CityZEN Strategy Plan # 6: Roeselare Belgium.


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Download date: 13. Dec. 2018
City-zen ‘Roeselare’ Roadshow

Een Duurzame Stadsvisie
Aim: Zero-Energy

Roadshow Methodology: Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Heart of process
Co-creation
Fun / Reachable

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

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

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

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

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

Roeselare, Belgium. April 2018
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
CARBON ACCOUNTING EXPLAINED

I DON'T BELIEVE IN
GLOBAL WARMING

UNIT kg CO₂-eq

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

EMISSION FACTOR
## Emission Factor of Electricity Grid Mix in Belgium

### GENERAL DATA

<table>
<thead>
<tr>
<th></th>
<th>LCA based EF</th>
<th>DATA</th>
<th>%</th>
<th>GHG EMISSION</th>
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<td><strong>NUCLEAR</strong></td>
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<td></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>0.181</td>
<td>8.23E+10</td>
<td>51.7%</td>
<td>1.49E+10</td>
</tr>
</tbody>
</table>

**BELGIUM 2016**

**Carbon Accounting: Riccardo M. Pulselli, University of Siena**

Roeselare, Belgium. April 2018

**Electricity EF** (LCA based)

0.181 kg CO2eq/kWh

0.460 kg CO2eq/kWh
<table>
<thead>
<tr>
<th>Emission sources</th>
<th>unit</th>
<th>rawdata</th>
<th>%</th>
<th>kg CO2-eq</th>
<th>%</th>
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<td>kWh</td>
<td>15840</td>
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<td>3476</td>
<td>51.3%</td>
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<tr>
<td>LIGHTING&amp;APPLIANC.</td>
<td>kWh</td>
<td>3563</td>
<td>100%</td>
<td>643</td>
<td>9.5%</td>
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<tr>
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<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>12277</td>
<td>100%</td>
<td>2833</td>
<td>41.8%</td>
</tr>
<tr>
<td>Nat gas</td>
<td>kW h</td>
<td>10021</td>
<td>82%</td>
<td>2522</td>
<td>37.2%</td>
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<tr>
<td>LGP</td>
<td>kWh</td>
<td>460</td>
<td>4%</td>
<td>121</td>
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<tr>
<td>Biomass</td>
<td>kWh</td>
<td>1662</td>
<td>14%</td>
<td>189</td>
<td>2.8%</td>
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<tr>
<td>Solar thermal</td>
<td>kWh</td>
<td>43</td>
<td>0.3%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td>Geothermal</td>
<td>kWh</td>
<td>91</td>
<td>1%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td>MOBILITY</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>WASTE</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>
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<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>
</tr>
<tr>
<td>% recycling</td>
<td>kg</td>
<td>490</td>
<td>46%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td>WATER</td>
<td>m³</td>
<td>96</td>
<td>100%</td>
<td>56</td>
<td>0.8%</td>
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<tr>
<td>m³ per yr (house)</td>
<td>m³/yr</td>
<td>96</td>
<td>100%</td>
<td>56</td>
<td>0.8%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>6779</td>
<td>100%</td>
</tr>
</tbody>
</table>

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
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

ROESELARE CITY (BELGIUM)

TYPICAL HOUSEHOLD PROFILING

HOUSEHOLD IN ROESELARE

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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
The ecological footprint of Londoners is 293 times the size of London. The area of London and the UK are superimposed for a clearer comparison.

- Food: 41%
- Energy: 10%
- Transport: 5%
- Materials & waste: 44%
- Water: 0.3%
- Degraded land: 0.7%
Roeselare, Belgium. April 2018

CollieviJver Neighbourhood

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena

CF: 9206 t CO$_2$-eq
COLLIEVIJVER NEIGHBOURHOOD

X 8.9

CF: 9206 t CO₂-eq

= 682 ha forestland

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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
CF: 9206 t CO$_2$-eq

