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Carbon Footprint Report

UNIVERSITY OF TWENTE.

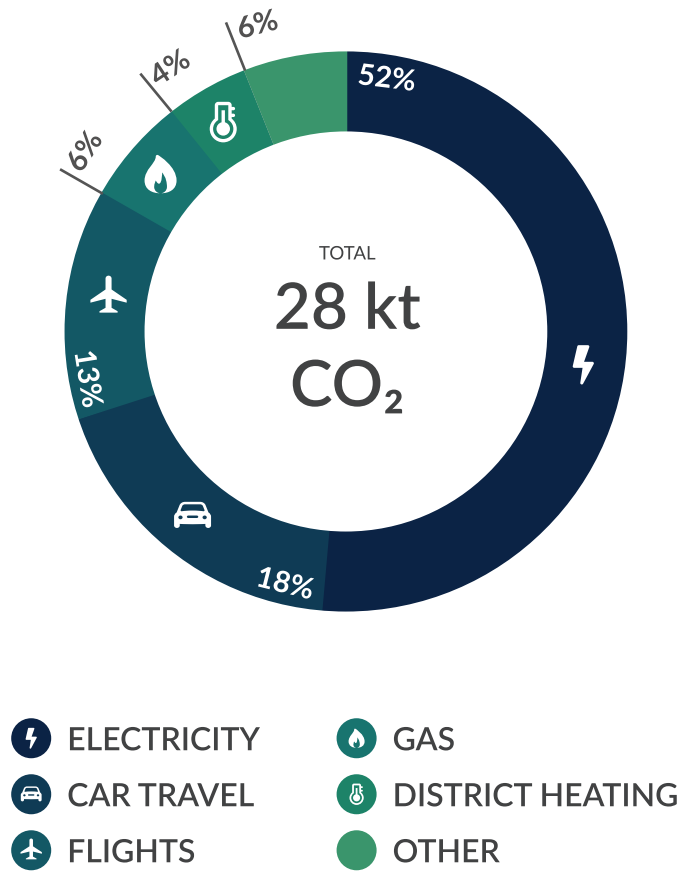
University of Twente Carbon Footprint 2019

Summary

The University of Twente is the ultimate people-first University of Technology. We empower society through sustainable solutions.

By adapting the mission above, the University of Twente aims to lead by example and consider sustainability to be a precondition in everything she does. The university has been assessing its environmental impact by reporting her carbon footprint since 2014. The carbon footprint reflects not only the impact of the activities of the university itself, but is also used as a tool to encourage its partners to report their greenhouse gas emissions and work together towards a sustainable future. The carbon footprint enables monitoring of progress of the strategic goal to:

"Implement sustainable solutions on our campus in the areas of food, water, waste, travel and energy use, thereby reducing our footprint by 15% in 2023."



