# UAntwerp's Carbon Footprint 2018

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# Voorstelling Ecolife

Kenniscentrum voor footprinting en ecologische gedragsverandering

- Leuvense milieuorganisatie (2002) erkend door Vlaamse overheid
- Impactmeting, coaching, campagnes en workshops
- Multidisciplinair team met 11 medewerkers/freelancers
- Opdrachten van overheden, middenveld, bedrijven
- Partner van netwerken: Global Footprint Network, Water Footprint Network, Association Bilan Carbone®, Bond Beter Leefmilieu, Netwerk Bewust Verbruiken, The Shift

# The carbon footprint

Emissions of anthropogenic Kyoto greenhouse gases

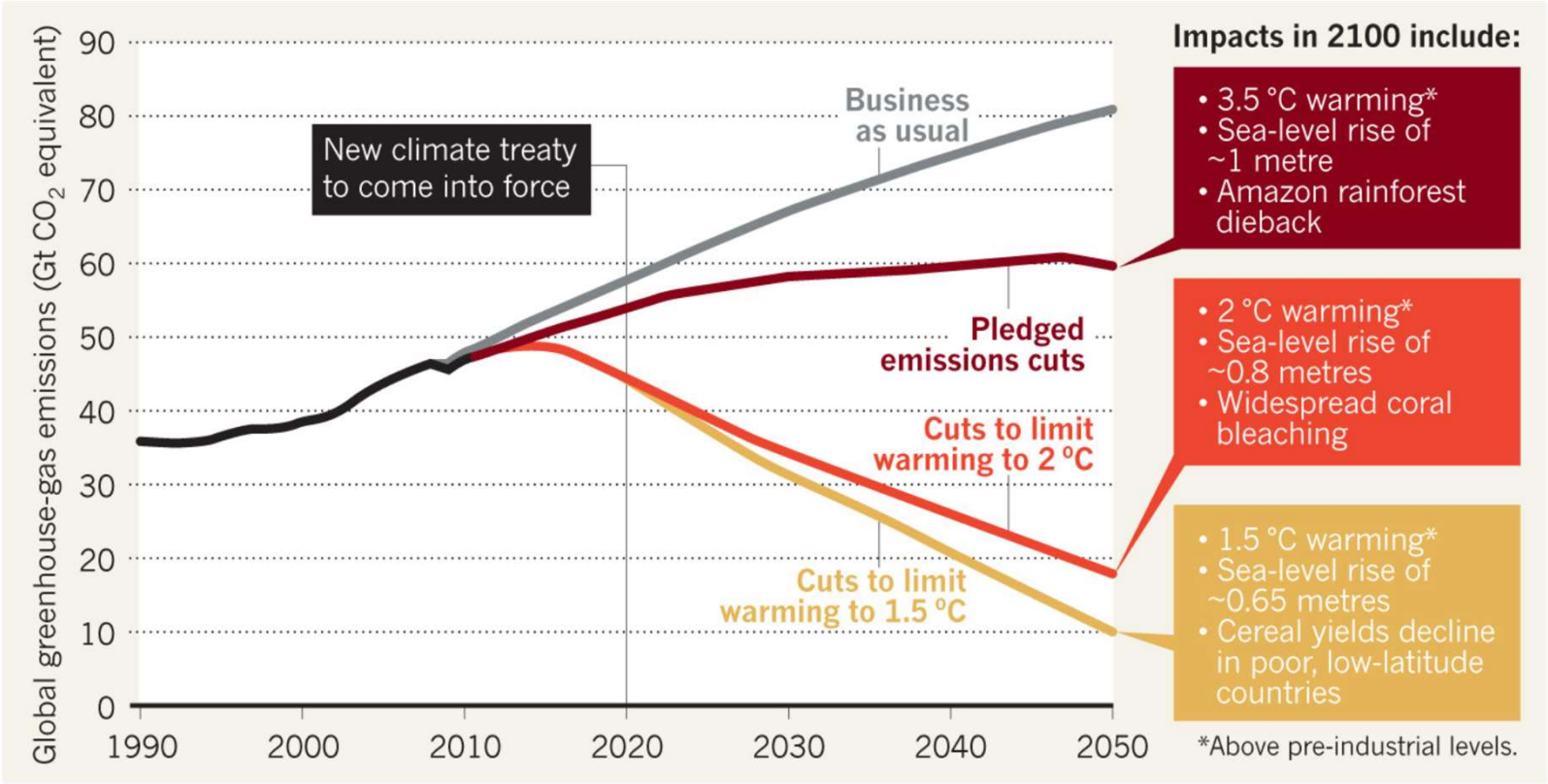
- CO2
- CH4
- N2O
- Fluorine gases SF6, HFCs, PFCs