= 682 ha forestland
## Carbon Footprint of Roeselare City

### Emission Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Unit</th>
<th>Data</th>
<th>% Raw</th>
<th>t CO2-eq</th>
<th>% Emission</th>
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<tr>
<td><strong>Energy</strong></td>
<td>MWh</td>
<td>415,222</td>
<td>91,118</td>
<td>91,118</td>
<td>22.1%</td>
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<tr>
<td>Lighting &amp; Appliance</td>
<td>MWh</td>
<td>93,402</td>
<td>100</td>
<td>16,867</td>
<td>4.1%</td>
</tr>
<tr>
<td>Electricity</td>
<td>MWh</td>
<td>93,402</td>
<td>100</td>
<td>16,867</td>
<td>4.1%</td>
</tr>
<tr>
<td>Heat + DHW + cooking</td>
<td>MWh</td>
<td>321,820</td>
<td>74,251</td>
<td>74,251</td>
<td>18.0%</td>
</tr>
<tr>
<td>Nat gas</td>
<td>MWh</td>
<td>262,681</td>
<td>82%</td>
<td>66,115</td>
<td>16.0%</td>
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<tr>
<td>LGP</td>
<td>MWh</td>
<td>12,071</td>
<td>4%</td>
<td>3,171</td>
<td>0.8%</td>
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<tr>
<td>Biomass</td>
<td>MWh</td>
<td>43,560</td>
<td>14%</td>
<td>4,965</td>
<td>1.2%</td>
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<tr>
<td>Solar thermal</td>
<td>MWh</td>
<td>1124</td>
<td>0%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td>Geothermal</td>
<td>MWh</td>
<td>2383</td>
<td>1%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Mobility</strong></td>
<td>MWh</td>
<td>284,617</td>
<td>77,894</td>
<td>77,894</td>
<td>18.9%</td>
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<tr>
<td>Electric car</td>
<td>MWh</td>
<td>63</td>
<td>0%</td>
<td>11</td>
<td>0.0%</td>
</tr>
<tr>
<td>LGP + Gas</td>
<td>MWh</td>
<td>731</td>
<td>0.3%</td>
<td>192</td>
<td>0.0%</td>
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<tr>
<td>Diesel</td>
<td>MWh</td>
<td>234,482</td>
<td>82.4%</td>
<td>66,836</td>
<td>16.2%</td>
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<td>Gasoline</td>
<td>MWh</td>
<td>40,733</td>
<td>14.3%</td>
<td>10,855</td>
<td>2.6%</td>
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<tr>
<td>Bio-fuel</td>
<td>MWh</td>
<td>8608</td>
<td>3%</td>
<td>0</td>
<td>0.0%</td>
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<tr>
<td><strong>Waste</strong></td>
<td>t</td>
<td>28,345</td>
<td>100%</td>
<td>7,260</td>
<td>1.8%</td>
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<tr>
<td>% waste-to-energy</td>
<td>t</td>
<td>8,231</td>
<td>29%</td>
<td>5,367</td>
<td>1.3%</td>
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<tr>
<td>% organic</td>
<td>t</td>
<td>6,049</td>
<td>21%</td>
<td>548</td>
<td>0.1%</td>
</tr>
<tr>
<td>% landfill</td>
<td>t</td>
<td>1,159</td>
<td>4%</td>
<td>1,345</td>
<td>0.3%</td>
</tr>
<tr>
<td>% recycling</td>
<td>t</td>
<td>12,919</td>
<td>46%</td>
<td>0</td>
<td>0.0%</td>
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<td><strong>Water</strong></td>
<td>m³</td>
<td>252,169</td>
<td>100%</td>
<td>1,476</td>
<td>0.4%</td>
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<td>m³ per yr (house)</td>
<td>m³/yr</td>
<td>252,169</td>
<td>100%</td>
<td>1,476</td>
<td>0.4%</td>
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<td><strong>Residential</strong></td>
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<td>177,748</td>
<td>43%</td>
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<td>Tertiary (private + public)</td>
<td>MWh</td>
<td>44,2647</td>
<td>99,898</td>
<td>99,898</td>
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<td>7,666</td>
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<td>1.9%</td>
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<td>Industry</td>
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<td>63,848</td>
<td>124,644</td>
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<td>Public transport</td>
<td>MWh</td>
<td>5270</td>
<td>1,439</td>
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<td>Public lighting</td>
<td>MWh</td>
<td>5546</td>
<td>1,002</td>
<td>1,002</td>
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<td><strong>Total</strong></td>
<td></td>
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<td>412,396</td>
<td>100%</td>
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</table>

### Additional Information

- **Roeselare City**
  - 61,657 inhabitants
  - 26,349 households
  - 5979 ha area

