City-zen 'Roeselare' Roadshow

Een Duurzame Stadsvisie

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ROESELARE
IS 'R VOOR JOU

DE KLIMAATSWITCH
RSL 180°
#VANRSL

CITY-zen
New urban energy
ROADSHOW

ROADSHOW METHODOLOGY : Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018

‘Co-creation’ & ‘Synergy of Solutions’

Aim: Zero-Energy

Heart of process

Co-creation

Fun / Reachable

CITY-zen
New urban energy
ROADSHOW

What went on …

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

CITY-zen
New urban energy
ROADSHOW

What went on …

Maandag 23 april |
Introductie
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CITY-zen
New urban energy
ROADSHOW

What went on …

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

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What went on …





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

CITY-zen
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What went on …

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

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New urban energy
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What went on …

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

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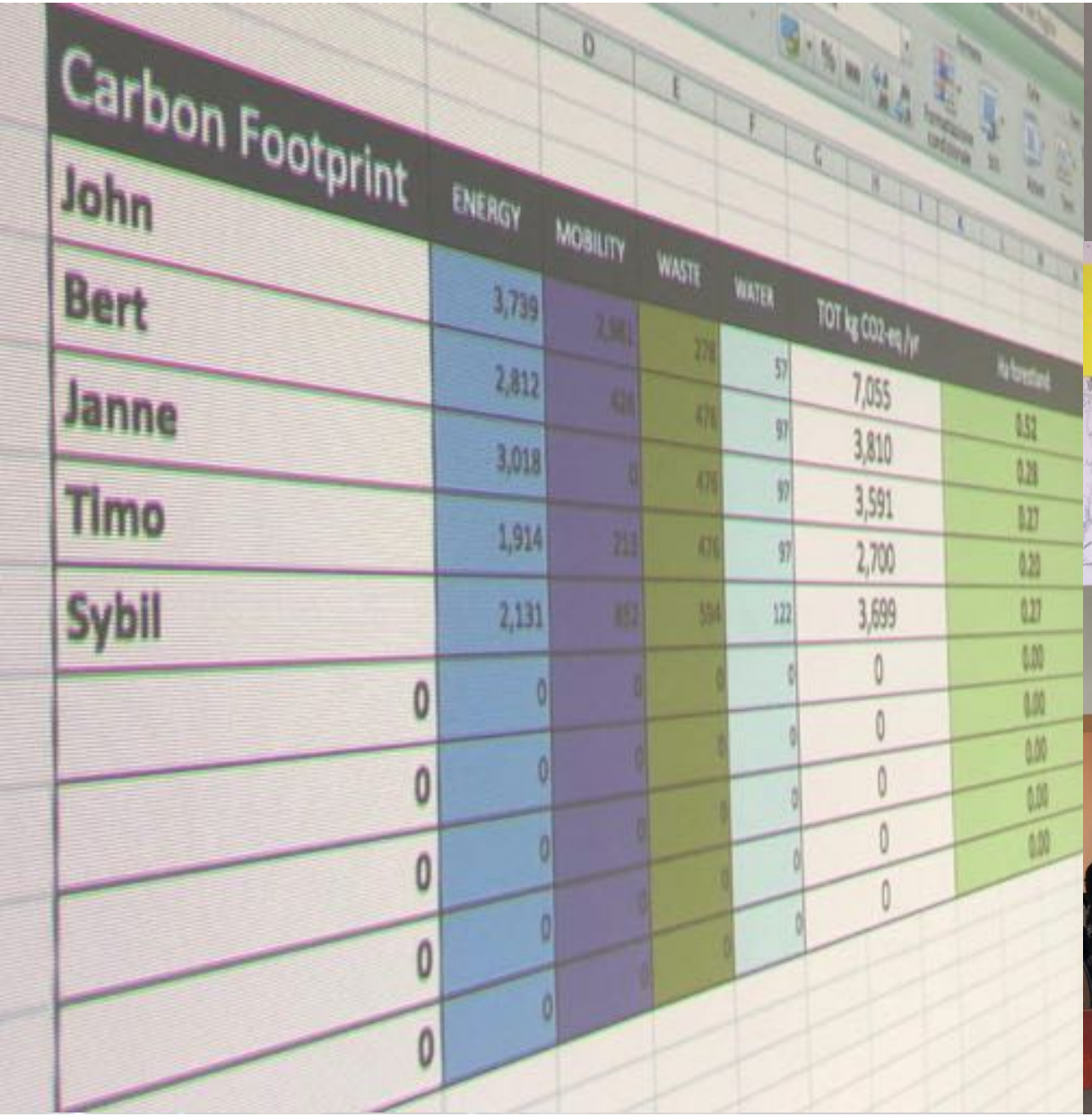
What went on …



Carbon Footprint	ENERGY	MOBILITY	WASTE	WATER	TOT kg CO2-eq /yr	ha forestland
John	3,739	2,581	278	57	7,055	0.52
Bert	2,812	426	476	97	3,810	0.28
Janne	3,018	0	476	97	3,591	0.27
Timo	1,914	213	476	97	2,700	0.20
Sybil	2,131	852	594	122	3,699	0.27
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00
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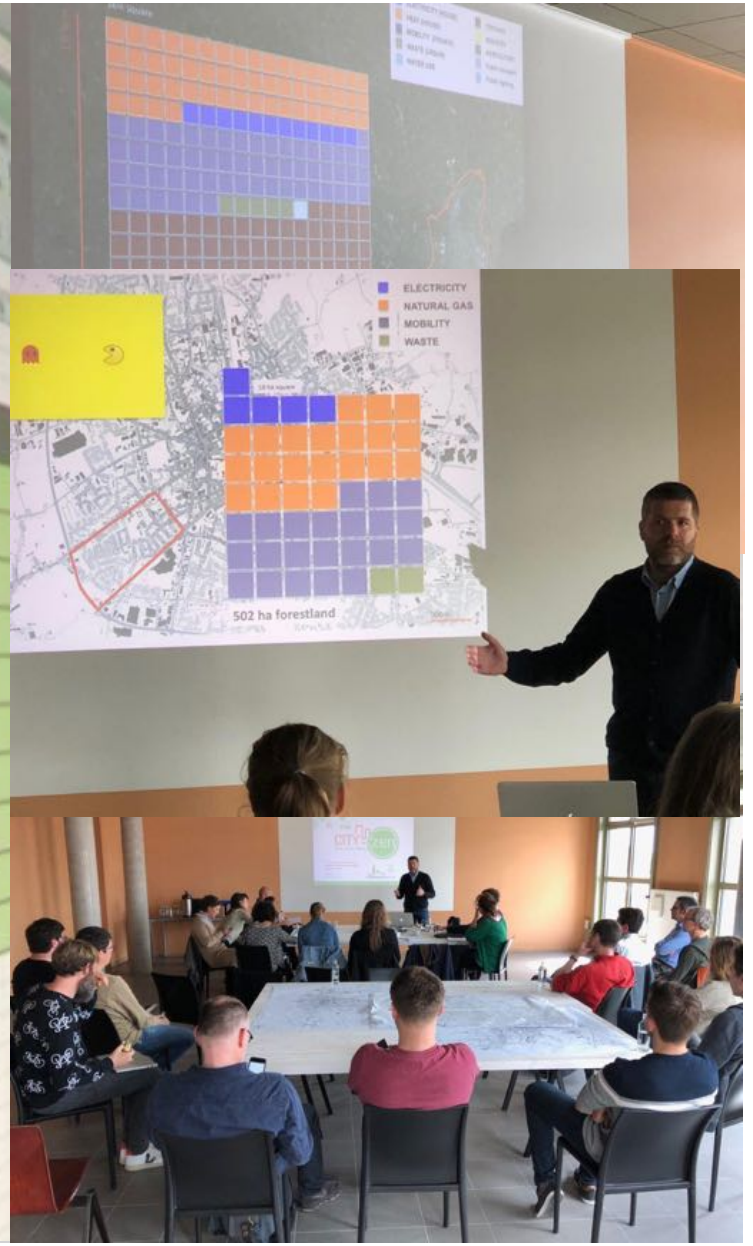
0	0	0	0	0	0	0.00
0	0	0	0	0	0	0.00



Woensdag 25 april | Design
13 u. - 14.30 u.: Mini-masterclass C02-voetafdruk en de stappen die we moeten zetten

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ROADSHOW

What went on …

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

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What went on …

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

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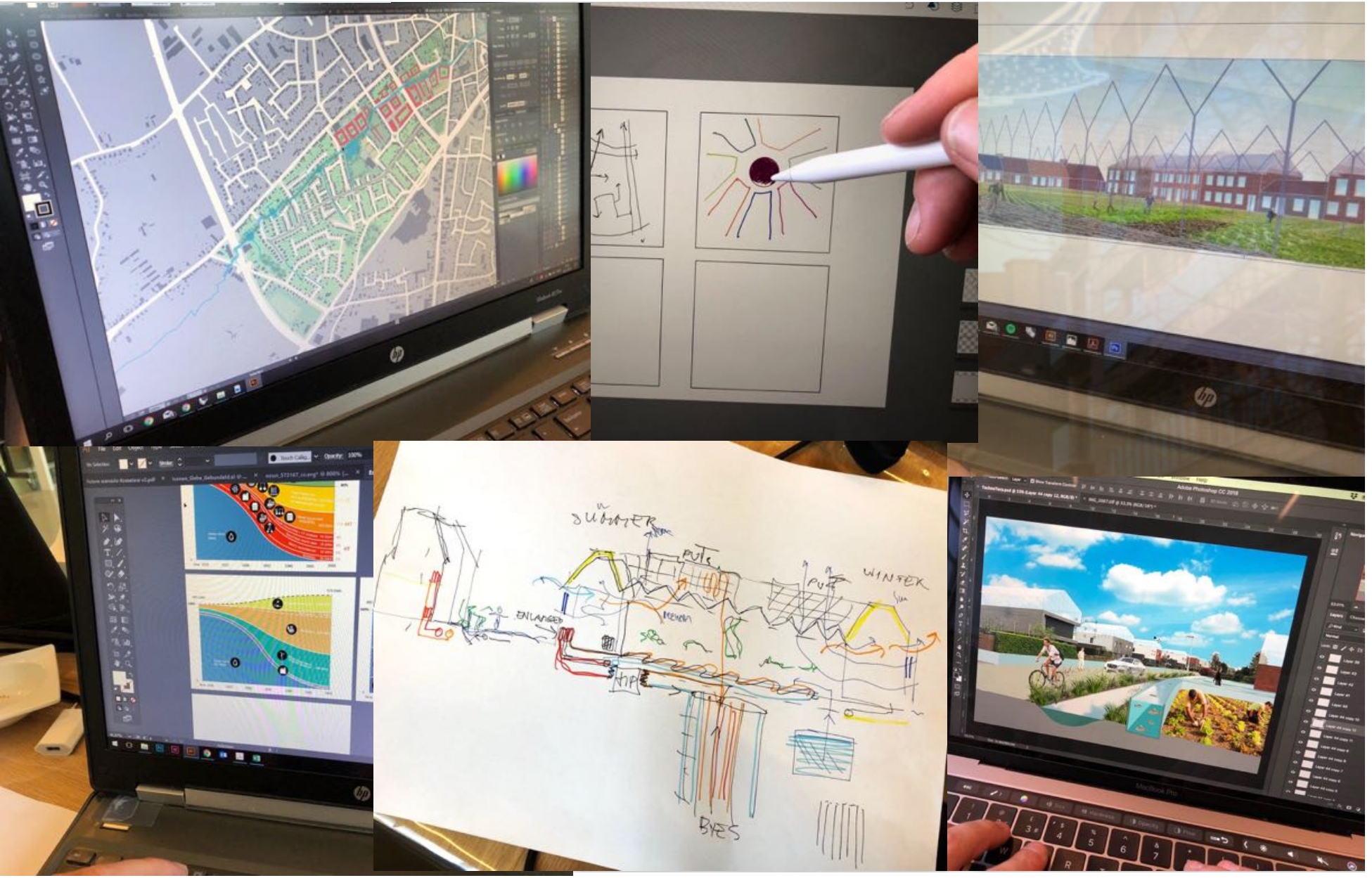
New urban energy
ROADSHOW

What went on …



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

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Vrijdag 27 april | Outro

10 u. - 11 u.:
Een duurzame stadsvisie #VANRSL met de Roadies

11 u. - 12 u.:
Roadshow discussie & Food for thought

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CARBON ACCOUNTING EXPLANED

CO_2-eq

UNIT kg CO_2-eq

GWP CO2 = 1
GWP CH4 = 34
GWP N2O = 298

EMISSION FACTOR

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New urban energy
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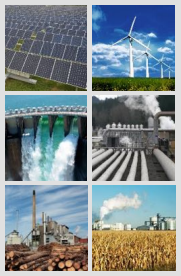
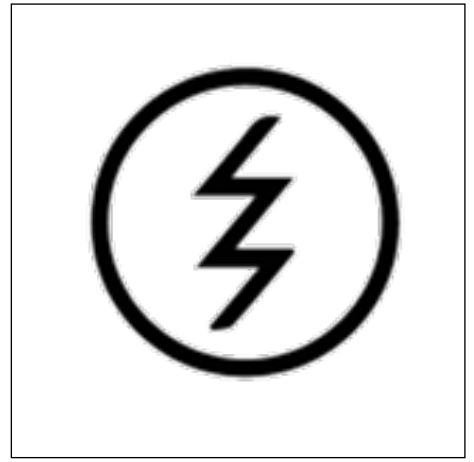
Emission Factor of Electricity Grid Mix in Belgium



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
petrolium 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 CO_2eq/kWh

0.460 kg CO_2eq/kWh

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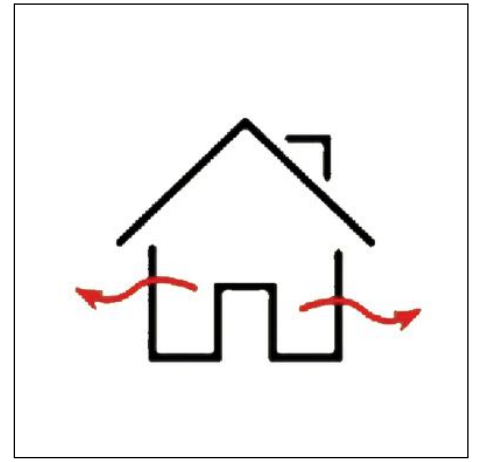
HOUSEHOLD PROFILING

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_e**	**3563**	100%	643	9.5%
electricity	Kwh_e	3563	100%	643	9.5%
HEAT+DHW+cooking	**kWh_h**	**12277**	100%	2833	41.8%
Nat gas	kWh_h	10021	82%	2522	37.2%
LGP	kWh_h	460	4%	121	1.8%
Biomass	kWh_h	1662	14%	189	2.8%
Solar thermal	kWh_h	43	0.3%	0	0.0%
Geothermal	kWh_h	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	**m^3**	**96**	100%	**56**	**0.8%**
m3 per yr (house)	m^3/	**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

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Carbon Accounting: Riccardo M. Pulselli, University of Siena

ROESELARE CITY (BELGIUM)
TYPICAL HOUSEHOLD PROFILING

HOUSEHOLD IN ROESELARE

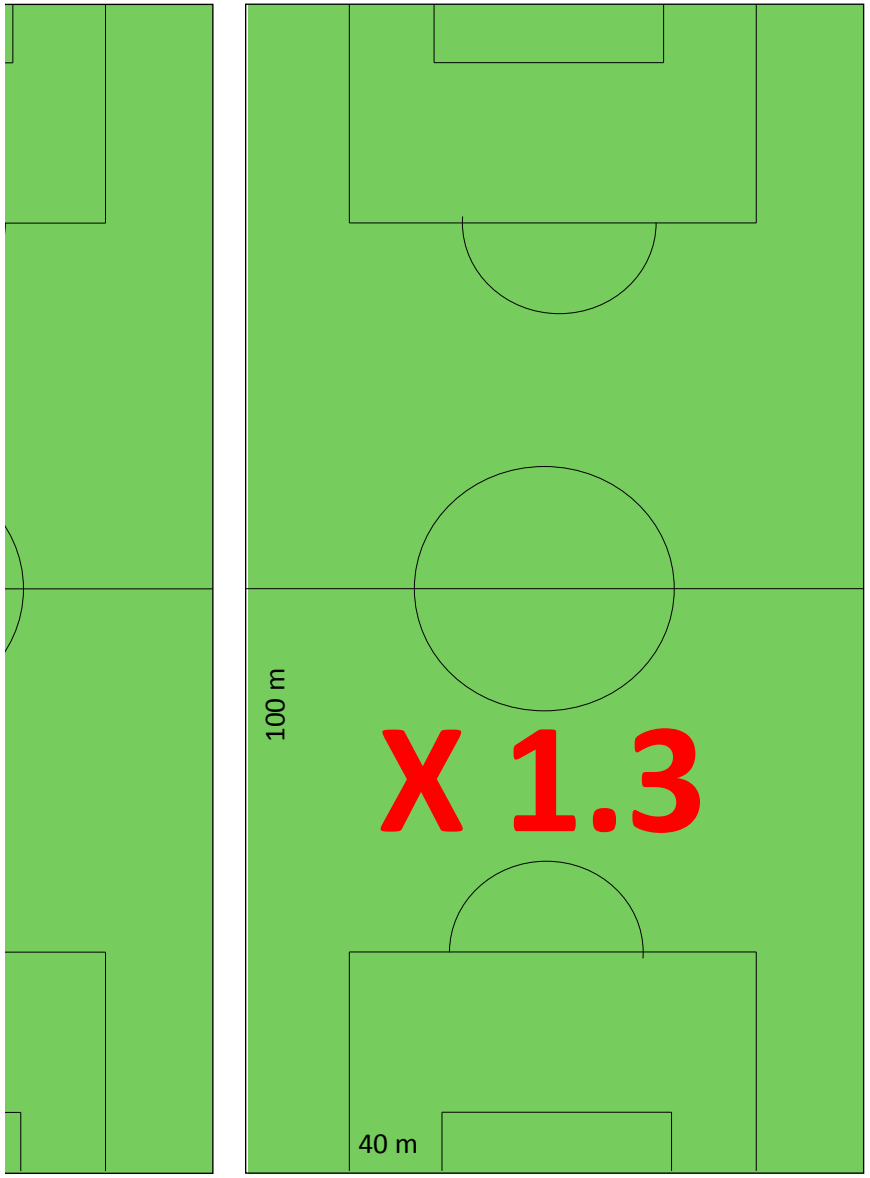
ROESELARE
IS 'R VOOR JOU

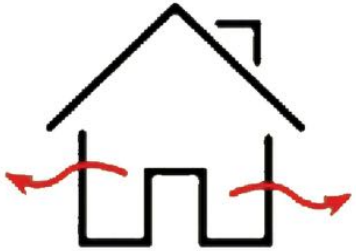
CARBON FOOTPRINT

6.78 t CO_2eq/yr

7.72 t CO_2eq/yr

Carbon Footprint Offset per household
0.50 ha forestland





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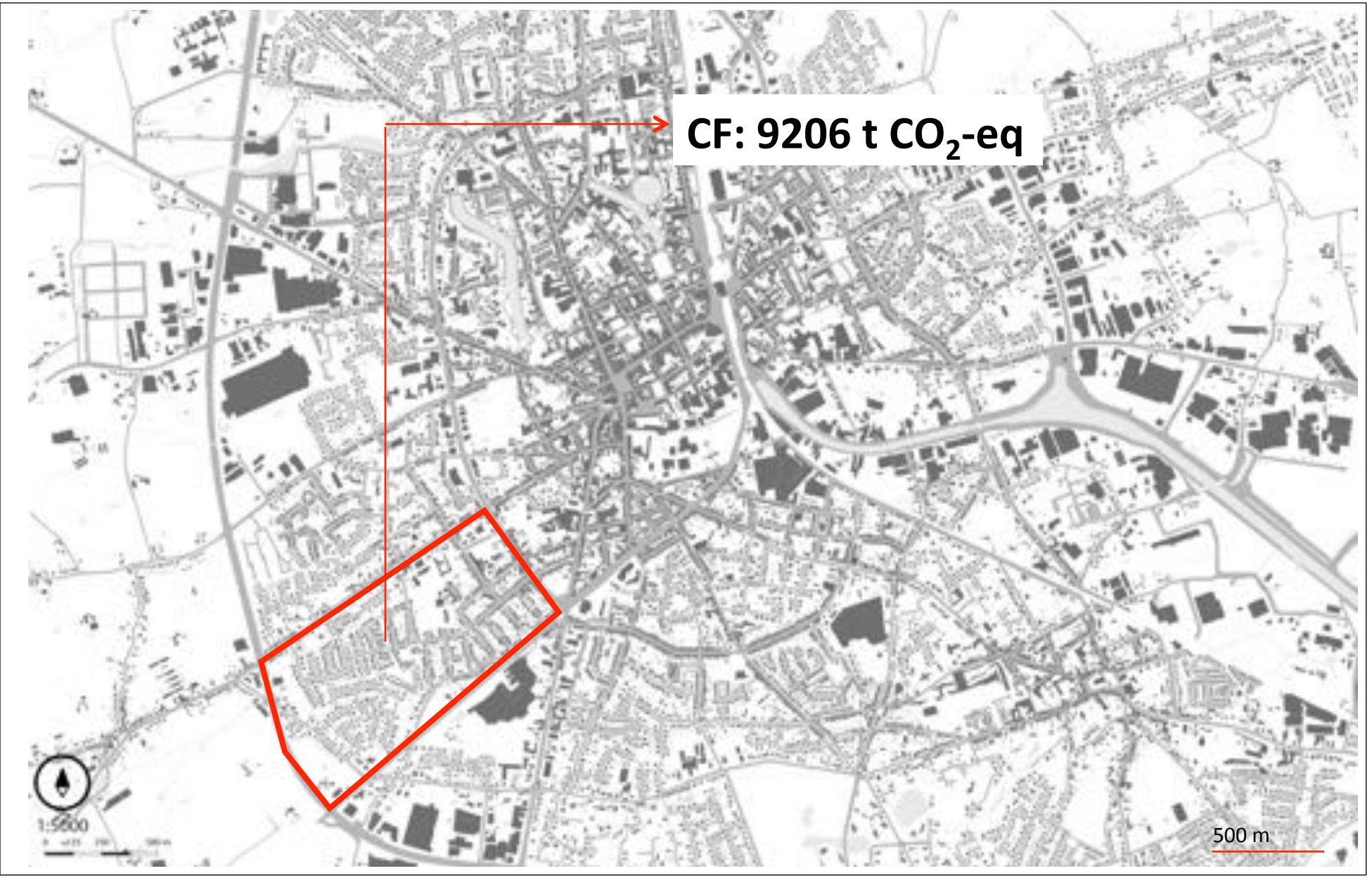
COLLIEVIJVER NEIGHBOURHOOD



COLLIEVIJVER NEIGHBOURHOOD

1358 households

2795 inhabitants

77 ha area

36 inhab./ha

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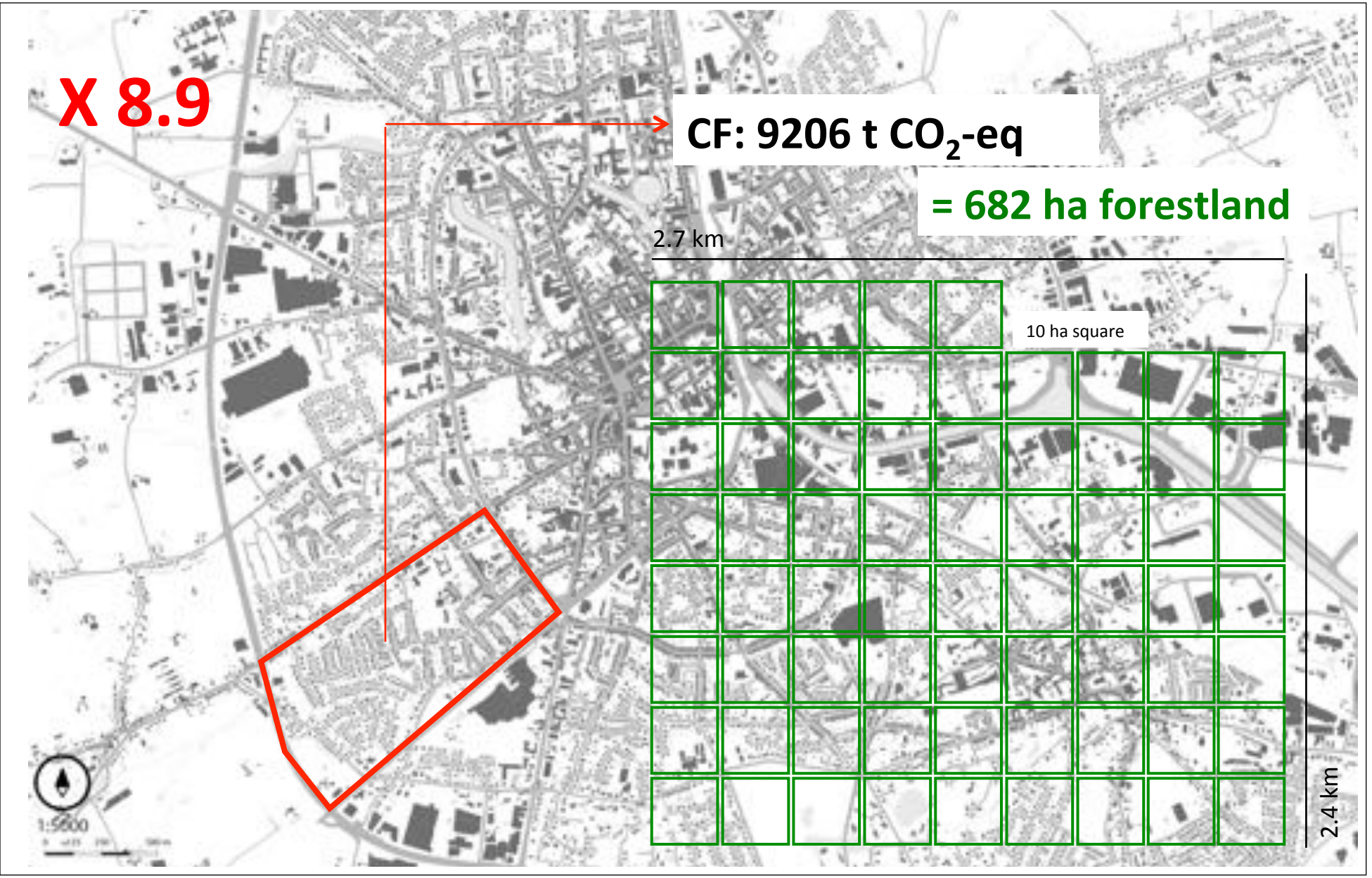
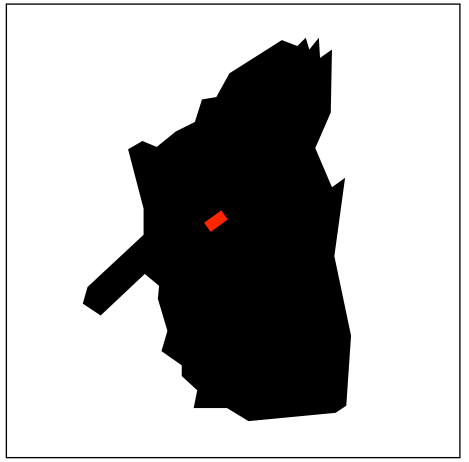
Roeselare, Belgium. April 2018

