City-zen ‘Roeselare’ Roadshow

Een Duurzame Stadsvisie

This project has received funding from the European Union’s Seventh Programme for research, technological development and demonstration under grant agreement No 608702
Aim: Zero-Energy

Heart of process

Co-creation

Fun / Reachable

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

Roeselare, Belgium. April 2018
Maandag 23 april | Introductie
9.30 u. - 11.30 u.: 'Het loopt op wieltjes'-fietstocht*
Maandag 23 april | Introductie
9.30 u. - 11.30 u.: 'Het loopt op wieltjes'-fietsstoct*
Maandag 23 april | Introductie
13.30 u. - 15.30 u.: Inspirerende presentaties
#VANRS

Maandag 23 april | Introductie
13.30 u. - 15.30 u.: Inspirerende presentaties
#VANRS
What went on...

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

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

Roeselare, Belgium. April 2018
What went on ...

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

Donderdag 25 april | Evalueren Fun-shops 'Buurten van de Toekomst' & 'Energie'
Woensdag 25 april | Design
9 u. - 12.30 u.: Serious Game ‘Go2Zero’
Woensdag 25 april | Design
13 u. - 14.30 u.: Mini-masterclass C02-voetafdruk en de stappen die we moeten zetten

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

Roeselare, Belgium. April 2018
What went on ...

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

ROADSHOW METHODOLOGY: Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands
What went on ...
Vrijdag 27 april | Outro

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

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

UNIT kg CO$_2$-eq

GWP CO$_2$ = 1
GWP CH$_4$ = 34
GWP N$_2$O = 298

EMISSION FACTOR
# Emission Factor of Electricity Grid Mix in Belgium

<table>
<thead>
<tr>
<th></th>
<th>LCA based EF</th>
<th>DATA</th>
<th>%</th>
<th>GHG EMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL DATA</strong></td>
<td></td>
<td>kWh</td>
<td>%</td>
<td>kt CO2-eq/yr</td>
</tr>
<tr>
<td>electricity demand</td>
<td></td>
<td>8.35E+10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>electricity production</td>
<td></td>
<td>7.98E+10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INPORT</strong></td>
<td></td>
<td></td>
<td>4.4%</td>
<td>1.68E+09</td>
</tr>
<tr>
<td>natural gas</td>
<td>0.46</td>
<td>3.65E+09</td>
<td>29.0%</td>
<td>1.03E+10</td>
</tr>
<tr>
<td>petroleum products</td>
<td>0.778</td>
<td>2.31E+10</td>
<td>29.0%</td>
<td>0.00E+00</td>
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<tr>
<td>coal</td>
<td>1.050</td>
<td></td>
<td></td>
<td>0.00E+00</td>
</tr>
<tr>
<td><strong>RENEWABLES</strong></td>
<td></td>
<td></td>
<td>17.9%</td>
<td>2.14E+08</td>
</tr>
<tr>
<td>solar thermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>solar PV</td>
<td>0.032</td>
<td>2.95E+09</td>
<td>3.7%</td>
<td>9.45E+07</td>
</tr>
<tr>
<td>wind</td>
<td>0.010</td>
<td>5.11E+09</td>
<td>6.4%</td>
<td>5.11E+07</td>
</tr>
<tr>
<td>hydro</td>
<td>0.012</td>
<td>3.19E+08</td>
<td>0.4%</td>
<td>3.83E+06</td>
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<tr>
<td>geothermal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>biomass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>biogas</td>
<td>0.011</td>
<td>5.91E+09</td>
<td>7.4%</td>
<td>6.50E+07</td>
</tr>
<tr>
<td>hydrogen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NUCLEAR</strong></td>
<td></td>
<td></td>
<td>51.7%</td>
<td>2.72E+09</td>
</tr>
<tr>
<td>nuclear</td>
<td>0.066</td>
<td>4.13E+10</td>
<td>51.7%</td>
<td>2.72E+09</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0.181</td>
<td>8.23E+10</td>
<td></td>
<td>1.49E+10</td>
</tr>
</tbody>
</table>