---

**Carbon Accounting:** Riccardo M. Pulselli, University of Siena
Roeselare City

61,657 inhabitants
26,349 households
5979 ha area
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
Current Electricity Demand

Electricity demand Roeselare 2015 (GWh)

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

495 GWh-e in 2015
Current Heat Demand

620 GWh-th in 2015
+ 320 GWh-pr

Heat demand Roeselare 2015 (GWh)

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

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.
Temperature levels

High-T for district heat network (DHN)

Mid-T needs energy renovation

Low-T needs heat pumps and energy renovation

Heat potentials in Roeselare

Heat Demand
- 650 GWh (100%)

Heat Potential (HT)
- 1710 GWh (263%)

- Sunboiler
  - 1480 GWh (86%)

- Industrial
  - 100 GWh (6%)

- Incineration
  - 130 GWh (8%)

Heat Potential (MT)
- 2025 GWh (312%)

- Residual
  - 25 GWh (1%)

Heat Potential (LT)
- 1000 GWh (154%)

ATES / BTES
- 1000 GWh (100%)

Energy strategy: Siebe Broersma MSc, Technical University, Delft.
Heat Balance towards 2050

- Temperature levels:
  - 30% High-T for DHN
  - 25% Mid-T
  - 25% Low-T
  - 20% reduction

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

Modal shift

Electrification

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

Roeselare, Belgium. April 2018
Assumptions

30% reduction of current demand for appliances

15% total increase due to Electrification of Heating + transport

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

25 Wind Turbines
240 ha PV panels
Co-generation of waste incineration
Temperature levels for heating of buildings towards 2050

Required temperatures

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

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

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

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

Roeselare, Belgium. April 2018
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
Main measures

60% of building stock moderately renovated by 2050

Solar collectors and MT-storage in underground

---

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

<table>
<thead>
<tr>
<th>Now</th>
<th>2020</th>
<th>2035</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>Facilitate 3 GWh/year MT storage up to 80 GWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To store summer heat on mid-temperature levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i.e.w. central heat pumps in case MT-storage is not allowed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Install 1 ha/year of solar thermal collectors on roofs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>And optimize for seasonal storage in ATES / BTES and supply by mid-temperature systems</td>
<td></td>
<td></td>
</tr>
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</table>

**Renovate 500 res. eq. /year from G/F/E/D labels to C/B labels**

<table>
<thead>
<tr>
<th>G</th>
<th>F</th>
<th>E</th>
<th>D</th>
<th>C</th>
<th>B</th>
</tr>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These buildings will be heated with mid-temperature heat

**Renovate 600 res. eq. /year from C/B to A labels**

<table>
<thead>
<tr>
<th>C</th>
<th>B</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

These buildings will be heated with low-temperature heat

**Facilitate 3 GWh/year ATES/BTES systems up to 80 GWh**

For non-residential functions with similar heating and cooling demands

---

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

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Roeselare, Belgium. April 2018
**Roadmap for sustainable electricity production in Roeselare**

<table>
<thead>
<tr>
<th>Year</th>
<th>PV on Roofs</th>
<th>PV - thermal</th>
<th>PV non-roof</th>
<th>Wind turbines</th>
<th>Waste incineration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td></td>
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<tr>
<td>2020</td>
<td>Install 5 ha. <strong>30,000 panels</strong> of PV-electric on roofs per year</td>
<td></td>
<td></td>
<td>Install one 4 MW-wind turbines per year</td>
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<tr>
<td>2030</td>
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<tr>
<td>2050</td>
<td></td>
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</tr>
</tbody>
</table>

- Install 5 ha. **30,000 panels** of PV-electric on roofs per year
  - Up to 152 ha. (228 GWh) in 2050
- Install 1 ha. **8,000 panels** of PV-thermal on roofs per year
  - Up to 17 ha. (25 GWh) in 2050
- Install 2 ha. **13,000 panels** of non-roof PV projects per year
  - Up to 67 ha. (100 GWh) in 2050
- Install one 4 MW-wind turbines per year
  - up to 100 MW
  - Including replacement of existing smaller turbines during the final phase
- **17 GWh/year**
  - as currently already produced