Key figures

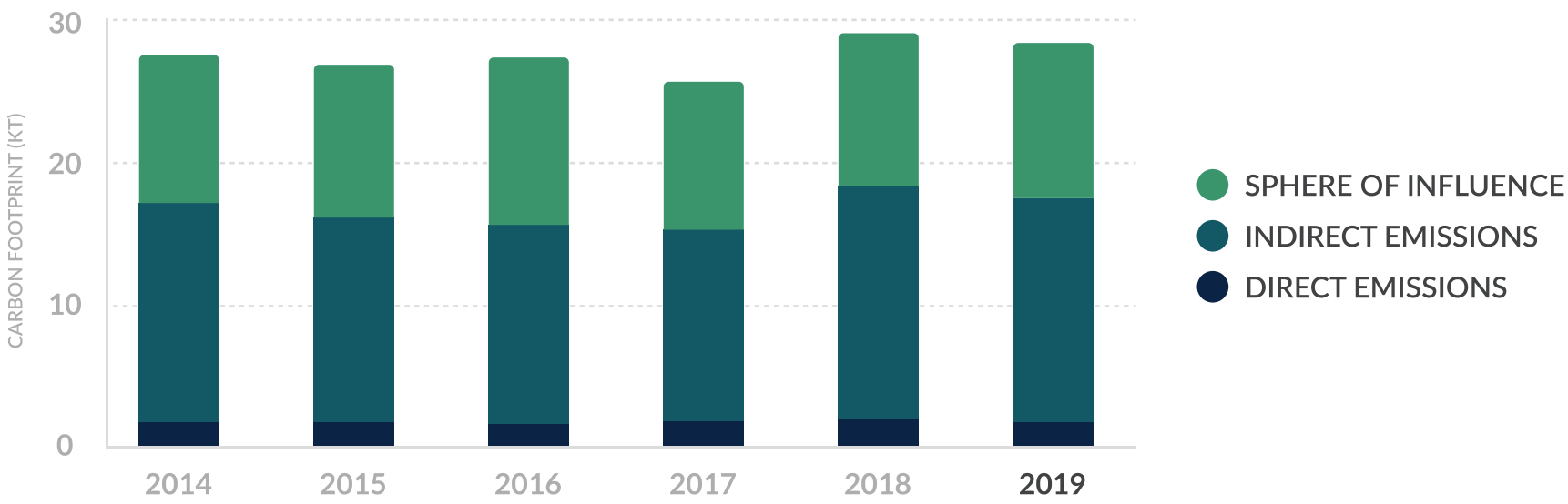
-4%
Total energy consumption

-19%
Short flights (<700 km)

+585
Solar panels placed on campus

-37t
Paper waste

Carbon footprint development



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Introduction

Dear reader,

Thank you for reading the University of Twente 2019 carbon footprint report. Every year the university reports their carbon footprint with the goal of providing full transparency of its impact. In 2019, the ambitions of the university have been formulated, resulting in the Shaping 2030 strategy. A key topic in this strategy is sustainability. Reducing the carbon footprint is an important part of that. We encourage everyone to first read the management summary. This will help you to get the key takeaways and get familiar with the basics that will support this detailed report.

This report elaborates on the CO_2 emissions of the university in 2019. The CO_2 calculations are divided into three scopes, each containing their respective sources of CO_2 emissions. This will be elaborated in separate sections. The university has been reporting their footprint since 2014 and aims to become more comprehensive year on year.

The report of 2019 presents you with more of a progress report rather than the usual snapshot. Reducing CO_2 emissions is a goal to be achieved over a longer period of time and understanding progress over time can help to shape new goals and policies. By providing a management summary that is quickly and easily understandable we hope to increase the visibility of this topic, encouraging employees and students to contribute in their own way to a more sustainable university. Feedback and ideas can be sent to sustainability@utwente.nl.

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Scope 1 - Direct GHG emissions

The University of Twente has various direct sources of GHG emissions. The majority of the CO_2 emissions in scope 1 come from gas used for air humidification and heating of buildings where district heating is not yet available. The gas consumption of the university is low due as most buildings use district heating. The gas consumption and CO_2 emissions are provided in table 1. Details on the consumption per building are given in appendix 1. Real time information about energy consumption can be found at energydata.utwente.nl.

Category	Unit	2014	2015	2016	2017	2018	2019
Gas	m^3	802.914	815.380	785.064	922.870	946.095	907.402
Emission factor gas	*kg CO_2 / m^3*	*1,88*	*1,88*	*1,88*	*1,89*	*1,89*	*1,89*
Total emissions	**tonnes CO_2**	**1.513**	**1.536**	**1.479**	**1.744**	**1.788**	**1.715**

Table 1: Gas consumption with CO_2 conversion factors and total CO_2 emissions, 2014-2019

Also part of scope 1 are the fuel consumption of the vehicles owned by the university and the refilling of air conditioning systems with refrigerants. In table 2, the total emissions resulting from these two sources have been calculated using the respective emissions factors given in table 2a.

Category	Unit	2016	2017	2018	2019
Petrol	litres	0	0	0	2.760
Diesel	litres	3.717	4.386	8.159	9.657
Refrigerant R134a	kg	0	0	43	0
Refrigerant R407c	kg	0	0	9	0
Refrigerant R410a	kg	12	6	32	3
Total emissions	**tonnes CO_2**	**38**	**26**	**169**	**45**

Table 2: Fuels and refrigerants and total CO_2 emissions, 2016-2019

Category	Unit	Emission factor
Petrol	kg CO_2/litre	*2,74*
Diesel	kg CO_2/litre	*3,23*
Refrigerant R134a	kg CO_2/kg	*1.430*
Refrigerant R407c	kg CO_2/kg	*1.774*
Refrigerant R410a	kg CO_2/kg	*2.088*

Table 2a: Emission factor for fuels and refrigerants, 2019

The development of the scope 1 emissions is shown in figure 1 and table 3. The refilling of air conditioning systems is incidental and therefore varies year by year. Additionally, it is important to take into consideration that gas and district heating consumption vary based on outside temperature and humidity. Some fluctuation in the graph can be explained by this.