**Electricity EF** (LCA based)

- 0.181 kg CO₂eq/kWh
- 0.460 kg CO₂eq/kWh
## HOUSEHOLD PROFILING

### ROESELARE (BELGIUM)

#### HOUSEHOLD PROFILE

<table>
<thead>
<tr>
<th>Emission sources</th>
<th>unit</th>
<th>rawdata</th>
<th>%</th>
<th>kg CO2-eq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENERGY</strong></td>
<td>kWh</td>
<td>15840</td>
<td></td>
<td>3476</td>
<td>51.3%</td>
</tr>
<tr>
<td>LIGHTING &amp; APPLIANCE</td>
<td>kWh</td>
<td>3563</td>
<td>100%</td>
<td>643</td>
<td>9.5%</td>
</tr>
<tr>
<td>ELECTRICITY</td>
<td>kWh</td>
<td>3563</td>
<td>100%</td>
<td>643</td>
<td>9.5%</td>
</tr>
<tr>
<td>HEAT + DHW + COOKING</td>
<td>kWh</td>
<td>1277</td>
<td>100%</td>
<td>2833</td>
<td>41.8%</td>
</tr>
<tr>
<td>NAT GAS</td>
<td>kWh</td>
<td>10021</td>
<td>82%</td>
<td>2522</td>
<td>37.2%</td>
</tr>
<tr>
<td>ELECTRICITY</td>
<td>kWh</td>
<td>3563</td>
<td>100%</td>
<td>643</td>
<td>9.5%</td>
</tr>
<tr>
<td>HEAT + DHW + COOKING</td>
<td>kWh</td>
<td>1277</td>
<td>100%</td>
<td>2833</td>
<td>41.8%</td>
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<tr>
<td><strong>MOBILITY</strong></td>
<td>kWh</td>
<td>10858</td>
<td>100%</td>
<td>2972</td>
<td>43.8%</td>
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<tr>
<td>ELECTRIC CAR</td>
<td>kWh</td>
<td>2</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td>LGP + GAS</td>
<td>kWh</td>
<td>28</td>
<td>0.3%</td>
<td>7</td>
<td>0.1%</td>
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<tr>
<td>DIESEL</td>
<td>kWh</td>
<td>8945</td>
<td>82%</td>
<td>2550</td>
<td>37.6%</td>
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<tr>
<td>GASOLINE</td>
<td>kWh</td>
<td>1554</td>
<td>14%</td>
<td>414</td>
<td>6.1%</td>
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<tr>
<td>BIO-FUEL</td>
<td>kWh</td>
<td>328</td>
<td>3%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td><strong>WASTE</strong></td>
<td>kg</td>
<td>1076</td>
<td>100%</td>
<td>276</td>
<td>4.1%</td>
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<tr>
<td>WASTE TO ENERGY</td>
<td>kg</td>
<td>312</td>
<td>29%</td>
<td>204</td>
<td>3.0%</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>kg</td>
<td>230</td>
<td>21%</td>
<td>21</td>
<td>0.3%</td>
</tr>
<tr>
<td>LANDFILL</td>
<td>kg</td>
<td>44</td>
<td>4%</td>
<td>51</td>
<td>0.8%</td>
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<tr>
<td>RECYCLING</td>
<td>kg</td>
<td>490</td>
<td>46%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>WATER</strong></td>
<td>m³</td>
<td>96</td>
<td>100%</td>
<td>56</td>
<td>0.8%</td>
</tr>
<tr>
<td>TOTAL m³ per yr (house)</td>
<td>m³</td>
<td>96</td>
<td>100%</td>
<td>56</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

#### Typical Household Profiling

- 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
HOUSEHOLD PROFILING

ROESELARE CITY (BELGIUM)

TYPICAL HOUSEHOLD PROFILING

HOUSEHOLD IN ROESELARE

CARBON FOOTPRINT

6.78 t CO$_2$eq/yr

7.72 t CO$_2$eq/yr

Carbon Footprint Offset per household

0.50 ha forestland

0.50 ha forestland

CITY-zen

NEW URBAN ENERGY ROADSHOW

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, Belgium. April 2018

Carbon Accounting: Riccardo M. Pulselli, University of Siena
COLLIEVIJVER NEIGHBOURHOOD