**Unit:** tons of CO2-equivalents
**Average Belgian:** 20 tons of CO2e
**1 ton of CO2e =** 2 years of breathing
4000 km with a car
2 x 10-12 ° C warming up
Cost 100 euros
30 m² of planted forest

# Climate target

Max 1,5°C warming (430 ppm)

3% reduction per year



# Scope

Sites:

- 5 campuses Drie Eiken, Groenenborger, Middelheim, Mutsaard, Stad4
- administrative, research and education buildings
- student homes owned by UAntwerp
- the student restaurants at the campuses

Activities:

- administration and academic research: research equipment, waste generation, business travel, employee commuting
- education: educational equipment (ICT), student mobility (including airplane travel for foreign students studying at UAntwerp), energy use and general waste generated at the student homes on the campuses
- food consumption (meals) at the student restaurants

# Impact categories

1. **Energy:** emissions related to direct energy use (natural gas, electricity used on campuses)
2. **Non-energy:** leaks of halocarbons from cooling installations
3. **Inputs:** emissions from production of purchased materials and services, meals at student restaurants, ICT equipment and services
4. **Direct waste:** emissions from transport and treatment of waste collected at UA
5. **End-of-life:** emissions from transport and treatment of waste generated for UA related activities but not collected at UA (e.g. paper for student courses)
6. **Transporting people:** emissions from employee commuting, business travel and student mobility, including direct and indirect emissions from production of fuels and vehicles
7. **Capital goods:** embodied energy related emissions from production, construction and renovation of infrastructure, equipment and vehicles owned by UA

# Data and calculation

Footprint = consumed quantity (metric unit) x emission factor (ton $CO_2e$ per unit)

Data collected by UA

Data of Bilan Carbone®

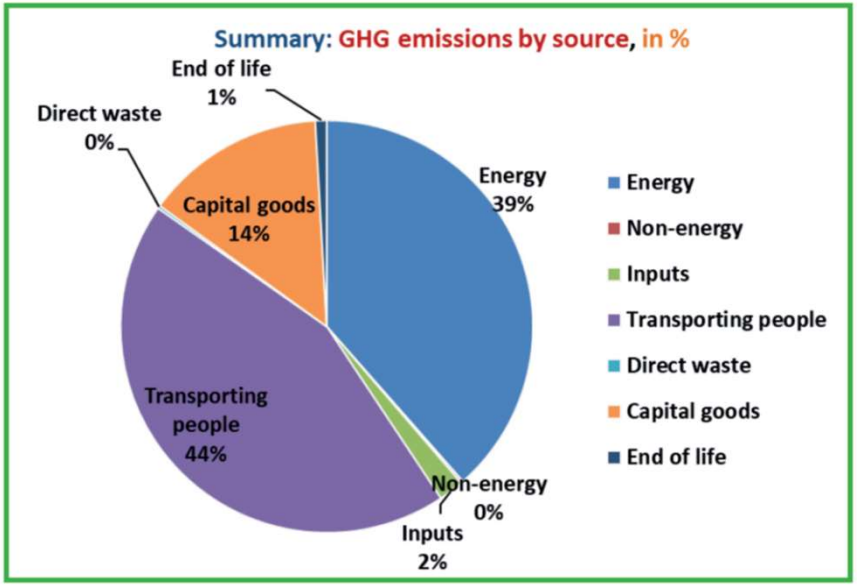
# Global results

| Overview | Total | | Uncertainties | |
|---|---|---|---|---|
| | t $CO_2$eq | Share | t $CO_2$eq | % |
| Energy | 16 134 | 39% | 888 | 6% |
| Non-energy | 75 | 0% | 20 | 27% |
| Inputs | 823 | 2% | 287 | 35% |
| Transporting people | 18 457 | 44% | 2 665 | 14% |
| Direct waste | 96 | 0% | 26 | 27% |
| Capital goods | 5 923 | 14% | 2 189 | 37% |
| End of life | 373 | 1% | 101 | 27% |
| Total | 41 882 | 100% | 3 574 | 9% |

