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Paris Proofing UGhent Mobility

Climate Transition Scenario Simulations for Ghent University

GHENT UNIVERSITY

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Titel: *Paris Proofing UGhent Mobility: Climate Transition Scenario Simulations for Ghent University*

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The *'Climate Transition Scenario Simulations for Ghent University'* were calculated by Climate Lab at the request of Ghent University.

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1. Situation and policy question

- In 2020, the Carbon Footprint of Ghent University was calculated for the years 2016, 2017, 2018 and 2019, in line with the norm ISO 14064-1.
- For the year 2019, the carbon footprint was equal to 47.5k tCO2e (Figure 1).
- As mobility comprises half of the carbon footprint, a key policy question remains: *How can we align the UGhent mobility policy with the climate targets of the Paris Agreement?*
- In this report, we present quantitative simulations for plausible UGhent Mobility Transition Scenarios aiming at the year 2030. We check whether the results are compatible with the ambitions of the 2015 Paris Agreement (see §3 for these ambitions).

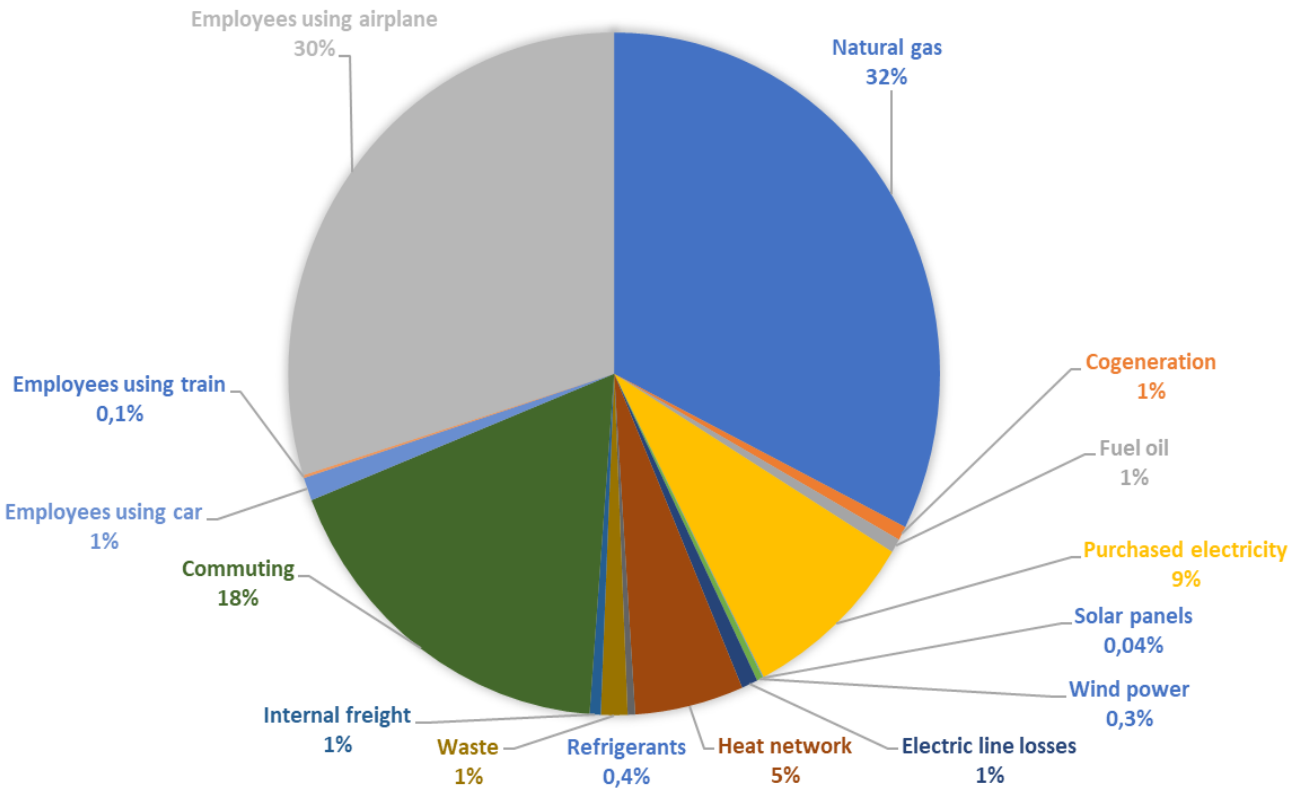

Figure 1: Overall carbon assessment of all organisational activities as a share of the total footprint (47.5k tCO2e) for 2019.