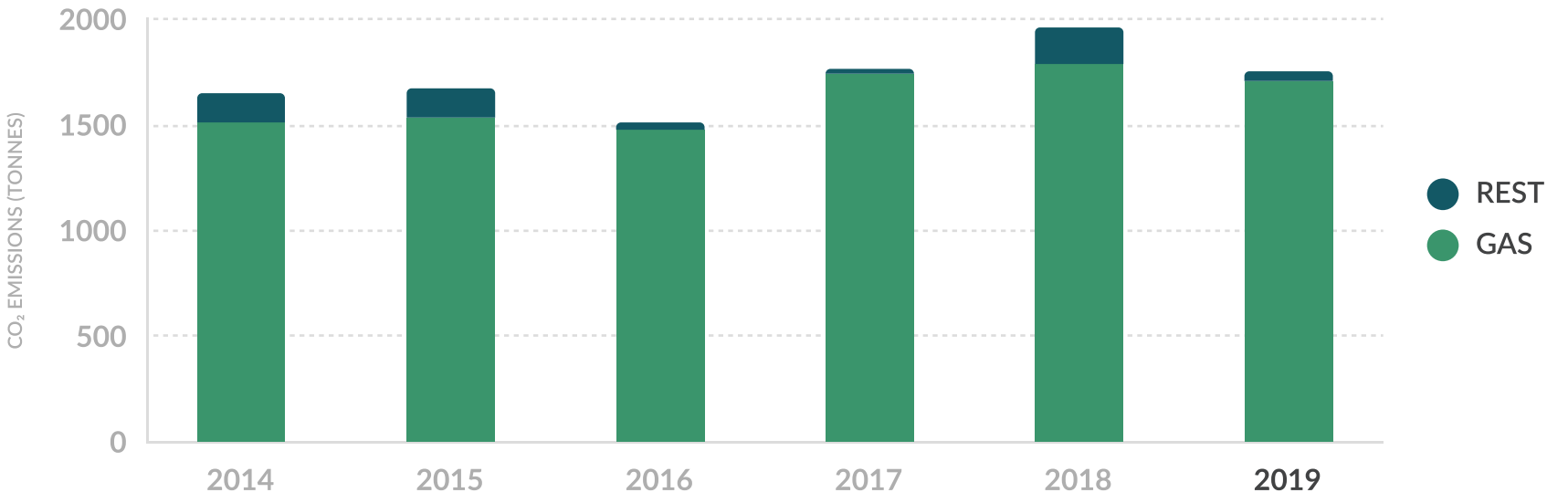

Figure 1: CO_2 emission development scope 1 2014-2019

Category	Unit	2014	2015	2016	2017	2018	2019
Gas	tonnes CO_2	1.513	1.536	1.479	1.744	1.788	1.715
Fuels and refrigerants	tonnes CO_2	137	137	38	26	169	45
Total emissions scope 1	**tonnes CO_2**	**1.650**	**1.673**	**1.517**	**1.770**	**1.958**	**1.760**

Table 3: Scope 1 CO_2 emissions, 2014-2019

Scope 2 - Indirect GHG emissions

Indirect GHG emissions are caused by the electricity and district heating consumed at the university. These forms of energy are generated elsewhere but are directly consumed by the university. The electricity consumption of the university has dropped significantly since 2014, which can be seen in table 4. The carbon emissions of electricity have increased with respect to 2017 due to a change in the Dutch electricity mix.