COLLIEVIJVER NEIGHBOURHOOD





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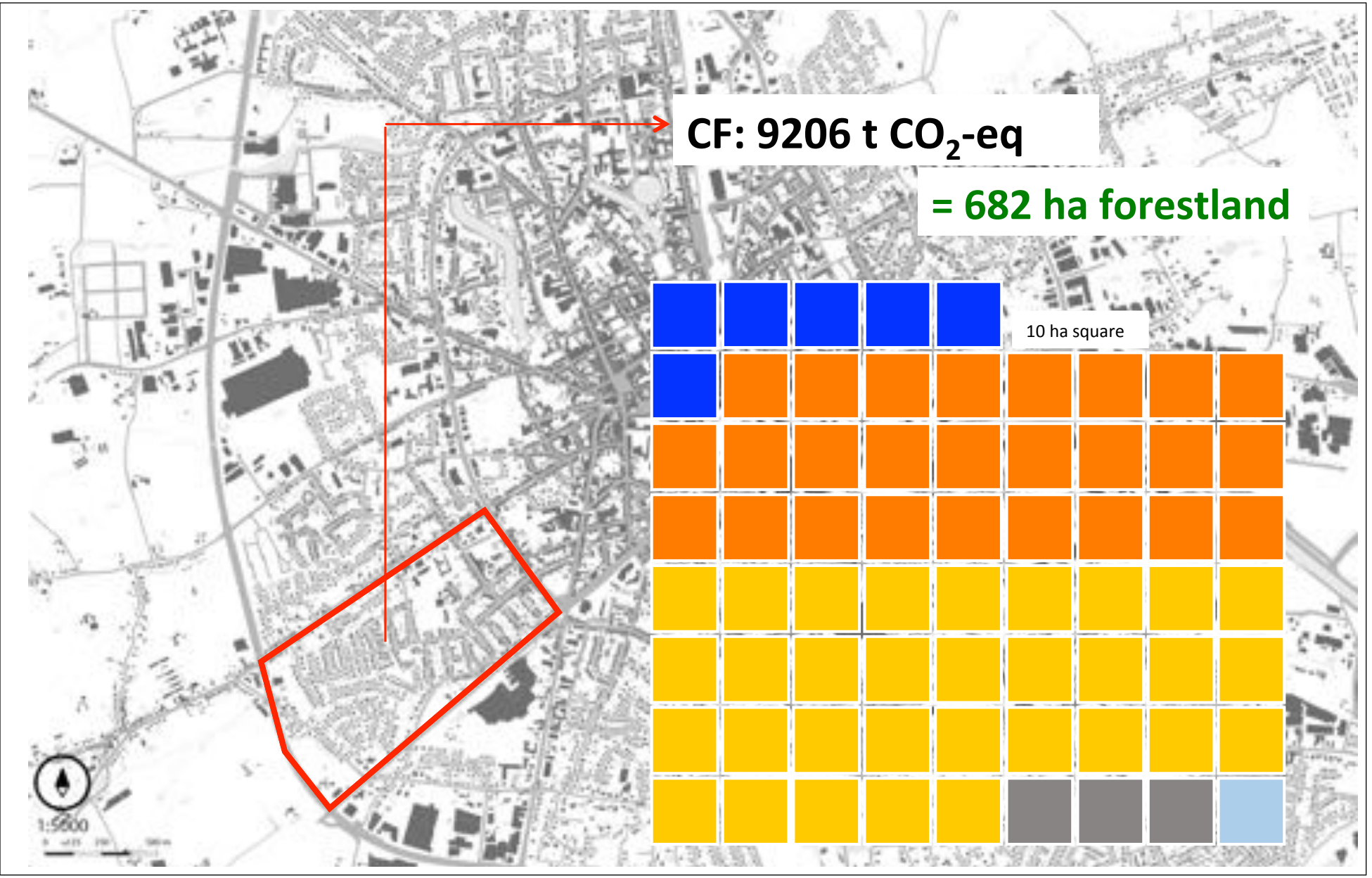

COLLIEVIJVER NEIGHBOURHOOD

- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE

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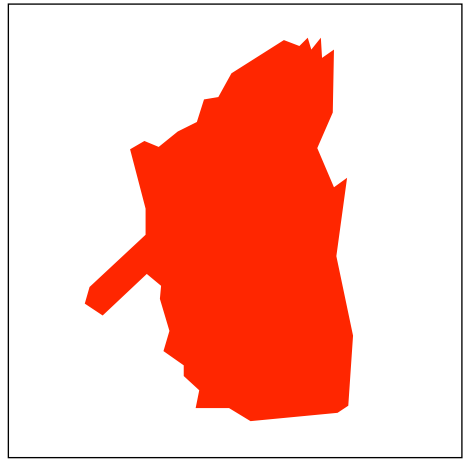
CARBON FOOTPRINT OF ROESELARE CITY

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)	m³/ 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%**

CARBON FOOTPRINT

412 kt CO_2eq/yr



Roeselare City

61,657 inhabitants

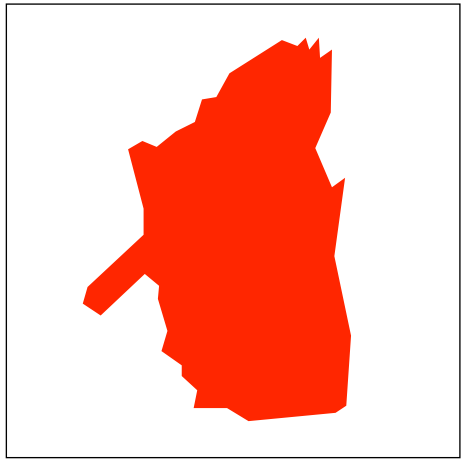
26,349 households

5979 ha area

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT OF ROESELARE CITY



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New urban energy
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CARBON FOOTPRINT OF ROESELARE CITY

30548 ha forestland grabbing

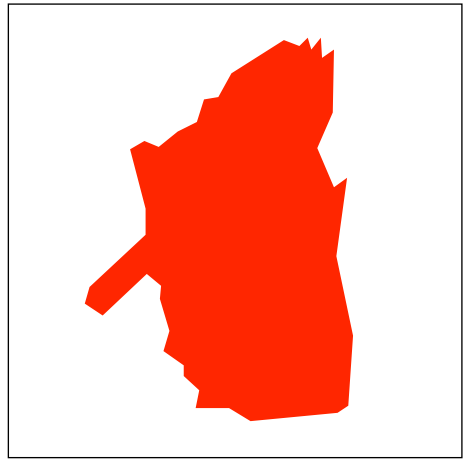
vs 5979 ha area

X 5.1

18 km

17 km

5km



Roeselare City

CARBON FOOTPRINT

412,000 t CO2 eq

FORESTLAND GRABBING

30,548 ha

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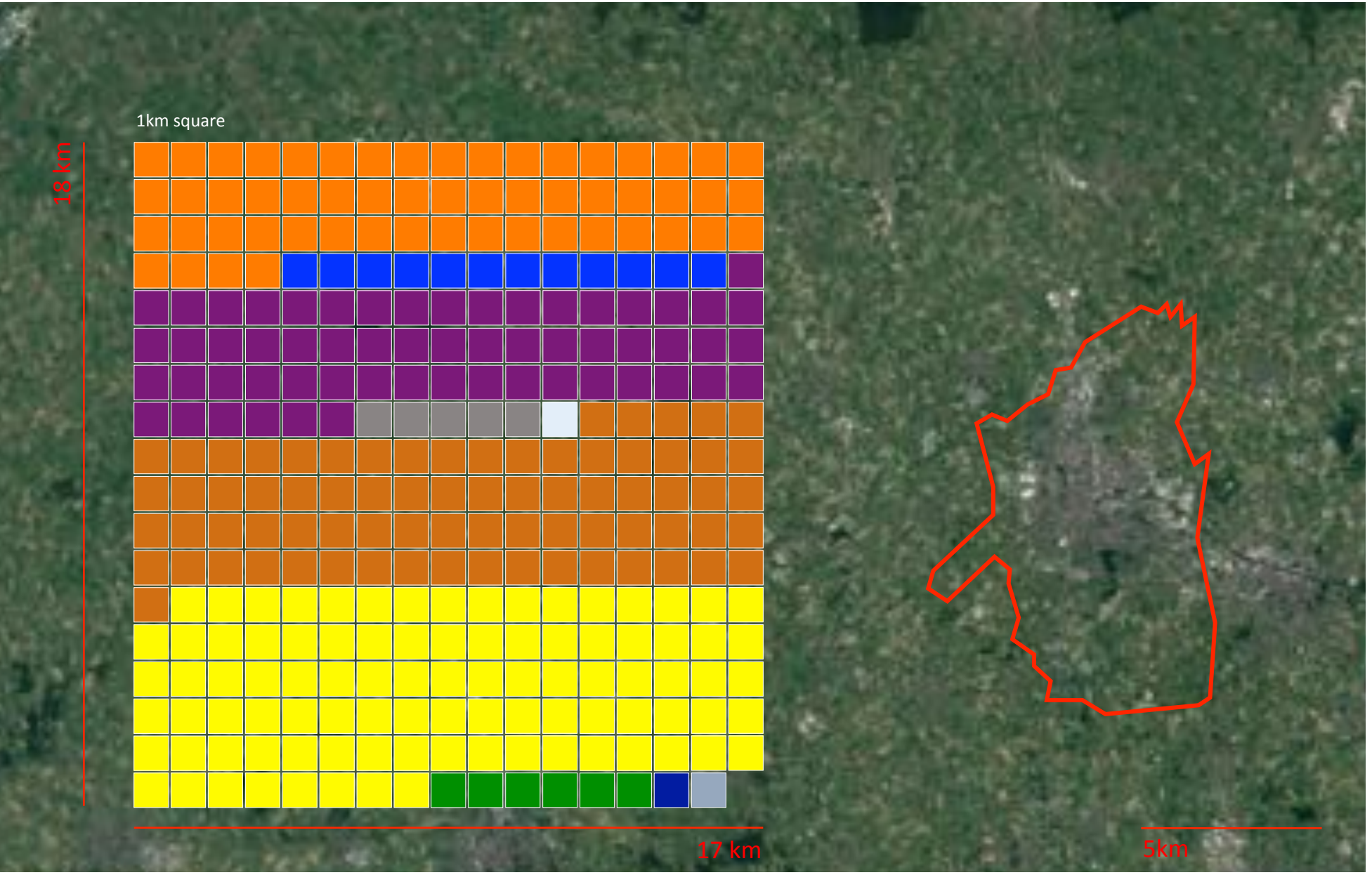
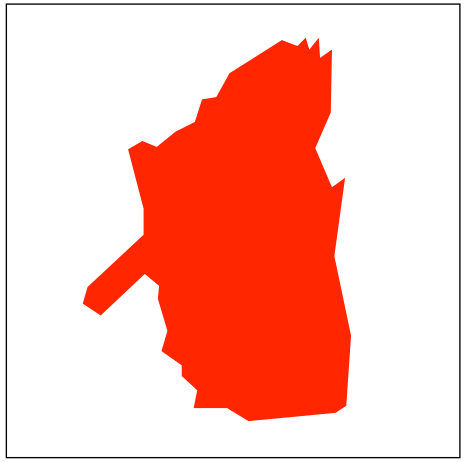
CARBON FOOTPRINT OF ROESELARE CITY





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

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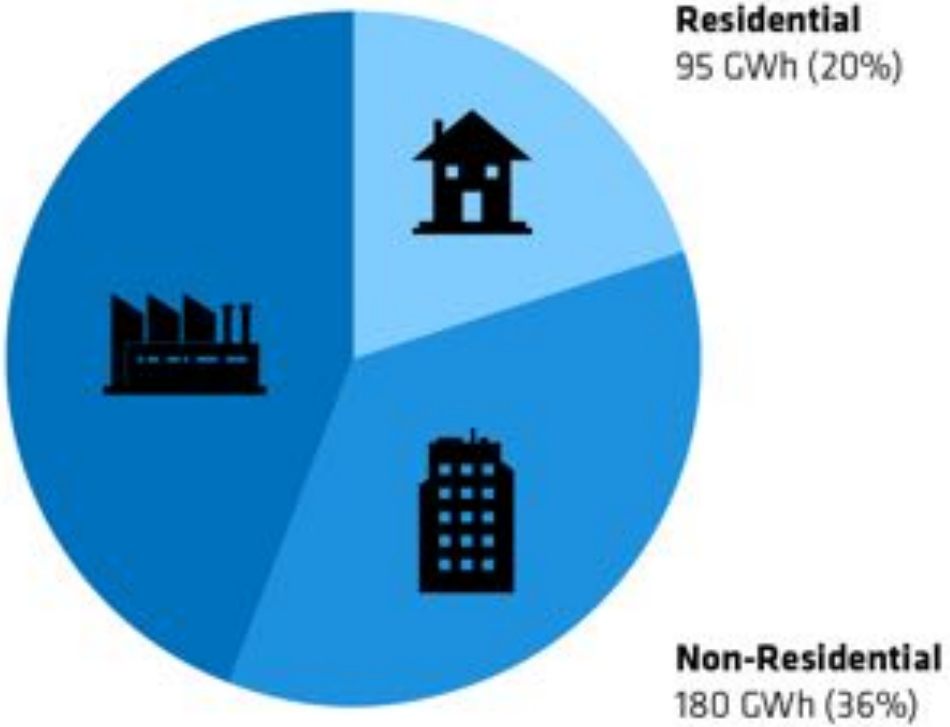
Electricity demand Roeselare 2015 (GWh)



Current Electricity Demand

495 GWh-e in 2015

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

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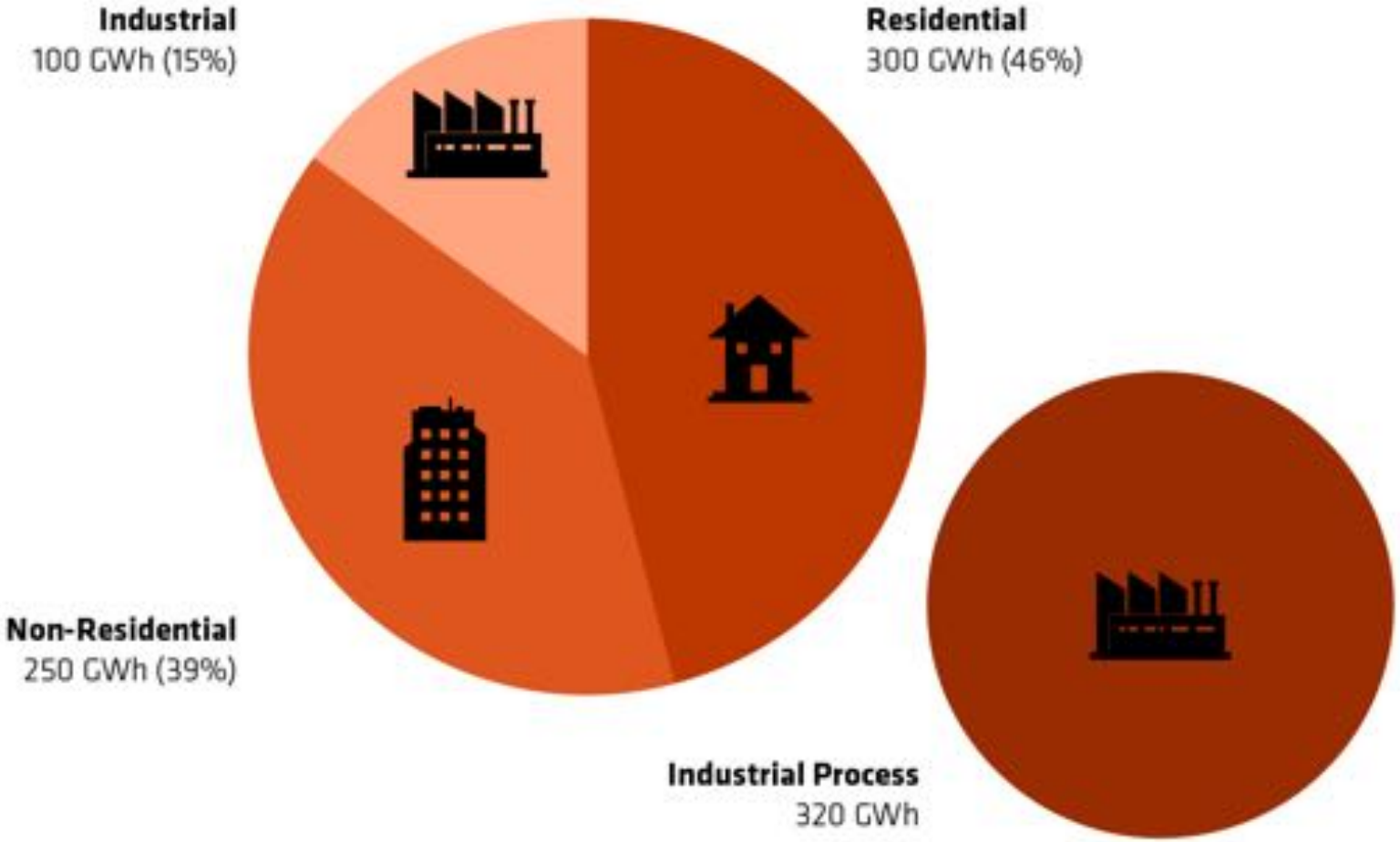
Heat demand Roeselare 2015 (GWh)



Current Heat Demand

620 GWh-th in 2015
+
320 GWh-pr

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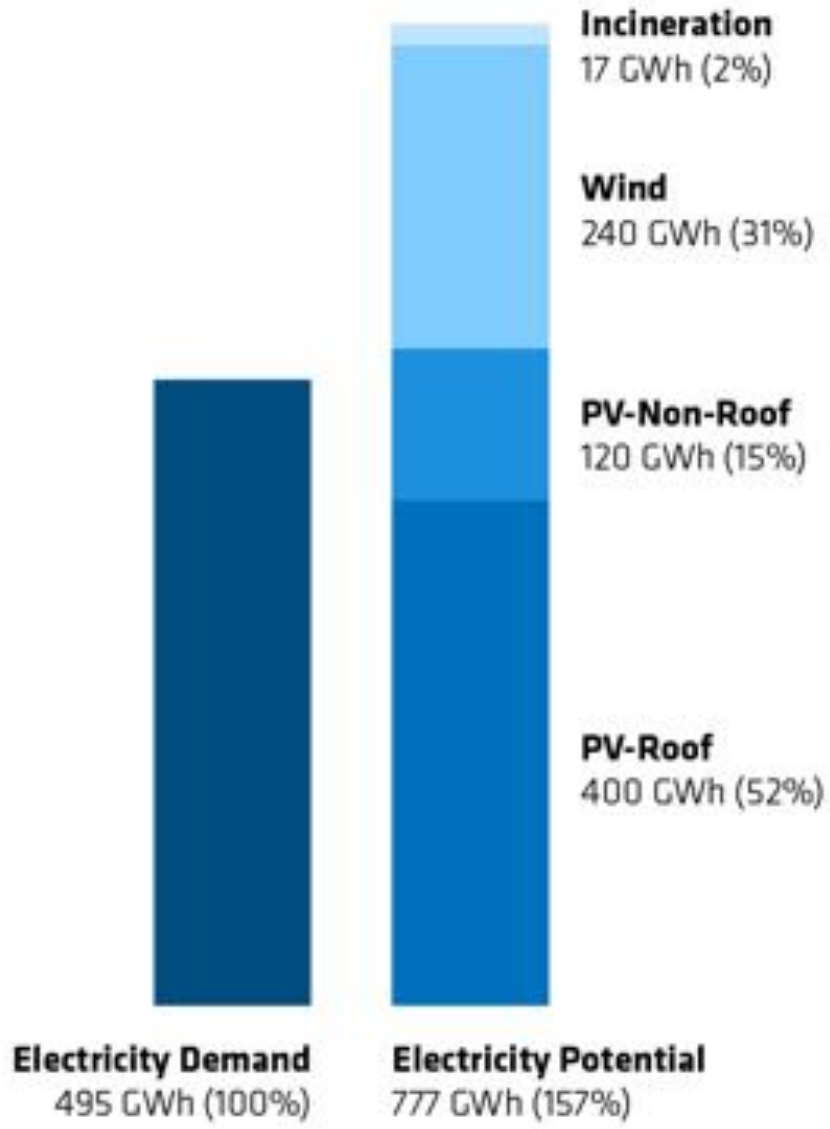
Electricity potentials in Roeselare



Space for production

40 Wind turbines

50% of all roofs (235 ha)

80 ha non-roof

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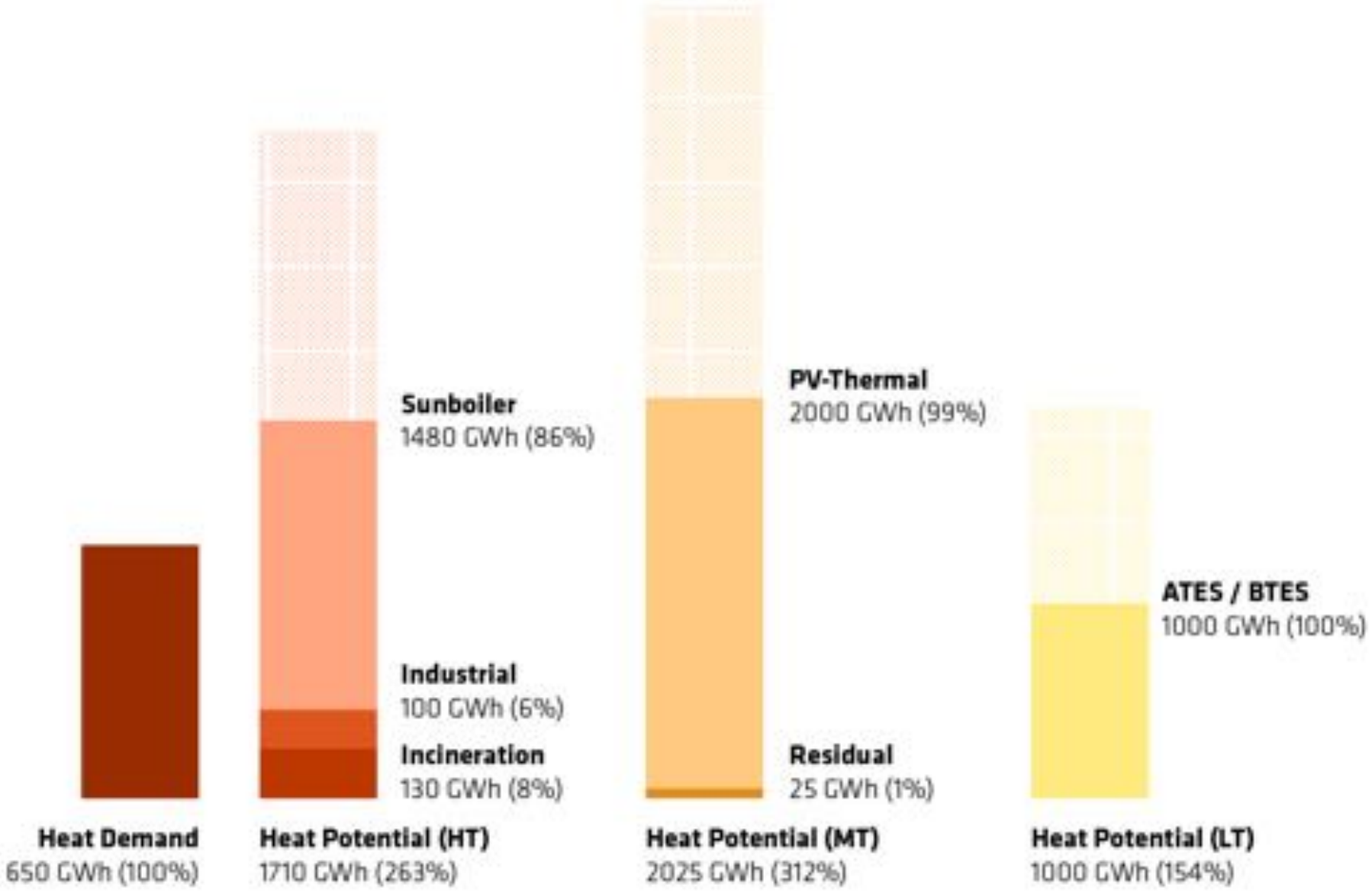

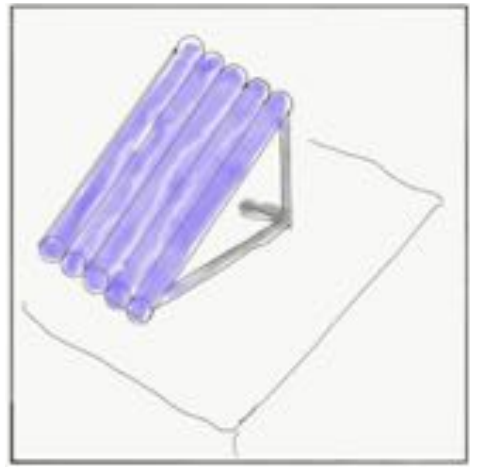

Temperature levels

High-T for district heat network (DHN)

Mid-T needs energy renovation

Low-T needs heat pumps and energy renovation

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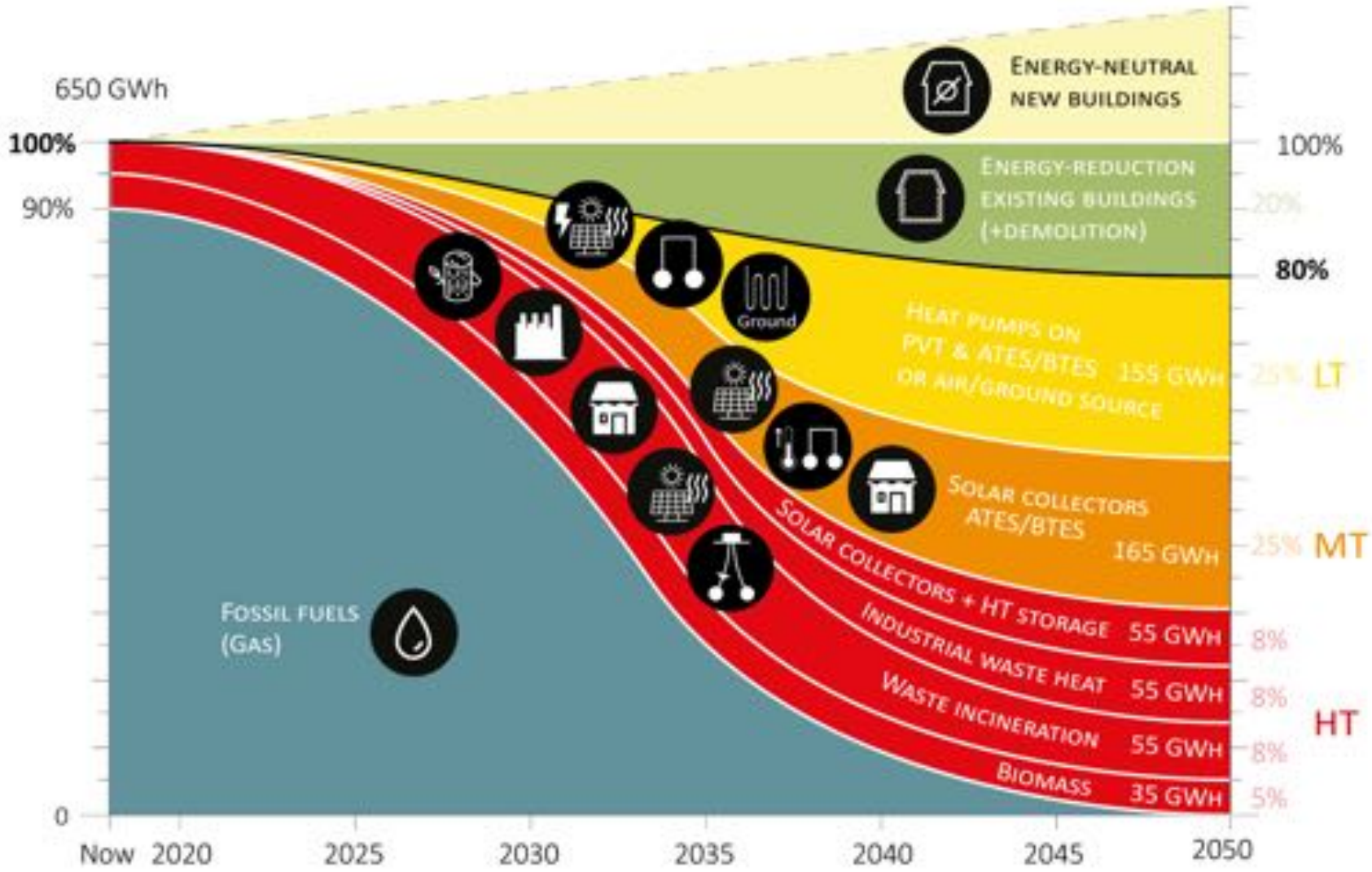
Heat Balance towards 2050



Temperature levels

30% High-T for DHN

25% Mid-T

25% Low-T

20% reduction

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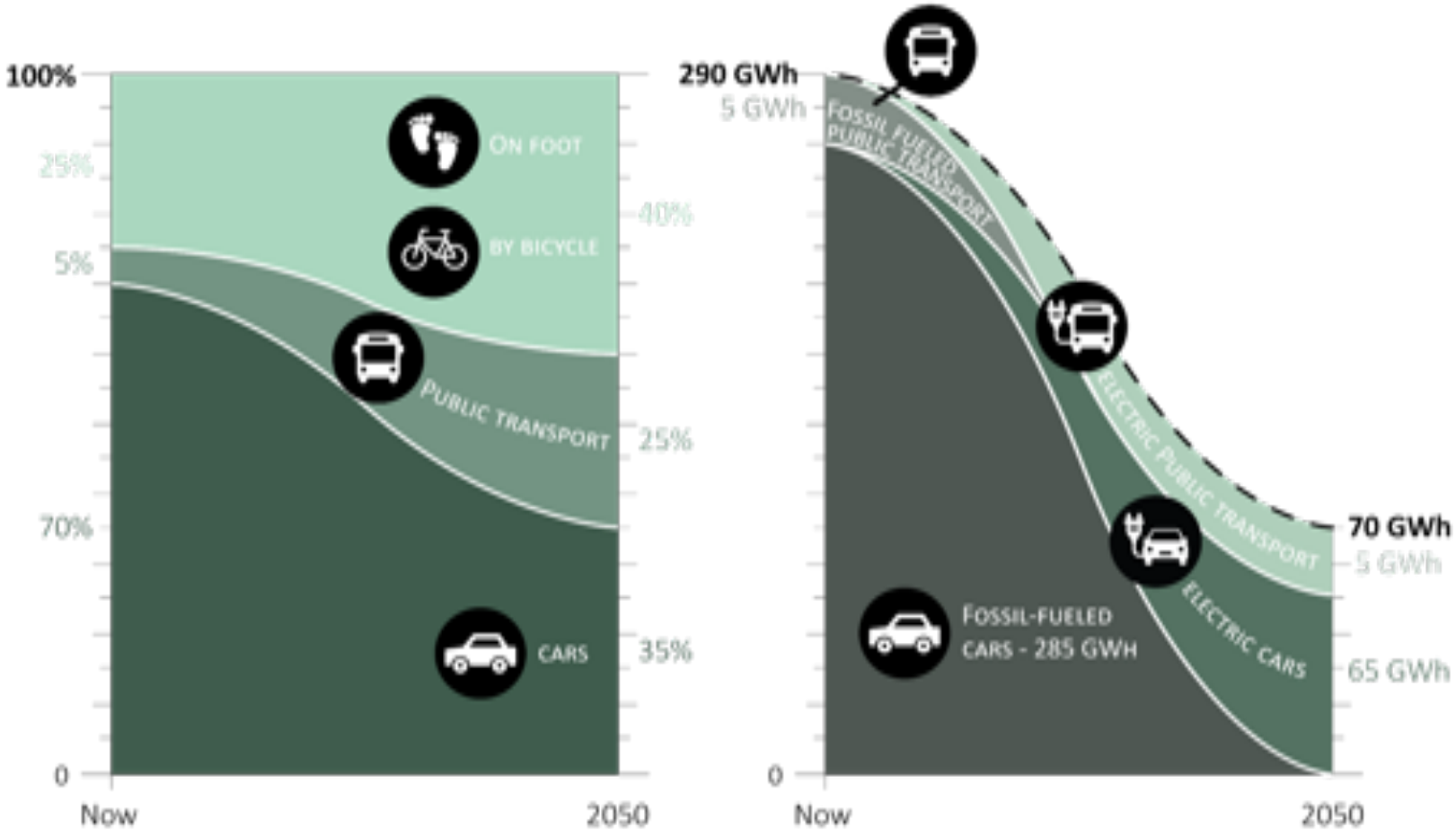
Sustainable transport scenario