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2. Method

Our simulation approach consists of three steps:

- In a first step (see §3), we model which organizational greenhouse gas **emission reduction targets** are in line with the Paris Agreement.
- In a second step (see §4), we simulate 7 **carbon transition scenarios** using the Bilan Carbone® Comparateur tool. We focus on the aspects of mobility.
- In a final step (see §5), we performed a **budgetary stress test** using the Bilan Carbone® ECO module, in order to assess the budgetary risks and opportunities of the climate transition.

Note 1: The aim of our scenario approach is not to make exact predictions of UGhent emissions. The goal is rather to assess the *sensitivity* of the UGhent carbon footprint to plausible policies. This is done in order to ensure that mobility decisions in 2020 will suffise to achieve the intermediate climate targets of the Paris Agreement by 2030.

Note 2: As no data on student mobility were available, student mobility was not included in the carbon footprint calculations, and neither in the simulations of this report.

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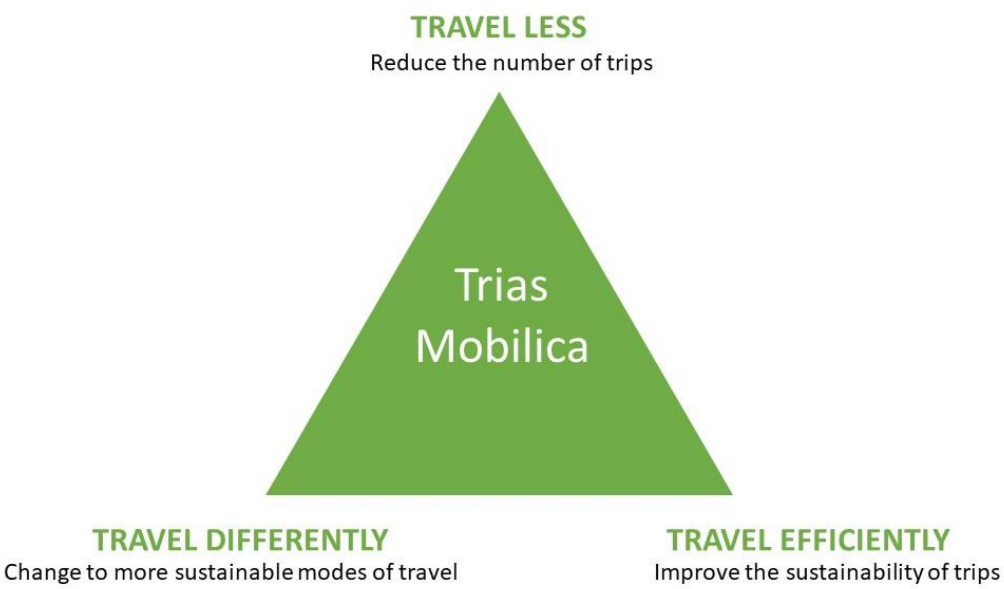
3. Setting science-based climate targets for Ghent University in 2030

- In their 2030 Climate Target Plan, the European Commission wants to reduce greenhouse gas emissions to at least 55% below 1990 levels by 2030. The existing target aims for at least 40%. The European Parliament recently confirmed its support for a 2030 target of 60%. Nevertheless, the carbon footprint of Ghent University of the year 1990 is unknown.
- We therefore calculated UGhent climate targets that can be considered "science-based", meaning they are in line with what the latest climate science says would be necessary to meet the goals of the Paris Agreement. The Agreement aims to limit global warming to well-below 2°C above pre-industrial levels (WB2C target) and pursue efforts to limit warming to 1.5°C (1.5C target).
- Using the SBTi® target module (Science Based Targets) , we calculate a WB2C target of minus **<u>27,5%</u>** below 2019 levels by 2030. The UGhent 1.5°C target represents a reduction of **<u>46.2%</u>** below 2019 levels.