160 million km car

2100 people in Belgium

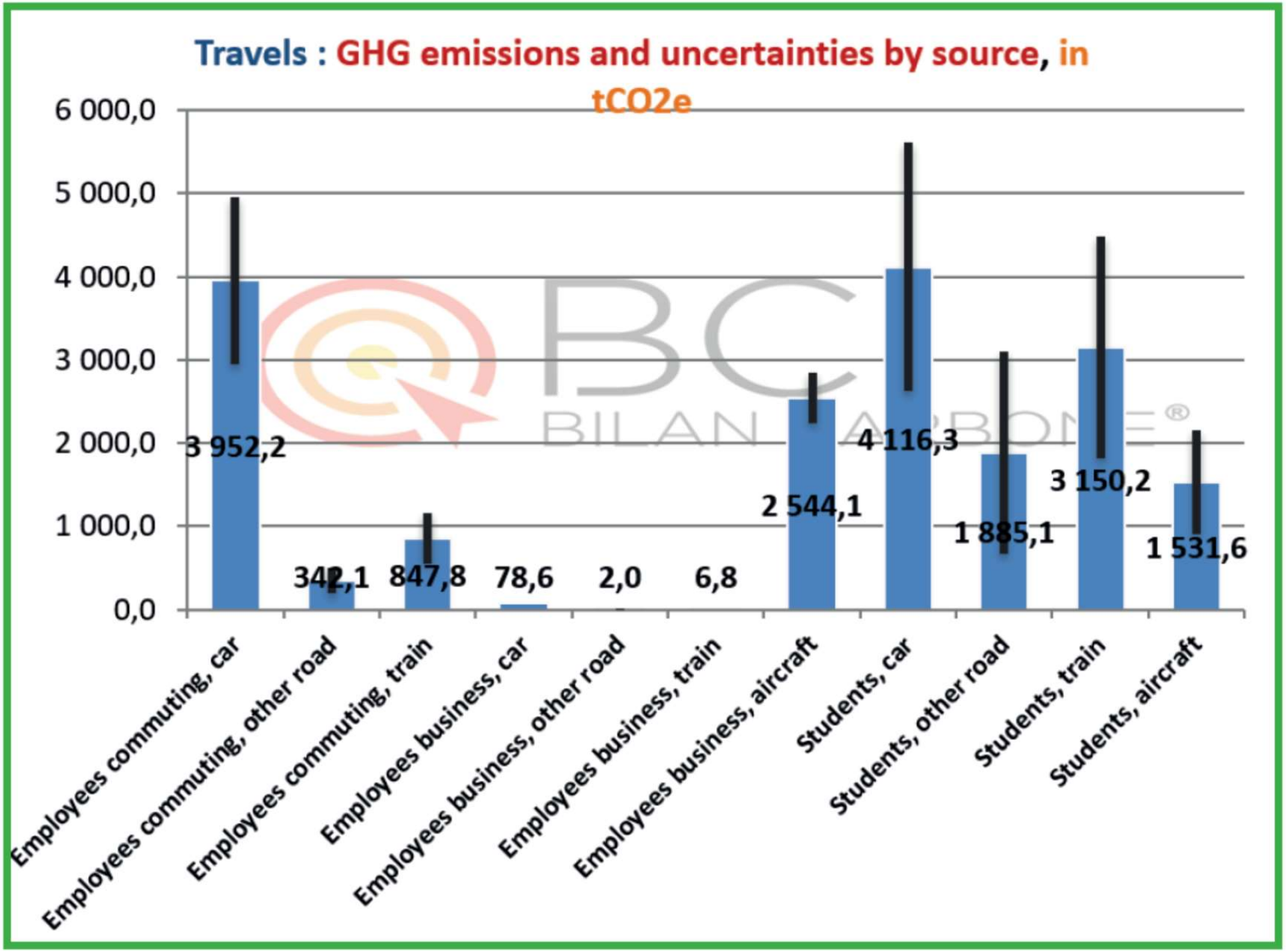
1,7 million trees



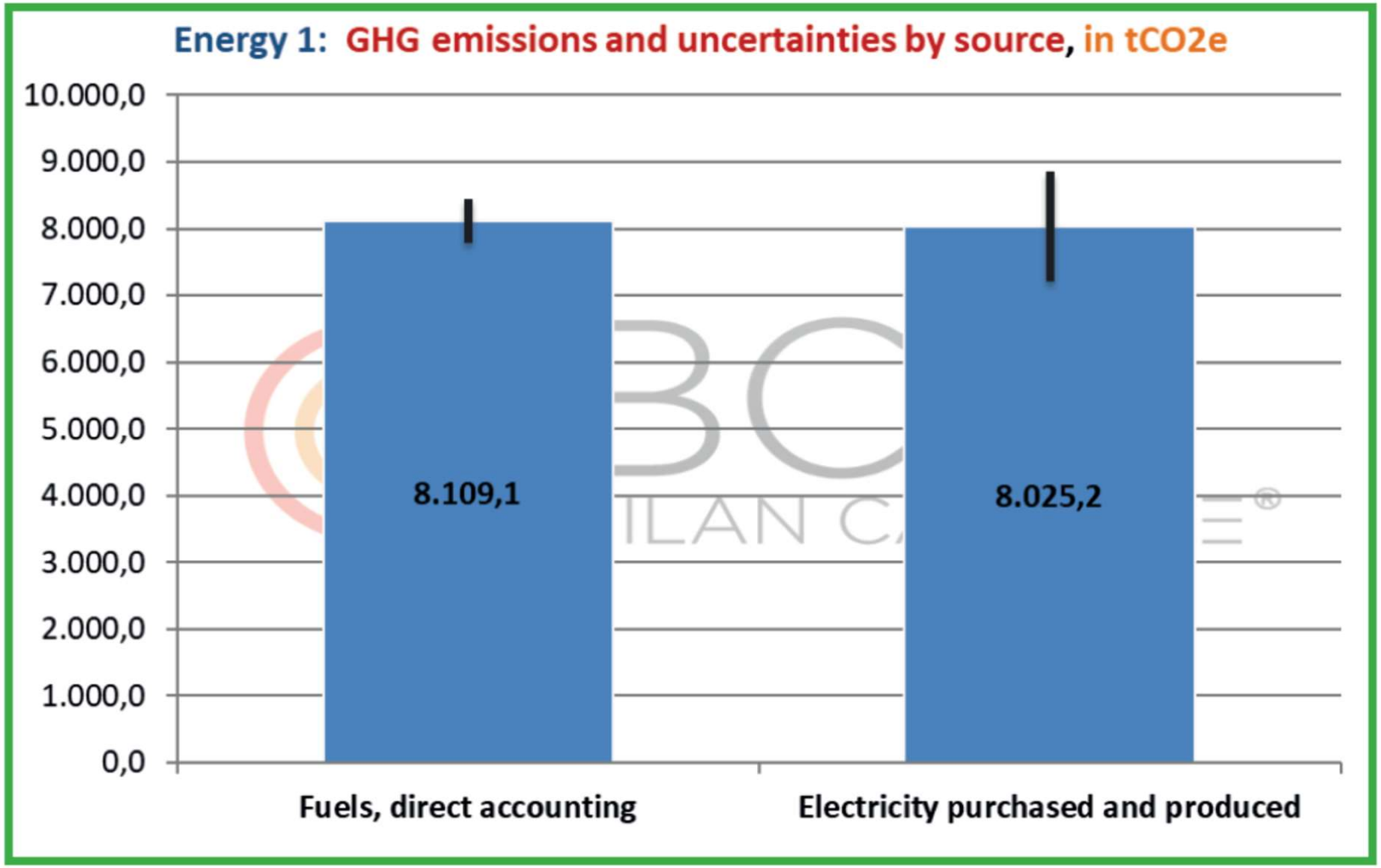
# Footprint benchmark

| Summary | Emissions, t $CO_2e$ | t $CO_2e$ per employee | t $CO_2e$ per student |
|---|---|---|---|
| Energy | 16 134 | 3,36 | 0,77 |
| Non-energy | 75 | 0,02 | 0,00 |
| Inputs | 823 | 0,17 | 0,04 |
| Transporting people | 18 457 | 3,84 | 0,88 |
| Direct waste | 96 | 0,02 | 0,00 |
| Capital goods | 5 923 | 1,23 | 0,28 |
| End of life | 373 | 0,08 | 0,02 |
| **Total** | **41 882** | **8,72** | **2,01** |

# Transport


Travels : GHG emissions and uncertainties by source, in tCO2e
6 000,0
5 000,0
4 000,0
3 000,0
2 000,0
1 000,0
0,0
3 952,2
342,1
847,8
78,6
2,0
6,8
2 544,1
4 116,3
1 885,1
3 150,2
1 531,6
Employees commuting, car
Employees commuting, other road
Employees commuting, train
Employees business, car
Employees business, other road
Employees business, train
Employees business, aircraft
Students, car
Students, other road
Students, train
Students, aircraft