Main directions

Modal shift

Electrification

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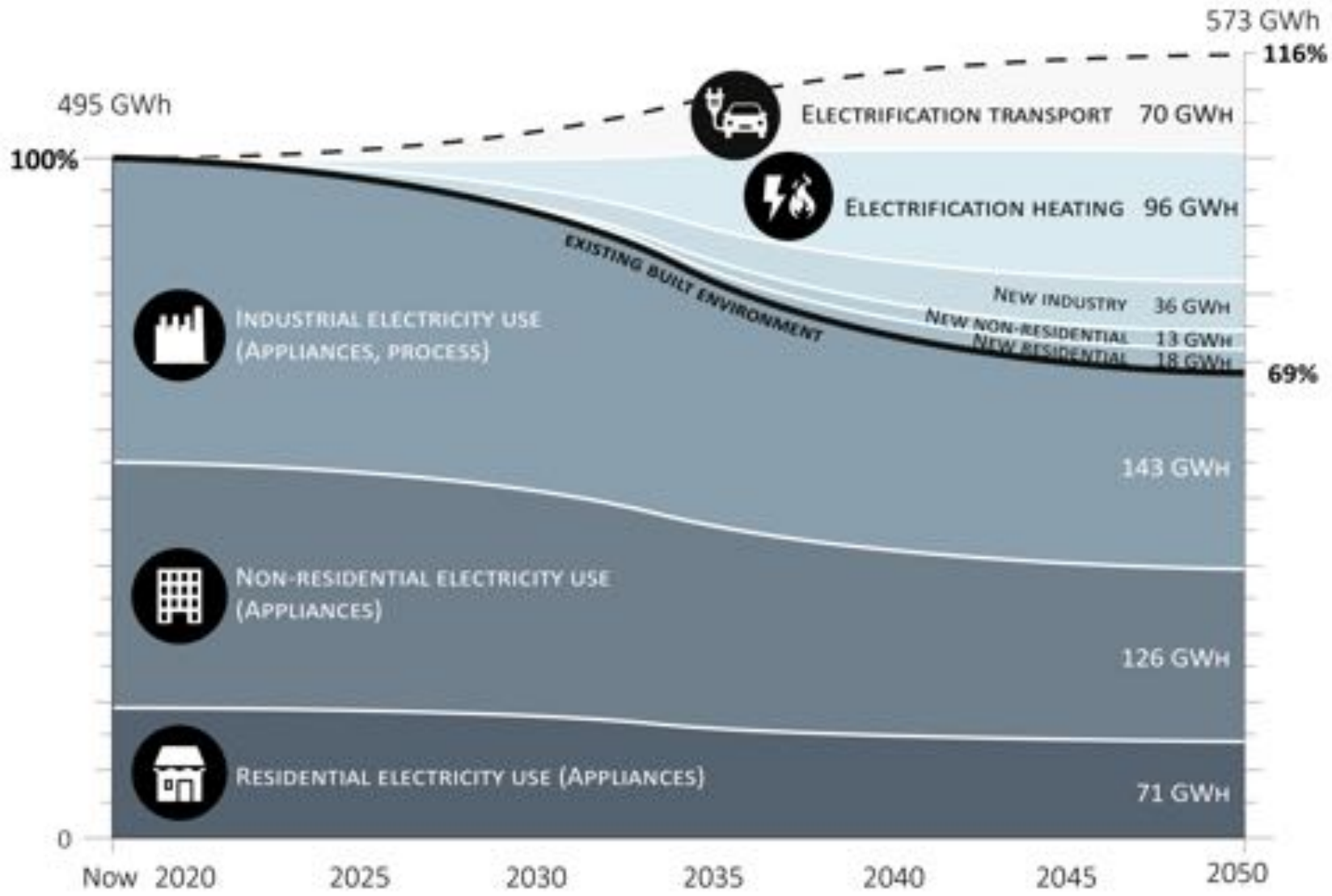
Electricity demand scenario towards 2050



Assumptions

30% reduction of current demand for appliances

15% total increase due to Electrification of

Heating + transport

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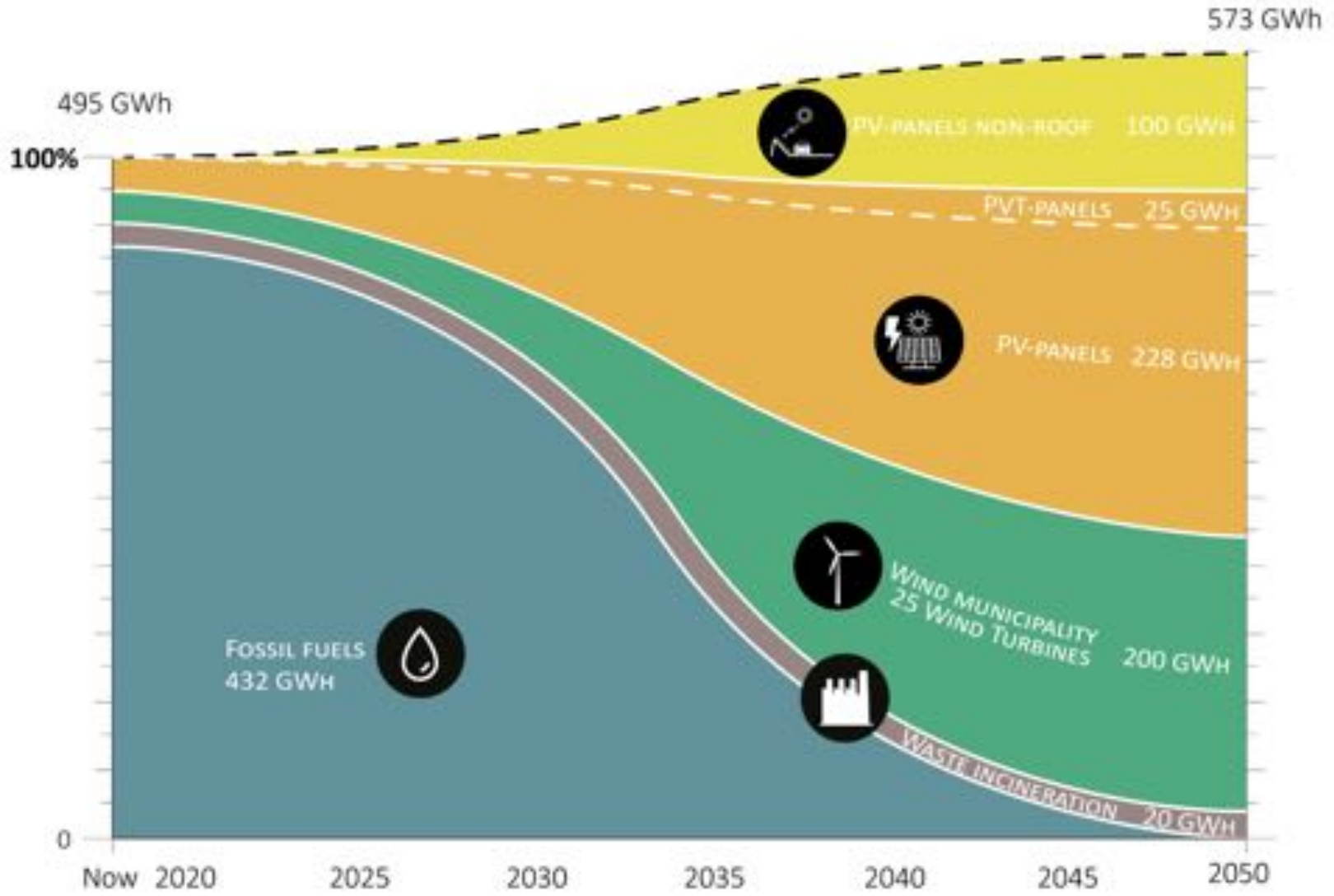
Electricity Balance towards 2050



Main measures

25 Wind Turbines

240 ha PV panels

Co-generation of waste incineration

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

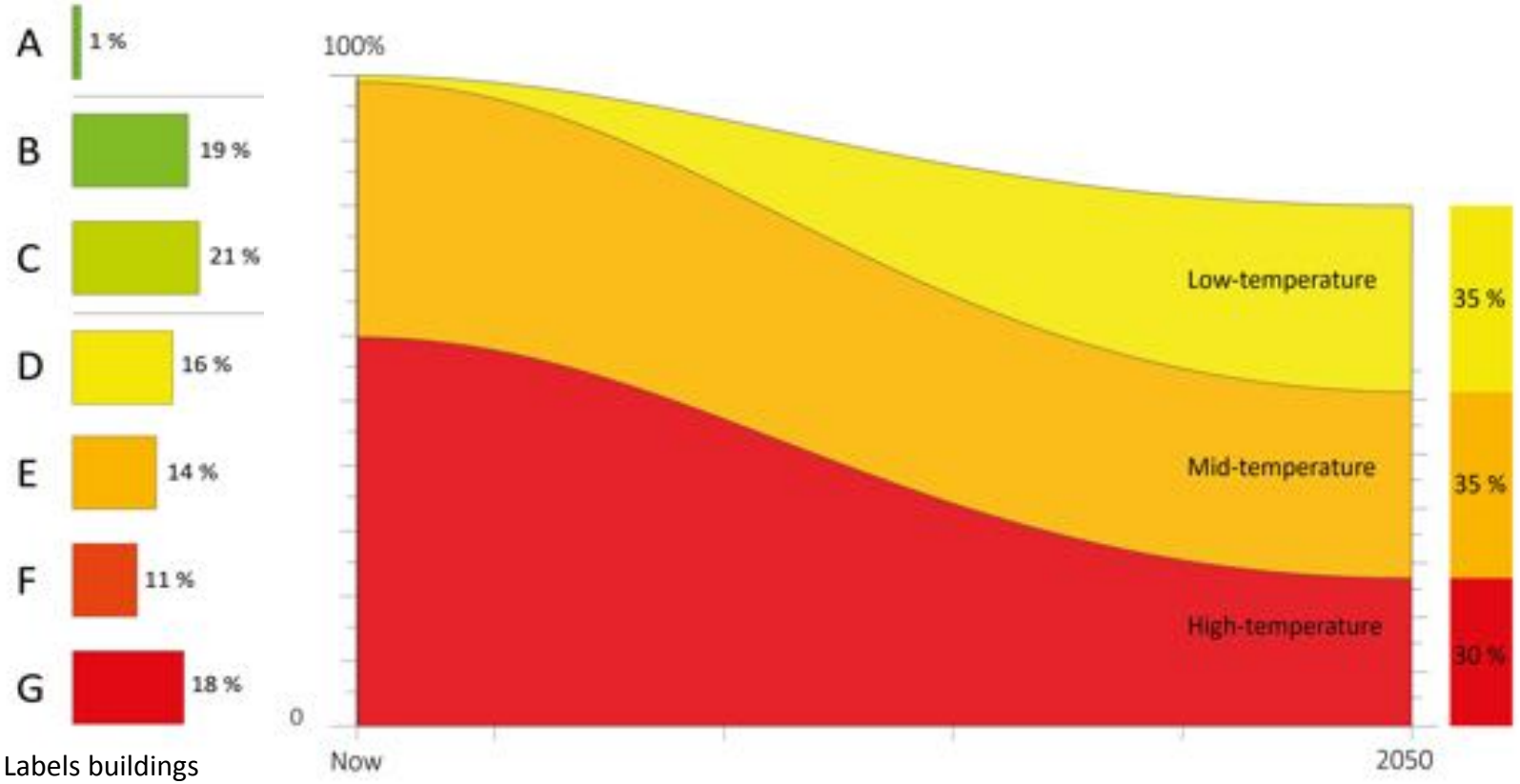
Temperature levels for heating of buildings towards 2050

Required temperatures

HT = > 65°C

MT = 40°C - 65°C

LT = < 45°C



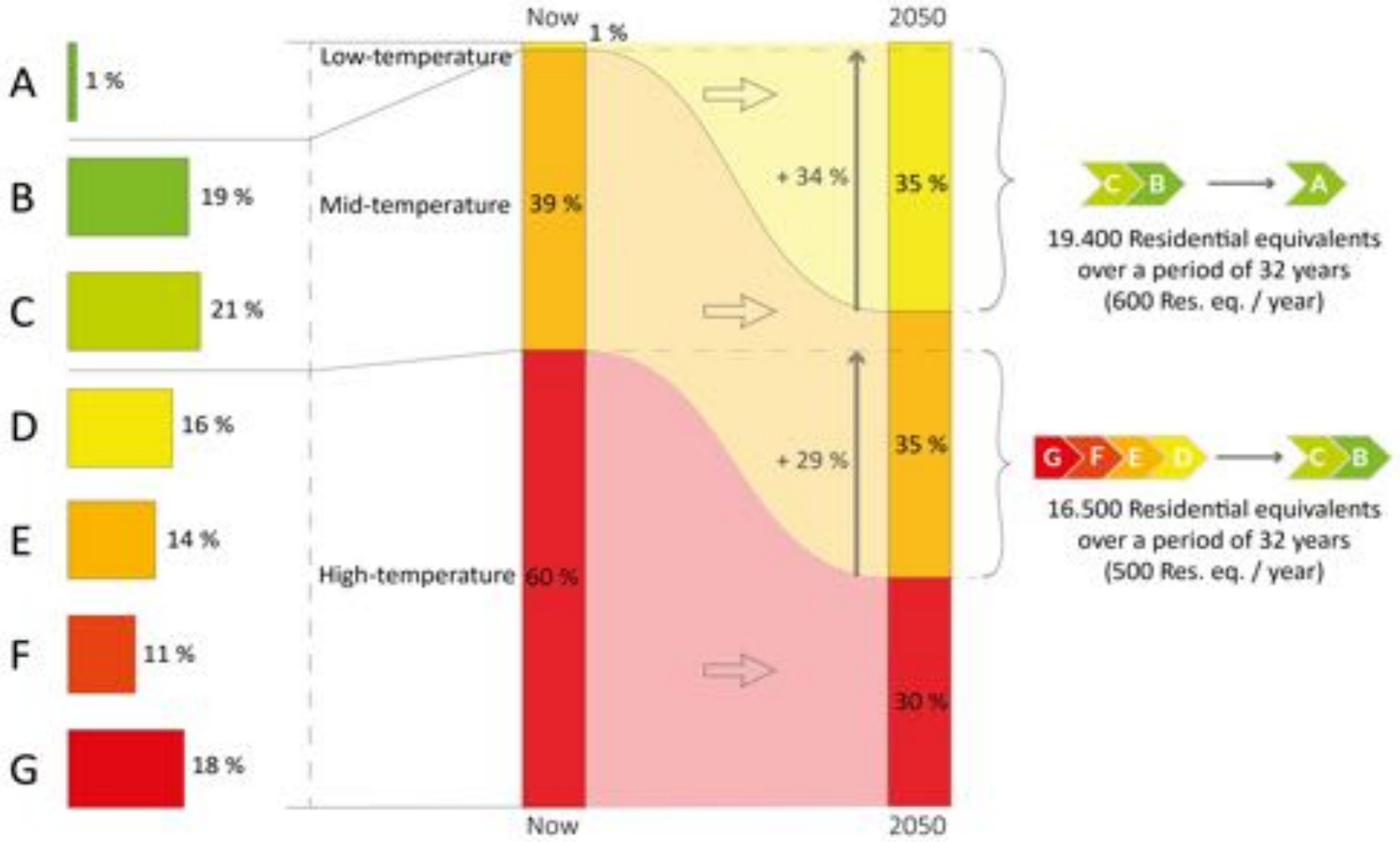
Labels buildings Flanders

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Required energy renovations of building stock towards 2050



Building stock

57000 residential unit equivalents of which:

26000 residential

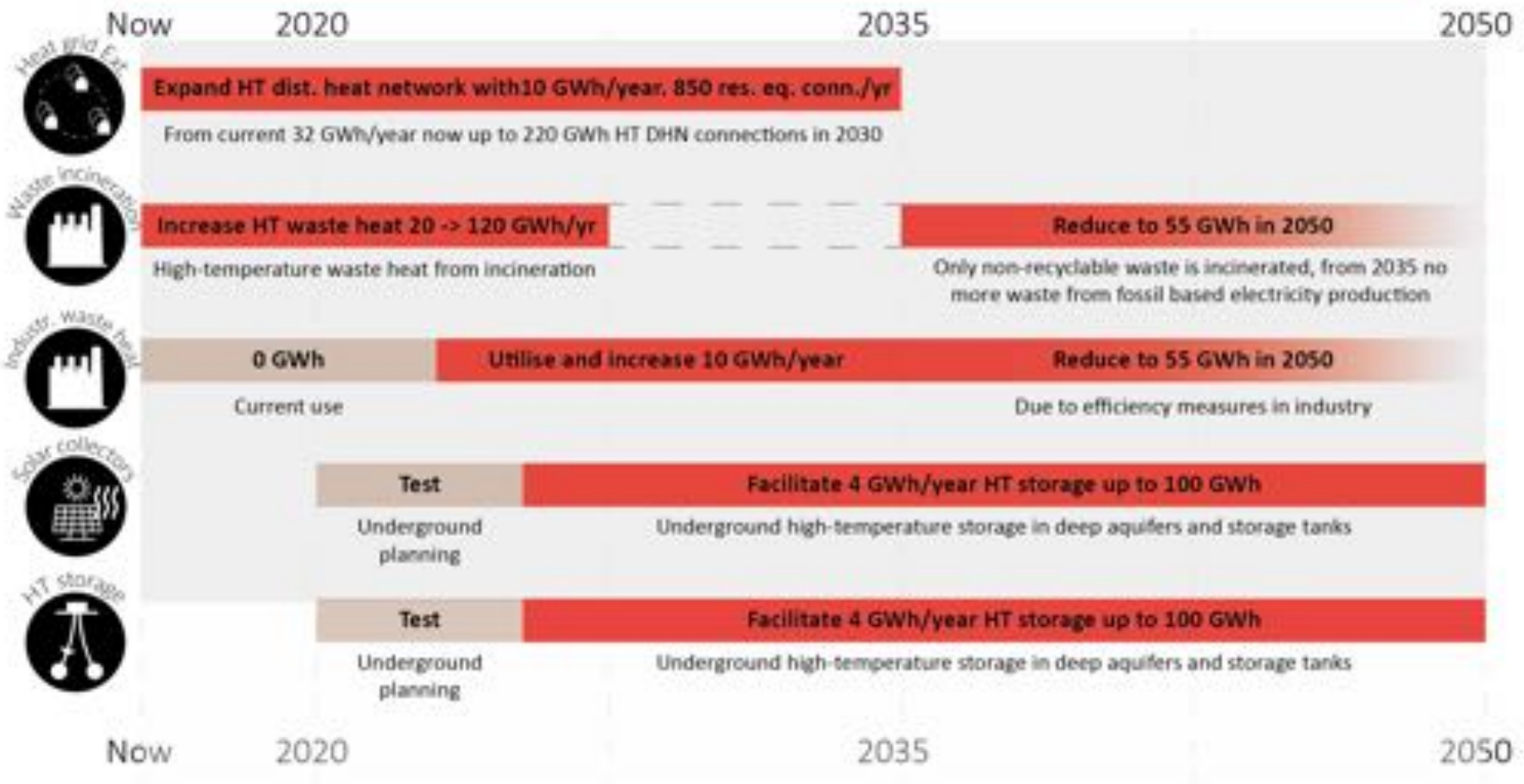
31000 non-residential

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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



Main measures

DHN extension

Maximize waste heat use of industrial waste by 2035

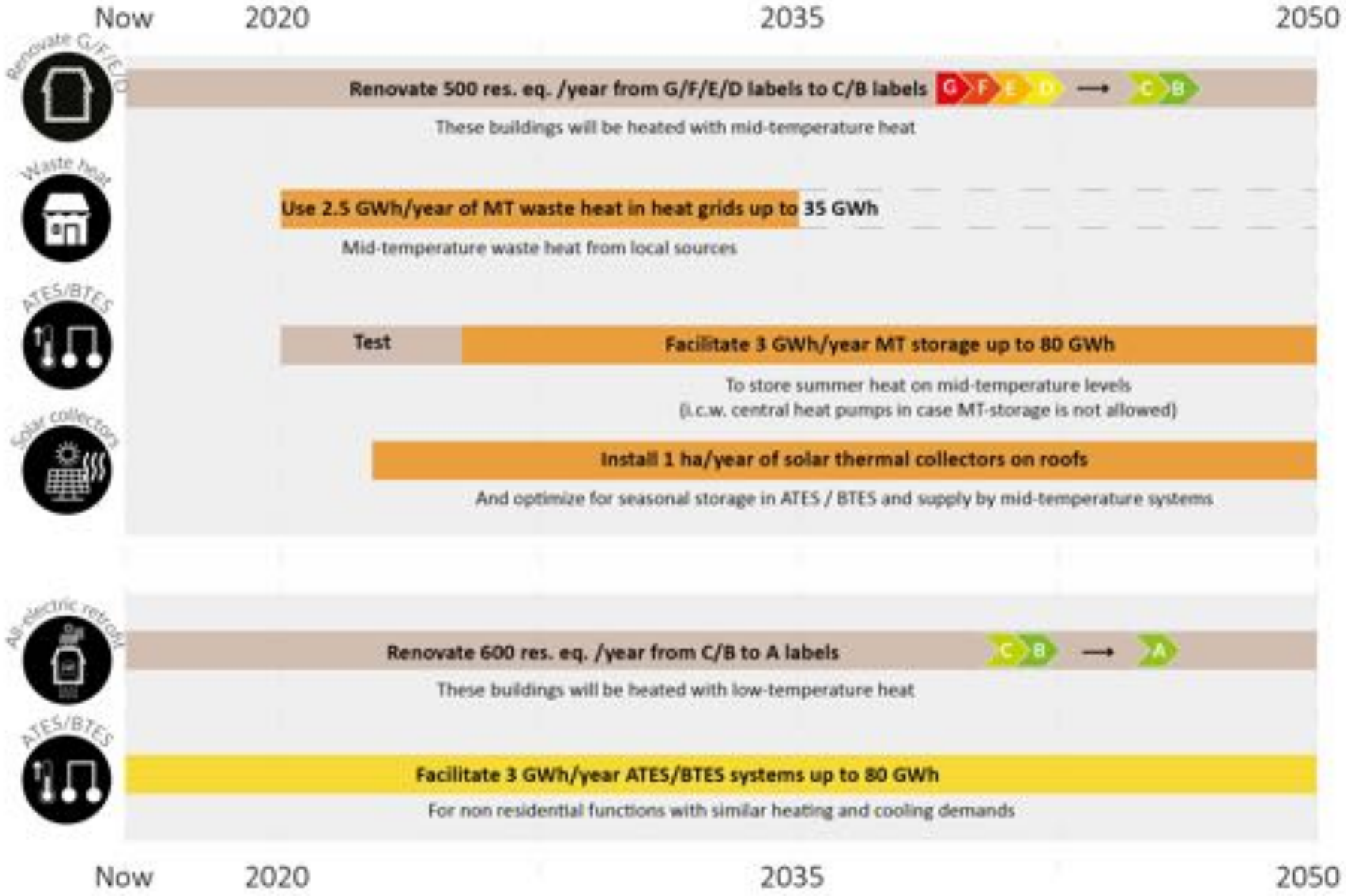
Partly reduced and replaced by solar heat and underground storage towards 2050

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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



Main measures

60% of building stock moderately renovated by 2050

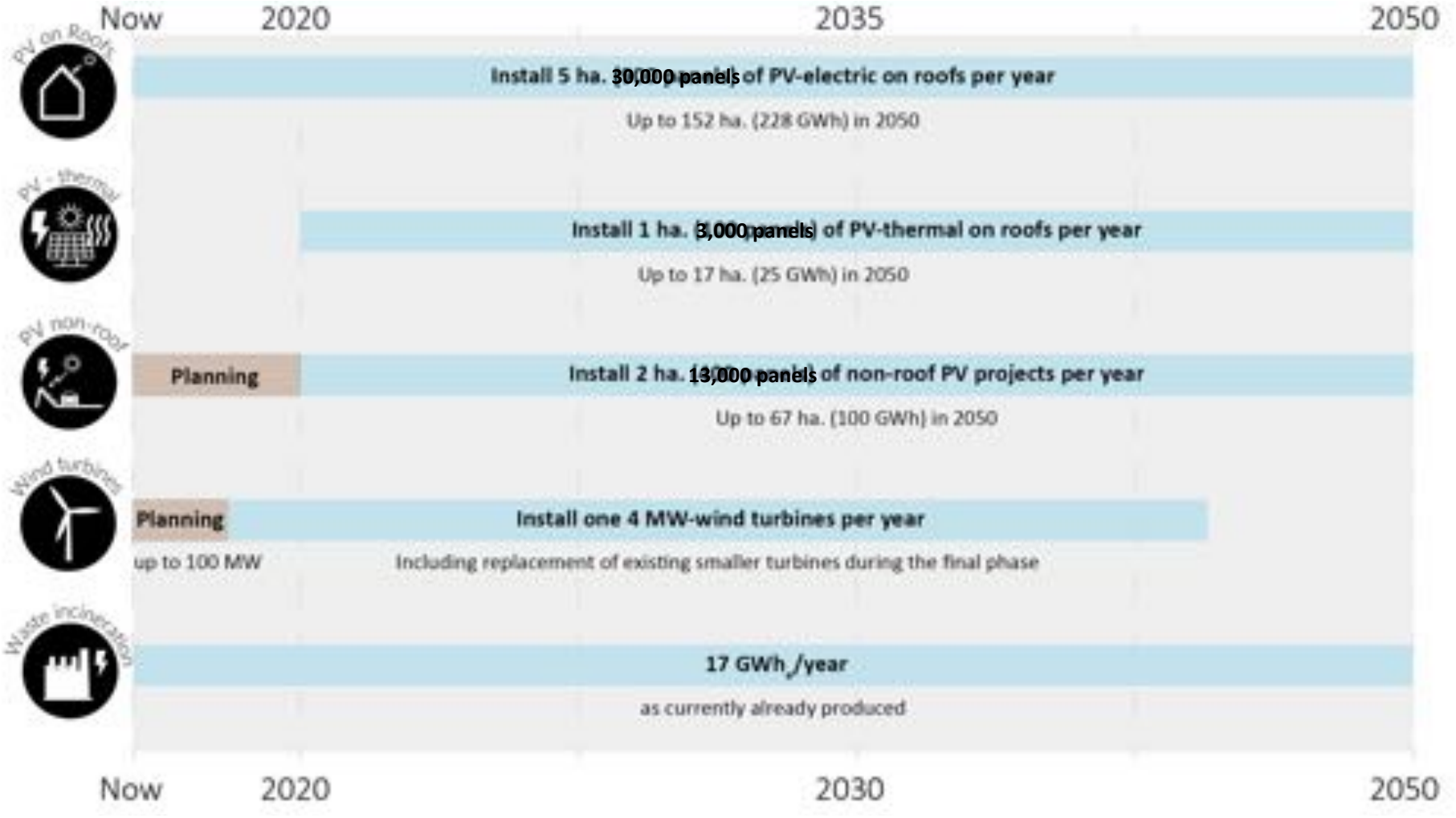
Solar collectors and MT-storage in underground

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Roadmap for sustainable electricity production in Roeselare



