 DISTRICT HEATING NETWORK Waste incineration

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

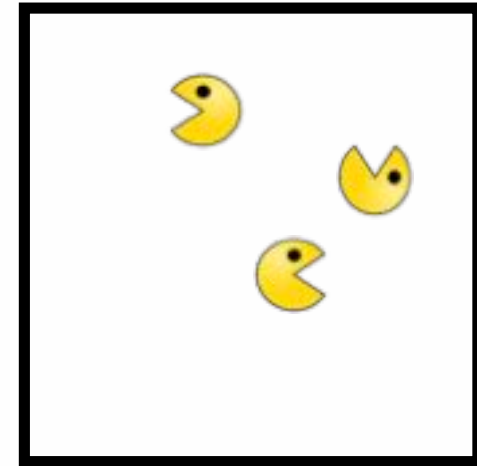
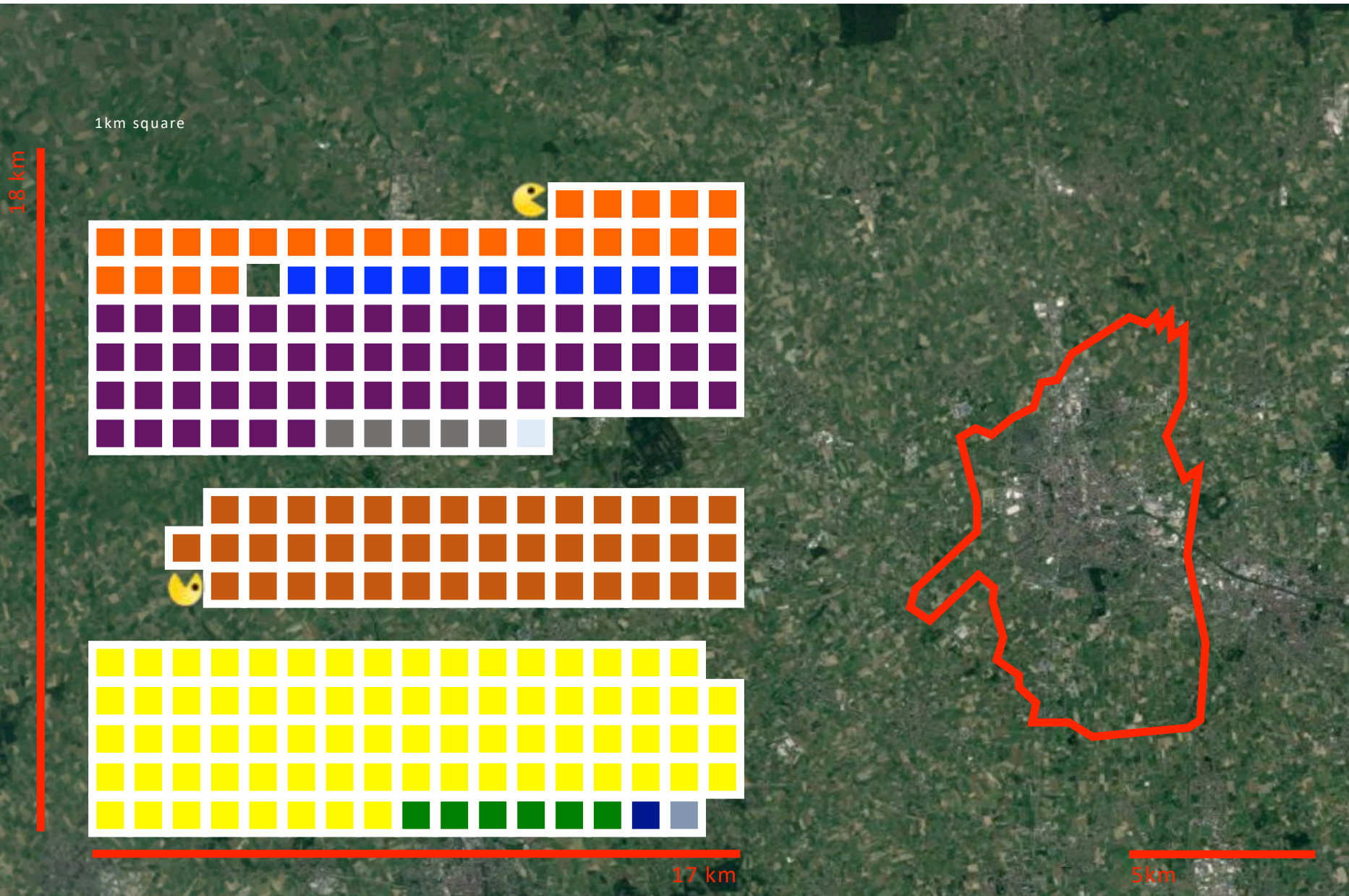


MEASURE #4 DISTRICT HEATING NETWORK Solar collectors + HT storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

