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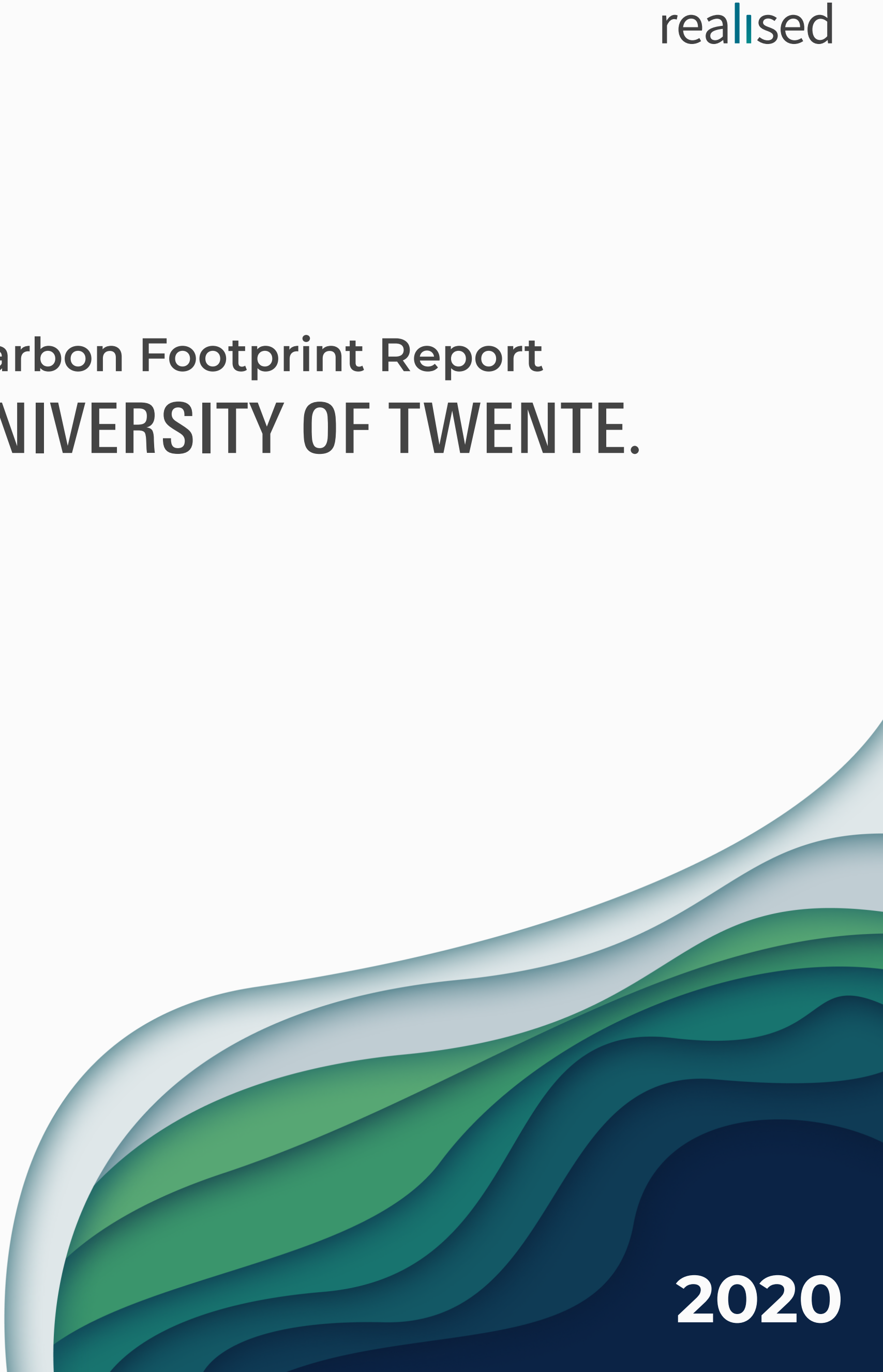
Carbon Footprint Report

UNIVERSITY OF TWENTE.



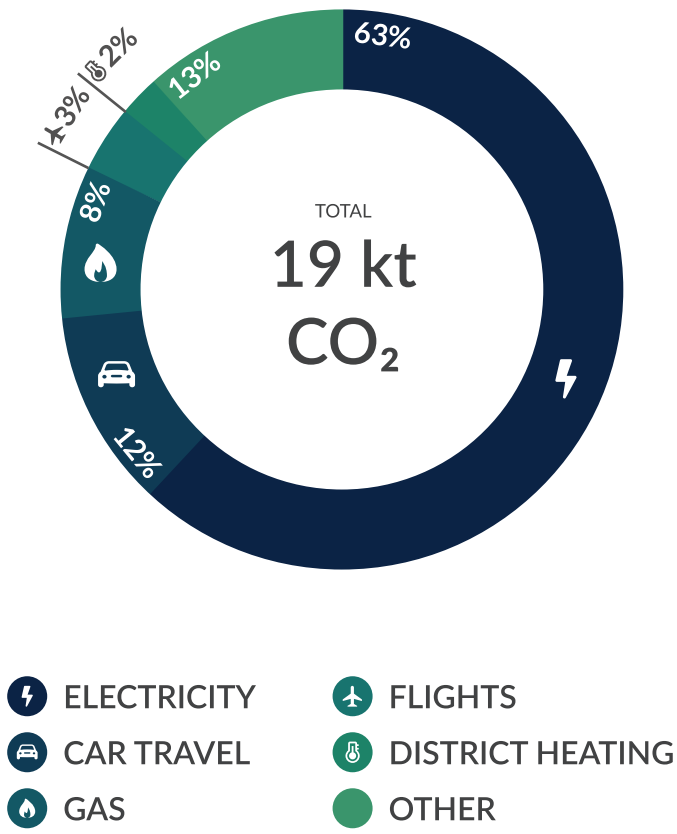
University of Twente Carbon Footprint Report 2020

Management 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."