Category	Unit	2014	2015	2016	2017	2018	2019
Electricity	MWh	26.064	23.866	23.300	22.645	23.023	22.220
Emission factor electricity	*kg CO_2 / MWh*	*526*	*526*	*526*	*526*	*649*	*649*
Emissions electricity	**tonnes CO_2**	**13.710**	**12.554**	**12.256**	**11.911**	**14.942**	**14.421**
District heating	GJ	59.158	63.444	62.292	59.783	56.772	54.571
Emission factor district heating	*kg CO_2 / GJ*	*26,49*	*26,49*	*26,49*	*26,49*	*24,119*	*24,119*
Emissions district heating	**tonnes CO_2**	**1.567**	**1.681**	**1.650**	**1.584**	**1.369**	**1.316**
Total emissions scope 2	**tonnes CO_2**	**15.277**	**14.234**	**13.906**	**13.495**	**16.311**	**15.737**

Table 4: Electricity and district heating consumption with CO_2 conversion factors and CO_2 emissions, 2014-2019

A correction to the electricity consumption has been applied for the past years as solar panel generation had been accounted for insufficiently. In figure 2 the development of scope 2 emissions is shown.

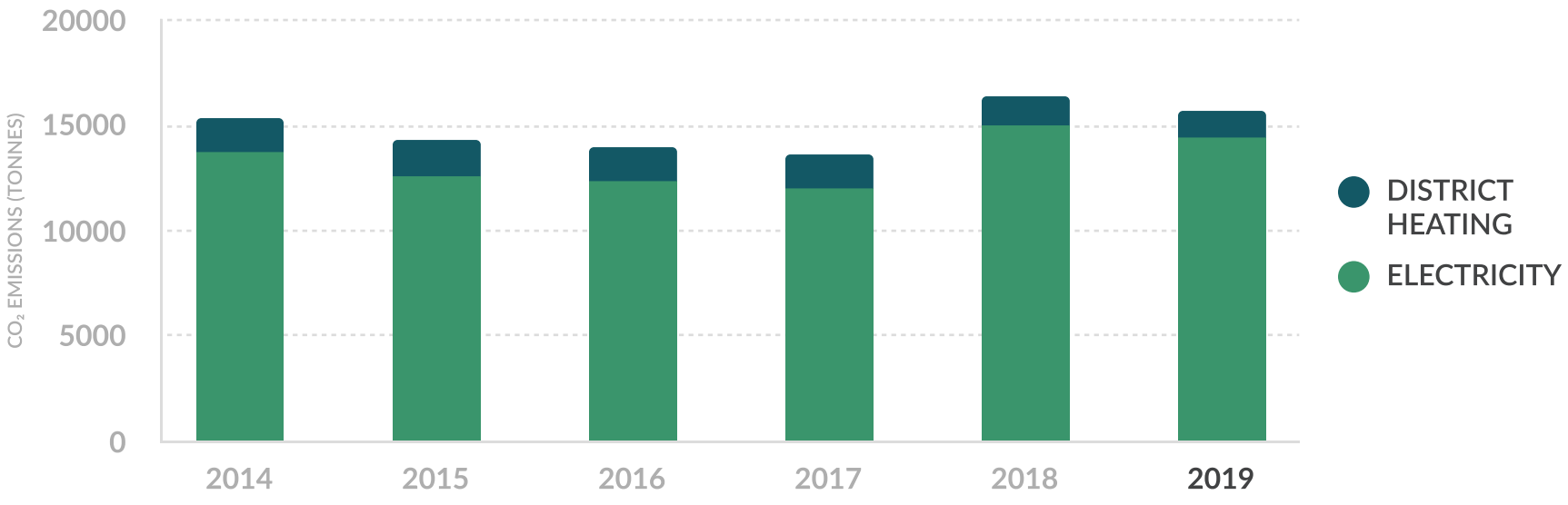

Figure 2: CO_2 emission development scope 2 2014-2019

Mitigation

The electricity generation with solar panels and the subsequent mitigation of carbon emissions are shown in table 5. Currently solar panels can be found on the Horst and Technohal buildings. The newly installed solar panels on the Technohal (585 panels) will be taken into account next year when the energy monitoring systems are up and running.

Category	Unit	2014	2015	2016	2017	2018	2019
Solar panels Horst	kWh	28.315	25.886	25.000	24.965	30.529	28.382
Emission factor electricity	*kg CO_2 / kWh*	*0,526*	*0,526*	*0,526*	*0,526*	*0,649*	*0,649*
Mitigated emissions	**tonnes CO_2**	**15**	**14**	**13**	**13**	**20**	**18**

Table 5: Energy generation solar panels and CO_2 mitigation, 2014-2019

Scope 3 - Sphere of influence

The third scope of the carbon footprint considers upstream and downstream GHG emissions. Upstream refers to purchased goods and services, waste, rented assets, work-related travel and transport and distribution while downstream includes waste processing, let assets, investments and transport and distribution.