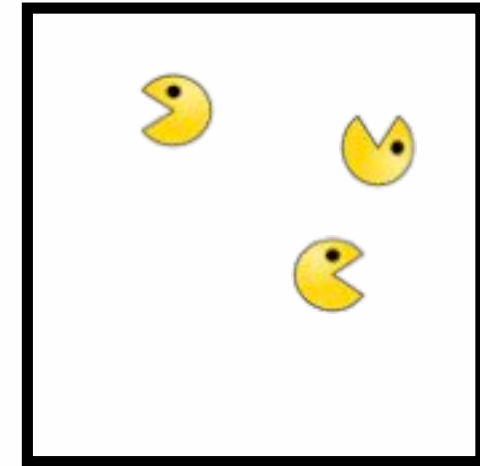
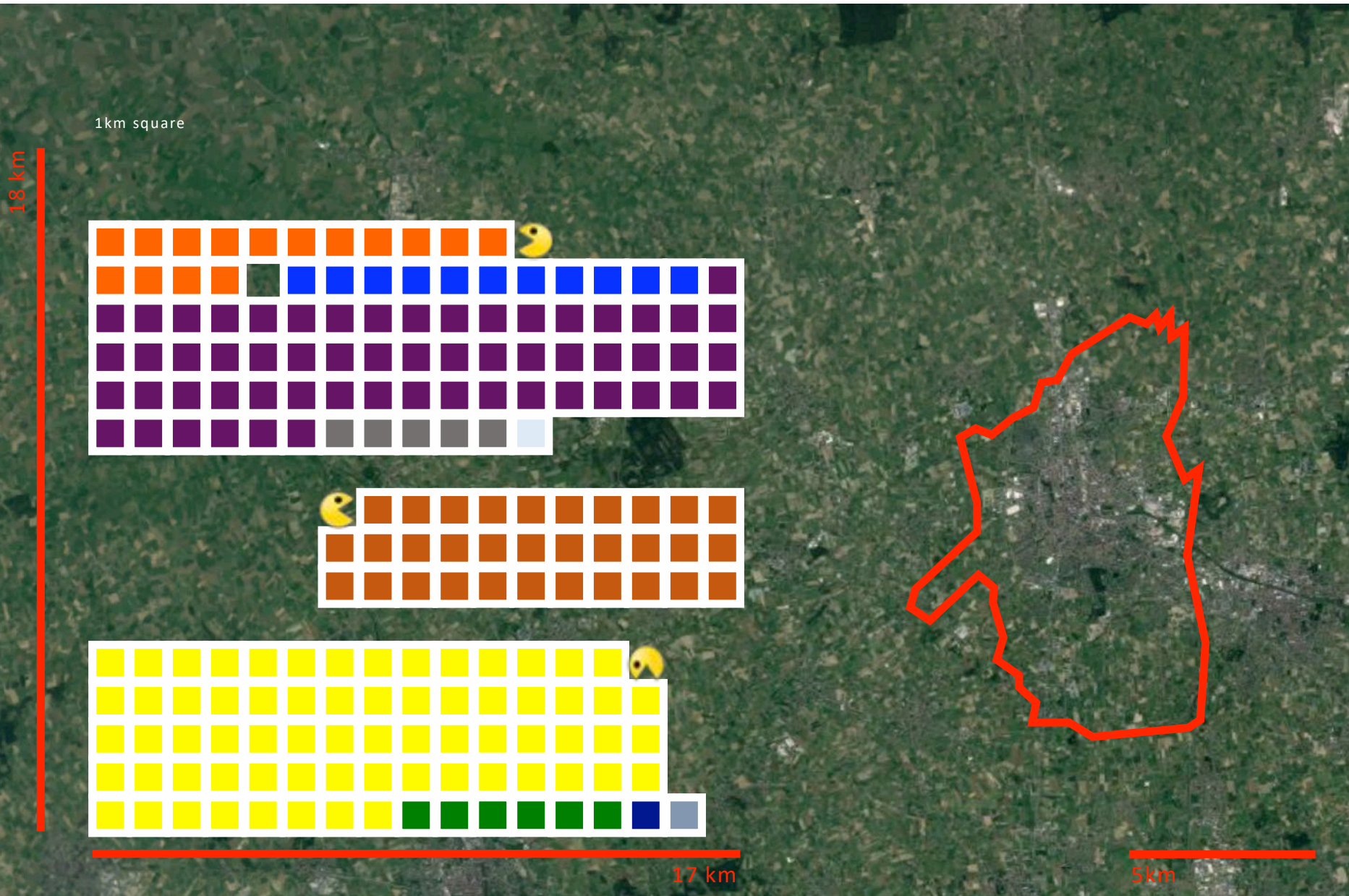


MEASURE #5 DISTRICT HEATING NETWORK HT industrial waste

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

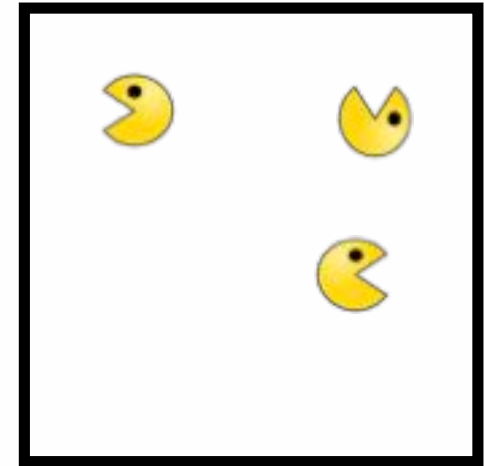
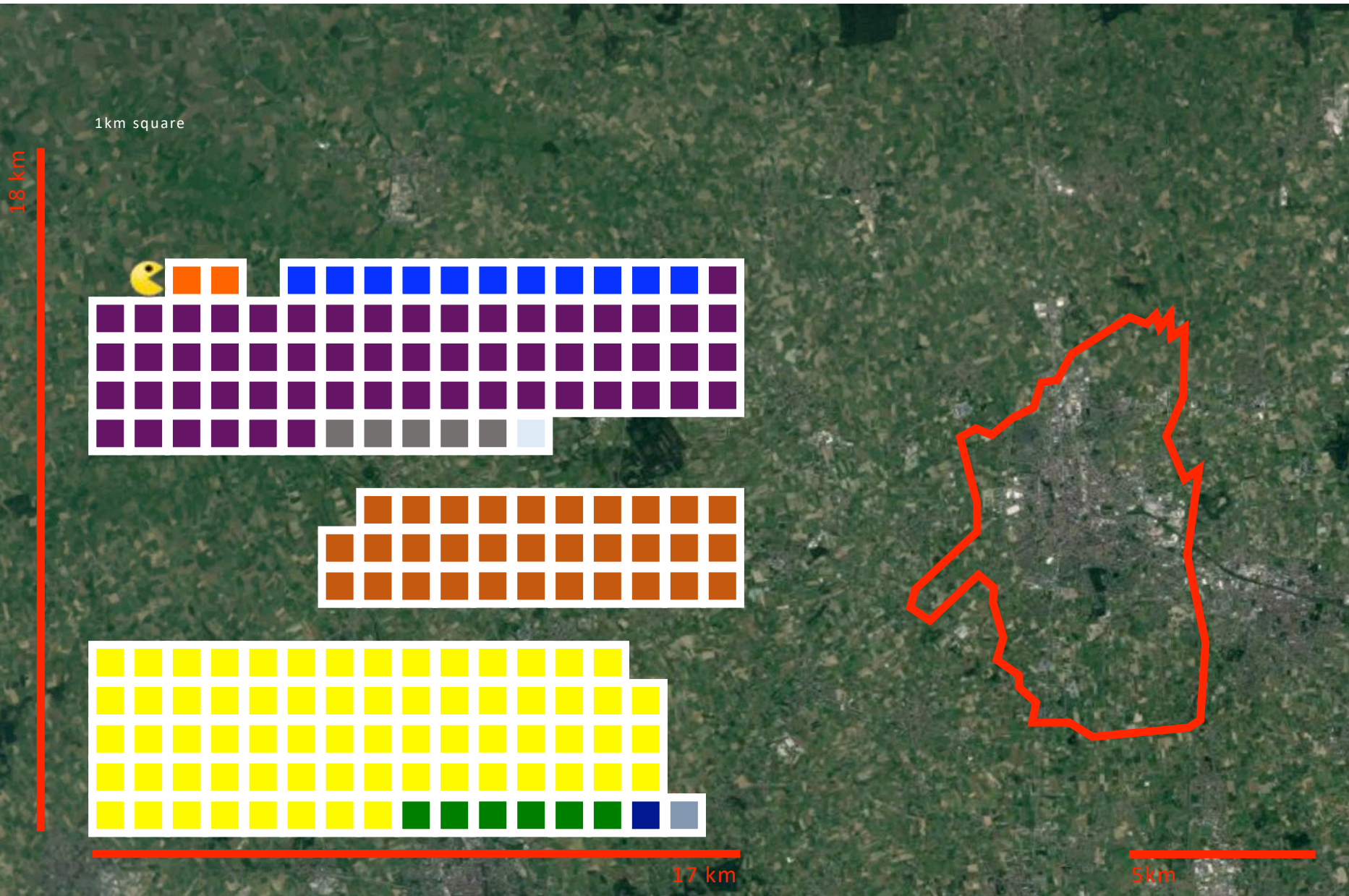