Main measures

235 ha PV panels

25 4MW Wind Turbines

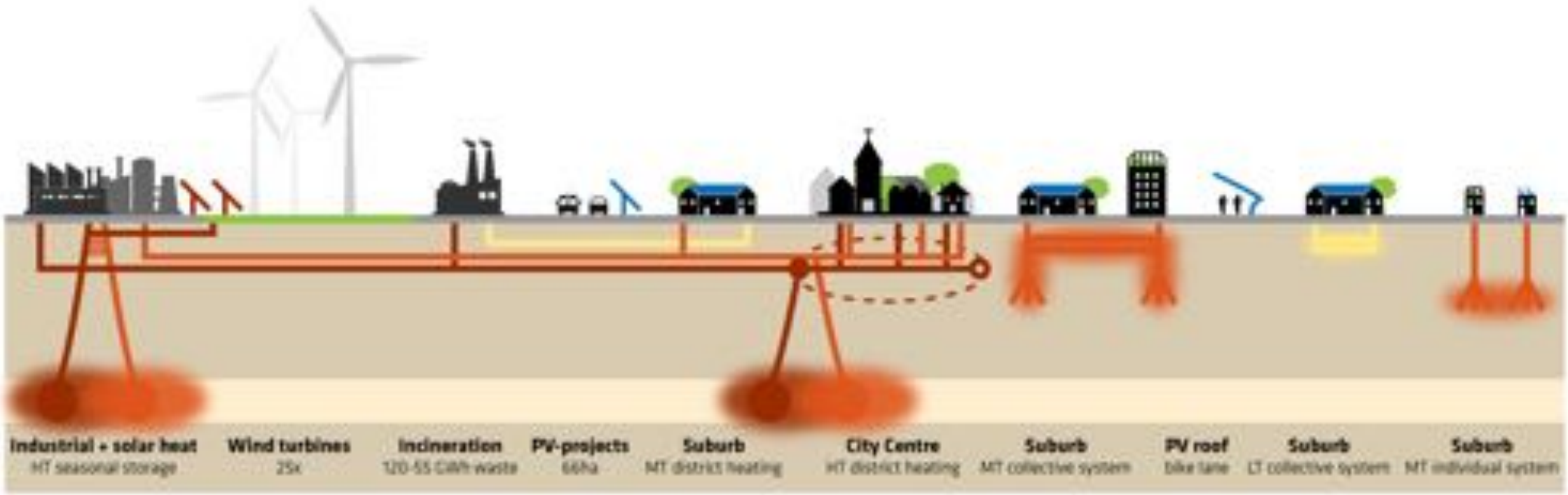
17 GWh-e from Waste Incineration

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

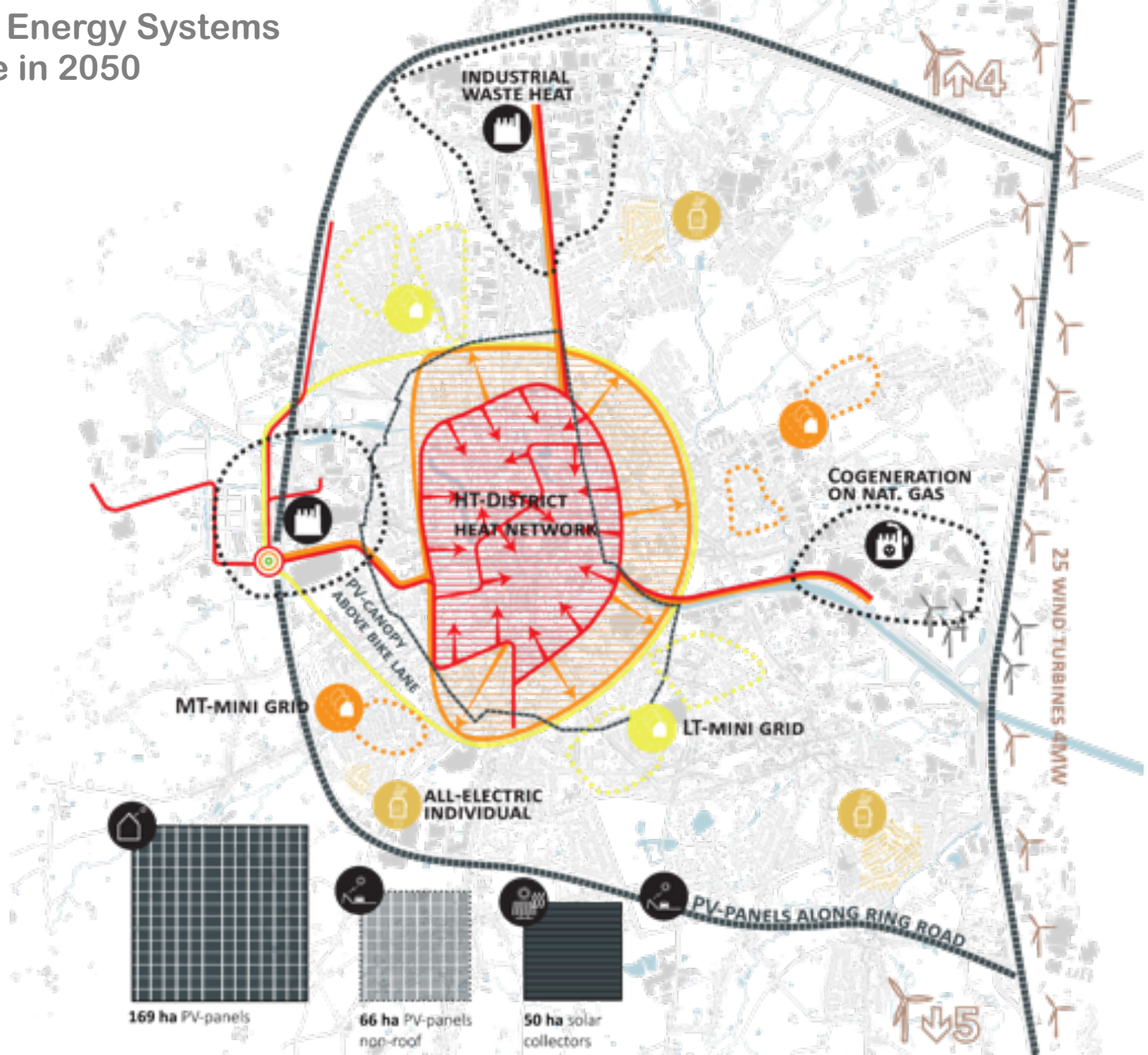
Schematic section of Roeselare's sustainable energy systems in 2050



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

Roeselare, Belgium. April 2018

Sustainable Energy Systems in Roeselare in 2050



Main directions

Central HT-DHN
Cascaded to

235 ha PV panels

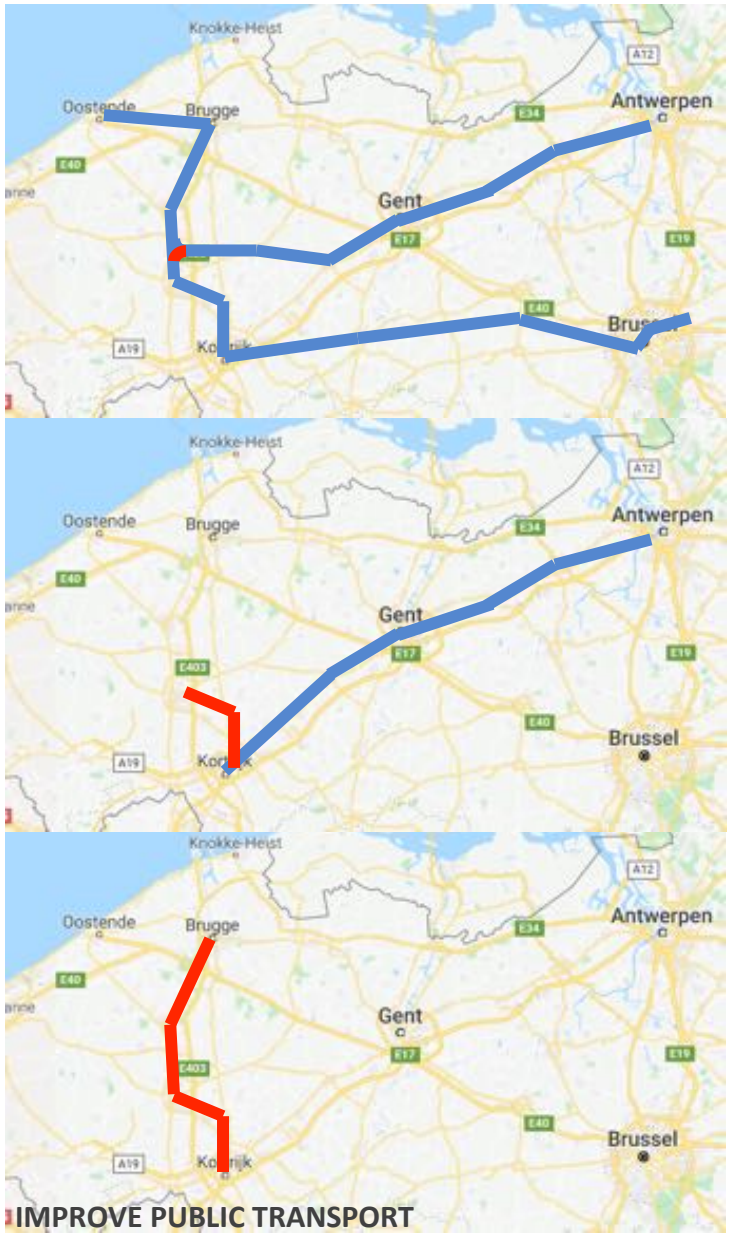
25 4MW Wind Turbines

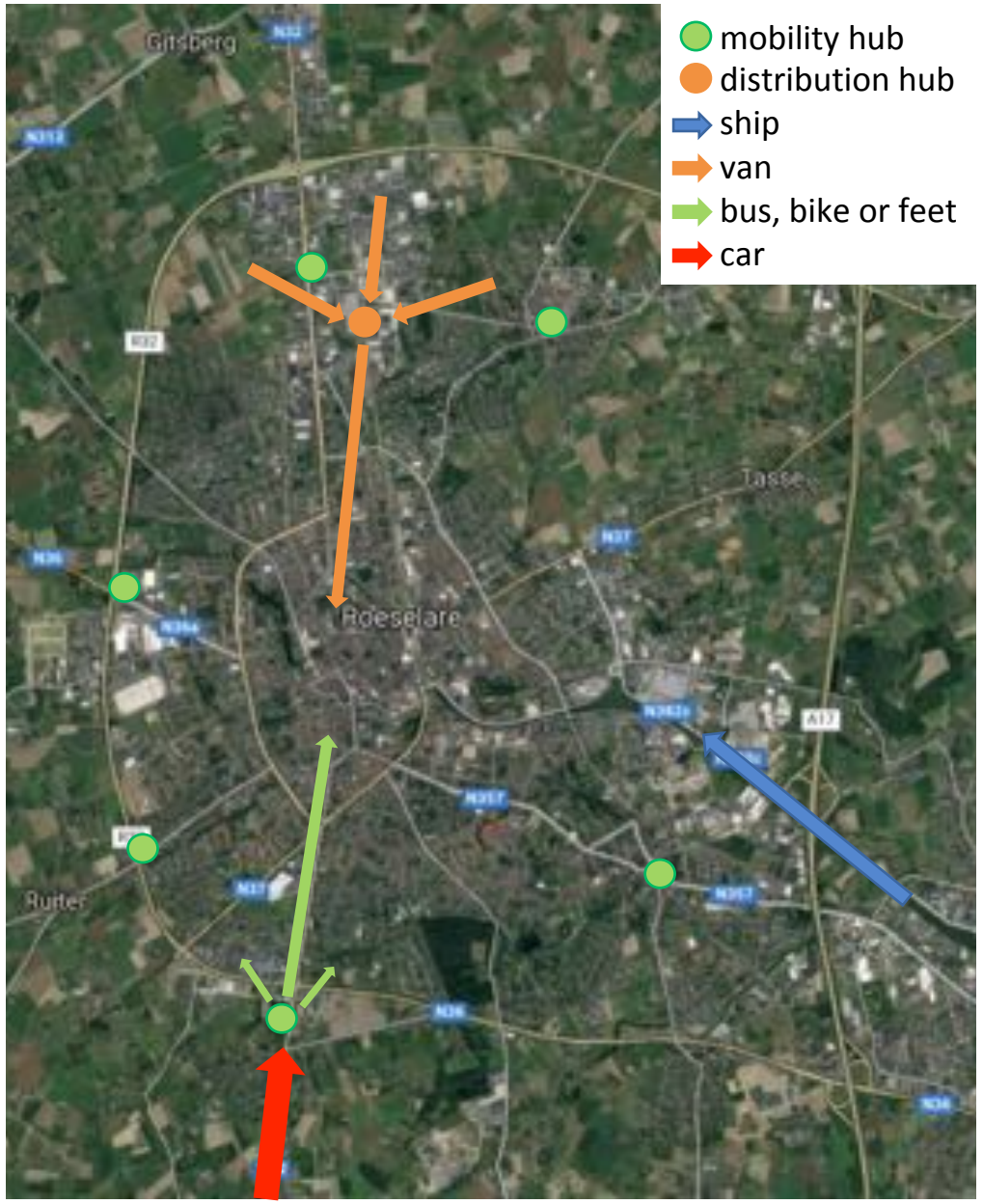
17 GWh-e from Waste Incineration

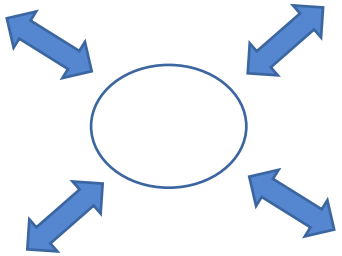
CITY-zen
New urban energy
ROADSHOW

Roeselare, Belgium. April 2018

Sustainable transport and mobility







Regional connectivity

People

Packages

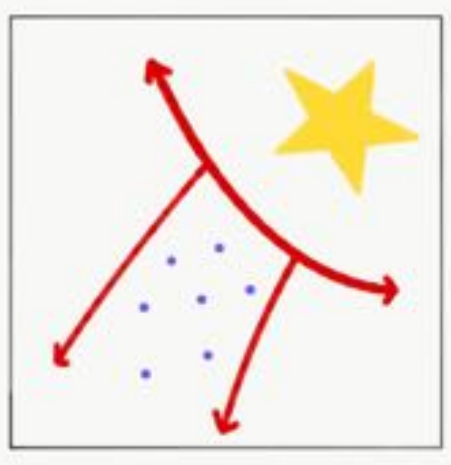
Heavy materials

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Analysis



Urban disconnection

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

CITY-zen
New urban energy
ROADSHOW

Roeselare, Belgium. April 2018

Urban Analysis

Neighbourhood disconnection

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

Roeselare, Belgium. April 2018

Urban Analysis

Low Density

1300 Houses

85 Hectares

15 Homes/Ha

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Analysis

Low Intensity

No bars

No cafes

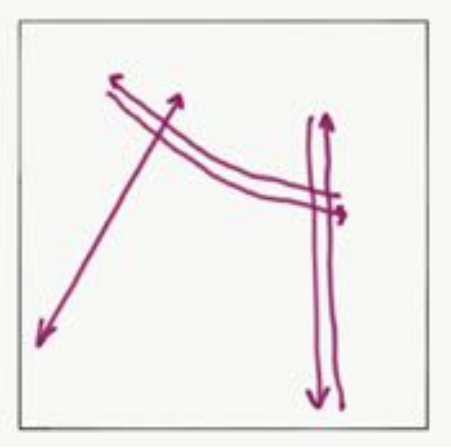
No civic functions

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

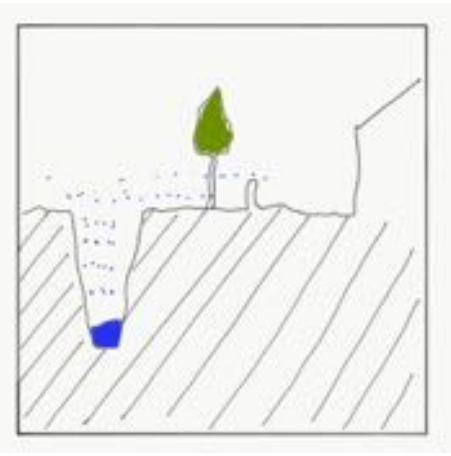
Urban Analysis



Over-engineered Roads

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

Urban Analysis



Over-engineered water ways

Flooding an issue

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

CITY-zen New urban energy ROADSHOW

Roeselare, Belgium. April 2018

Urban Analysis

Empty but full

75 Homes/Ha

17 Hectares

68 Hectares empty

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

Roeselare, Belgium. April 2018

Urban Analysis

Small green spaces

Indvidual gardens

Grass verges

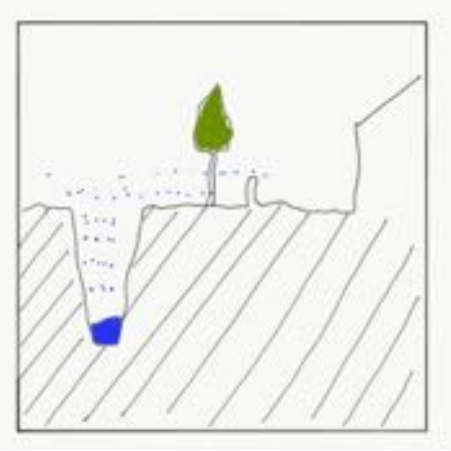
Road infrastructure

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Analysis

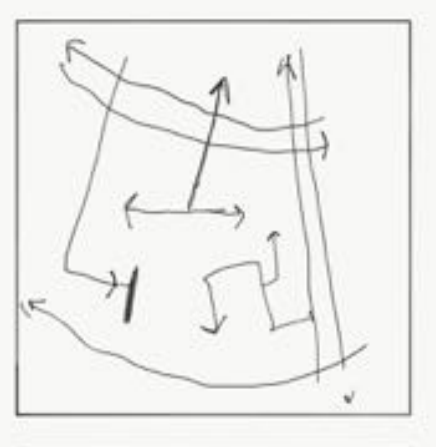


Over-engineered water ways

Flooding issues

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

Urban Analysis



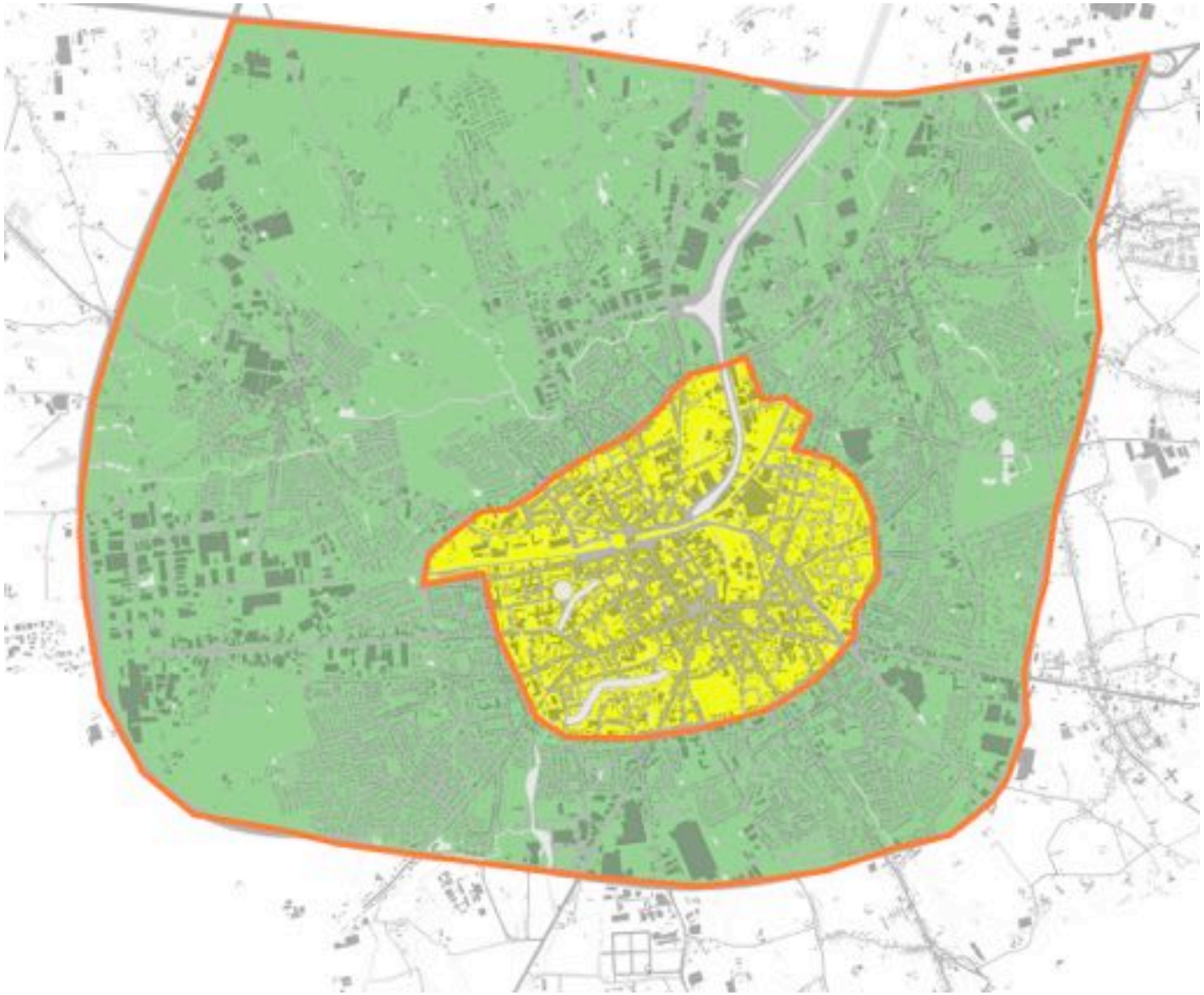
Car-orientated

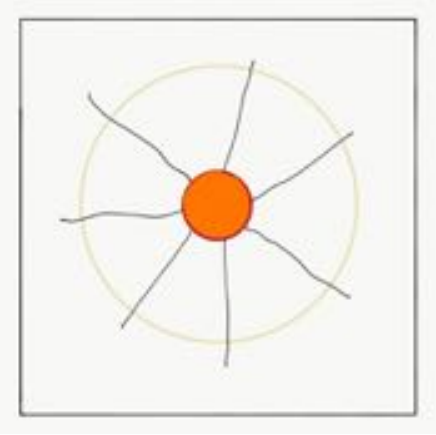
Highest mobility impact

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

Roeselare, Belgium. April 2018

Urban Analysis





Egg-like structure

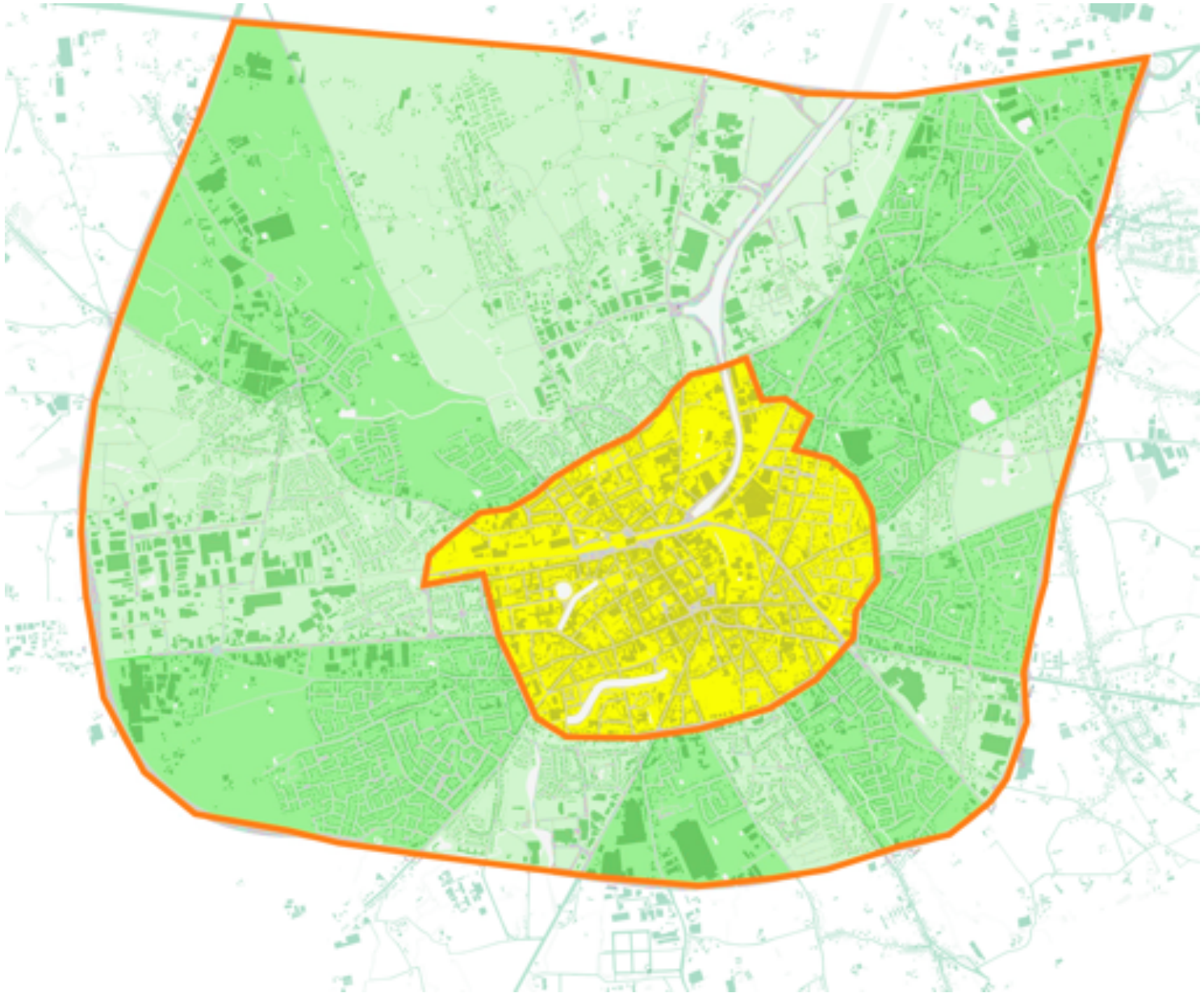
Neighbourhood is isolated, both from city and nature

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Analysis



City of bits

Very little contact between neighbourhoods

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

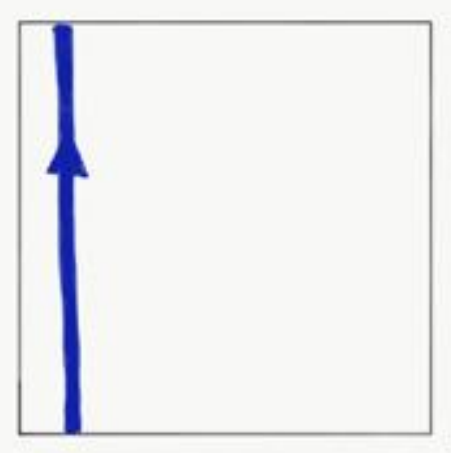
Urban Design: blurring boundaries

Star-city

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

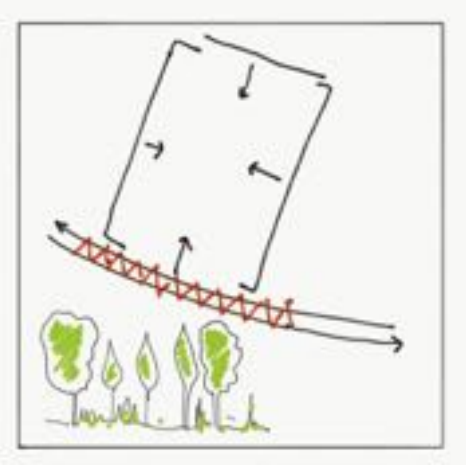
Roeselare, Belgium. April 2018

Urban Analysis



No nature

Urban Analysis



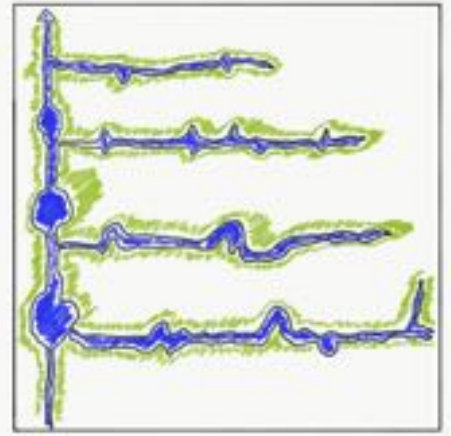
Isolated from nature

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

CITY-zen
New urban energy
ROADSHOW

Roeselare, Belgium. April 2018

Urban Design: flood proofing naturally



Sustainable urban drainage

- Cheap
- Easy
- Bio-diverse

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban MOves

Interface between blue and green

Create blue route

Create Green cycle route

Connect in neighbourhood

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design

Community Agora

Food focussed neighbourhood

Community food trading

Paddy field

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design

Blurred boundaries

Bring city to neighbourhood

Bring neighbourhood to city

Increase density

CITY-zen
New urban energy
ROADSHOW

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

Modal shift provides urban space

Source: www.verkehrswende-ev.de

Source: www.wegcode.be

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

Neighbourhood connectivity

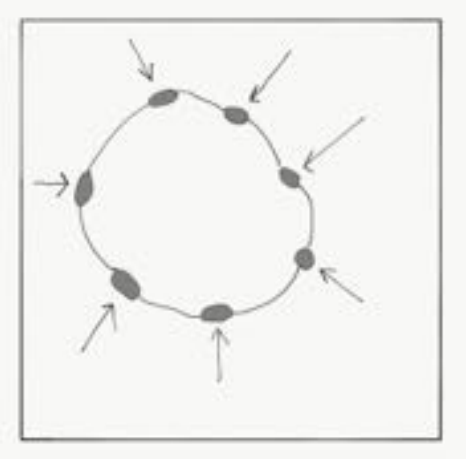
Social

Safe

Healthy

CITY-zen
New urban energy
ROADSHOW

Urban Analysis



No need to visit

Very generic

No difference

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design: New green ring of exciting neighbourhoods

New green ring

Lots of reasons to visit!