This year the data collection from suppliers was expanded to include as many partners as possible. An overview of the development of scope 3 emissions is given in figure 3, an overview of the data in table 6.

The upstream and downstream categories are further specified and aligned with the university's strategy into: Business Travel, Commuting, Procurement, Waste and Water. In these categories the supply of data from third parties varies yearly. More details per category are provided below.

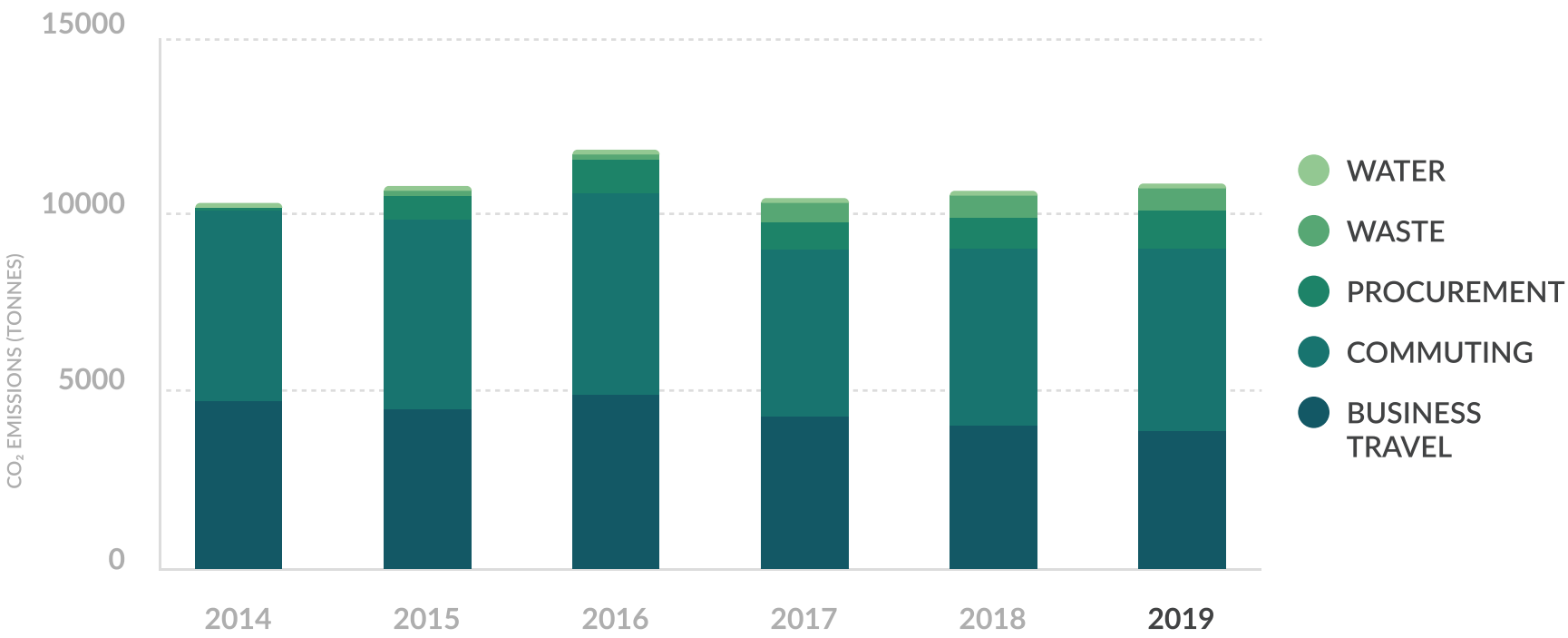

Figure 3: CO_2 emission development scope 3 2014-2019

Category	Unit	2014	2015	2016	2017	2018	2019
Business Travel	tonnes CO_2	4.712	4.498	4.924	4.335	4.045	3.938
Commuting	tonnes CO_2	5.430	5.347	5.712	4.740	4.972	5.129
Procurement	tonnes CO_2	88	673	937	742	912	1.090
Waste	tonnes CO_2	28	113	133	529	607	631
Water	tonnes CO_2	142	108	107	126	121	150
Total emissions scope 3	**tonnes CO_2**	**10.401**	**10.739**	**11.814**	**10.472**	**10.658**	**10.938**