Figure 2: SBTi calculation of reduction targets for Ghent University, in line with the Paris Agreement (WB2C and 1.5°C scenarios).

4. Transition Scenarios

Scenario EDT & Teleconference



Scenario Modal Shift

Scenario ECP & EUF

Figure derived from: Low Carbon Initiative, 2020

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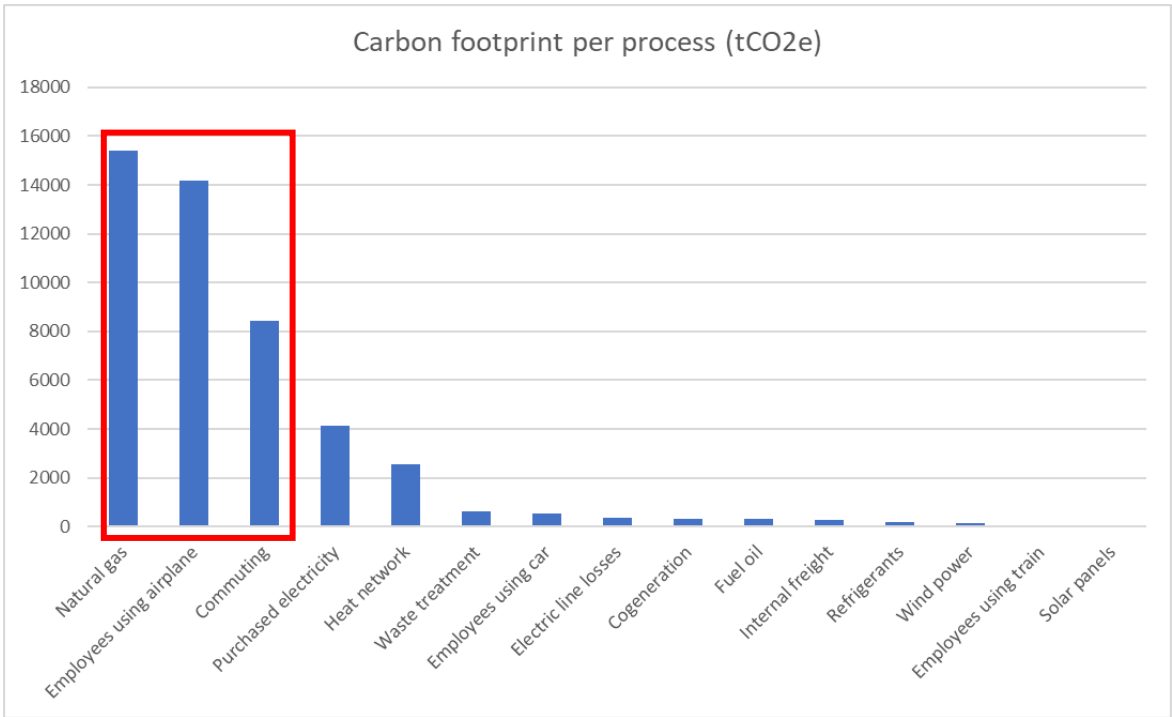
4a. Baseline scenario

- The first scenario to consider is the baseline state, i.e. the carbon footprint for the year 2019.
- The carbon footprint of the mobility component (in total ~**23.5k tCO2e**) consists of (i) the employee commuting & business-related travel (23.2k tCO2e) as well as (ii) the freight movements using UGhent vans (260 tCO2e).
- Aligning the baseline scenario with the WB2C target thus implies a reduction of 6.5k tCO2e **towards 17.0k tCO2e**.
- Aligning the baseline scenario with the 1.5C target thus would imply to nearly halve the mobility emissions with 10.8k tCO2e **towards 12.7k tCO2e**.