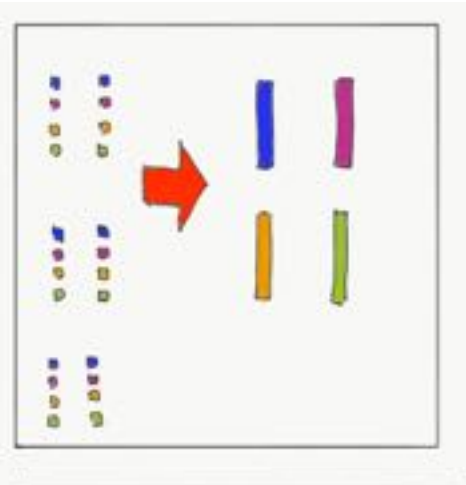
Each neighbourhood is individual and productive!

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Proposal Super sharing, low impact, urban agriculture neighbourhood

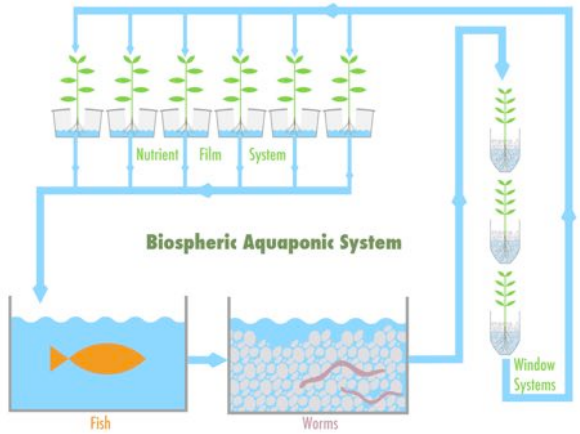


Shared surface

Productive

Flood proof

Community focussed

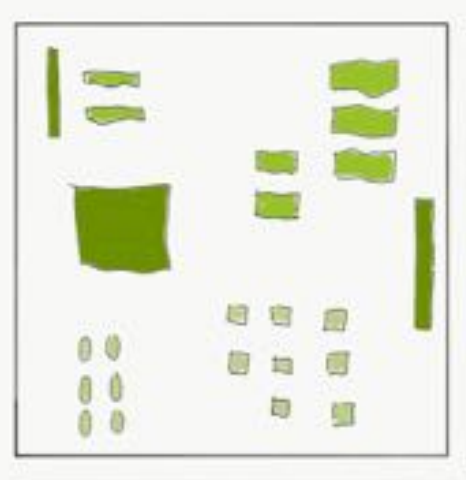


CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban agriculture: low impact with technical food systems



Productive Landscapes

- Urban Castles
- Productive street systems
- Techno terps

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design. Aquaponic people first highways

Urban Agriculture everywhere

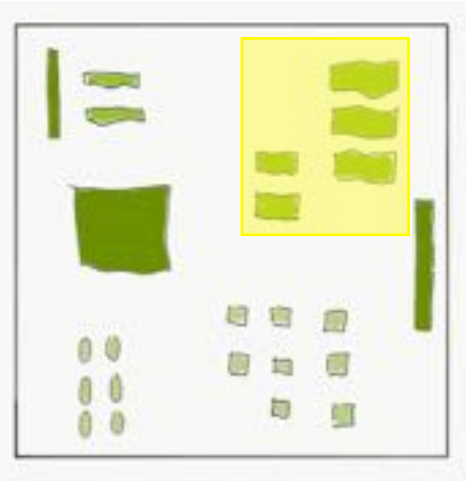
Aquaponic cycleway

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design - Blue Green castles



Consolidation of green space

Energy renovation

Urban Agriculture

Community focussed

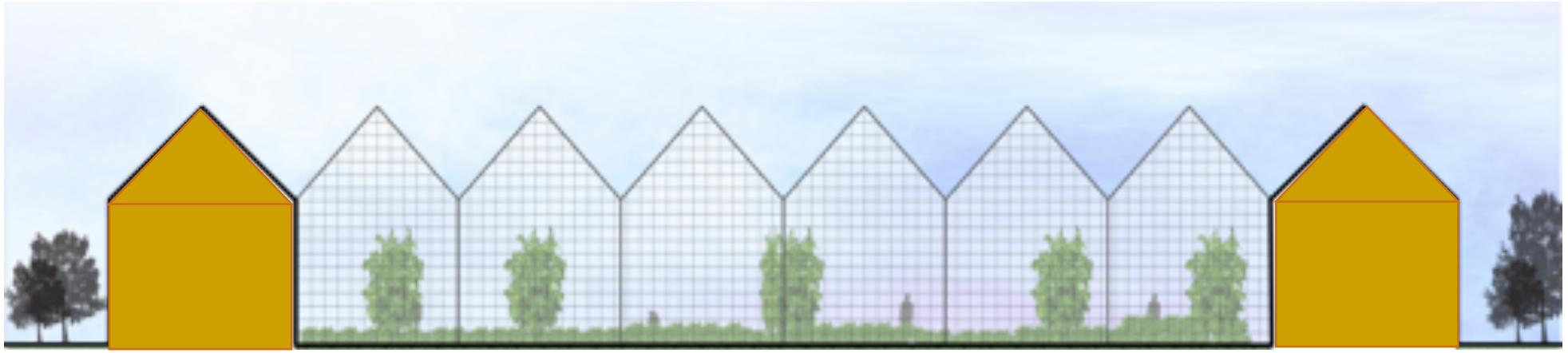
Sharing

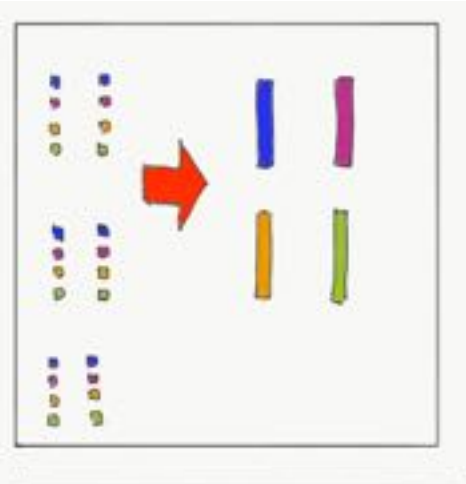
CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design - Blue Green castles





Sharing

Energy

Food

Community

CITY-zen
New urban energy
ROADSHOW

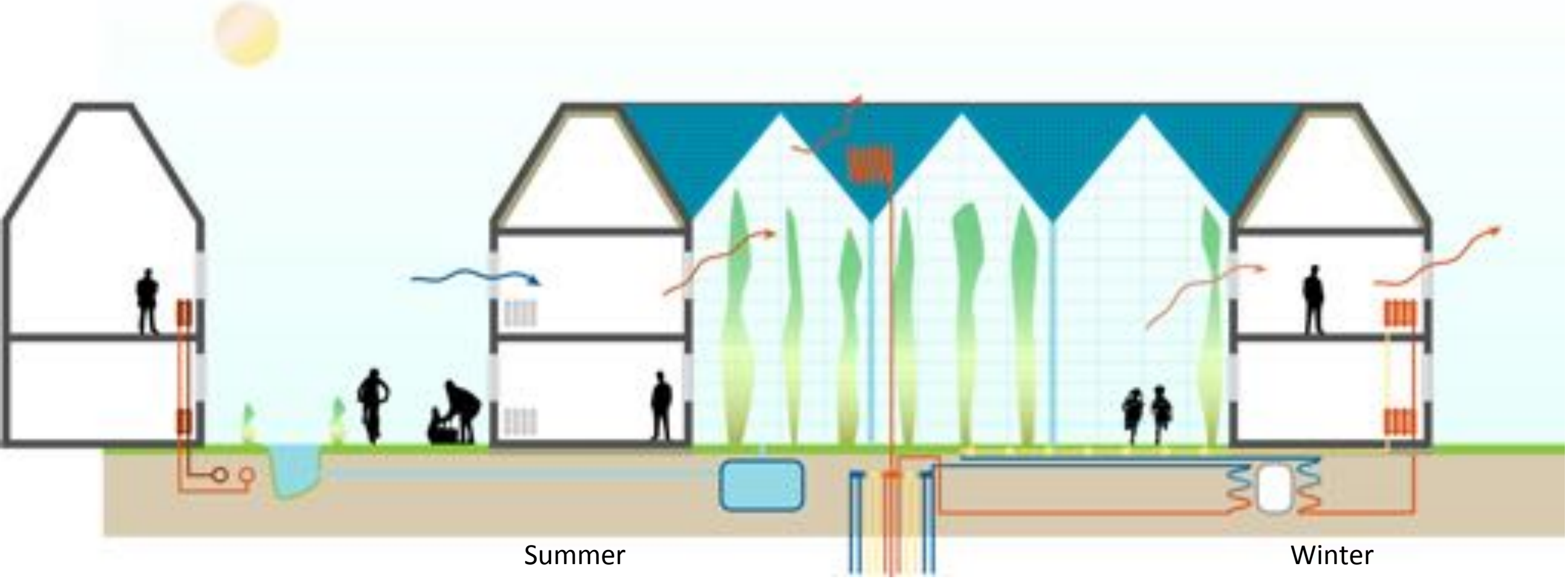
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Roeselare, Belgium. April 2018

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

Main measures

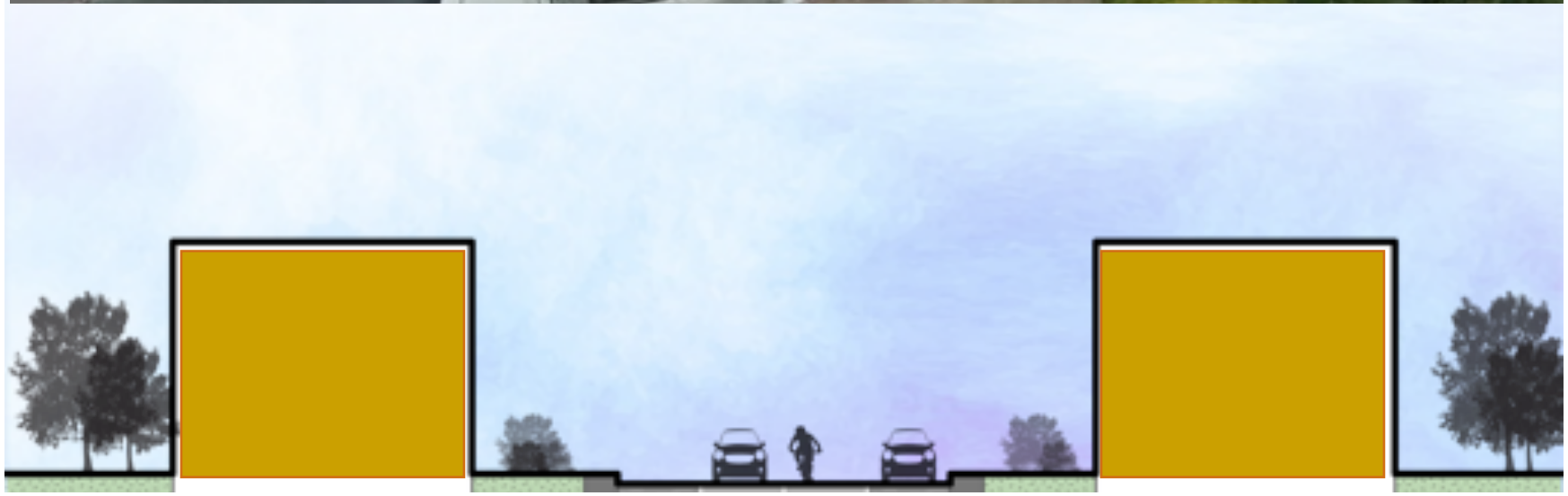
- PV-Thermal roof
- Collective Heat pump
- Triple glazing
- Greenhouse garden
- BTES
- DHW booster
- Roof insul.
- SUDS

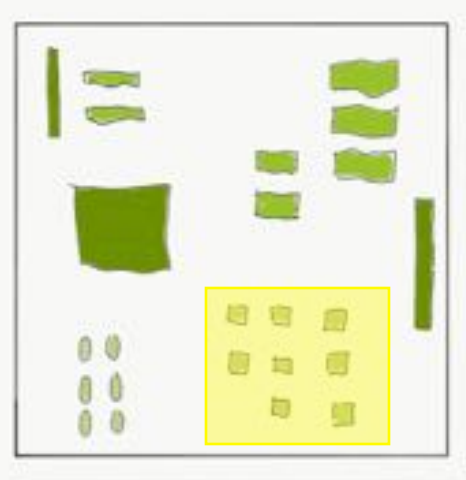


Energy strategy: Siebe Broersma MSc, Technical University, Delft.

Roeselare, Belgium. April 2018

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





Consolidation of green space

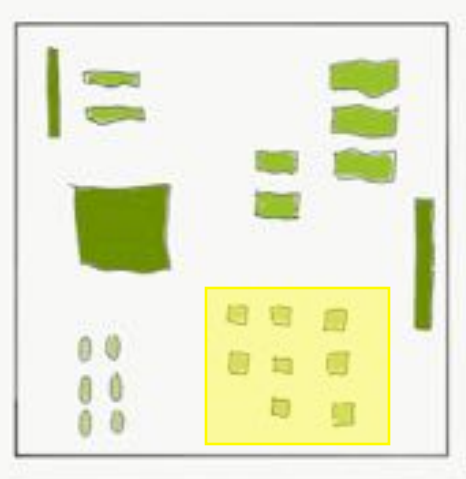
- List 1
- List 2
- List 3

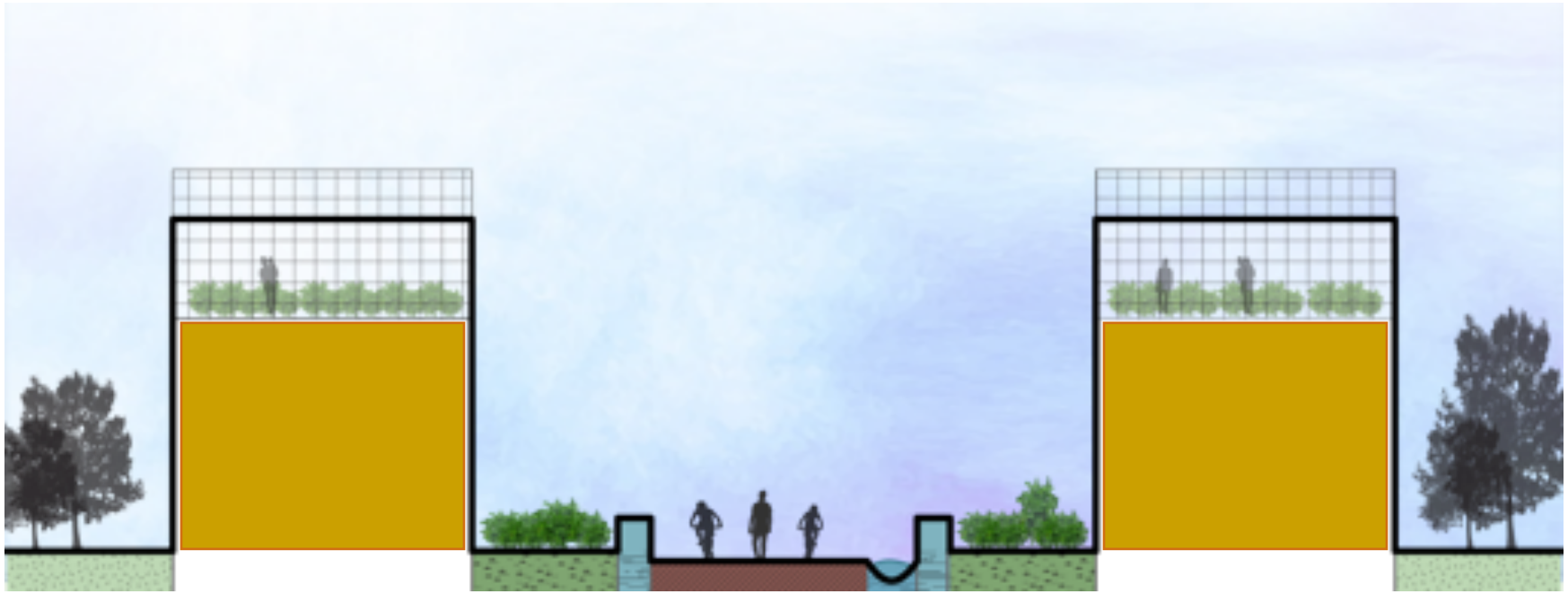
CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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





Techno terps

Technical food system with aquaponics

Fishtanks provide flood protection

Bio-swales in street

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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

Techno terp

Independent energy

Aquaponic greenhouse

Fish-tank flood barrier

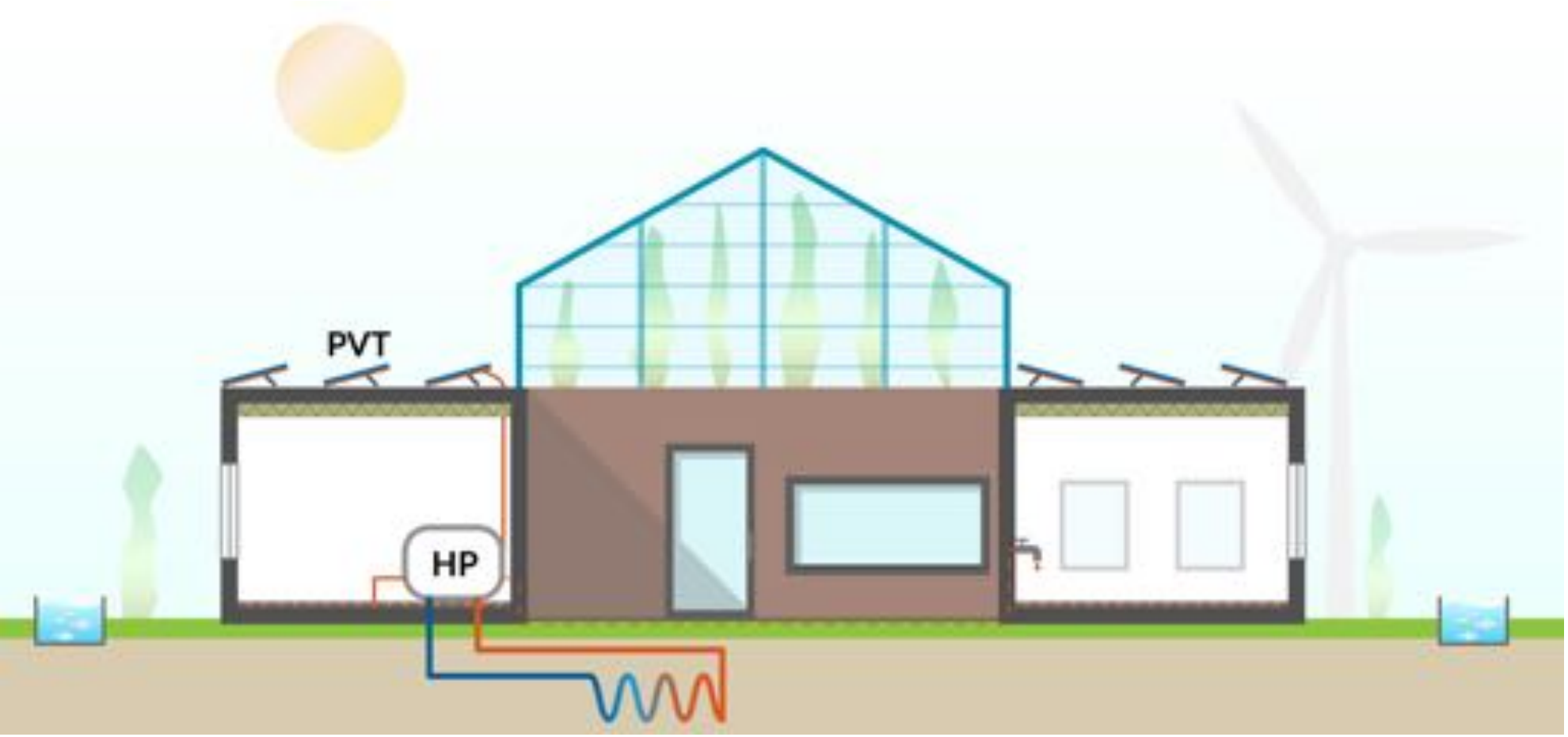
SUDS

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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.

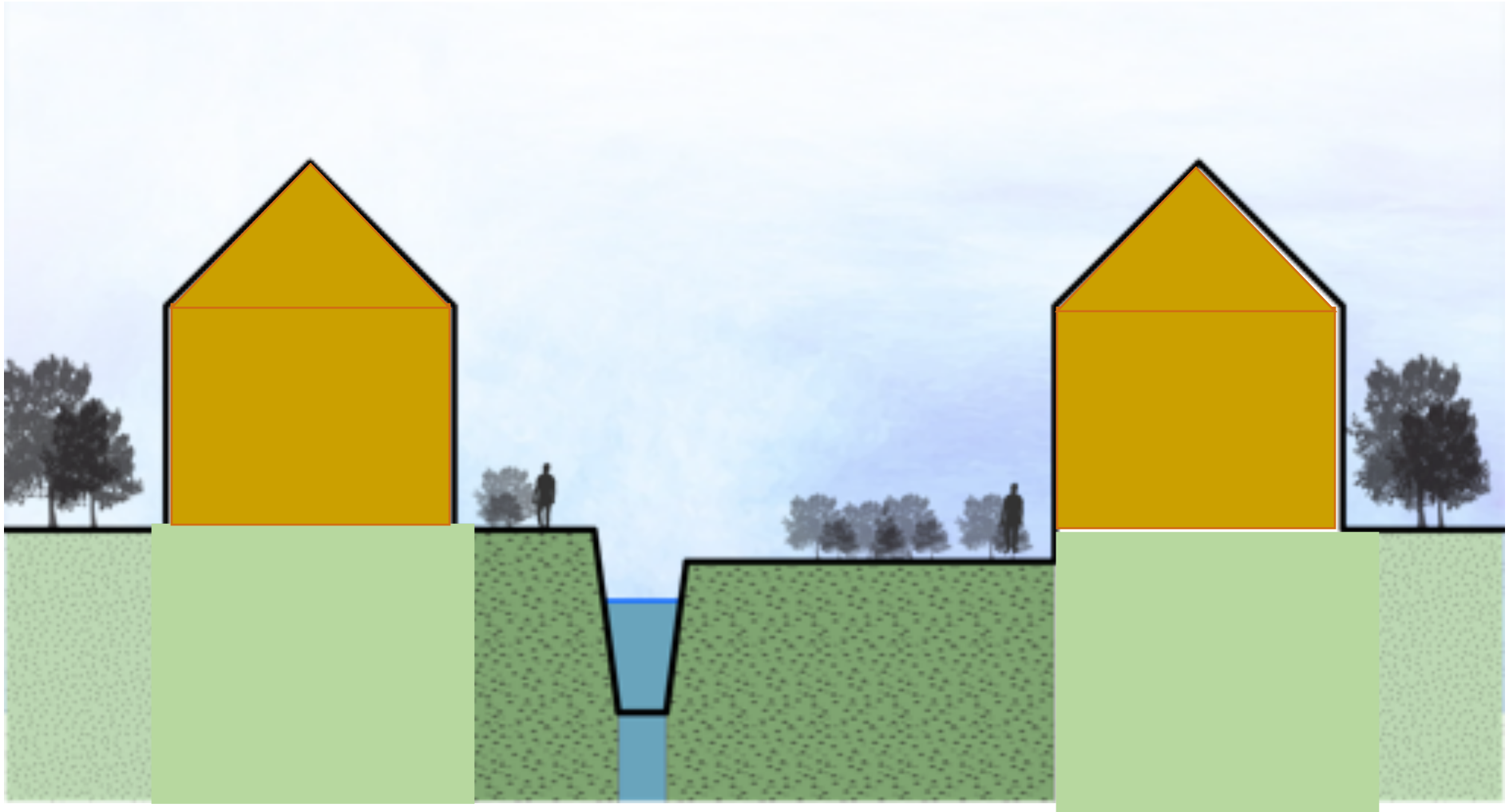
Aquaponics

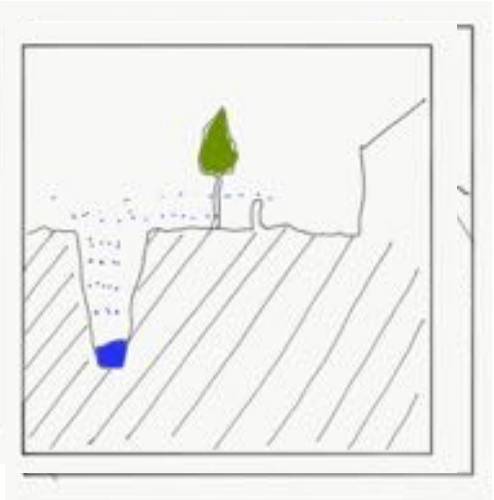
CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design