# Direct energy



# Comparison between campuses

| Shares | CDE | CGB | CMI | CMU | CST | Total |
|---|---|---|---|---|---|---|
| Number of students | 20% | 21% | 1% | 8% | 50% | 100% |
| Number of FTE employees | 41% | 19% | 1% | 3% | 35% | 100% |
| Number of people | 24% | 21% | 1% | 7% | 47% | 100% |
| Fossil fuel use | 38% | 19% | 6% | 5% | 32% | 100% |
| Electricity | 46% | 25% | 7% | 2% | 20% | 100% |
| Footprint employee commuting | 51% | 16% | 1% | 2% | 29% | 100% |
| Footprint inputs and waste | 46% | 18% | 11% | 0% | 20% | 100% |
| Total footprint (excl. student mobility and business travel) | 42% | 20% | 6% | 4% | 28% | 100% |

# Comparison with other universities

| | UAntwerp 2018 | VUB 2016 | KULeuven 2010 | KHLeuven 2010 |
|---|---|---|---|---|
| Number of students | 20 860 | 15 418 | 51 000 | 6 946 |
| Number of employees (FTE) | 4 805 | 3 177 | 11 800 | 700 |
| Floor surface area ($m^2$) | 329 349 | 278 091 | 720 000 | 39 960 |
| Floor surface area ($m^2$/person) | 12,8 | 15,0 | 11,5 | 5,2 |
| Direct primary energy use (kWhp/$m^2$) | 265 | 321 | 293 | 299 |
| Direct primary energy use (kWhp/person) | 3398 | 4805 | 2659 | 1564 |
| Electricity (kWh/$m^2$) | 66 | 79 | 80 | 80 |
| Electricity (kWh/person) | 847 | 1 179 | 637 | 417 |
| Electricity (ton $CO_2$/person) | 0,313 | 0,065 | 0,163 | 0,107 |
| Fossil fuels, direct use (kWh/$m^2$) | 100 | 124 | 93 | 100 |
| Fossil fuels, direct use (kWh/person) | 1 279 | 1 857 | 1 067 | 522 |
| Fossil fuels, direct use (ton $CO_2$/person) | 0,32 | 0,45 | 0,26 | 0,13 |
| Paper (kg/person) | 8,3 | 7,0 | 4,8 | 8,4 |
| Total waste (kg/person) | 16 | 40 | 28 | 15 |
| Residual/household waste (kg/person) | 3 | 31 | 13 | 12 |
| Paper/cardboard waste (kg/person) | 8,3 | 7,0 | 9,4 | 2,0 |
| Hazardous waste | 3,1 | 1,9 | 1,3 | 0,0 |
| Other selectivelly collected waste (kg/person) | 1,7 | 0,3 | 4,0 | 0,5 |
| Car (km/person) | 1 244 | 1 365 | 1 196 | 974 |
| Public transport (km/person) | 3 533 | 4 378 | 2 868 | 2 336 |
| Airplane (km/person) | 662 | 1 245 | 1 301 | 73 |
| Total mobility (ton $CO_2$/person) | 0,72 | 0,87 | 0,74 | 0,44 |
| Total footprint, all impact categories incl. in UA study (ton $CO_2$/person) | 1,6 | 1,7 | 1,9 | 0,9 |