MEASURE #6
MINI HEAT GRIDS
Solar collectors +
MT storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

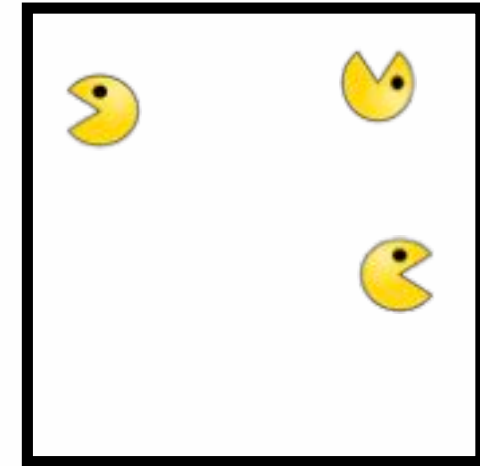
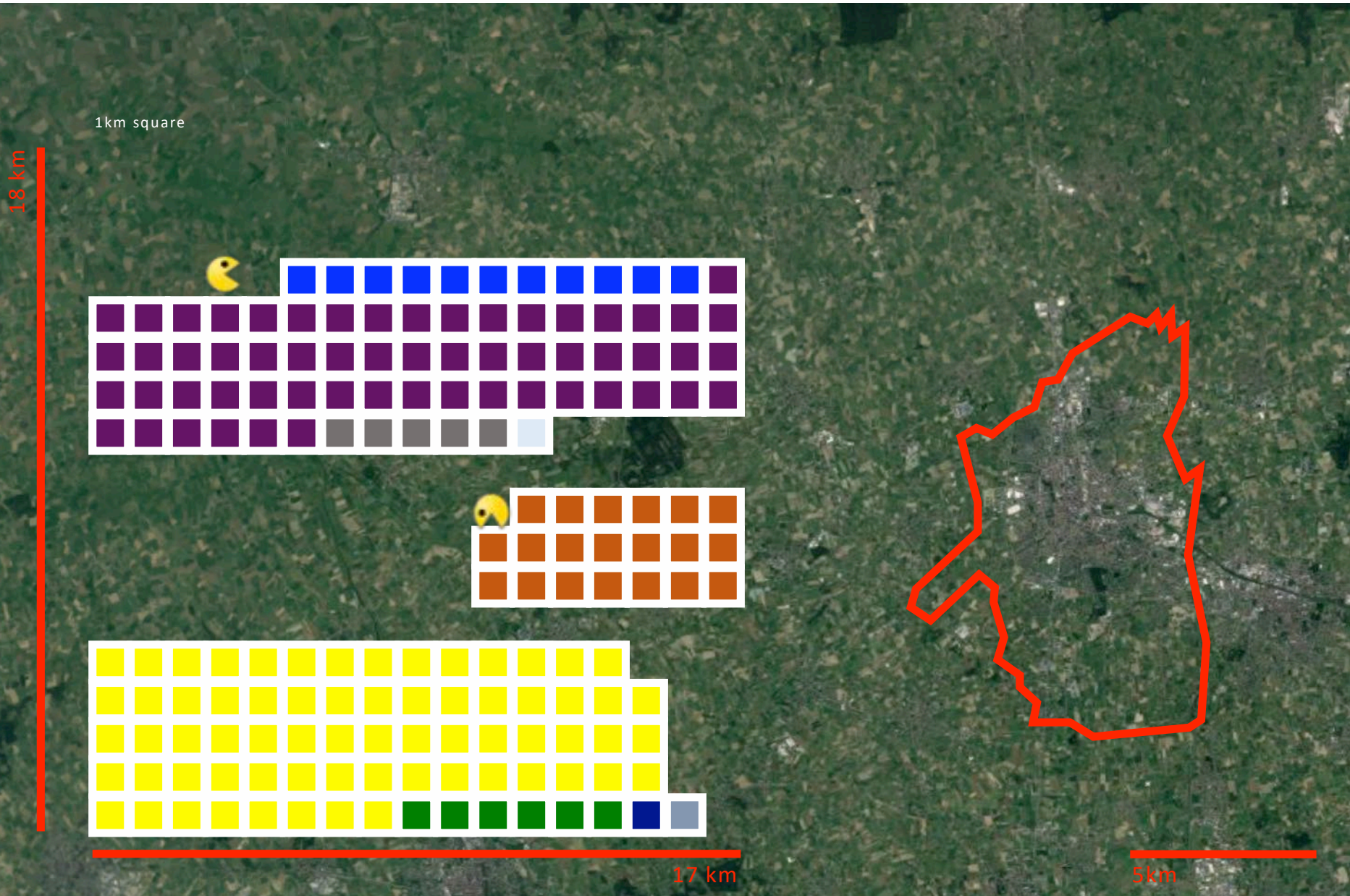