CF: 9206 t CO$_2$-eq

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018
COLLIEVIJVER NEIGHBOURHOOD

X 8.9

CF: 9206 t CO$_2$-eq

= 682 ha forestland

2.7 km

10 ha square

COLLIEVIJVER NEIGHBOURHOOD

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
COLLIEVJVER NEIGHBOURHOOD

CF: $9206 \text{ t CO}_2\text{-eq}$

= 682 ha forestland

10 ha square

COLLIEVJVER NEIGHBOURHOOD

- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018
## CARBON FOOTPRINT OF ROESELARE CITY

<table>
<thead>
<tr>
<th>Emission sources</th>
<th>ROESELARE</th>
<th>MUNICIPALITY</th>
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<tbody>
<tr>
<td></td>
<td>unit</td>
<td>rawdata</td>
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<tr>
<td><strong>ENERGY</strong></td>
<td>MWh</td>
<td>415222</td>
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<tr>
<td>LIGHTING &amp; APPLIANCES</td>
<td>MWh</td>
<td>321820</td>
</tr>
<tr>
<td>Electricity</td>
<td>MWh</td>
<td>75502</td>
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<tr>
<td>Heat + DHW + cooking</td>
<td>MWh</td>
<td>262888</td>
</tr>
<tr>
<td>Nat gas</td>
<td>MWh</td>
<td>12071</td>
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<tr>
<td>LPG</td>
<td>MWh</td>
<td>8608</td>
</tr>
<tr>
<td>Solar thermal</td>
<td>MWh</td>
<td>284617</td>
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<tr>
<td>Geothermal</td>
<td>MWh</td>
<td>2383</td>
</tr>
<tr>
<td><strong>MOBILITY</strong></td>
<td>MWh</td>
<td>284617</td>
</tr>
<tr>
<td>Electric car</td>
<td>MWh</td>
<td>63</td>
</tr>
<tr>
<td>LPG + Gas</td>
<td>MWh</td>
<td>731</td>
</tr>
<tr>
<td>Diesel</td>
<td>MWh</td>
<td>234482</td>
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<tr>
<td>Gasoline</td>
<td>MWh</td>
<td>40733</td>
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<tr>
<td>Bio-fuel</td>
<td>MWh</td>
<td>8608</td>
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<tr>
<td><strong>WASTE</strong></td>
<td>t</td>
<td>28345</td>
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<tr>
<td>% waste-to-energy</td>
<td>t</td>
<td>8231</td>
</tr>
<tr>
<td>% organic</td>
<td>t</td>
<td>6049</td>
</tr>
<tr>
<td>% landfill</td>
<td>t</td>
<td>12919</td>
</tr>
<tr>
<td>% recycling</td>
<td>t</td>
<td>1159</td>
</tr>
<tr>
<td><strong>WATER</strong></td>
<td>m³</td>
<td>2521892</td>
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<tr>
<td>m³ per yr (house)</td>
<td>m³/yr</td>
<td>2521892</td>
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<tr>
<td><strong>RESIDENTIAL</strong></td>
<td></td>
<td>177,748</td>
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<td><strong>TERTIARY</strong></td>
<td>MWh</td>
<td>442647</td>
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<tr>
<td><strong>AGRICULTURE</strong></td>
<td>MWh</td>
<td>28392</td>
</tr>
<tr>
<td><strong>INDUSTRY</strong></td>
<td>MWh</td>
<td>639487</td>
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<tr>
<td>Public transport</td>
<td>MWh</td>
<td>5270</td>
</tr>
<tr>
<td>Public lighting</td>
<td>MWh</td>
<td>5546</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>412,396</td>
</tr>
</tbody>
</table>
CARBON FOOTPRINT OF ROESELARE CITY