Carbon component of UGhent Employee Mobility	Emissions			Uncertainties	
	kg CO2e	t CO2e	%	tCO2e	%
Commuting	8.449.787	8.450	36%	947	11%
Business travel by car	521.941	522	2%	70	13%
Business travel by train	62.922	63	0%	13	20%
Business travel by airplane	14.178.192	14.178	61%	4.585	32%
Total	23.212.841	**23.213**	100%	4.682	20%

By mode, t CO2e	Commuting	Business travel	Total, t CO2e
Route	6.967	522	7.489
Air		14.178	14.178
Train	1.483	63	1.546
Total	8.450	14.763	23.213

Table 1 (a and b): Recapitulation of the mobility component of the baseline scenario (carbon footprint of 2019) (excluding freight)



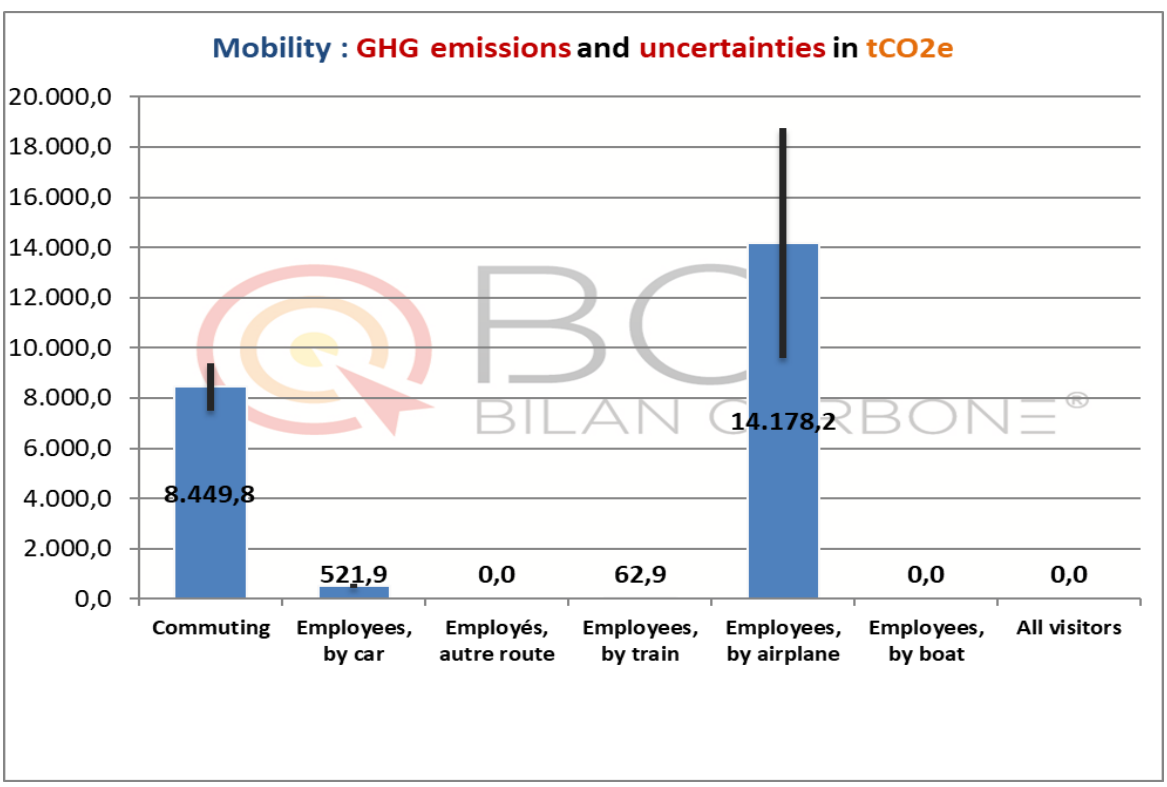


Figure 3 (a and b): The baseline scenario shows that about 80% of the entire carbon footprint of Ghent University is related to three main sources: (i) natural gas consumption, (ii) airplane travel and (iii) employee commuting. In order to achieve the WB2C target, UGhent would need to reduce the mobility emissions with 6.5k tCO2e towards 17.0k tCO2e (for mobility only).