MEASURE #7
PV THERMAL
Individual or blocks

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

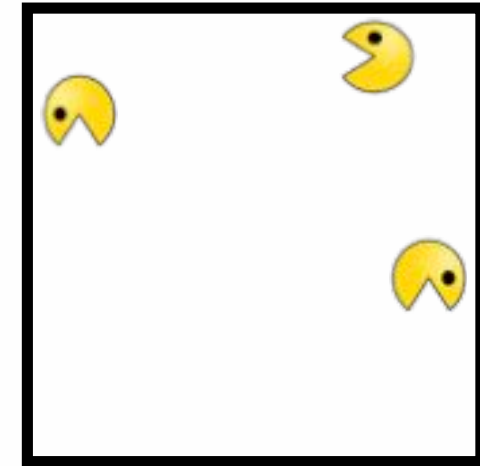
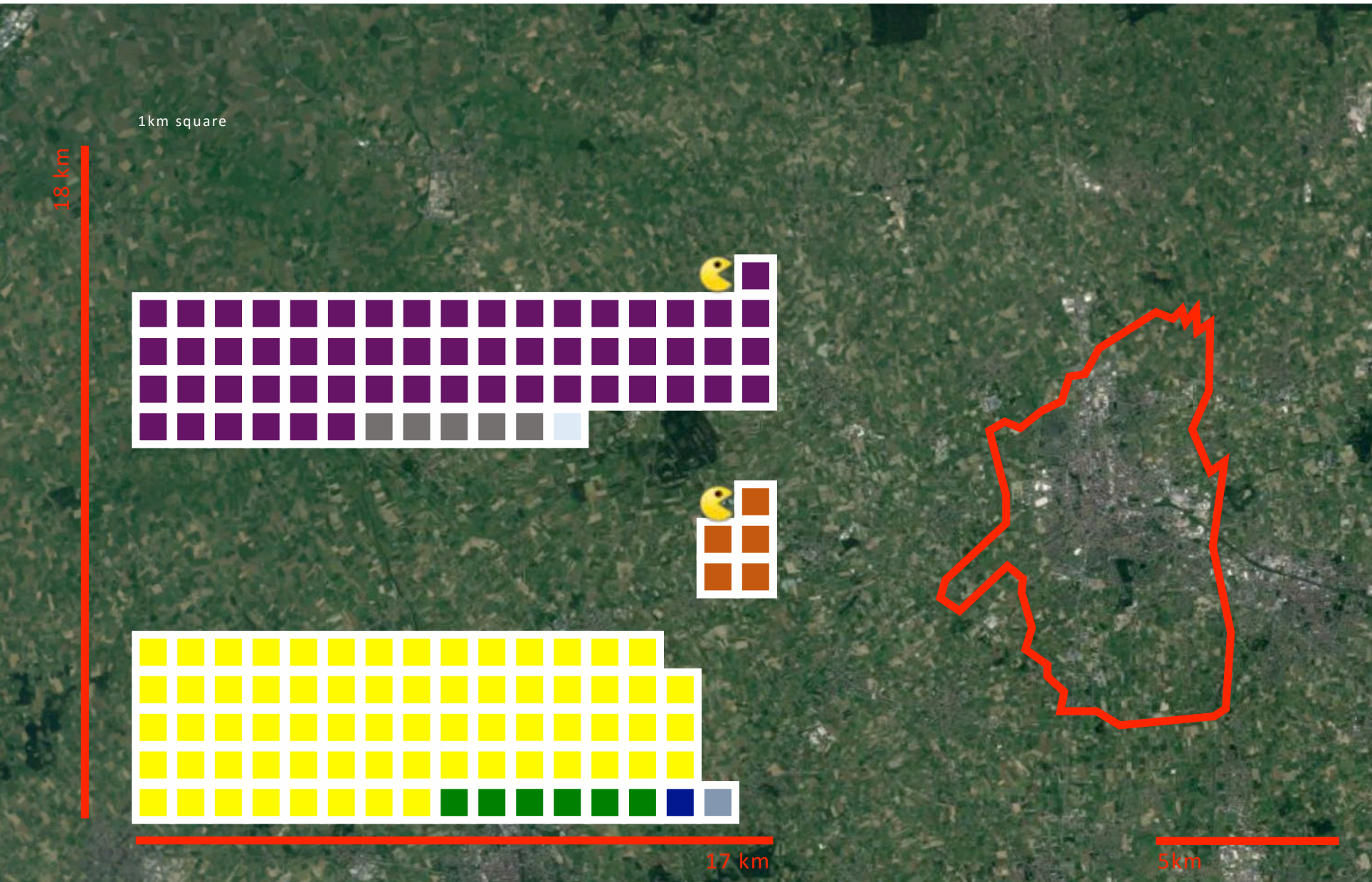


MEASURE #8 LT MINI HEAT GRID LT ATES Aquifer Thermal Energy Storage

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

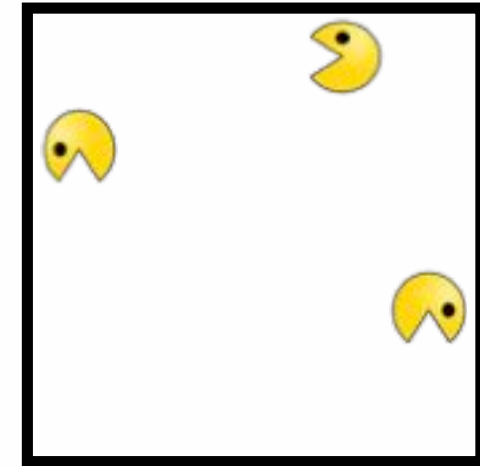
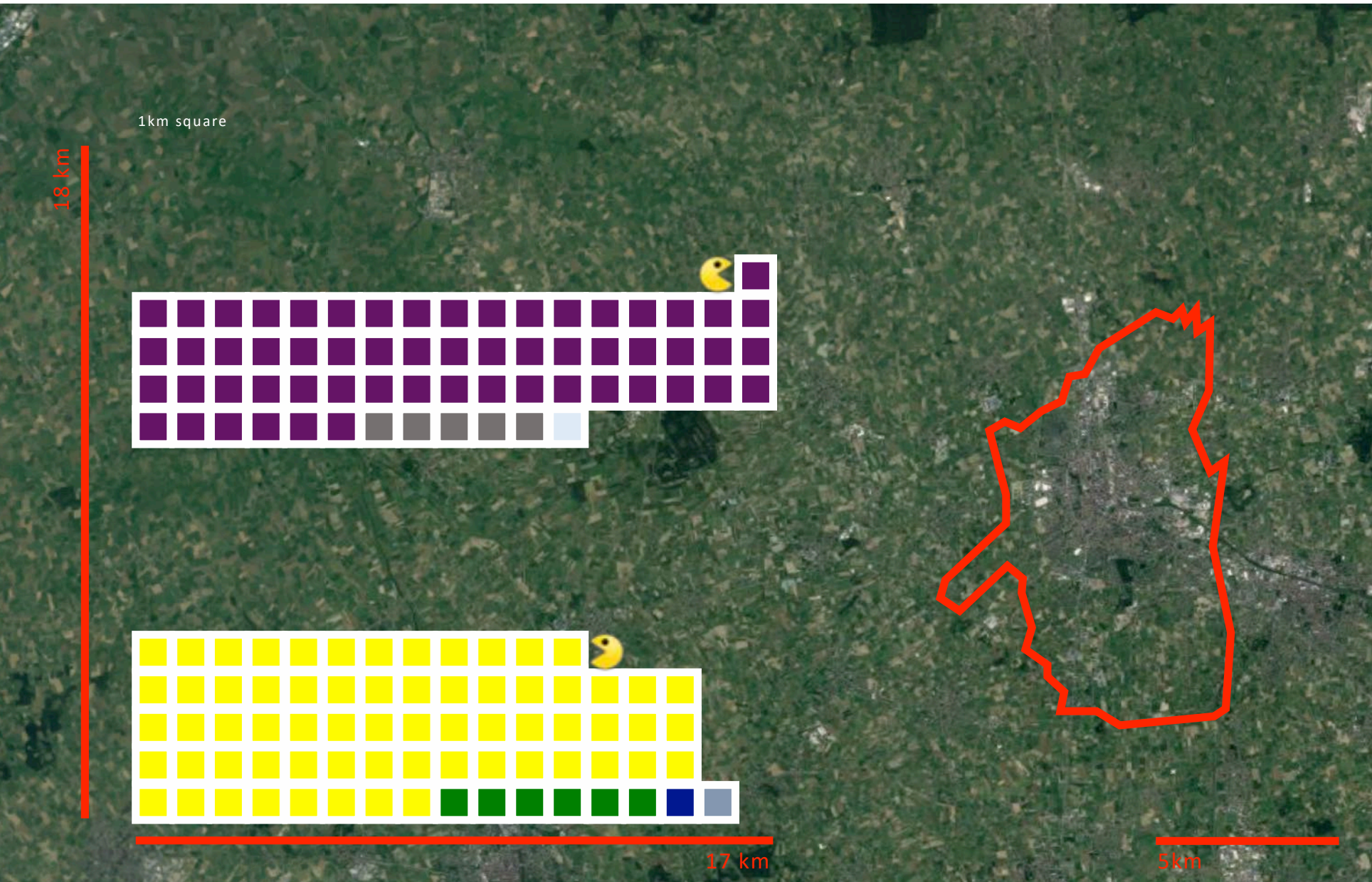


CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE



MEASURE #9
PV on ROOF

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

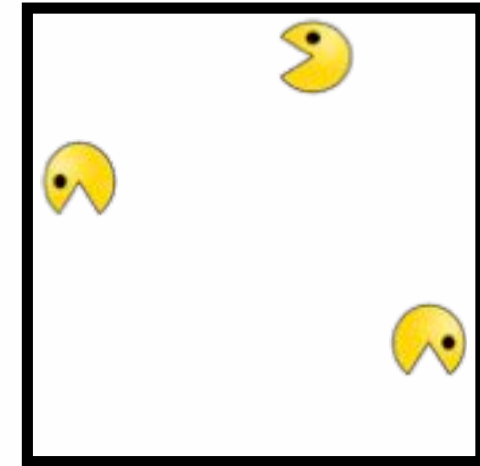
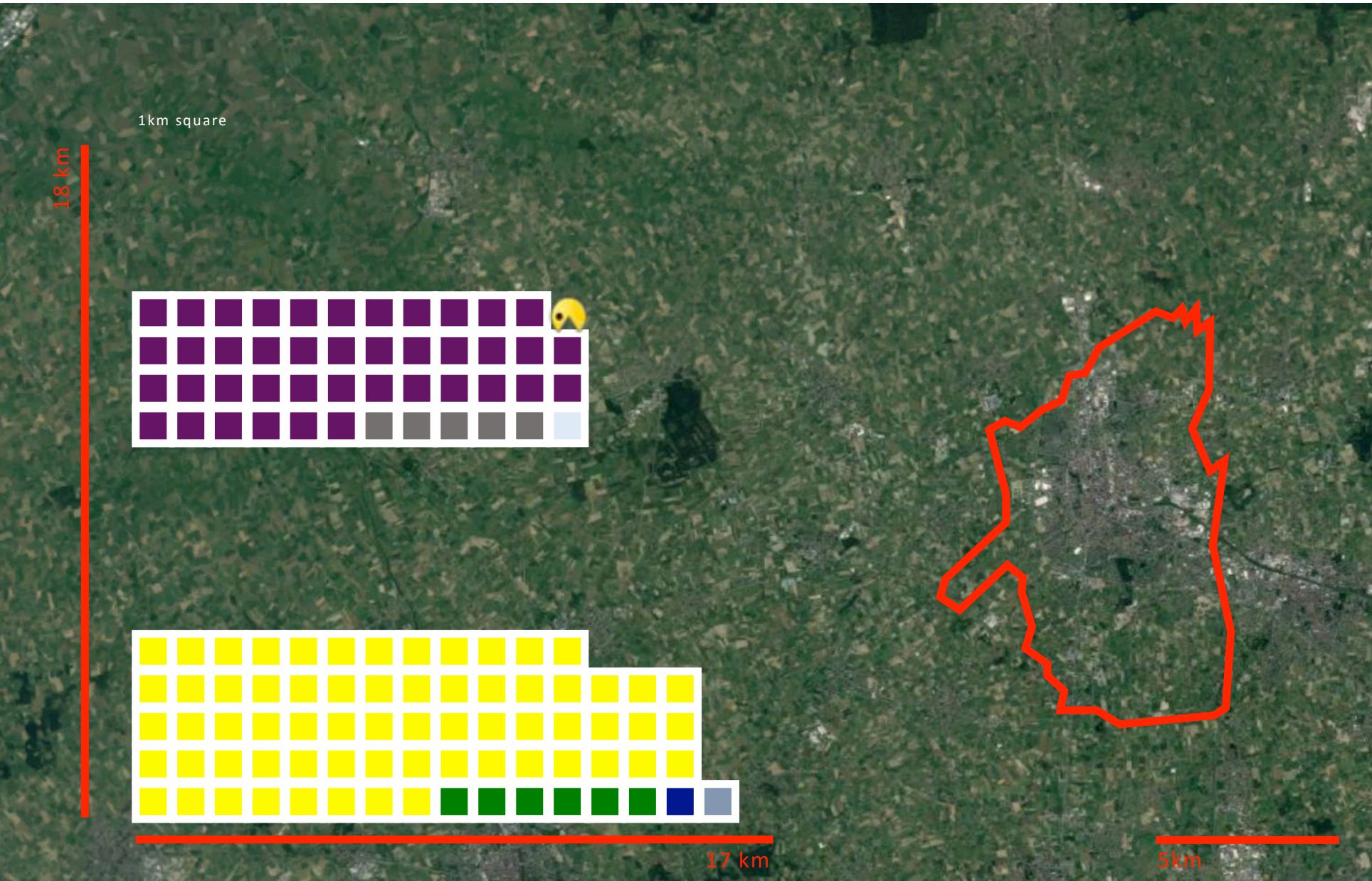