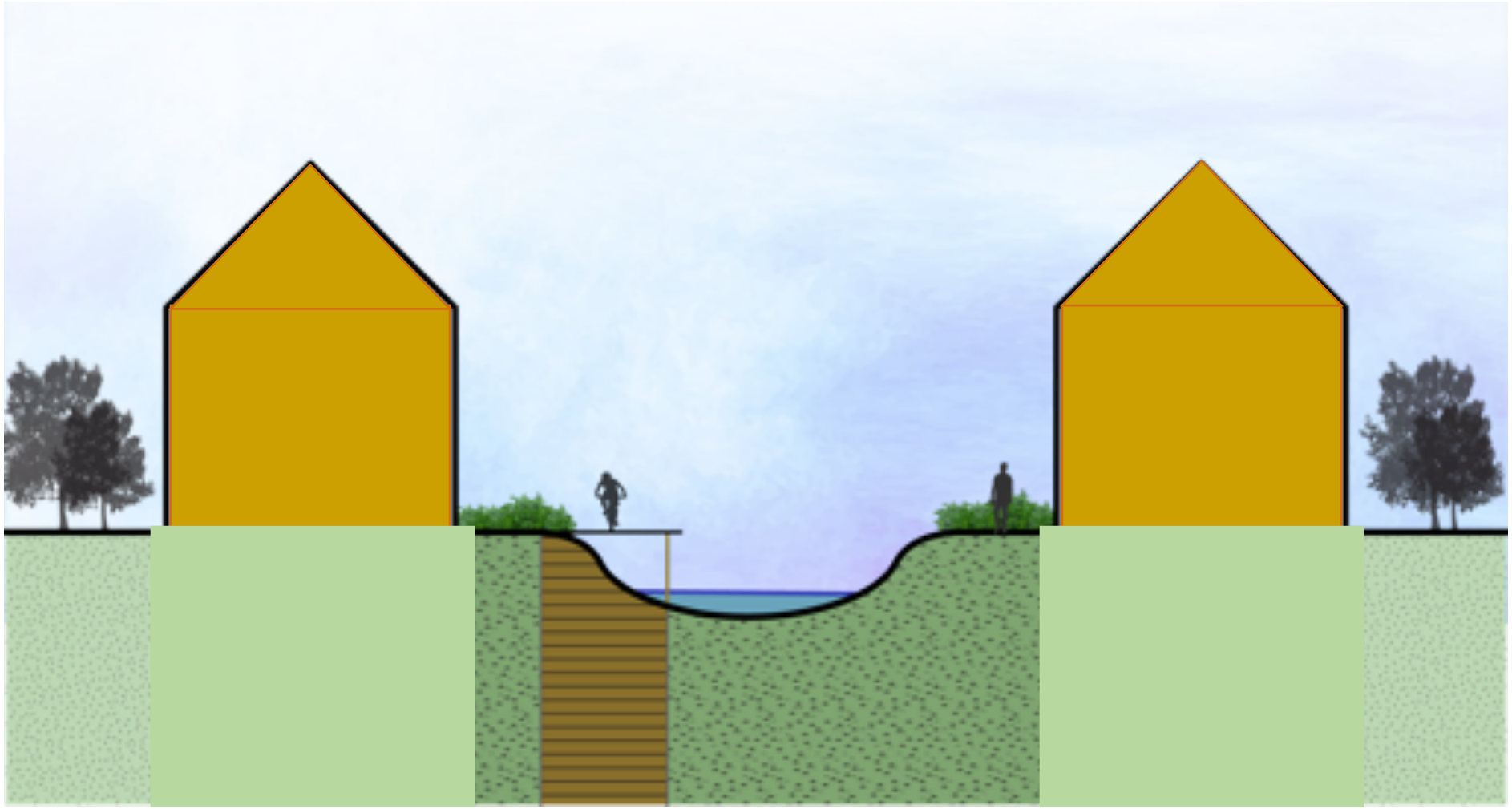
Unsafe and unnatural

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Urban Design

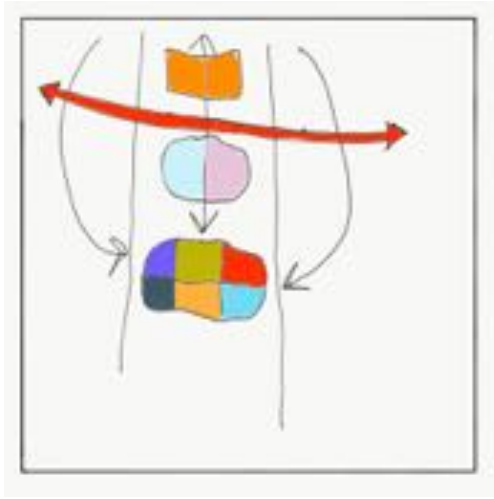


Safe and Natural

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

Roeselare, Belgium. April 2018

Urban Design



Unpacking the city into the neighbourhood

Increased intensity

Community services

Increased density

Reason to visit

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

Food-LETTS Agora

Community Agora

Food focussed neighbourhood

Community food trading

Paddy fiels

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

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

PV-Thermal roof

Waste heat from refrigeration

BTES

MT mini heat grid

Greenhouse roof

Water storage

Main measures

Full PV-roof

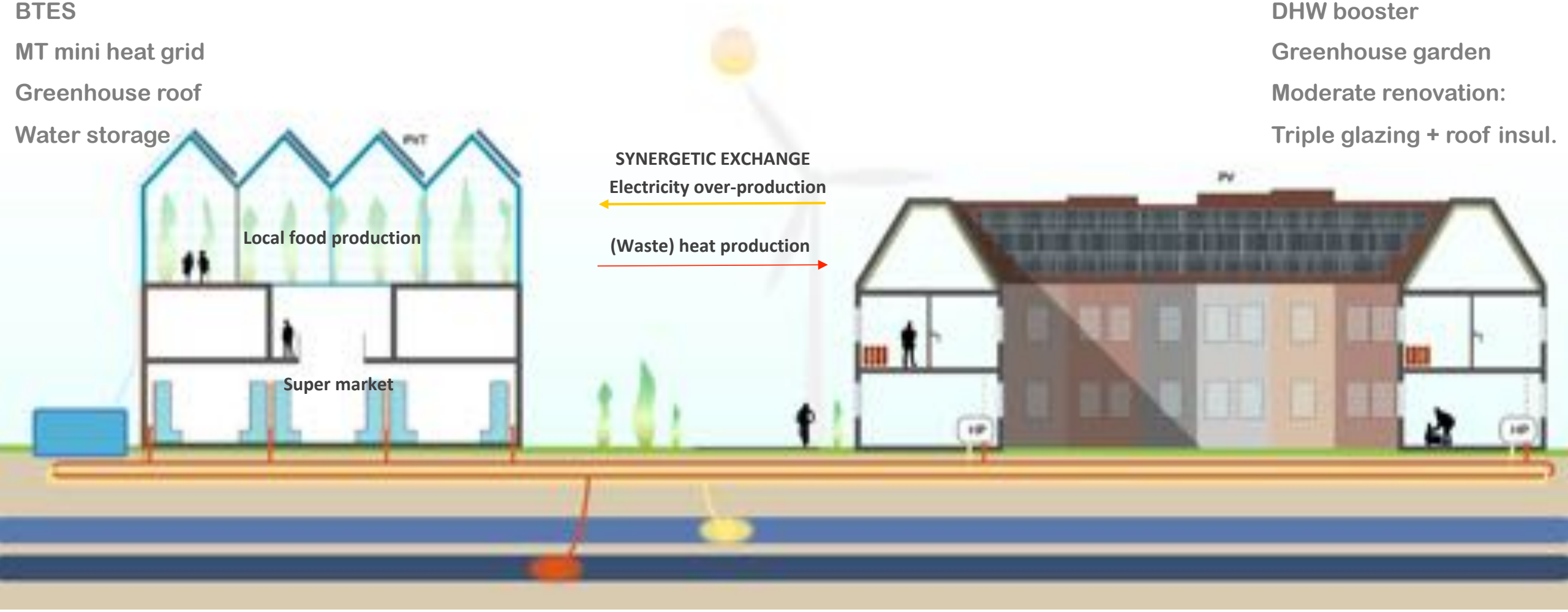
Collective Heat pump

DHW booster

Greenhouse garden

Moderate renovation:

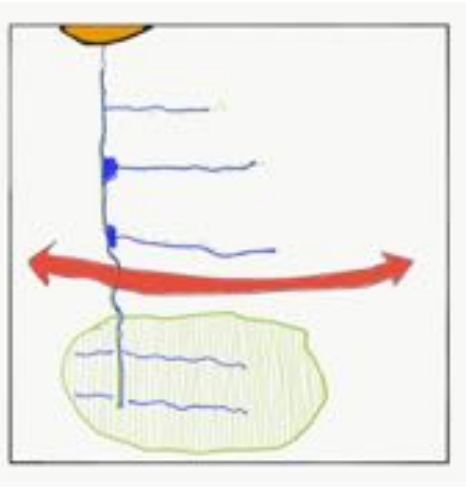
Triple glazing + roof insul.



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

Roeselare, Belgium. April 2018

Urban Design: nature reconnection



Enjoy the environmental tax!

Short coppice willow provides carbon sink

Amenity space

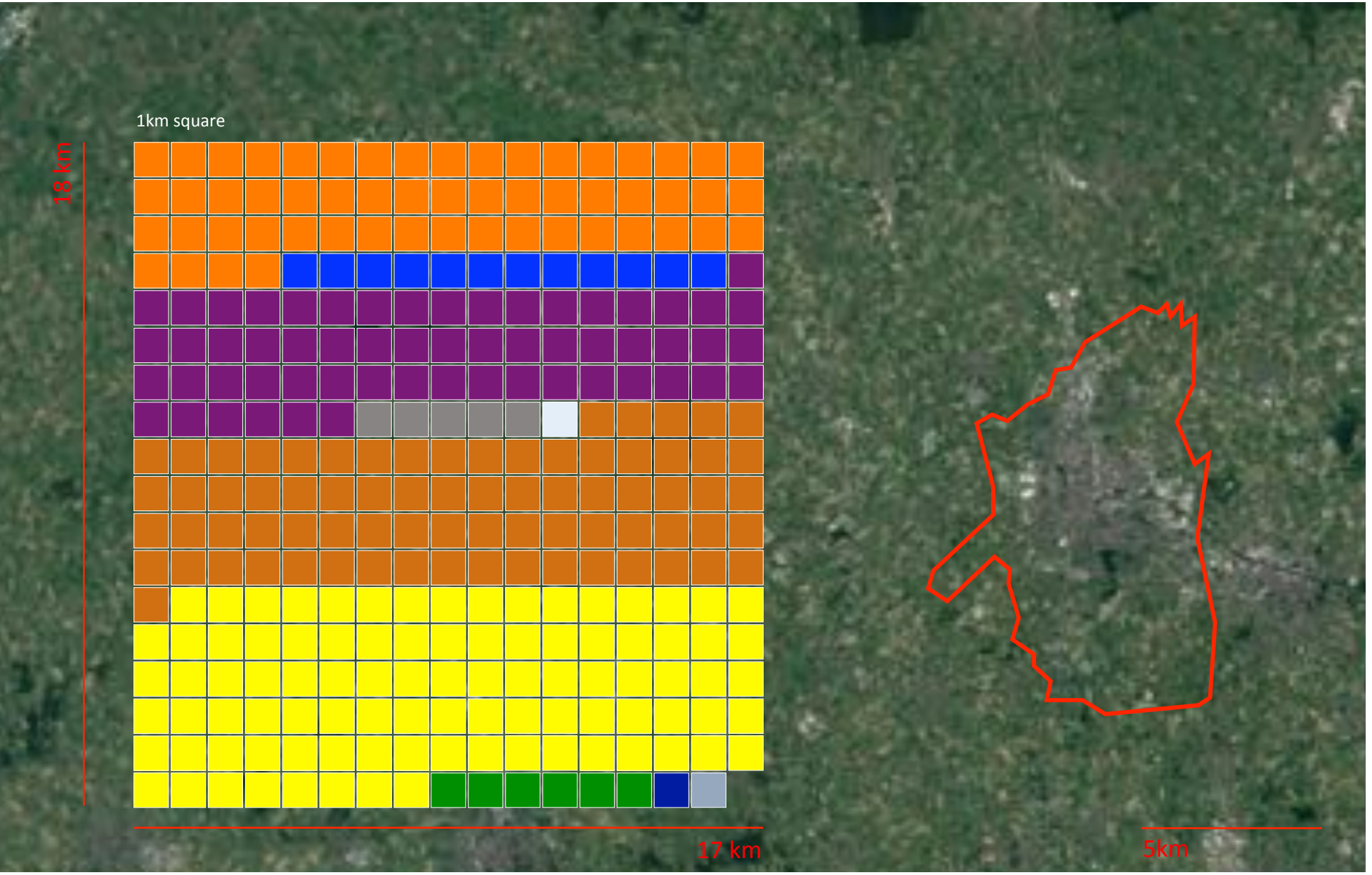
bio-diversity

CITY-zen
New urban energy
ROADSHOW

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

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE



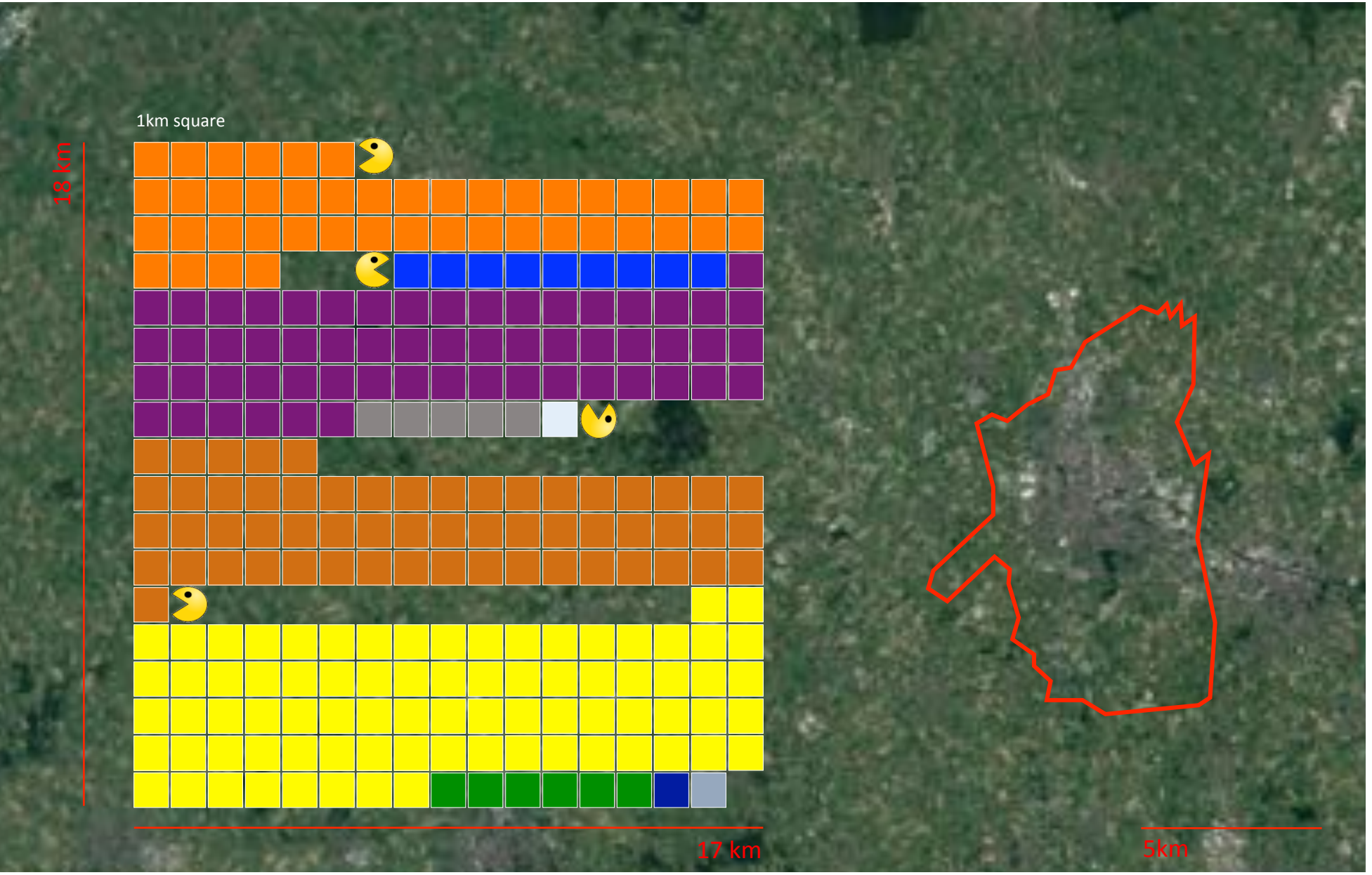
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- WASTE (URBAN)
- WATER USE (HOUSING)
- TERTIARY
- INDUSTRY
- AGRICULTURE
- Public transport
- Public lighting

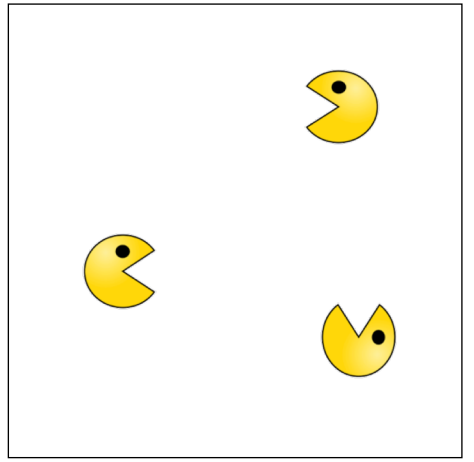
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #1
ENERGY SAVING
Building energy retrofitting

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

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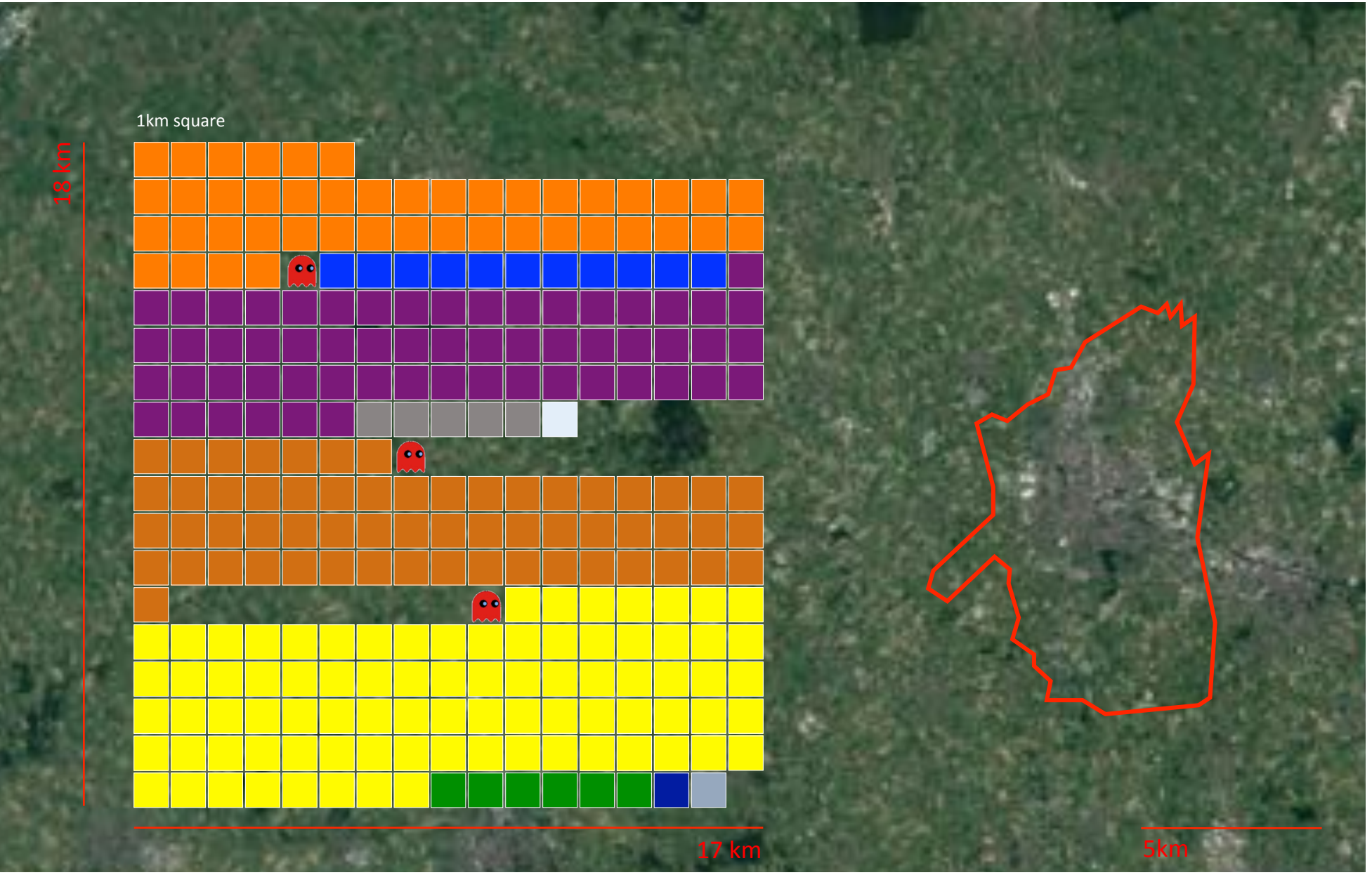
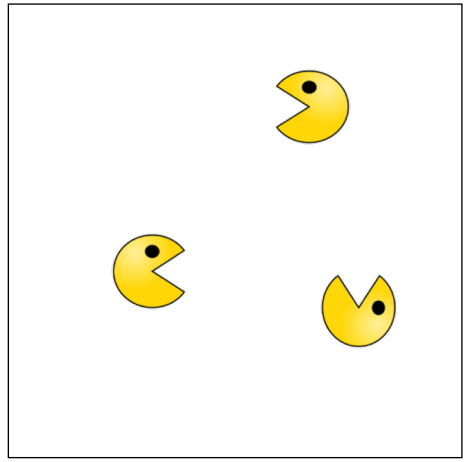
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





GROWTH
2050 forecast

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

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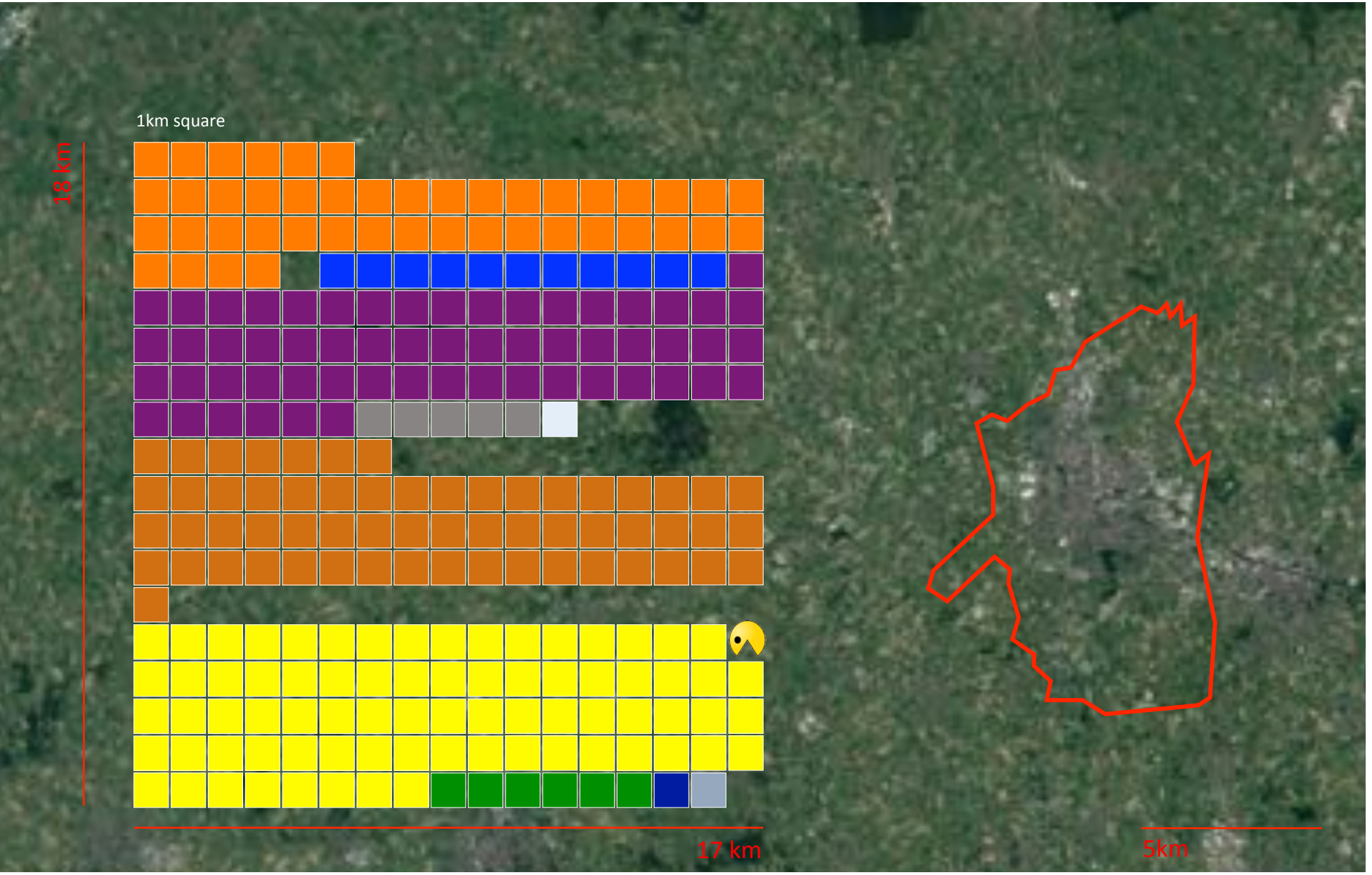
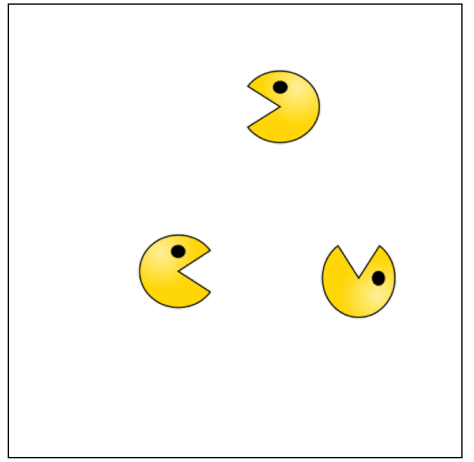
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #2
BIOMASS
Industrial use

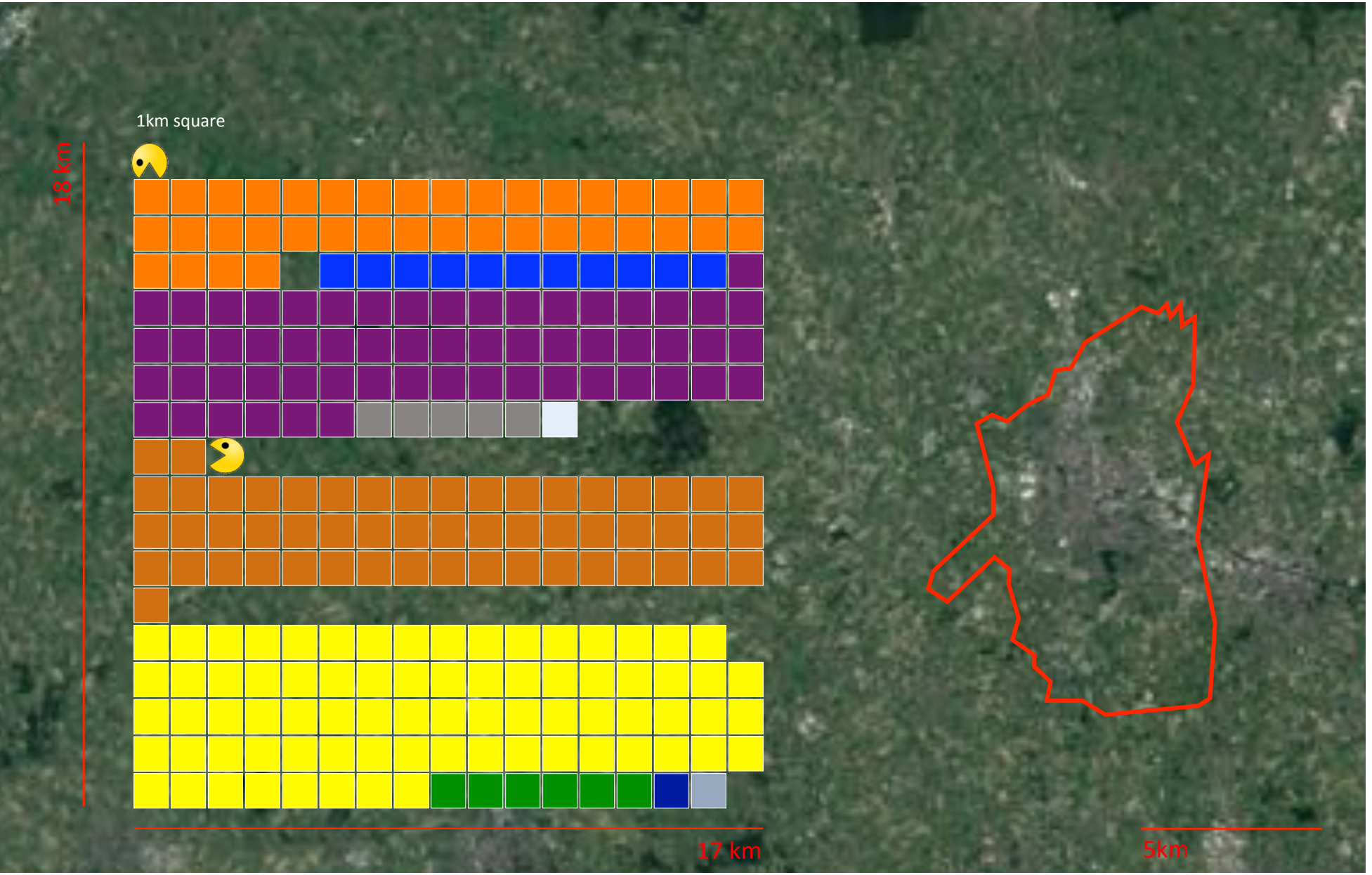
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

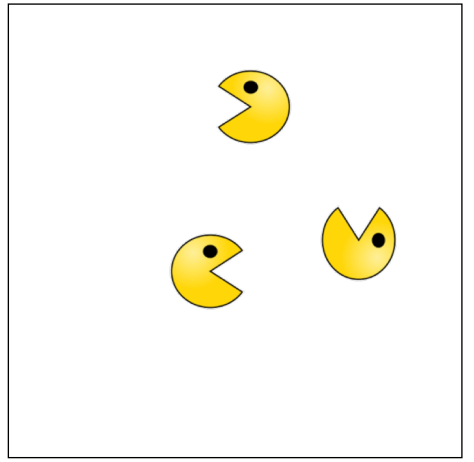
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #3
DISTRICT HEATING NETWORK
Waste incineration