Table 6: Scope 3 CO_2 emissions, 2014-2019

Business Travel

All travel by employees, using all forms of transport is accounted for in scope 3. This includes train travel, car rental, flying and private car use for work. The university aims to reduce flying to locations within a 800 kilometer radius from the university. Although a mobility study and carbon footprint rely on the same data, a carbon footprint accounts for the GHG emissions for flights in three distance categories. For example: a flight with a distance of 700 kilometers or less can occur between locations anywhere in the world, thus making the figures represented here relevant for GHG emissions but not directly for a mobility study. The impact of flying is categorised in three categories: short (<700 km), medium (700-2500 km) and long (>2500 km). The business travel impact by employees for 2019 is given in table 7. A comparison with previous years is shown in table 8.

Category	Kilometers	kg CO_2 / km	tonnes CO_2
Train	4.752.510	0,006	29
Flying short	638.238	0,297	190
Flying medium	2.692.438	0,2	538
Flying long	20.066.236	0,147	2.950
Car rental	264.100	0,118	31
Car expense claims	909.835	0,22	200
Total emissions			**3.938**

Table 7: Travel and CO_2 impact, 2019

Category	Unit	2014	2015	2016	2017	2018	2019
Train	tonnes CO_2	11	138	252	240	25	29
Flying short	tonnes CO_2	352	326	343	72	234	190
Flying medium	tonnes CO_2	843	780	742	587	627	538
Flying long	tonnes CO_2	3.223	2.971	3.279	3.153	2.883	2.950
Car rental	tonnes CO_2	0	0	61	62	55	31
Car expense claims	tonnes CO_2	282	282	247	221	221	200
Total emissions	**tonnes CO_2**	**4.712**	**4.498**	**4.924**	**4.335**	**4.045**	**3.938**

Table 8: Business travel CO_2 emissions, 2014-2019

CO_2 compensation

In 2019, the ITC faculty has started compensating their GHG emissions from flying. Their affiliated party for compensation is the Climate Neutral Group (CNG). The CNG uses their own accounting standard, which differs with the standard used in this rapport. As it was not possible to filter the flights of ITC from the university data, the amount compensated by ITC will be reported but not subtracted from this report.

ITC has compensated 1997.73 tons of CO_2 for their business travel in 2019.

Commuting

Most employees and students travel to the university by car, train or bike. In 2010, a mobility survey was conducted. The CO_2 footprint for this section is calculated based on the information from the survey in combination with the adjusted student and employee numbers. In table 9 the impact of commuting for this year is presented.

Category	Kilometers	kg CO_2 / km	tonnes CO_2
Employees car	9.235.897	0,22	2.032
Employees train	8.216.469	0,006	49
Students car	12.951.092	0,22	2.849
Students train	33.097.013	0,006	199
Total emissions			**5.129**

Table 9: Commuting and CO_2 impact, 2019

Procurement

The suppliers and contractors of the university were invited to submit CO_2 footprint data concerning the services or goods delivered to the university. The various categories in this section and their impact are listed in table 10.

Category	Supplier	tonnes CO_2
Paper & cardboard	Based on waste SUEZ	174
Infrastructure	BAM/Wilmink Oosterveld	39
Maintenance	ENGIE/Heijmans	421
Catering	Appèl	341
Landscaping	Krinkels	62
Movers	Convoi/Mondial Movers	5
Mobility hired personnel	Randstad	48
Total emissions		**1.090**

Table 10: Procurement and CO_2 impact, 2019

The impact of paper and cardboard consumption is calculated based on the amount of paper waste produced. This data is supplied by the waste management company, SUEZ. Infrastructural works and maintenance are performed by the companies Heijmans, BAM and Wilmink Oosterveld. Their figures are directly represented here. The catering on campus is provided by Appèl.

The landscaping on campus is provided by Krinkels. With landscaping biomass is obtained and transported to be used in an appropriate facility. This is subtracted from the footprint of Krinkels. The kilometers driven by trucks of movers such as Convoi and Mondial Movers is converted to a carbon equivalent. The same holds for the commute of hired personnel from Randstad.

Transport & Distribution

In previous years the GHG emissions of transport and deliveries to the university was estimated. Many companies have now included this aspect in their CO_2 reporting rendering the current estimate unreliable. In the coming years this will be researched further on how to best reflect this impact.