# Simulations

| Impact category | Possible measures | Calculation assumptions | Ton $CO_2e$/year saved | % reduction relative to 2018 |
|---|---|---|---|---|
| Energy use | Green electricity | All purchased electricity is from renewable sources | 7 263 | 17,3% |
| | Solar panels | 10000m² roof surface area for solar panels, 1,5m² per solar panel, 0,26 kWp per panel, yield of 850 kWh/year/kWp, 0,22 kg CO2e/kWh avoided | 324 | 0,8% |
| | Wind turbine | 1,5 MW, 25% efficiency factor, 0,22 kg CO2e/kWh avoided | 723 | 1,7% |
| | Increased thermal insulation of buildings | 10% reduction in heating energy use | 811 | 1,9% |
| Inputs | Vegan meals | All meals in student restaurants are vegan. Same number of meals as in 2018. | 183 | 0,4% |
| | Less paper use | 10% less paper | 10 | 0,02% |
| Direct waste | Selective collection of waste | 50% of residual waste selectively collected for recycling | 12 | 0,03% |
| Transporting people | More students are residential students with a student room in Antwerp | 50% of non-residential students become residential (non-residential students decrease from 70% to 35%) and those students their distance travelled with 50%. Average home-campus distance of all students and non-residential students is resp. 26 km and 17 km. So total distance travelled decreases with 12%. Modal split of residential and non-residential students is similar. | 1 002 | 2,4% |
| | Employee commuting modal shift | 10% of employee commuting car travel switched to 70% train and 30% bus | 323 | 0,8% |
| | Student modal shift | 10% of student car travel switched to 70% train and 30% bus | 282 | 0,7% |
| | Employee telecommuting (promoting working from home) | 5% less employee commuting | 257 | 0,6% |
| | Student telecommuting (distance learning, promoting studying from home) | 5% less student travel (excluding plane) | 458 | 1,1% |
| | Employee ecodriving | 5% less emissions of employee car travel (commuting and business travel) | 202 | 0,5% |
| | Student ecodriving | 5% less emissions of student car travel | 206 | 0,5% |
| | Electric cars for employees | All cars are electric. Sum of commuting and business travel. 0,26 kg CO2/kWh Belgian electricity, 0,1 kWh/km average electric car, extra 0,02 kg CO2/km for production of car battery (Ricardo AEA (2013), Current and Future Lifecycle Emissions of Key 'Low Carbon' Technologies and Alternatives.) | 2 698 | 6,4% |
| | Electric cars for students | Same as above, applied to all student travel, all student cars are electric. | 2 755 | 6,6% |
| | Teleconferencing | 10% reduction of employee airplane business travel | 254 | 0,6% |
| Capital goods | Extended lifespan of IT-equipment | 10% reduction of IT-purchases | 83 | 0,2% |

# Footprint reduction

- **Energy:** 10% reduction of heating energy use, on site installation of 10 000 m² solar panel and one 1,5 MW wind turbine
- **Inputs:** all meals in the student restaurant are vegan, 10% less paper use
- **Direct waste:** 50% of residual waste is recycled instead of incinerated
- **Transporting people:** all employee and student car travel is switched to public transport or electric cars, 10% less employee airplane business travel due to teleconferencing, 50% of non-residential students become residential
- **Capital goods:** 10% reduction in IT purchases due to extended lifespan

| Overview | Emissions 2018 | Reductions | | Residual emissions |
|---|---|---|---|---|
| | t $CO_2$eq | t $CO_2$eq | % | t $CO_2$eq |
| Energy | 16 134 | 1 858 | 12% | 14 277 |
| Non-energy | 75 | 0 | 0% | 75 |
| Inputs | 823 | 193 | 23% | 630 |
| Transporting people | 18 457 | 6 923 | 38% | 11 534 |
| Direct waste | 96 | 12 | 12% | 84 |
| Capital goods | 5 923 | 83 | 1% | 5 841 |
| End of life | 373 | 0 | 0% | 373 |
| **Total** | **41 882** | **9 068** | **22%** | **32 814** |

# Recommendations

## ImPACT framework: Im = P x A x C x T

A = Activity factor (average activity per person)

Restrict activity (reducing A): teleconferencing, studying at home (on-line courses), work at home, lowering room temperature, avoiding heating of non-used rooms, avoiding printing

C = Consumption factor (resource consumption per unit of activity)

Rationalise consumption (reducing C): ecodriving, choosing public transport, electric cars and bikes, decreasing food waste, insulating buildings, double-sided printing

T = Technology factor (greenhouse gas emissions per unit of resources used)

Replace technology (reducing T): using renewable (green) electricity, wind turbines, solar panels, geothermal energy, plant-based food, recycled paper

# Climate neutrality

Own footprint reduction (30% in 10 years)

Compensating remaining emissions

- Non-financial $CO_2$-compensation
  - Wind turbines and solar panels
  - Charging stations for electric cars
  - Vegan meals
  - Sustainability in curriculum
  - Research clean energy technologies
- Financial $CO_2$-compensation
  - Mitigation by short-term emission avoidance: supporting projects and actions from organisations that result in avoidance of greenhouse gases elsewhere in the world
  - Mitigation by short term absorption: donate money to organisations that plant trees to absorb one's own emissions
  - Mitigation by long term emission avoidance: investments in research and develop-ment of technologies and market mechanism to reduce emissions in the long term
  - Remuneration of past emissions: purchase of 'virtual emission permits', i.e. donations to the poorest people who have the lowest carbon footprints, as a way of buying from them emission permits
  - Adaptation to past emissions: supporting health organisations to prevent climate related diseases such as malaria

# Contact

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