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4b. Transition scenario ECP

- In this second scenario, we focus on the effects of "Electrifying the Car Park".
- We thus assume that UGhent would electrify the entire university car park, while redirecting all *business travel by car* towards electric pool cars. Moreover, we assume that all commuting travel by car would gradually electrify in line with the expected market evolution in Flanders.
- The simulation shows a reduction of commuter emissions by 9% (minus ~750 tCO2e), a reduction of the university car park emissions by 59% (minus ~300 tCO2e) and a reduction of overall car emissions by only 14% (minus ~1.1k tCO2e).

Movements	t CO2e	Relative
Commuting	7.682	35%
Business, car	212	1%
Business, train	63	0%
Business, plane	14.178	64%
Total	22.136	100%

By mode, t CO2e	Commuting	Business	Total, t CO2e
Route	6.199	212	6.412
Air		14.178	14.178
Train	1.483	63	1.546
Total	7.682	14.453	22.136

Table 2 (a and b): Resulting carbon footprint under scenario ECP.

- Note 1: The coalition agreement of the Federal government states (2020): "Alle nieuwe bedrijfswagens moeten tegen 2026 broeikasgasvrij zijn."
- Note 2: The Flemish Climate Plan states (2020): "Naar verwachting zal de "Total Cost of Ownership" van batterij-elektrische wagens tegen 2025 gelijk worden aan die van traditionele wagens. In 2025 is het marktaandeel zero-emissie personenwagens minstens 20%". However, we perform this simulation using a market share of 20% by 2030, which is a more conservative/realistic assumption.
- Note 3: We made the choice not to simulate the introduction of hydrogen and CNG university cars, as to date full-electric vehicles are outpacing hydrogen and CNG cars.

4c. Transition scenario EDT

- In this third scenario, we focus on the effects of an “Extra Day of Telework” per week, for all employees.
- We thus assume UGhent would focus on reducing commuter traffic all together, by upgrading and institutionalizing a telework policy (e.g. following the Covid crisis).
- The simulation shows a significant reduction of commuter emissions from 8.5 to 6.8 tCO2e, and a reduction in overall car emissions from 7.5k to 6.1k tCO2e (minus 19%).

	Emissions		
	kg CO2e	t CO2e	Relative
Commuting	6.759.830	6.760	31%
Business, car	521.941	522	2%
Business, train	62.922	63	0%
Business, plane	14.178.192	14.178	66%
Total	21.522.884	21.523	100%

By mode, t CO2e	Commuting	Business	Total, t CO2e
Route	5.573	522	6.095
Air	-	14.178	14.178
Train	1.186	63	1.249
Total	6.760	14.763	21.523

Table 3 (a and b): Resulting carbon footprint under scenario EDT.

4d. Transition scenario “Modal Shift”

- In the fourth scenario, we calculate the emission effect of the “modal shift” stated in the Current Mobility Plan: “Het gebruik van duurzame vervoersmodi (non-auto) voor woon-werkverkeer laten stijgen van 48% tot 65%”.
- We assume that this shift would affect 17% of the 8268 employees (FTE) and would essentially be attractive for employees working in the Ghent Arrondissement (average single distance 7,5 km), thus resulting in a reduction of 4,6 M car kilometers (of the current 24.8 M car kilometers).
- We assume that these car kilometers are equally shifted towards four sustainable transport modes (bus, bike, tram and train), which is plausible given the increasing use of electric bikes and speedelecs.
- The simulations show that overall car emissions are reduced from 7.5 to 6.5 tCO2e (minus 13%).

	Emissions		
	kg CO2e	**t CO2e**	**Relative**
Commuting	7.528.147	7.528	34%
Business, car	521.941	522	2%
Business, train	62.922	63	0%
Business, plane	14.178.192	14.178	64%
Total	22.291.202	22.291	100%

By mode, t CO2e	**Commuting**	**Business**	**Total, t CO2e**
Route	5.982	522	6.504
Air		14.178	14.178
Train	1.546	63	1.609
Total	7.528	14.763	22.291

Table 4 (a and b): Resulting carbon footprint under scenario MS.