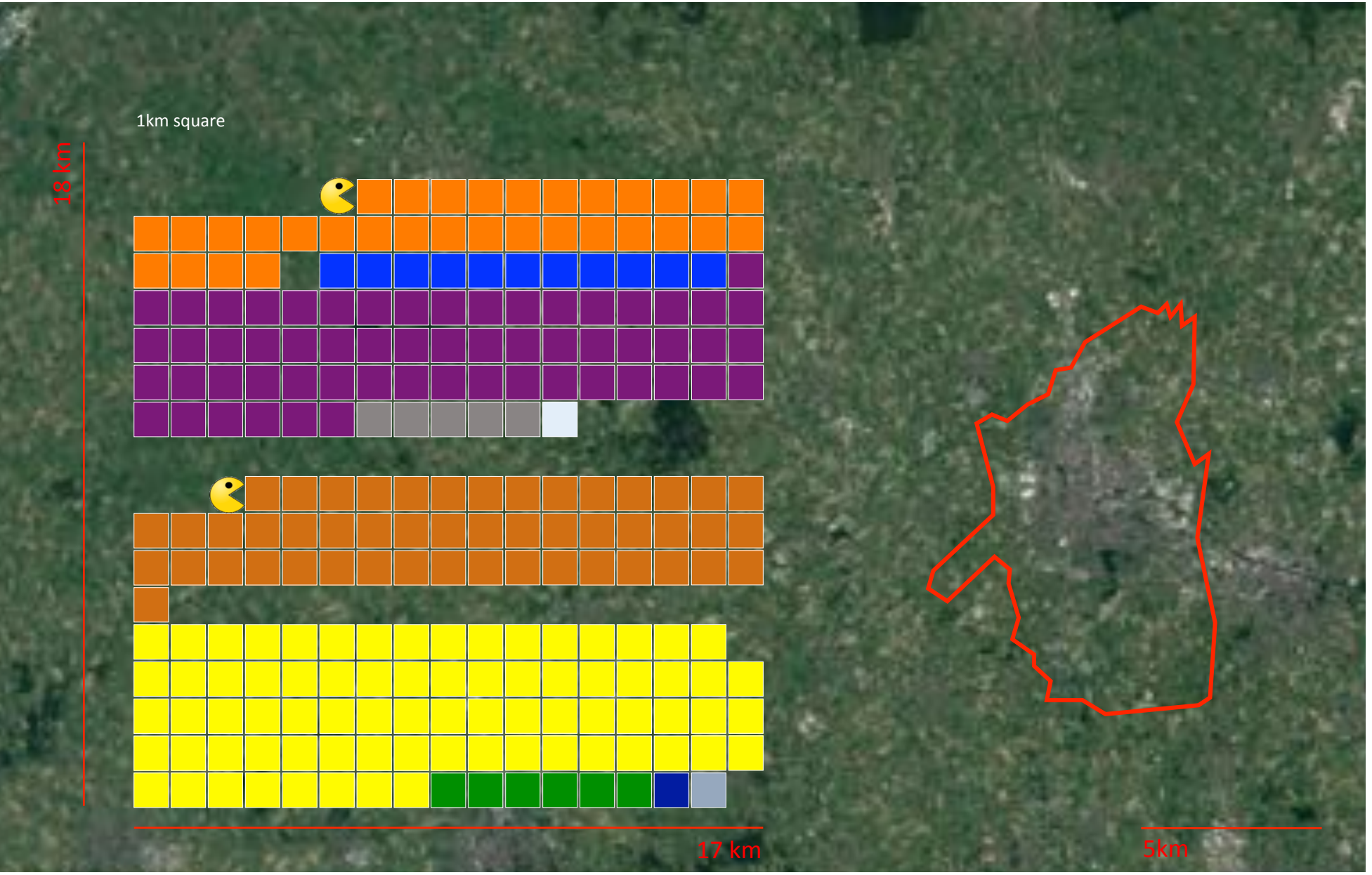
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

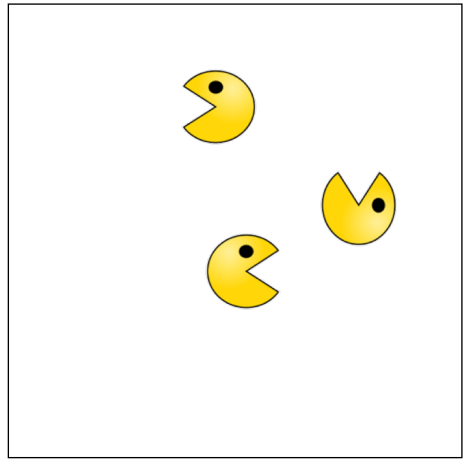
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #4
DISTRICT HEATING NETWORK
Solar collectors + HT storage

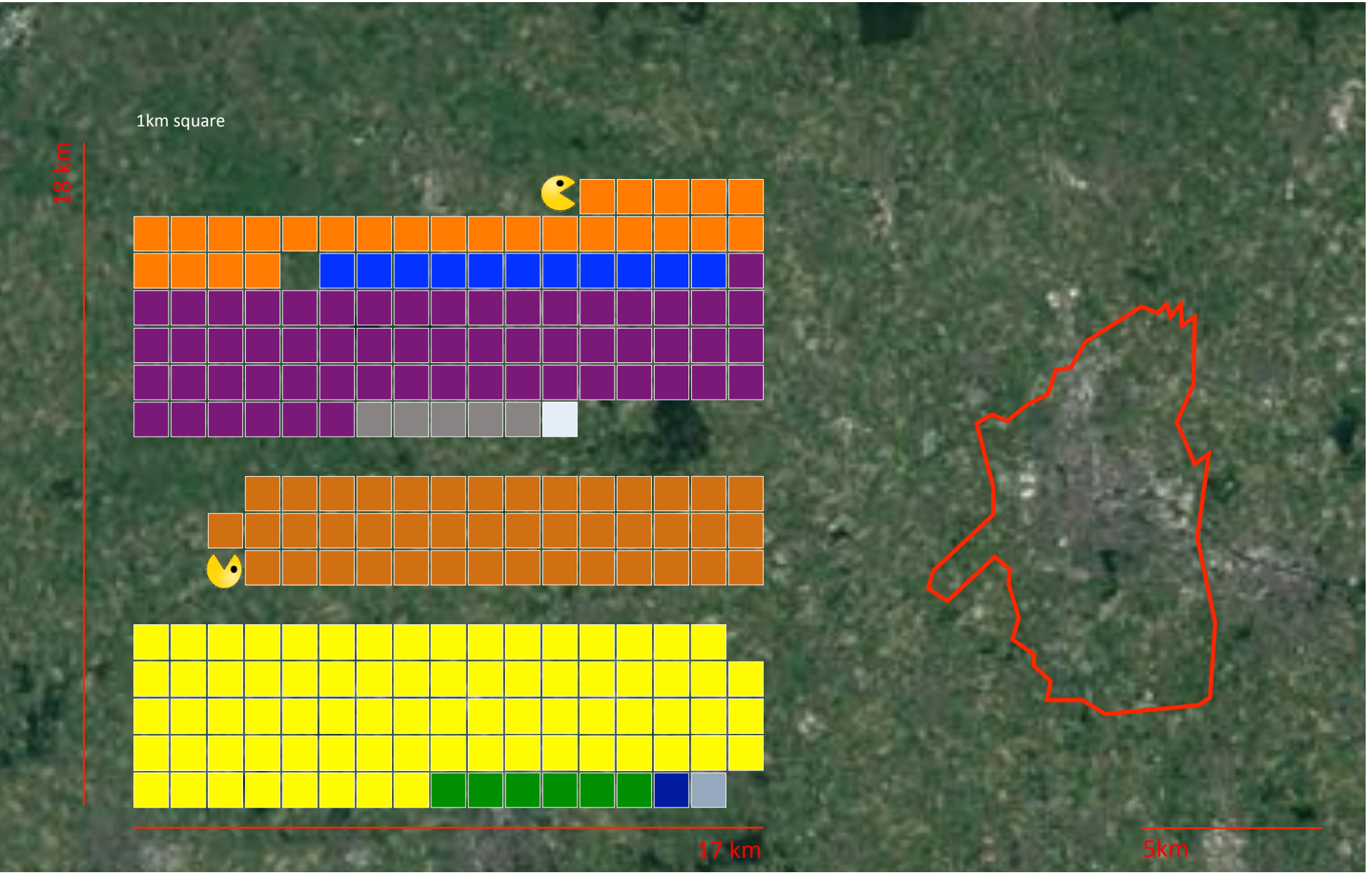
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

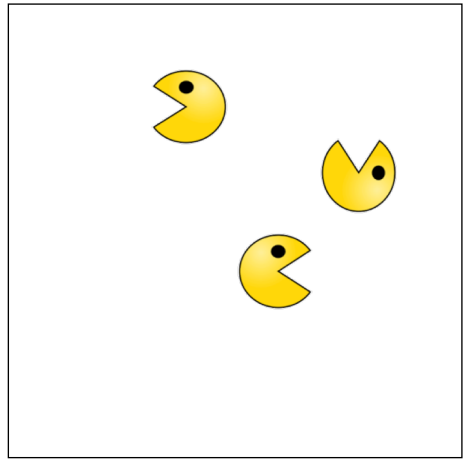
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #5
DISTRICT HEATING NETWORK
HT industrial waste

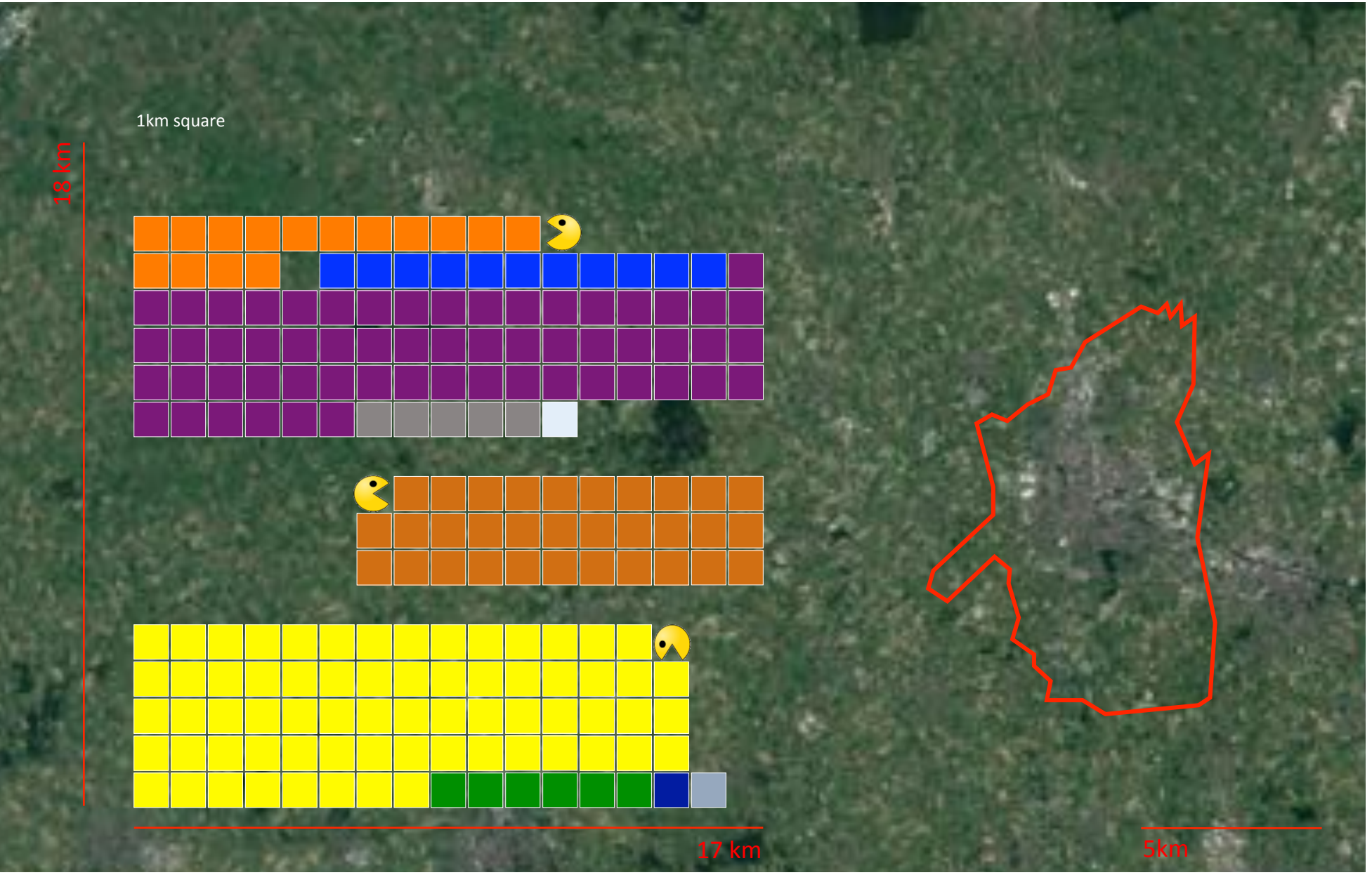
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

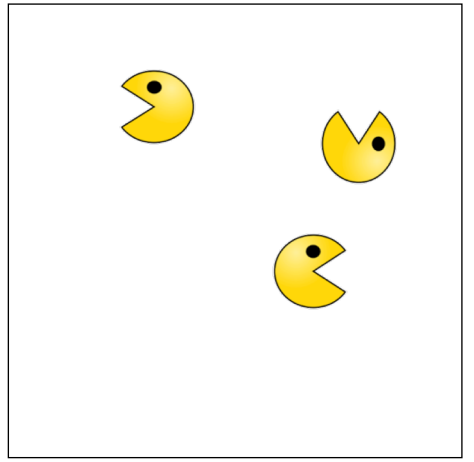
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #6
MINI HEAT GRIDS
Solar collectors + MT storage

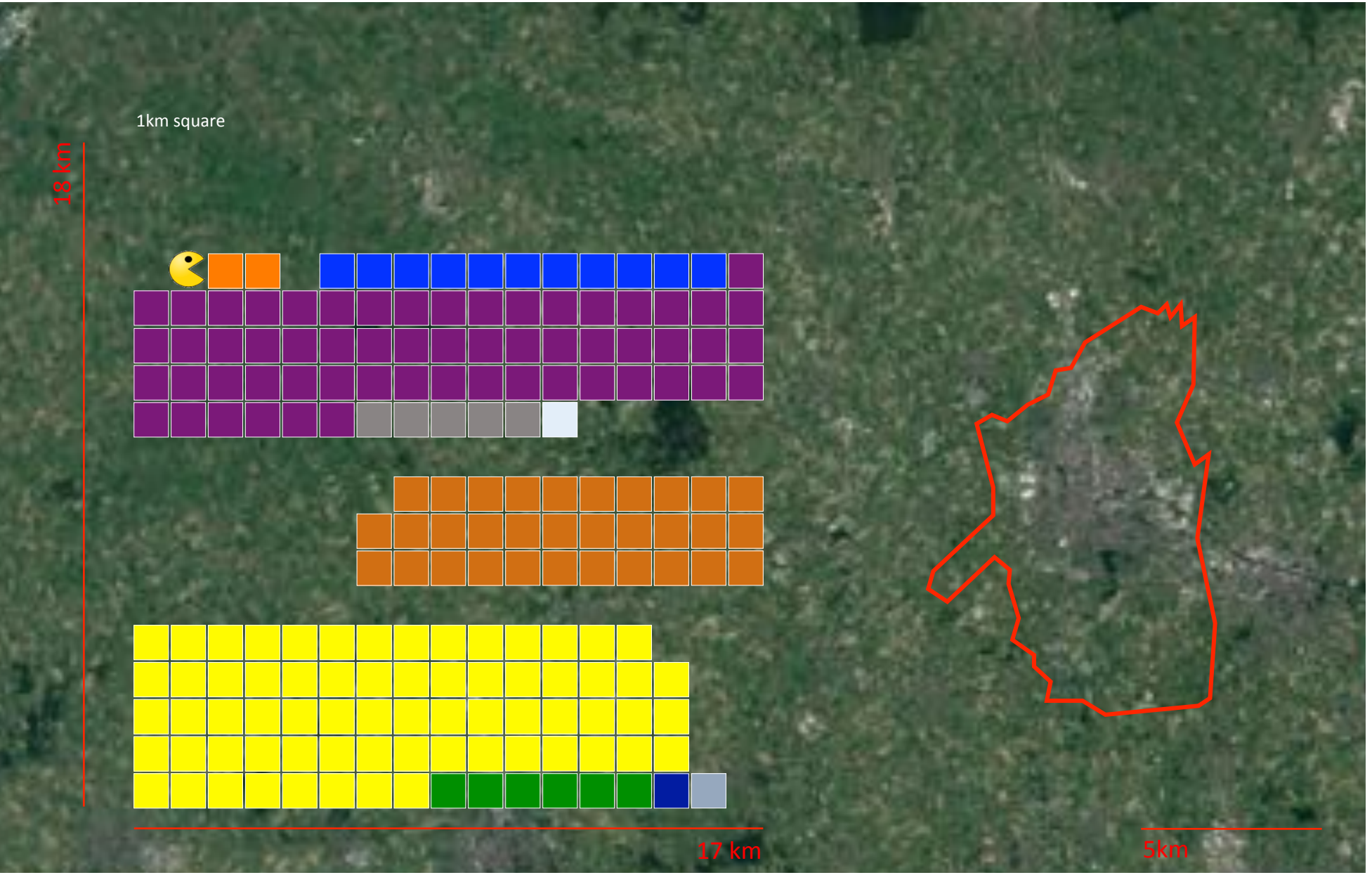
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

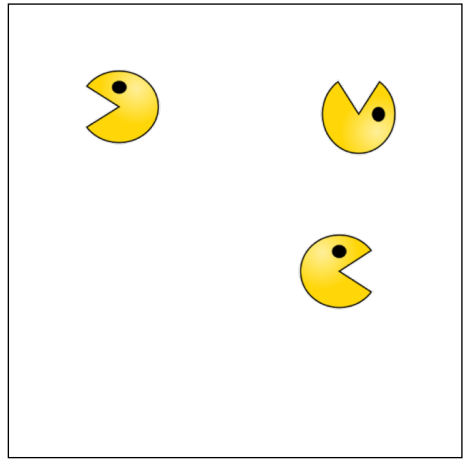
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #7
PV THERMAL
Individual or blocks

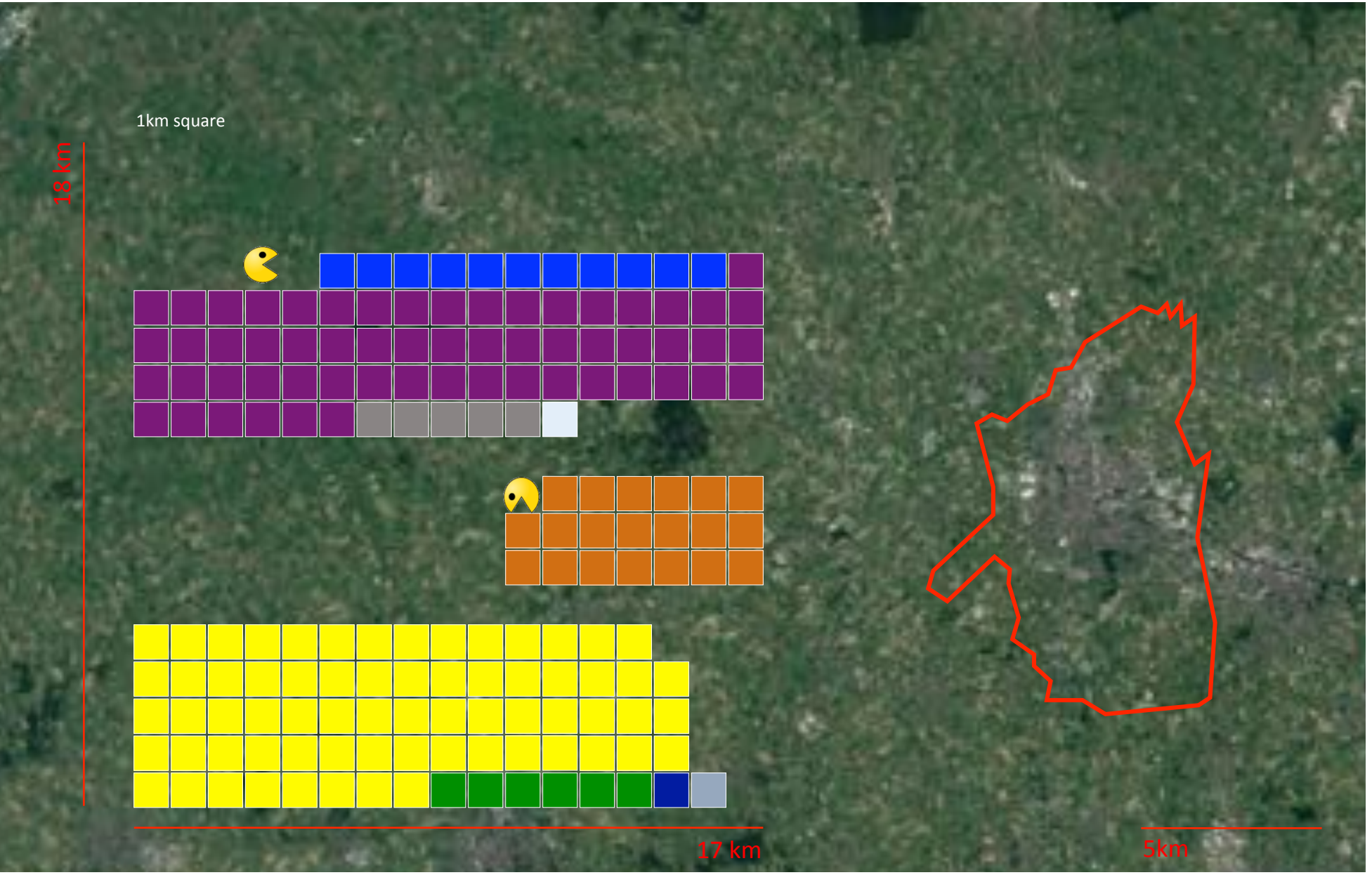
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

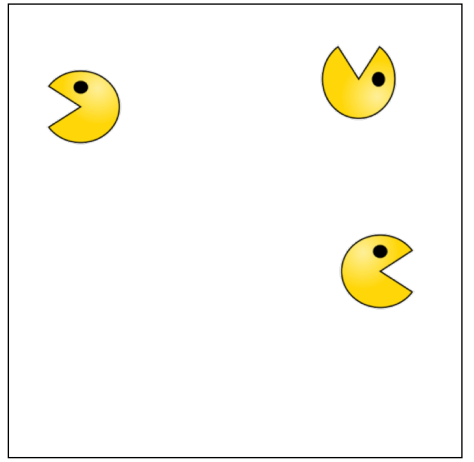
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





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

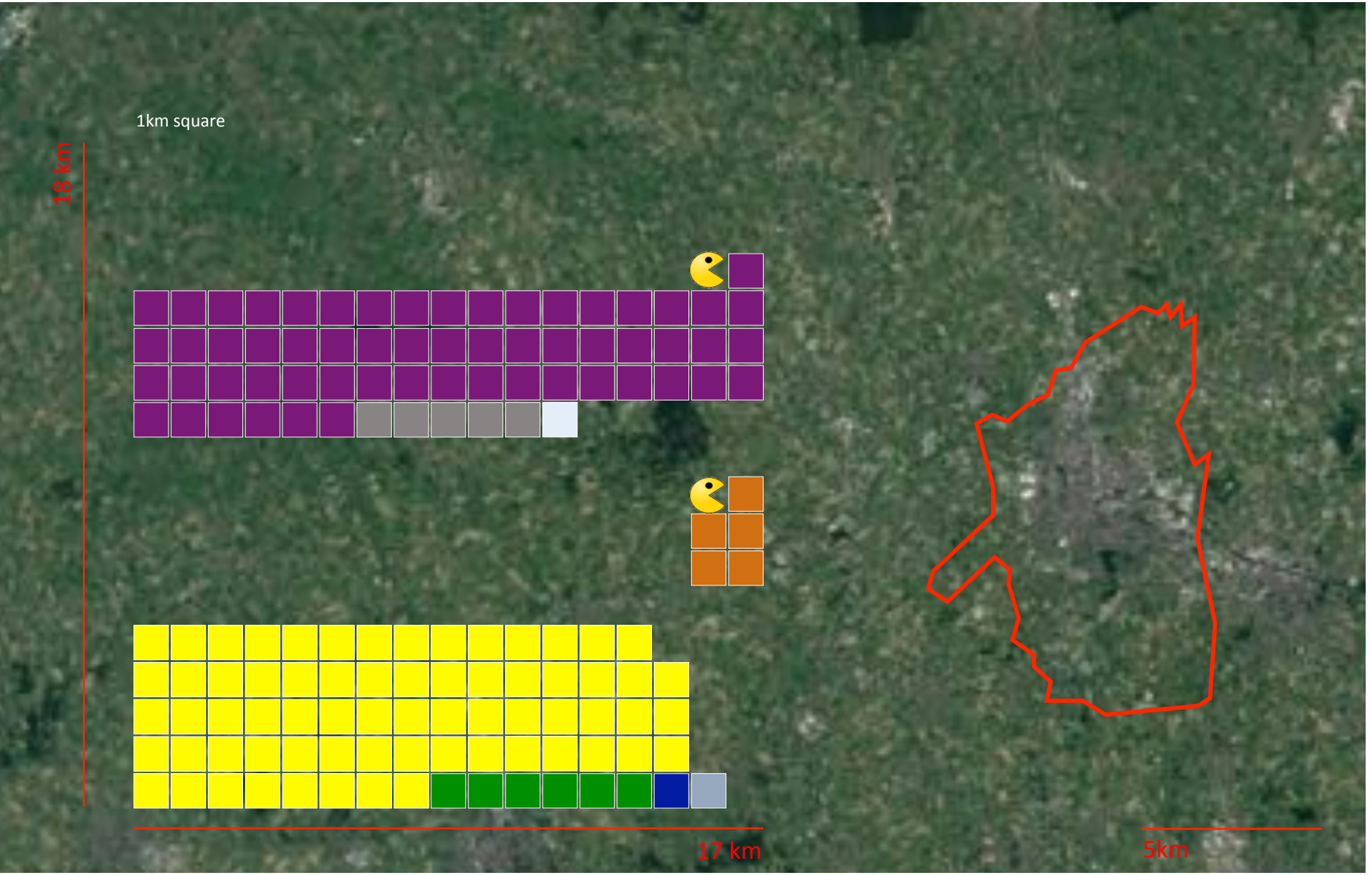
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

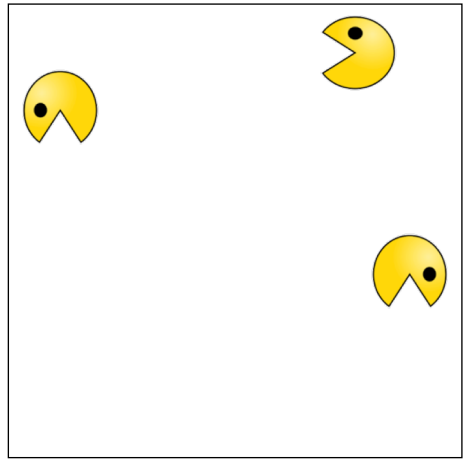
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #9
PV on ROOF

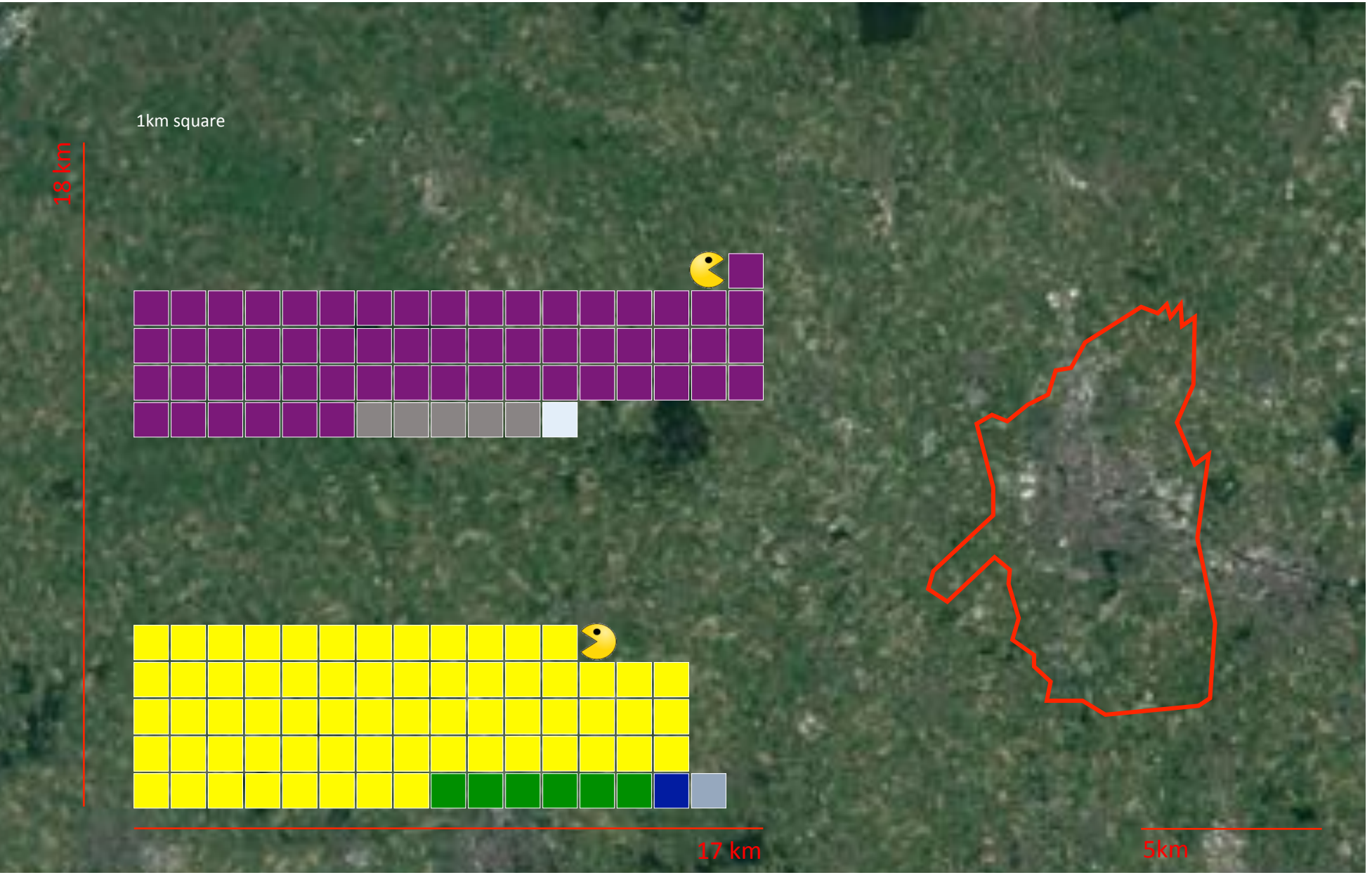
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