MEASURE #9
PV non ROOF

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

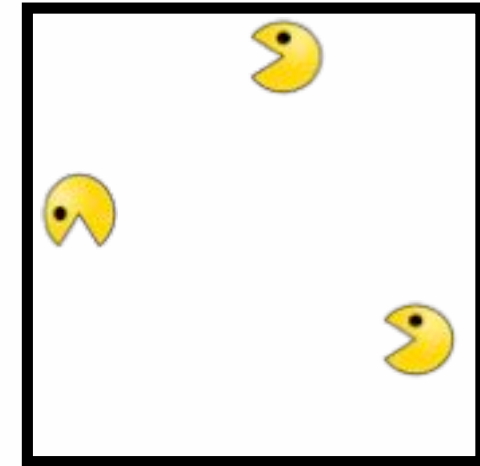
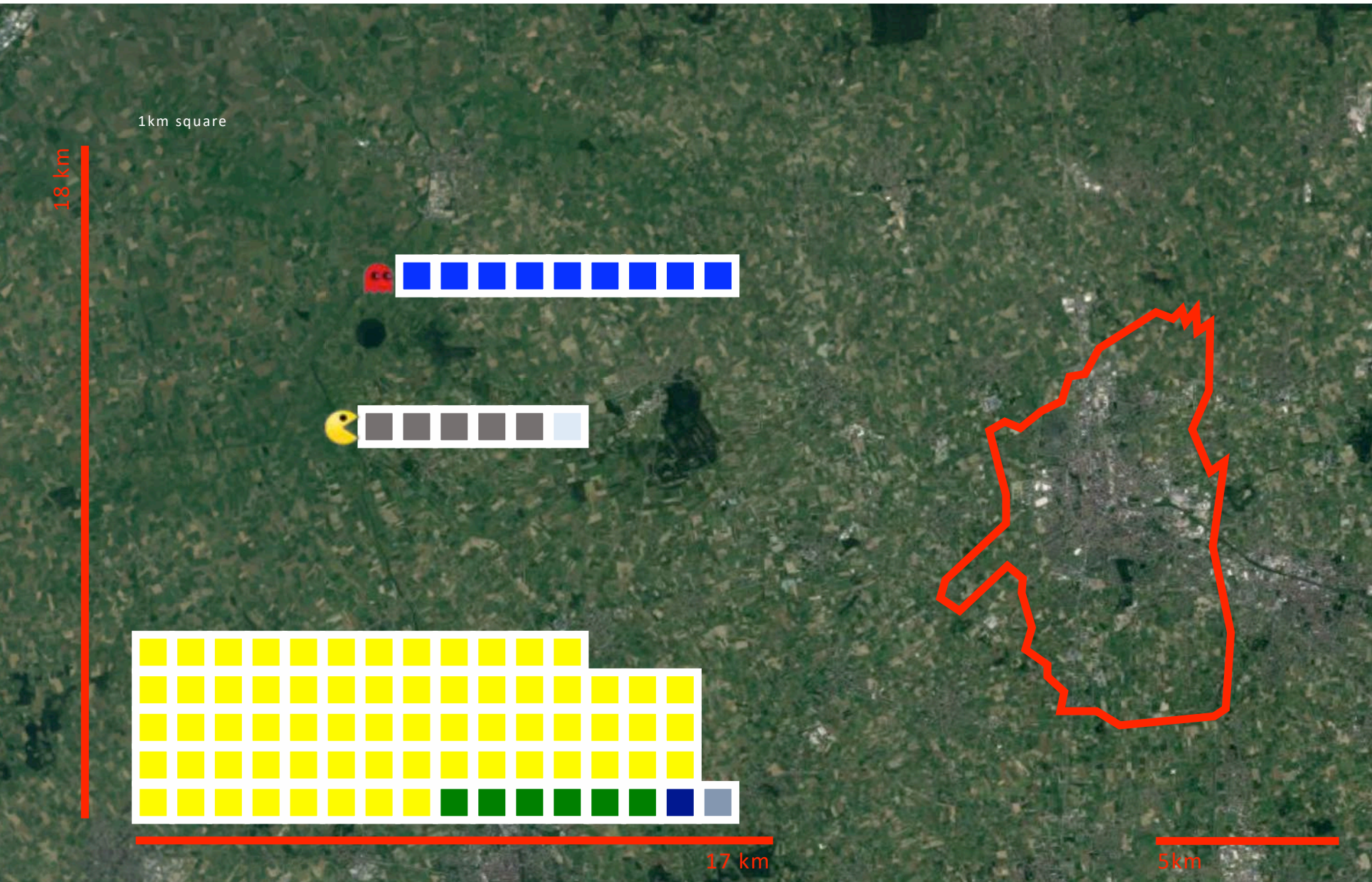