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4e. Transition scenario EUF

- In the fifth scenario, we calculate the emission effect of electrification of the UGhent truck/van park: “Electrifying UGhent Freight”.
- The vision is in line with the Flemish Climate Plan: “Voor bestelwagens en kleine vrachtwagens beogen we, parallel aan de personenwagens, een omschakeling naar batterij elektrische voertuigen. Een massaproductie wordt verwacht vanaf 2025.”
- The simulation shows overall UGhent freight emissions reduced from 260 to 185 tCO2e (minus 29%).
- Using the Flemish MVV tool, we additionally simulated the Total Cost of Ownership for an ‘average’ university car (electric and diesel). The simulation shows an extra TCO cost of only €595 over 5 years (for the electric option as compared to the diesel option).

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4f. Transition scenario “Teleconference”

- In the sixth “Teleconference” scenario, we assume a 20% reduction of all UGhent airmiles because of growing popularity of teleconferences.
- The vision is in line with significant conference behavior changes since the Covid crisis. Others, such as Caset et al. (2020), propose self-imposing an “academic emission ceiling” to cut academic airline travel. In any case, instead of rewarding academics through accumulation of airmiles, incentives may be designed to promote teleconferencing.
- The simulation shows overall UGhent flight emissions reducing from 14.2k to 11.3k tCO2e.
- Note: There has been some recent media attention to several statements by Stef Proost (2020), claiming that “taking the plane instead of the train” does not really impact emissions because airlines are included in the ETS system. Such twisted arguments can only hold if assuming that the ETS is a well-functioning instrument (which is not the case). In this report, we assume that flying less is the only real way to curb UGhent airline emissions.

4g. Combiscenario

- In the final scenario, we calculate the emission effect of combinging all of the above measures.
- The simulation shows overall UGhent mobility emissions reduced from 23.5k tCO2e to 17.6k tCO2e (minus 25%). This reduction (while considering the estimated uncertainties) is narrowly compatible with the WB2C target.
- The 1.5C target is not within reach (at least not without much stronger measures on airplane behavior which the University Management would have to enforce).

By mode, t CO2e	Commuting	Business	Total, t CO2e
Route	4.605	212	4.817
Air	-	11.343	11.343
Train	1.237	63	1.300
Freight	-	185	185
Total	5.842	11803	**17645**