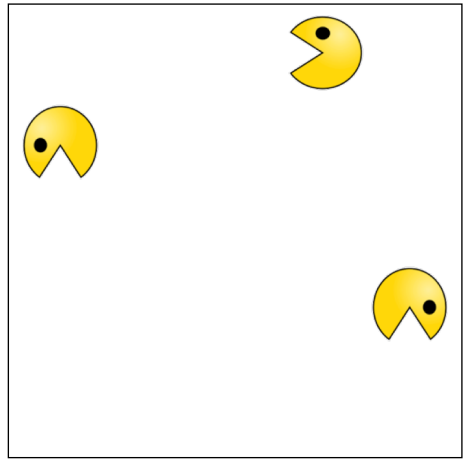
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #9
PV non ROOF

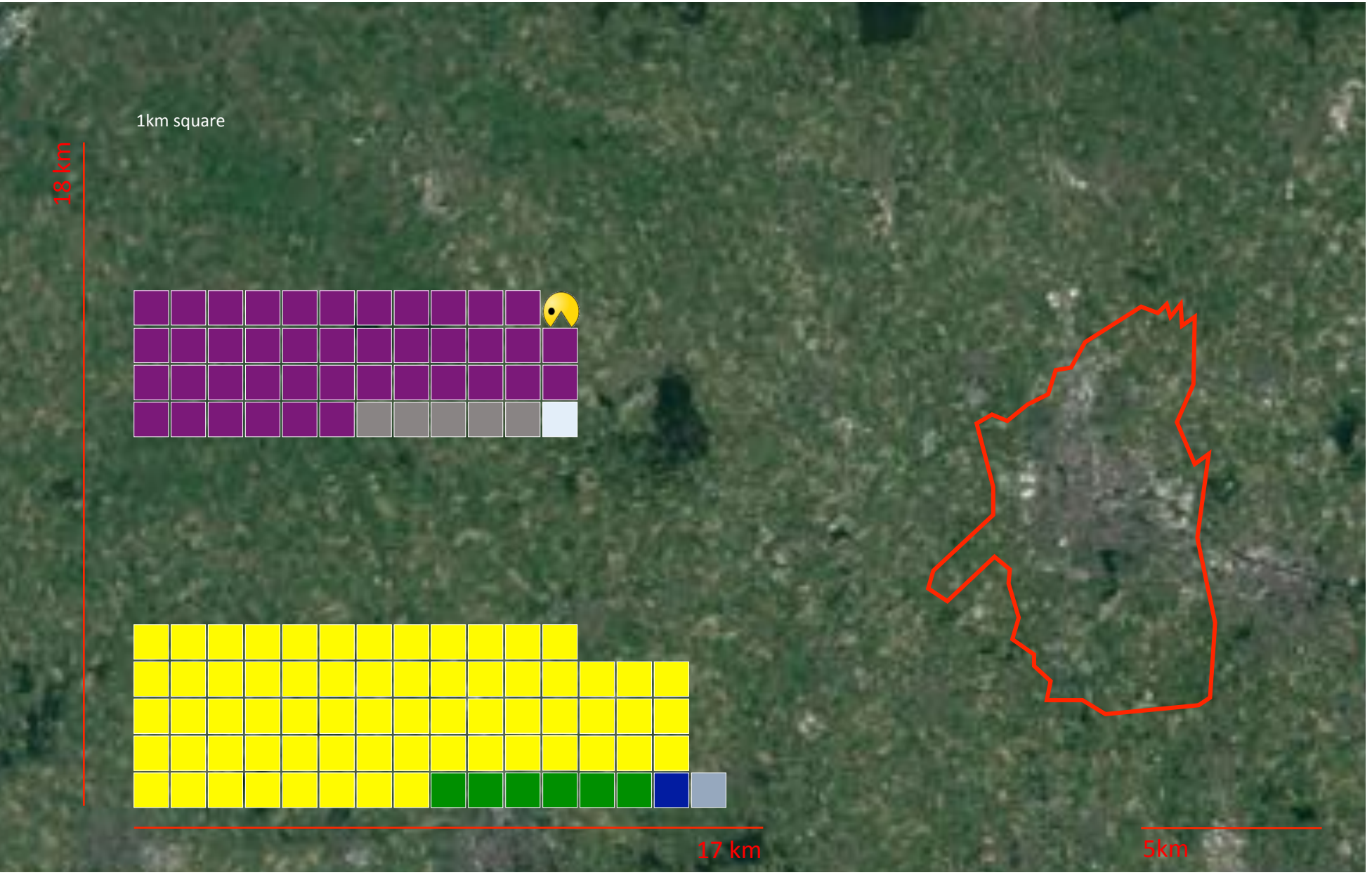
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

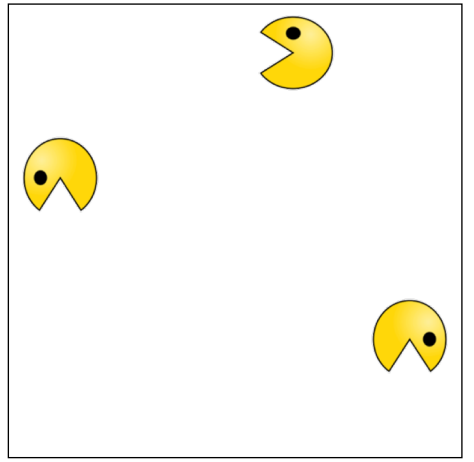
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





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

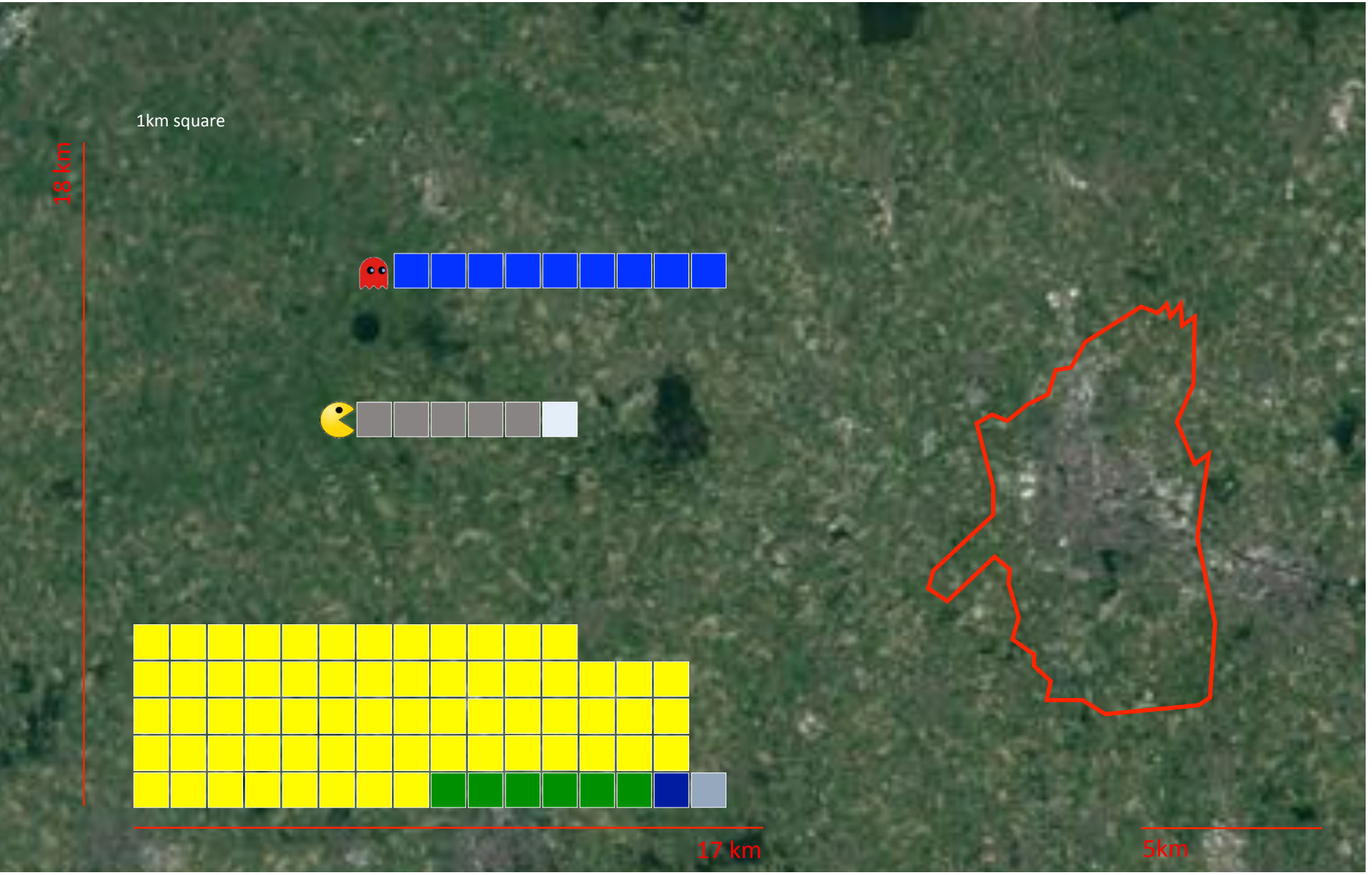
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

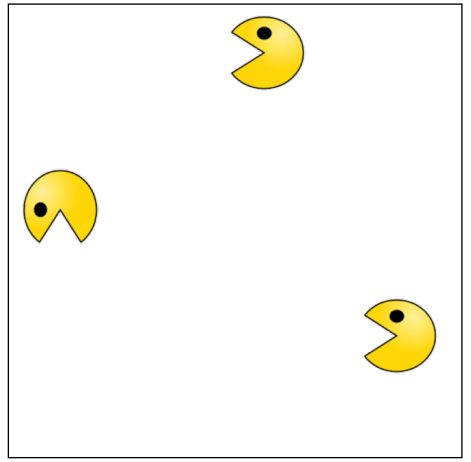
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #11
TRANSITION TO ELECTRIC MOBILITY

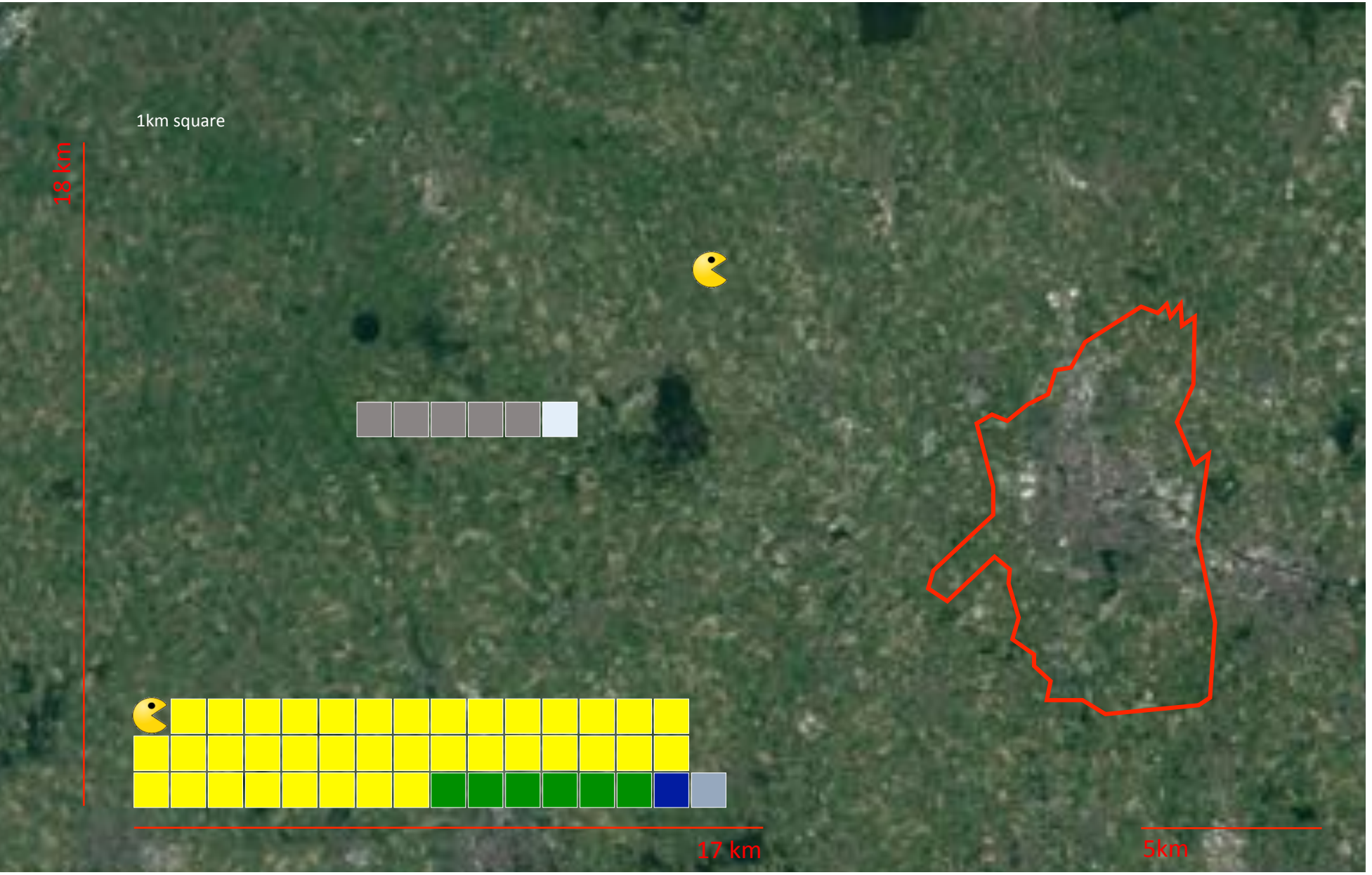
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

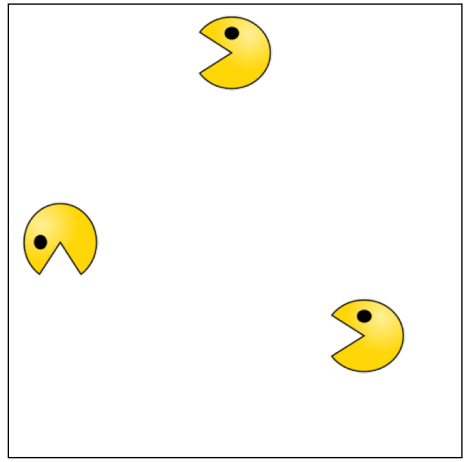
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #12
WIND FARM

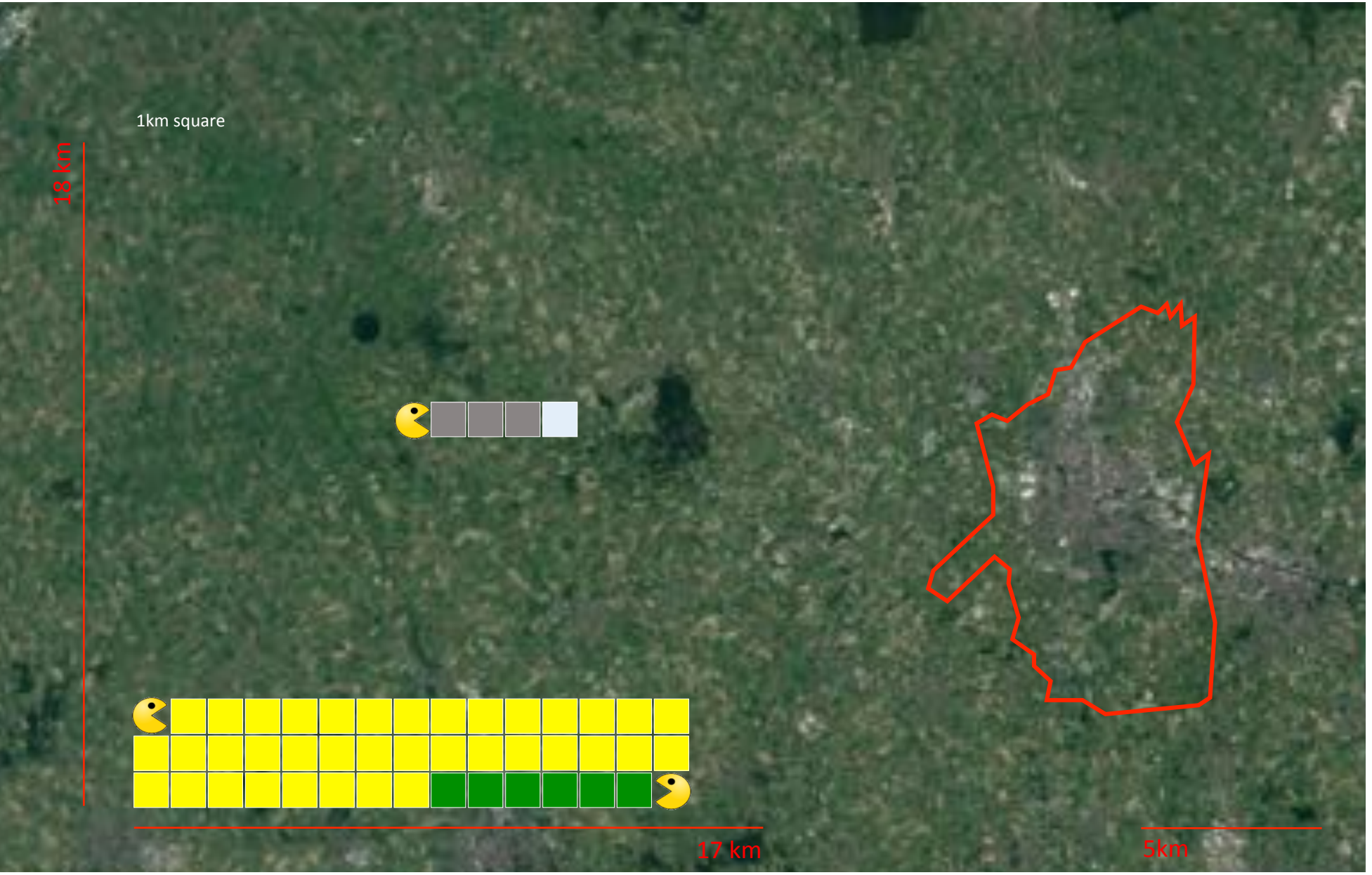
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

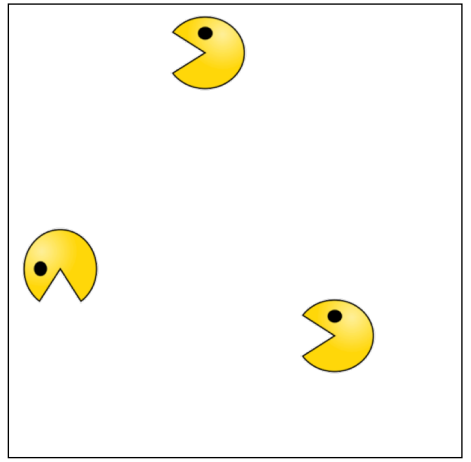
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





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

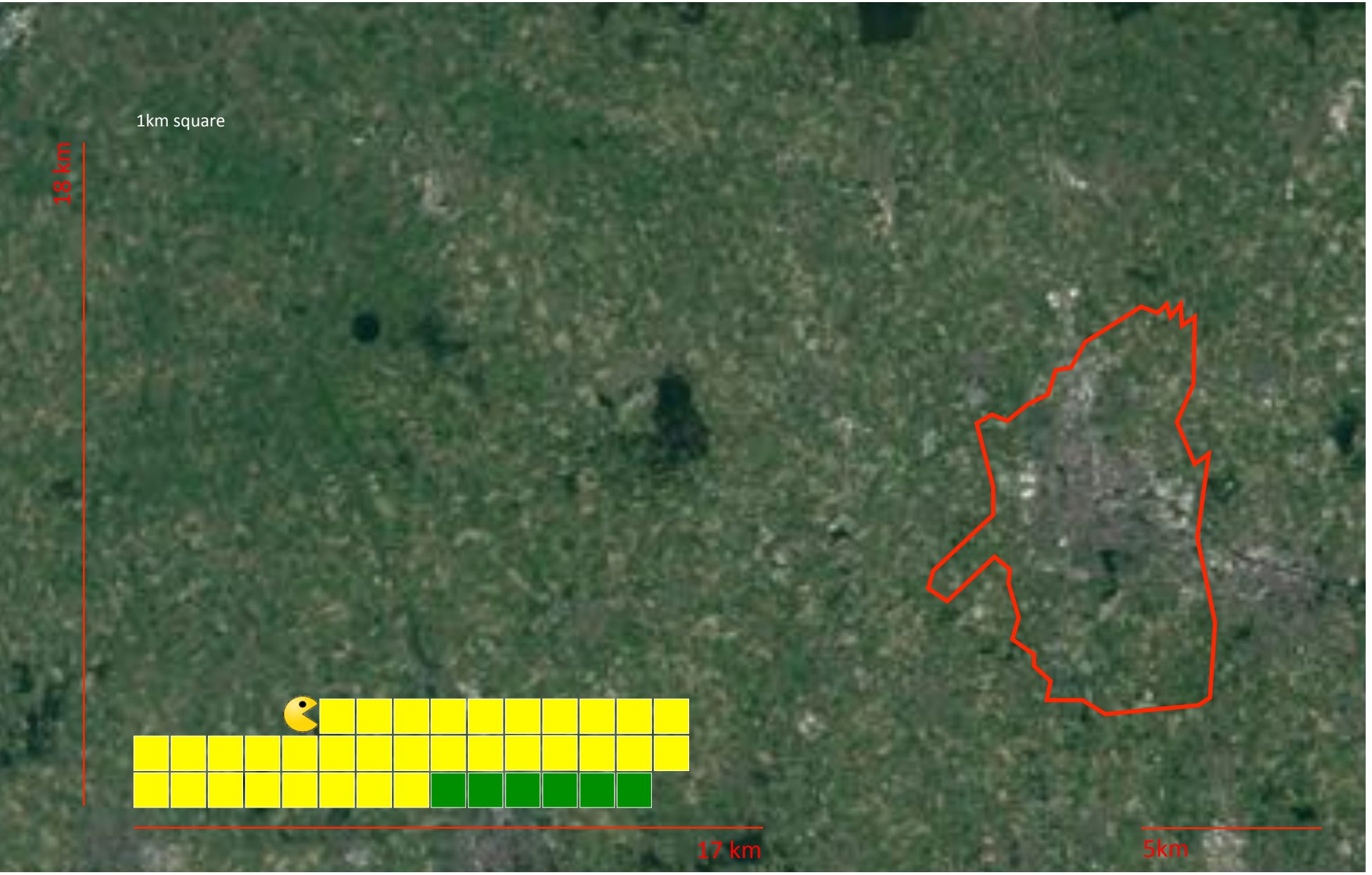
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

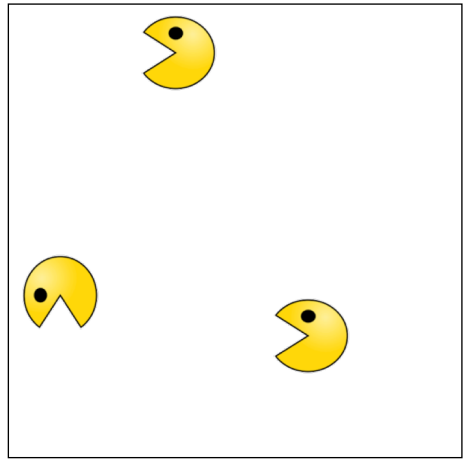
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #14
URBAN FORESTRY

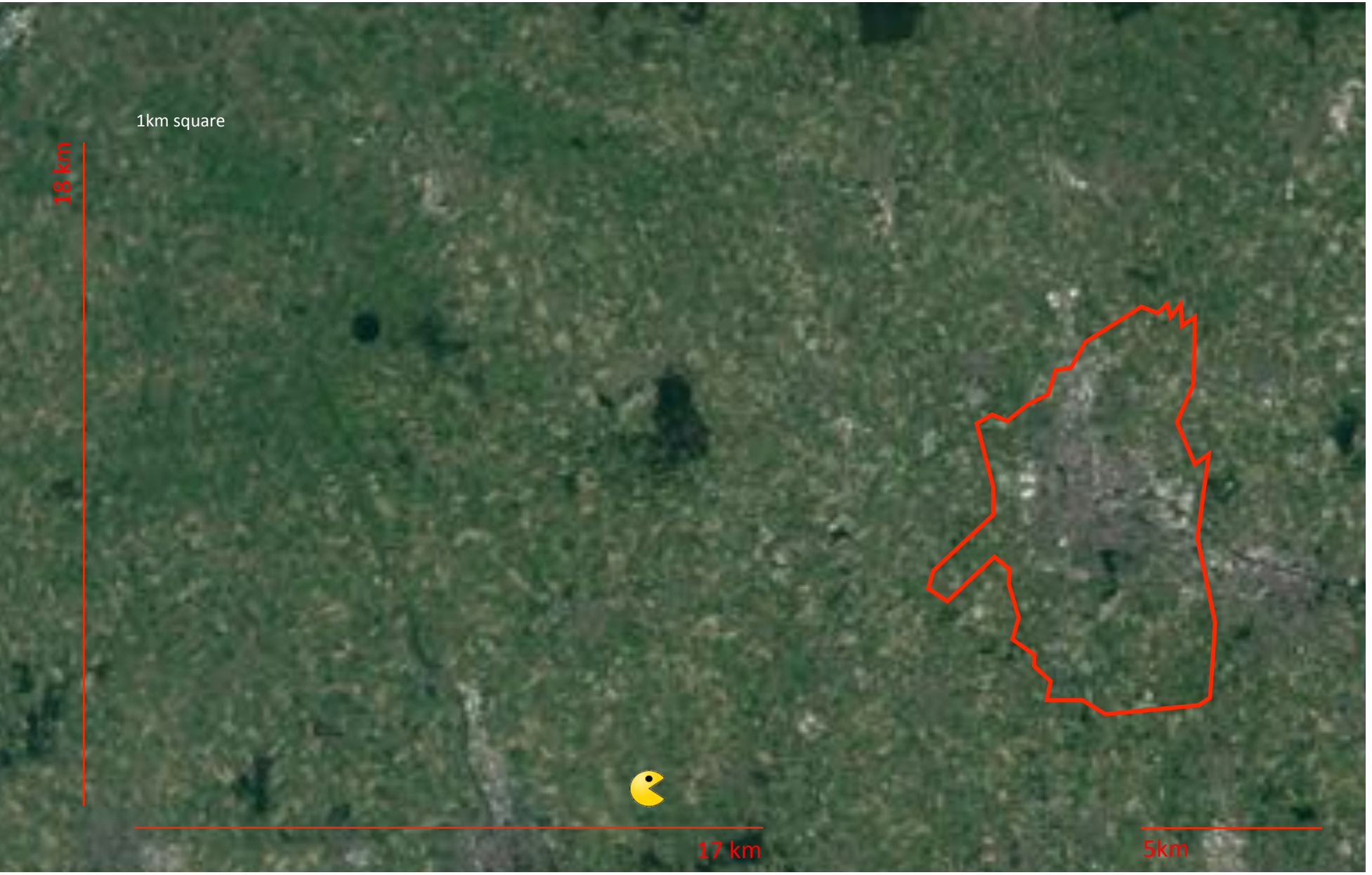
- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY

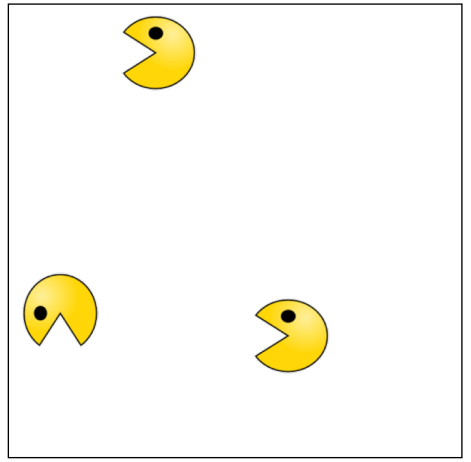
CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE





MEASURE #15
NEW FOREST

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

CITY-zen
New urban energy
ROADSHOW

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018

Nu is’t aan junder, veel succes!

Web:
https://www.klimaatswitch.be/programma-city-zen
https:// www.cityzen-smartcity.eu/nl/home-nl/

@CityzenRoadshow

@CityzenRoadshow

cityzenroadshow

Contact: c.l.martin@tudelft.nl

CITY-zen
New urban energy
ROADSHOW

City-zen Partners …