MEASURE #10
SUSTAINABLE
MOBILITY
Cycling roads, electric
public/sharing

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

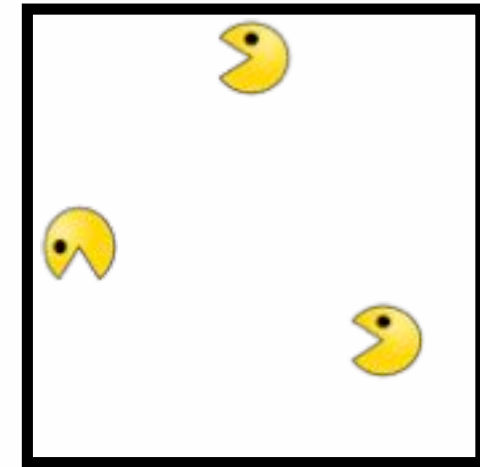
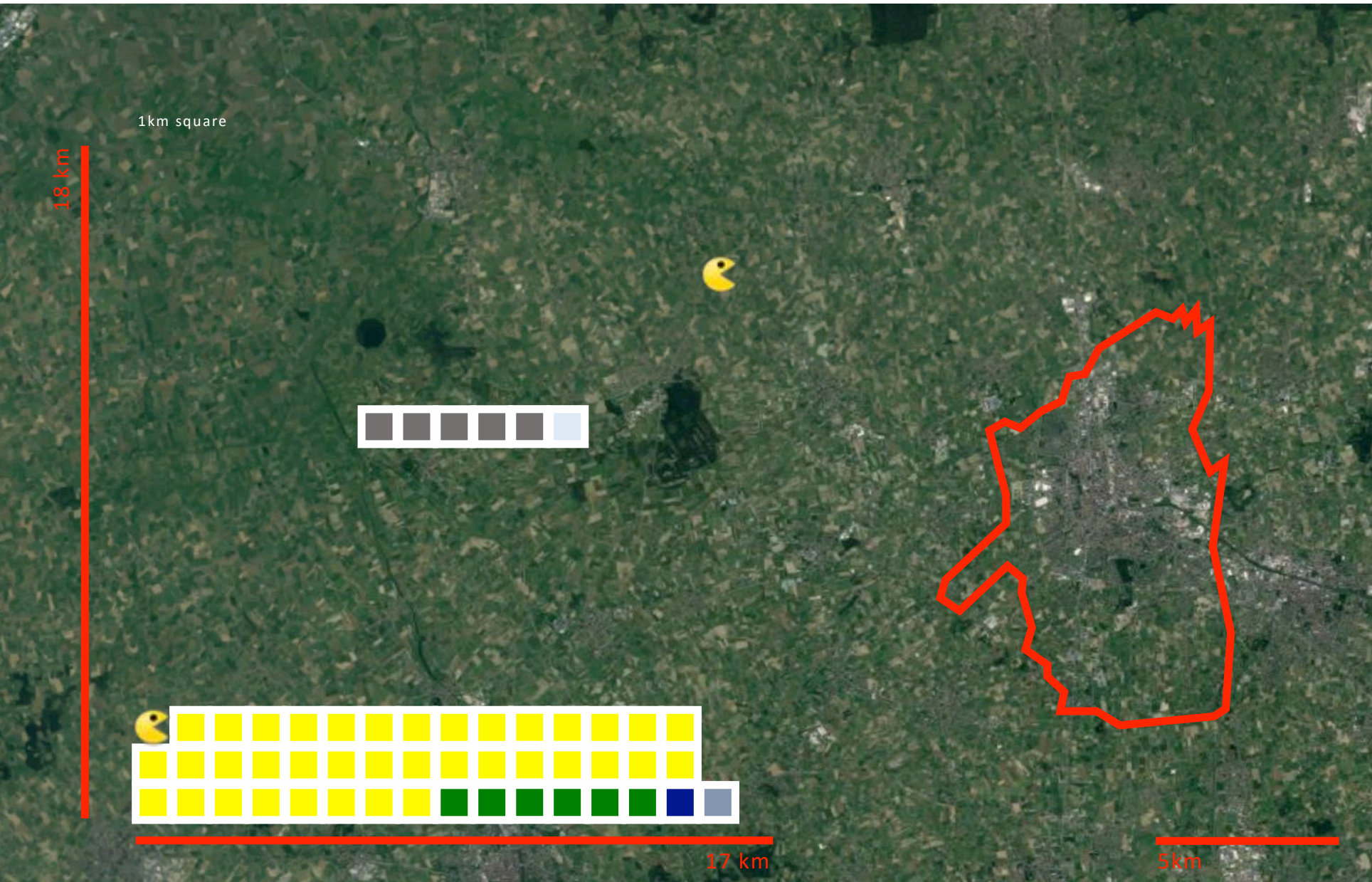


MEASURE #11 TRANSITION TO ELECTRIC MOBILITY

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

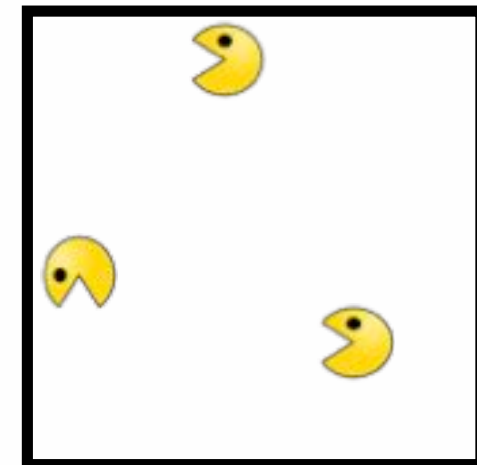
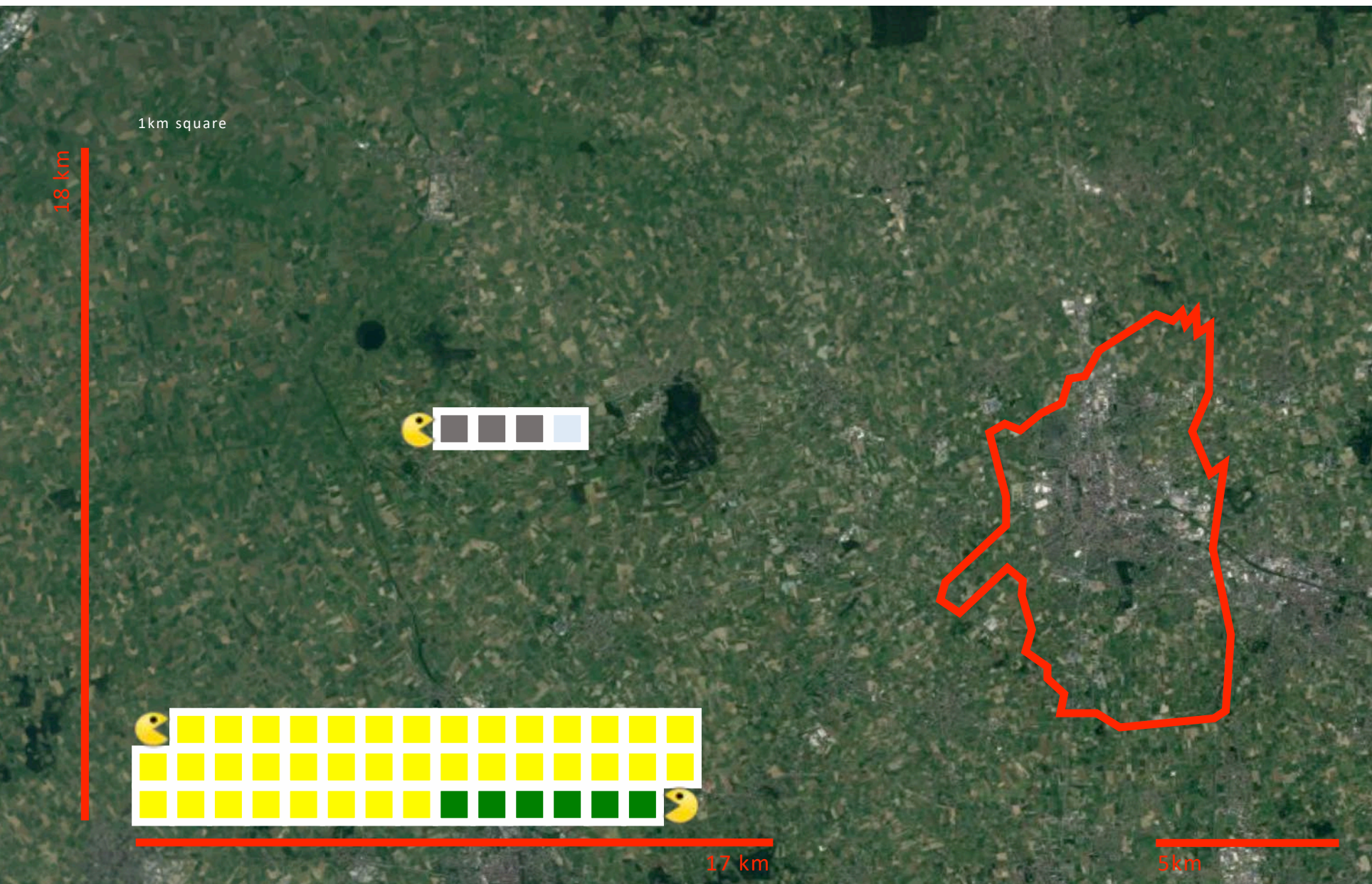