**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

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

Regional connectivity
- People
- Packages
- Heavy materials

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

Roeselare, Belgium. April 2018
Urban Analysis

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

Roeselare, Belgium. April 2018
Urban Analysis

Neighbourhood disconnection

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

Roeselare, Belgium. April 2018
Urban Analysis

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

Low Density

- 1300 Houses
- 85 Hectares
- 15 Homes/Ha

Roeselare, Belgium. April 2018
Urban Analysis

Low Intensity

- No bars
- No cafes
- No civic functions

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

Over-engineered Roads

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.
Over-engineered water ways

Flooding an issue
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
Small green spaces

- Individual gardens
- Grass verges
- Road infrastructure
Over-engineered water ways

Flooding issues

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

Roeselare, Belgium. April 2018
Urban Analysis

Car-orientated

Highest mobility impact

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

Neighbourhood is isolated, both from city and nature.

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

Very little contact between neighbourhoods
Urban Design: blurring boundaries

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

Star-city
Urban Analysis

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

Roeselare, Belgium. April 2018
Urban Analysis

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
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 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

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

Roeselare, Belgium. April 2018
Modal shift provides urban space

Source: www.verkehrswende-ev.de

Source: www.wegcode.be

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

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

No need to visit

Very generic

No difference
Urban Design: 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

Roeselare, Belgium. April 2018

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

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

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

Sharing

Energy
Food
Community

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

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

Roeselare, Belgium. April 2018
All-electric self-sufficient renovation – Techno terp

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

Techno terps

Technical food system with aquaponics

Fishtanks provide flood protection

Bio-swales in street
All-electric self-sufficient renovation – *Techno terp*

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

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

All-electric self-sufficient renovation – Techno terp

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

Roeselare, Belgium. April 2018
Unsafe and unnatural

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

Roeselare, Belgium. April 2018
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

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

Food-focussed neighbourhood
Community food trading
Paddy fields
All-electric self-sufficient renovation – *Collie Vijver 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

**Supermarket**
Local food production

**SYNERGETIC EXCHANGE**
Electricity over-production
(Waste) heat production

---

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
### CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

<table>
<thead>
<tr>
<th>Category</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity (Housing)</td>
<td>Blue</td>
</tr>
<tr>
<td>Heat (Housing)</td>
<td>Orange</td>
</tr>
<tr>
<td>Mobility (Private Cars)</td>
<td>Purple</td>
</tr>
<tr>
<td>Waste (Urban)</td>
<td>Grey</td>
</tr>
<tr>
<td>Water Use (Housing)</td>
<td>Light Purple</td>
</tr>
<tr>
<td>Tertiary</td>
<td>Yellow</td>
</tr>
<tr>
<td>Industry</td>
<td>Green</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Green</td>
</tr>
<tr>
<td>Public Transport</td>
<td>Black</td>
</tr>
<tr>
<td>Public Lighting</td>
<td>Black</td>
</tr>
</tbody>
</table>

**1km square**

**17 km**

**32 km**

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Roeselare, Belgium. April 2018

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Carbon Accounting: Riccardo M. Pulselli, University of Siena
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

Carbon Accounting: Riccardo M. Pulselli, University of Siena
MEASURE #2
BIOMASS
Industrial use
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

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
MEASURE #5
DISTRICT HEATING
NETWORK
HT industrial waste

ELECTRICITY (HOUSING)
HEAT (HOUSING)
MOBILITY (PRIVATE CARS)
TERTIARY
INDUSTRY
MEASURE #6
MINI HEAT GRIDS
Solar collectors + MT storage

Carbon Accounting: Riccardo M. Pulselli, University of Siena
MEASURE #7
PV THERMAL
Individual or blocks

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

- ELECTRICITY (HOUSING)
- HEAT (HOUSING)
- MOBILITY (PRIVATE CARS)
- TERTIARY
- INDUSTRY
Carbon Accounting: Riccardo M. Pulselli, University of Siena

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

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

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

Roeselare, Belgium. April 2018

Carbon Accounting: Riccardo M. Pulselli, University of Siena

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

Roeselare, Belgium. April 2018
CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

MEASURE #12
WIND FARM

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

Roeselare, Belgium. April 2018
MEASURE #14
URBAN FORESTRY

CARBON FOOTPRINT MITIGATION SCENARIO FOR ROESELARE

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

MEASURE #15
NEW FOREST

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
Roadshow Methodology: Prof. Dr. Craig Lee Martin, TU Delft, The Netherlands

Roeselare, Belgium. April 2018