Waste

SUEZ carries out the waste management for the university since 2017 and provides GHG emissions data for the various waste streams of the university. SUEZ works together with consultancy firm CE Delft to provide an accurate estimation of the impact of the waste streams. The supplied CO_2 emission data is given in table 11.

Category	Unit	2014	2015	2016	2017	2018	2019
Waste	tonnes CO_2	28	113	133	529	607	631

Table 11: Waste and CO_2 impact, 2014-2019

Water

The GHG emissions of water is based on a campus specific study from 2010. This emission figure is higher than in the reporting standard used for this report. As it also has been used in footprint reports in the previous years, this figure will be maintained. The water consumption information of the ITC hotel has been included, as this was not done in previous years, it causes an increase in water consumption. Building specific consumption can be viewed in the appendix and on the energy data platform.

Category	Unit	2014	2015	2016	2017	2018	2019
Water	m^3	94.943	71.892	71.365	84.129	80.979	100.022
Emission factor water	*kg CO_2 / m^3*	*1,5*	*1,5*	*1,5*	*1,5*	*1,5*	*1,5*
Total emissions	**tonnes CO_2**	**142**	**108**	**107**	**126**	**121**	**150**

Table 12: Water CO_2 emissions, 2014-2019

Appendix

1 - Energy consumption of buildings

Building	Gas (m^3)	Electricity (kWh)	District heating (GJ)	Water (m^3)
Afvalstoffendepot	1.055	2.931	0	68
Bastille	0	444.262	2.695	5.305
BMC	2.259	4.723	0	21
Boerderij Bosch	2.512	9.679	0	60
Boortoren	1.624	7.900	0	679
Carillon	0	3.139	0	0
Carré	206.545	2.800.921	12.073	15.029
Citadel	32.088	162.188	0	583
Cubicus	0	317.931	3.907	1.358
Erve Holzik - kantoren	10.088	13.004	0	73
Erve Holzik - schuren	0	12.285	0	0
Erve Holzik - woonhuis	0	1.141	0	0
Evenementenveld	0	2.502	0	0
Faculty Club & Schuur	11	134.334	716	408
Garage	11.752	18.777	0	84
Hogedruklab	3.690	269.020	2.075	2.817
Hoogspanningsverdeelstation	0	1.377	0	0
Horstcomplex	147.698	5.194.586	13.086	18.783
ITC	142.003	935.185	0	2.575
ITC Hotel	256.336	622.146	0	18.546
Koelcirkel	0	2.114.830	0	5.001
Kwekhoes	1.824	3.218	0	312
Nanolab	39.410	4.042.912	3.464	1.971
Openluchttheater	0	421	0	0
Openbare verlichting	0	127.421	0	0
Paviljoen	10.602	24.881	0	100
PTT Tussenstation (U-kast)	0	3.935	0	0
Ravelijn	0	295.748	2.307	2.599
Reinwaterkelder RWK	2.209	63.239	0	0
Rioolgemaal	0	6.857	0	0

Building	Gas (m³)	Electricity (kWh)	District heating (GJ)	Water (m³)
Seinhuis	1.241	761.620	0	79
Spiegel	0	568.085	3.791	1.791
Sportcentrum	13.642	510.169	2.819	9.263
Sportvelden	0	24.432	0	0
Stall	1.020	2.458	0	0
Summercampus	0	19.889	0	0
Teehuis	0	889.284	0	51
Tennispaviljoen	5.351	41.021	0	508
Vrijhof	0	738.700	3.710	3.988
Waaier	0	438.012	919	1.926
Windpark	1.693	5.482	0	126
Zilverling	0	579.401	3.009	2.626
Zwembad	12.749	0	0	3.292
Total	**907.402**	**22.220.046**	**54.571**	**100.022**

2 - Data acquisition and emission factors

The data and emissions factors used to compile this report were acquired with the utmost care. The data was supplied by the university unless otherwise indicated. The emissions factors used in this report are taken from www.co2emissiefactoren.nl, which is updated annually and supported by the Dutch Government and several NGOs. For water and district heating, different values have been used. District heating is localised and the supplier Ennatuurlijk provides the emission factor. A campus specific study for water by P. van Sleen was conducted in 2011 and as this value is higher than standard, it is maintained.