MEASURE #12 WIND FARM

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

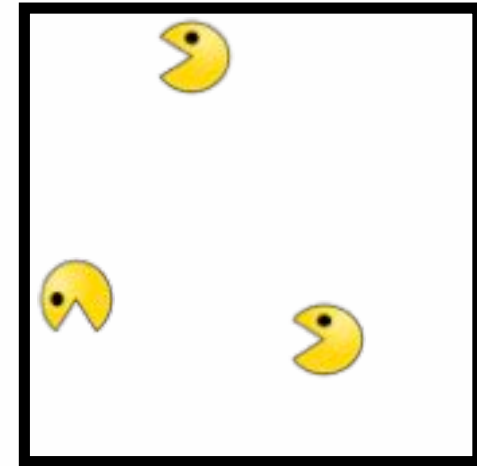
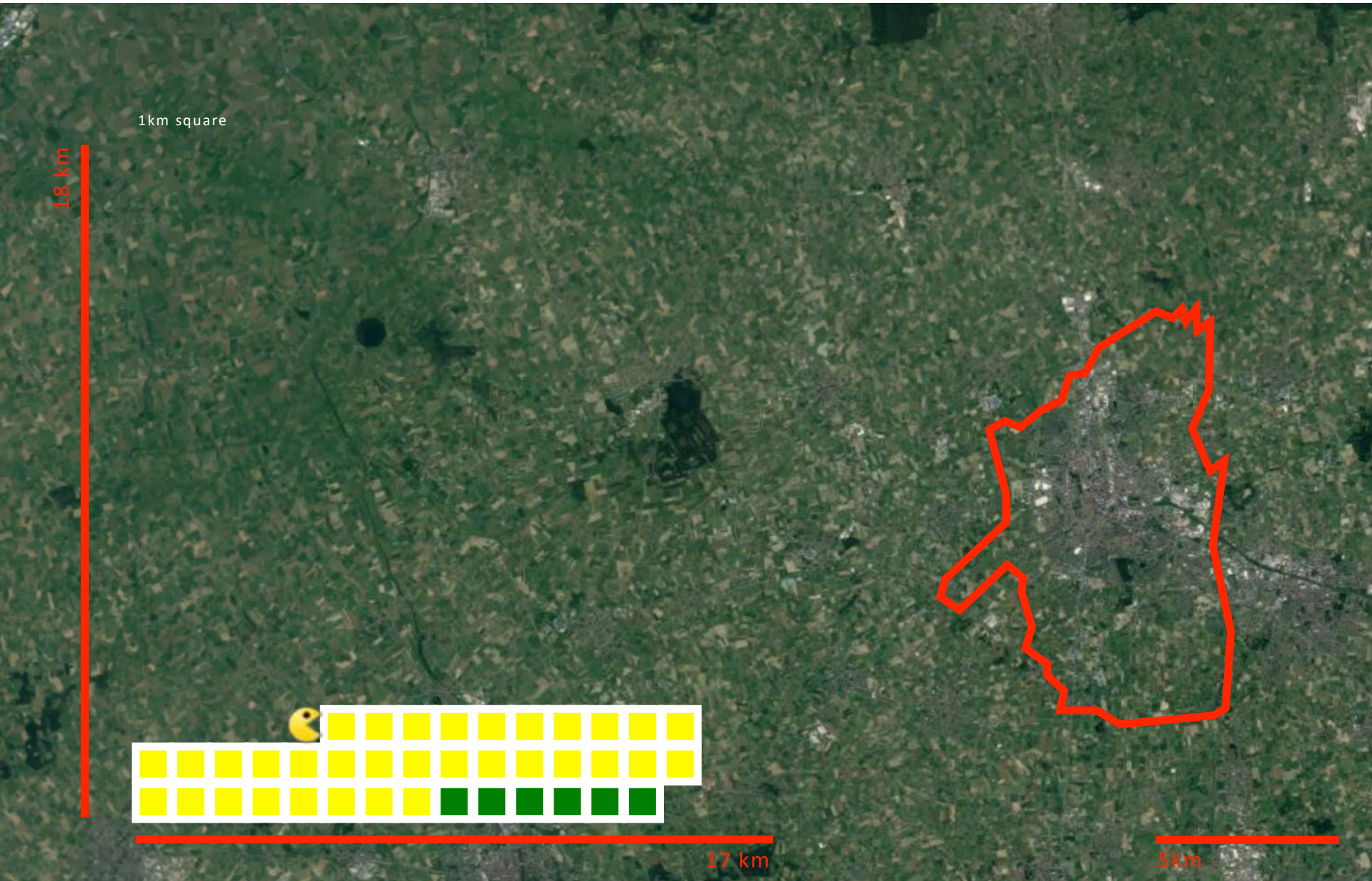


MEASURE #13
Waste recycling %
LED public lights
Electric public transport






- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

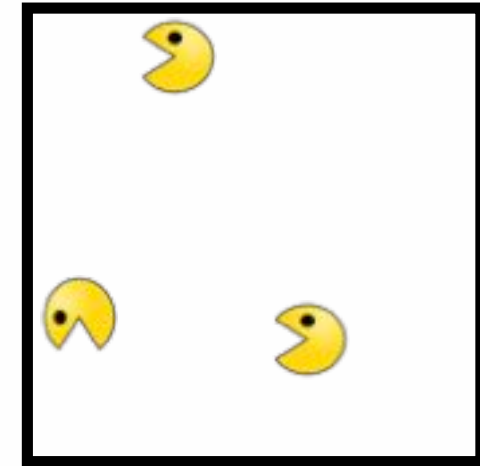


MEASURE #14 URBAN FORESTRY




-  ELECTRICITY (HOUSING)
-  HEAT (HOUSING)
-  MOBILITY (PRIVATE CARS)
-  TERTIARY
-  INDUSTRY



CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE



MEASURE #15 NEW FOREST

-  ELECTRICITY (HOUSING)
-  HEAT (HOUSING)
-  MOBILITY (PRIVATE CARS)
-  TERTIARY
-  INDUSTRY



Nu is't aan junder, veel succes!

Web:

<https://www.klimaswitch.be/programma-city-zen>

[https:// www.cityzen-smartcity.eu/nl/home-nl/](https://www.cityzen-smartcity.eu/nl/home-nl/)



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Contact: c.i.martin@tudelft.nl



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