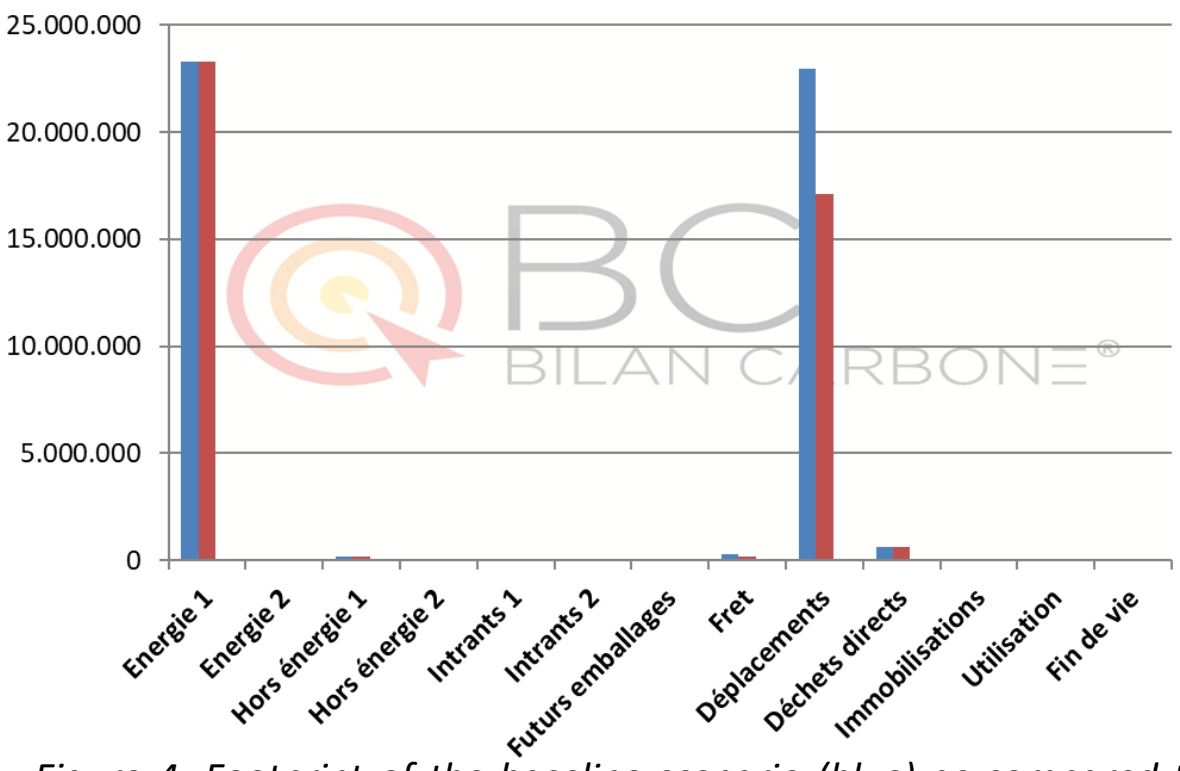
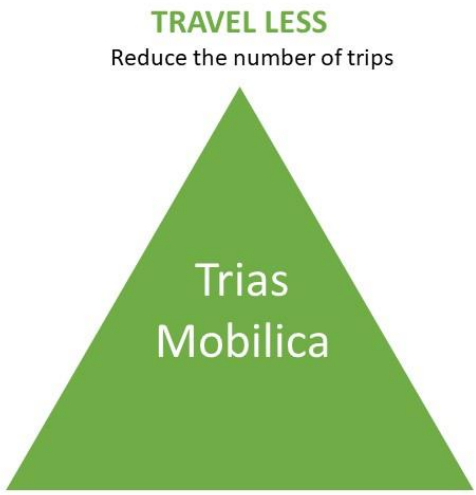


Figure 4: Footprint of the baseline scenario (blue) as compared to the Combiscenario (red), illustrating the huge efforts needed to drive down mobility emissions (as well as energy emissions).

Scenario EDT (minus 1.7k tCO2e)
Teleconference (minus 2.9k tCO2e)



Scenario Modal Shift
(minus 1.0 tCO2e)

Scenario ECP (minus 1.1k tCO2e)
Scenario EUF (minus 0.1k tCO2e)

5. Budgetary stress test

- Using the Bilan Carbone Eco Module, we can simulate the additional costs that would follow an increase in the price of hydrocarbons, assuming that all suppliers pass on the resulting increase in energy prices in their prices.
- Two other simulations evaluate the monetary content of the current hydrocarbon activities, as well as the additional costs that would result from the introduction of a carbon tax. Carbon taxes can be external or internal (on the department level, e.g. Microsoft).
- These simulations are not predictions. However, they represent broad monetary estimations of the "carbon dependency risk" of the organization, as well as the possible benefits of decarbonizing.
- In the baseline scenario, the monetary content of the hydrocarbon activities of Ghent University amounts to 5.8 M€ per year, of which 2.1 M€ is related with mobility. These costs risk to increase by half if oil prices would rise again to the levels of 2014.
- In the combiscenario, the monetary content of the hydrocarbon mobility activities of Ghent University would decrease to 1.5 M€ per year. The hydrocarbon dependency of Ghent University mobility thus decreases by 0.6 M€ per year when implementing the combiscenario.
- A sensible carbon tax of 50 €/ton would amount to ~2M€ per year.