Roeselare City

61,657 inhabitants
26,349 households
5979 ha area

Carbon Accounting: Riccardo M. Pulselli, University of Siena
CARBON FOOTPRINT OF ROESELARE CITY

30,548 ha forestland grabbing vs 5,979 ha area

X 5.1

Roeselare City

CARBON FOOTPRINT
412,000 t CO2 eq

FORESTLAND GRABBING
30,548 ha

Carbon Accounting: Riccardo M. Pulselli, University of Siena
CARBON FOOTPRINT OF ROESELARE CITY

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018
Current Electricity Demand

495 GWh-e in 2015

Electricity demand Roeselare 2015 (GWh)

- Industrial: 220 GWh (44%)
- Residential: 95 GWh (20%)
- Non-Residential: 180 GWh (36%)

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Heat demand Roeselare 2015 (GWh)

- **Industrial**: 100 GWh (15%)
- **Residential**: 300 GWh (46%)
- **Non-Residential**: 250 GWh (39%)
- **Industrial Process**: 320 GWh

**Current Heat Demand**

620 GWh-th in 2015 + 320 GWh-pr

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Electricity potentials in Roeselare

- **Incineration**: 17 GWh (2%)
- **Wind**: 240 GWh (31%)
- **PV-Non-Roof**: 120 GWh (15%)
- **PV-Roof**: 400 GWh (52%)

**Electricity Demand**: 495 GWh (100%)

**Electricity Potential**: 777 GWh (157%)

Space for production

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

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Heat potentials in Roeselare

- **High-T for district heat network (DHN)**
- **Mid-T needs energy renovation**
- **Low-T needs heat pumps and energy renovation**

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

30% High-T for DHN
25% Mid-T
25% Low-T
20% reduction
Main directions

Modal shift
Electrification

Sustainable transport scenario
Assumptions

30% reduction of current demand for appliances

15% total increase due to Electrification of Heating + transport

Electricity demand scenario towards 2050
Main measures

- 25 Wind Turbines
- 240 ha PV panels
- Co-generation of waste incineration
Required temperatures

- **HT** = > 65°C
- **MT** = 40°C - 65°C
- **LT** = < 45°C

Temperature levels for heating of buildings towards 2050

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Required energy renovations of building stock towards 2050

57000 residential unit equivalents of which:
- 26000 residential
- 31000 non-residential

Building stock

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
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 (HT) of Roeselare’s current building stock

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

Energy strategy: Siebe Broersma MSc, Technical University, Delft
Roadmap for sustainable electricity production in Roeselare

- **Main measures**
  - 235 ha PV panels
  - 25 4MW Wind Turbines
  - 17 GWh-e from Waste Incineration

**Energy strategy:** Siebe Broersma MSc, Technical University, Delft.
Schematic section of Roeselare’s sustainable energy systems in 2050

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

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

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

Neighbourhood disconnection

Roeselare, Belgium. April 2018
Low Density

1300 Houses
85 Hectares
15 Homes/Ha

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

Low Intensity

- No bars
- No cafes
- No civic functions

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.

Roeselare, Belgium. April 2018
Over-engineered water ways

Flooding an issue

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

Empty but full

75 Homes/Ha
17 Hectares
68 Hectares empty

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

Small green spaces

- Individual gardens
- Grass verges
- Road infrastructure

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

Roeselare, Belgium. April 2018
Over-engineered water ways

Flooding issues
Urban Analysis

Car-orientated

Highest mobility impact
Urban Analysis

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

City of bits

Very little contact between neighbourhoods

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

Urban Design: blurring boundaries

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

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

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
Urban Design: flood proofing naturally

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

Sustainable urban drainage
- Cheap
- Easy
- Bio-diverse

Roeselare, Belgium. April 2018
Interface between blue and green

Create blue route
Create Green cycle route
Connect in neighbourhood

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

Community Agora

- Food focussed neighbourhood
- Community food trading
- Paddy field

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

Blurred boundaries

Bring city to neighbourhood

Bring neighbourhood to city

Increase density

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

Roeselare, Belgium. April 2018
Modal shift provides urban space

Source: [www.verkehrswende-ev.de](http://www.verkehrswende-ev.de)