	Increase of the price of hydrocarbons (Brent oil price)				Carbon taks
	Current carbon dependency (at 64 $ per barrel)	Extra cost if oil price rises to 71 $ (situation 2018)	Extra cost if oil price rises to 100 $ (situation 2014)	Extra cost if oil price rises to 130 $ (situation 2011)	50 € / t CO2e
	Costs, in million euros				
Energy costs	3.6	0.4	2.0	3.7	1.2
Freight	0.02	0.002	0.01	0.02	0.01
Mobility of Employees	2.1	0.2	1.2	2.2	0.8
Direct waste	0	0	0	0	0.03
Total	**5.8**	**0.6**	**3.2**	**5.9**	**2.0**

Figure 5: Budgetary stress test of hydrocarbon dependency in the baseline scenario.

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6. Implications of a WB2C target per sub-sector

A. Science-based Targeting implies a total reduction of 13kton for the WB2C target and 22kton for the 1.5C target. If the WB2C target is chosen, ideally a "carbon insetting" project would be started to achieve the remaining 9kton.

B. A logical distribution key is to extend the minus 27.5% and minus 46% targets over all carbon streams, for example air travel and commuting. Hence it is possible to look at the sub-sectors separately, draw up a separate transition plan for them, and bring each sub-sector down according to a proportional share, for example **minus 27.5% by 2030 (WB2C).**

C. The implications are as follows:

   (i) For air miles: The simulation shows overall UGhent flight emissions need to reduce from 14.2k towards 10.3k tCO2e (WB2C) or 7,7k tCO2e (1.5C). Strongly boosting teleconferencing would not be sufficient by itself; a new “academic culture” and more far-reaching policies are required.

   (ii) For commuting: Emissions related with commuting would need to be reduced from 8.5k tCO2e towards 6,2k tCO2e (WB2C) or towards 4,6k tCO2e (1.5C). With one extra day of teleworking, a further reduction of car use from the current 42% towards the original goal of only 35% (minus 4M car km), and electrification of the car market in line with market predictions, the WB2C target is indeed just feasible.

   (iii) For internal transport: moving to electrify the entire university car park, offering electric pool cars and fully electrifying the truck park would achieve the WB2C target – and even the 1.5C target (internal emissions would be reduced by 49%).

7. Six key conclusions

A. The current mobility vision of Ghent University is **not 'Paris Proof'**, as its emission reductions amount only to 1.0k tCO2e. A new 'Paris Proof' mobility vision is needed that, at the very least, should induce a significant shift away from frequent flying.

B. The most effective way to drive down UGhent mobility emissions relates with **digitizing its workflows**: emission reductions through teleworking and teleconferencing amount to 4.6 tCO2e.

C. Because of the inclusion of their entire lifecycle in the carbon footprint, electric mobility is no "golden bullet". In fact, only by including **all partial scenarios** can UGhent narrowly obtain the WB2C target.

D. **Achieving the WB2C target thus requires** (i) strongly boosting teleconferencing and (ii) teleworking at the University level, while (iii) moving to electrify the entire university car park as well as (iv) the truck park, and (v) redirecting all business travel by car towards electric pool cars. On top of that, the University would (vi) need to support robust electric infrastructure for commuting cars. Finally, (vii) the push towards sustainable modi for commuters would need to continue, even beyond the previous target of 65%.

E. This strategy can even be "**budget neutral**", taking into account the following elements:

- To date, the TCO of electric vehicles is only slightly higher as compared to other cars (see scenario ECP and EUF).
- To date, most ESCO companies can include electric mobility in their EPC contracts (CaaS model, Comfort as a Service), taking the burden of investment and implementation.
- If achieving the WB2C target, the hydrocarbon dependency of Ghent University mobility would decrease by 0.6 M€ per year.

F. The practice of buying voluntary carbon credits to compensate for flying remains disputed in the scientific community. Science Based Targeting requires that organisations set targets based on emission reductions through direct action. Instead of "buying credits" from carbon retailers, it is recommended to directly support UGhent offset projects. In line with the vision of the Paris Agreement, offsetting only makes sense **to bridge the emission gap** between the WB2C target and the 1.5C target.