Source: [www.wegcode.be](http://www.wegcode.be)

Source: [http://www.iedereengorilla.be/](http://www.iedereengorilla.be/)

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
No need to visit

Very generic

No difference

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
New green ring of exciting neighbourhoods

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 design strategy: Prof Greg Keeffe, Queens University, Belfast.
Urban agriculture: low impact with technical food systems

Productive Landscapes

Urban Castles

Productive street systems

Techno terps

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
Urban Design. Aquaponic people first highways

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
Urban Design - Blue Green castles

Consolidation of green space

Energy renovation
Urban Agriculture
Community focussed
Sharing

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

Roeselare, Belgium. April 2018
Urban Design - Blue Green castles

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
All-electric self-sufficient renovation – *Green blue castle*

Main measures

- PV-Thermal roof
- Collective Heat pump
- Triple glazing
- Greenhouse garden

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

Roeselare, Belgium. April 2018
Consolidation of green space

List 1
List 2
List 3

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

Roeselare, Belgium. April 2018
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
All-electric self-sufficient renovation – Techno terp

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

Techno terp

Independent energy
Aquaponic greenhouse
Fish-tank flood barrier
SUDS
Main measures

- PV-Thermal roof
- Underground heat storage
- Ground source HP
- DHW booster
- Greenhouse roof
- Triple glazing + roof insul.
- Aquaponics
Unsafe and unnatural

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

Roeselare, Belgium. April 2018
Urban Design

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

Safe and Natural

Roeselare, Belgium. April 2018
Unpacking the city into the neighbourhood

Increased intensity

Community services

Increased density

Reason to visit
Community Agora

Food focussed neighbourhood

Community food trading

Paddy fields

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
All-electric self-sufficient renovation – *Collievijver agora*

**Main measures**

- Full PV-roof
- Collective Heat pump
- DHW booster
- Greenhouse garden
- Moderate renovation:
  - Triple glazing + roof insul.

**PV-Thermal roof**

**Waste heat from refrigeration**

**BTES**

**MT mini heat grid**

**Greenhouse roof**

**Water storage**

**SYNERGETIC EXCHANGE**

**Electricity over-production**

**(Waste) heat production**

**Local food production**

**Super market**

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Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Urban Design: nature reconnection

Enjoy the environmental tax!

- Short coppice willow provides carbon sink
- Amenity space
- bio-diversity

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

Carbon Accounting: Riccardo M. Pulselli, University of Siena
MEASURE #1
ENERGY SAVING
Building energy retrofitting

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

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
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

MEASURE #2
BIOMASS
Industrial use

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
MEASURE #3
DISTRICT HEATING NETWORK
Waste incineration

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018
MEASURE #4
DISTRICT HEATING NETWORK
Solar collectors + HT storage

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
MEASURE #5
DISTRICT HEATING NETWORK
HT industrial waste

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
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

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
Roeselare, Belgium. April 2018
MEASURE #9
PV on ROOF

ELECTRICITY (HOUSING)
HEAT (HOUSING)
MOBILITY (PRIVATE CARS)
TERTIARY
INDUSTRY
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

MEASURE #9
PV non ROOF

Carbon Accounting: Riccardo M. Pulselli, University of Siena
Roeselare, Belgium. April 2018
MEASURE #10
SUSTAINABLE MOBILITY
Cycling roads, electric public/sharing

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY
MEASURE #11
TRANSITION TO ELECTRIC MOBILITY

ELECTRICITY (HOUSING)
HEAT (HOUSING)
MOBILITY (PRIVATE CARS)
TERTIARY
INDUSTRY
MEASURE #12
WIND FARM

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

MEASURE #14
URBAN FORESTRY

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena

Roeselare, Belgium. April 2018
MEASURE #15
NEW FOREST

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

Carbon Accounting: Riccardo M. Pulselli, University of Siena
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
ROADSHOW METHODOLOGY: Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018