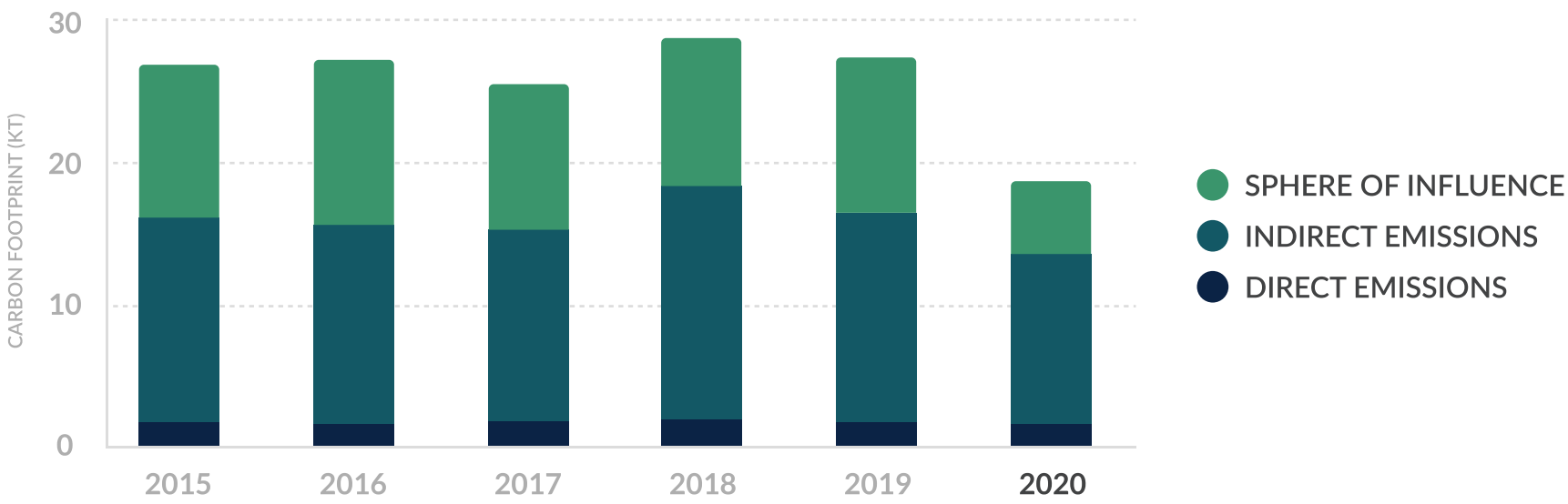
Key figures

+2
Buildings off gas

+17
Companies reported emissions

+5
Buildings with energy monitoring

Carbon footprint development



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Introduction

Dear reader,

Thank you for reading the University of Twente 2020 carbon footprint report. Every year the university reports their carbon footprint with the goal of providing full transparency of its impact. The ambition of the university is to reduce her carbon footprint by 15% in 2023 as set by the Shaping 2030 strategy. The aim of using 2020 as the reference year has unfortunately been hampered by the COVID-19 pandemic. This has had significant influence on emissions sources such as energy consumption, commuting and business travel.

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. 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.

With the experience gained in the organization by acquiring data for the carbon footprint, a new goal was formulated. The goal was to acquire more information about carbon emissions caused by partners of the university. In addition to that, information was collected about sustainable policies these companies have implemented. These partners may not be able to report their CO_2 yet, but their policies can for instance be interesting for the circular waste goals, also set in the Shaping 2030 strategy.

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.

Diederik Bakker, Olaf Haalstra, and Nando Tolboom

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Preamble

Changes to 2019

The companies Xerox and Asito have reported their emissions past the due date for the carbon footprint report of 2019. Their emissions for 2019 were 60.297 kg and 68.590 kg CO_2, respectively. The second change to the report of 2019 are the emissions caused by district heating. The company Ennatuurlijk communicated that the emission factor as used for their emission calculations in the 2019 CO_2 report is 5.5 kg of CO_2 per GJ of heating. This significantly lowers the CO_2 emissions of district heating and thus reduces the CO_2 footprint the university by 1.016 tons of CO_2.

Impact of COVID-19

Energy consumption, commuting and business travel have all declined due to the impact of the pandemic. In this report numbers are reported as supplied by the university and third parties. In this way part of the impact of the pandemic is visible in the year on year reporting. The only assumption that was made for this report is that commuting by employees and students reduced by 50%.

University buildings

The following buildings have been added to the list of university buildings that are included in the carbon footprint calculation: Pakkerij, Walstraat, Technohal, Hanger, Watersport Complex and Logica. Also the electricity generated by the solar panels of the Technohal have been added. Additionally, the ITC hotel and Drienerburght have switched from gas to district heating during the year.

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 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	2015	2016	2017	2018	2019	2020
Gas	m^3	815.380	785.064	922.870	946.095	907.402	798.537
Emission factor gas	*kg CO_2 / m^3*	*1,884*	*1,884*	*1,89*	*1,89*	*1,89*	*1,884*
Total emissions	**tonnes CO_2**	**1.536**	**1.479**	**1.744**	**1.788**	**1.715**	**1.504**

Table 1: Gas consumption with CO_2 conversion factors and total CO_2 emissions, 2015-2020

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	2020
Petrol	litres	0	0	0	2.760	2.925
Diesel	litres	3.717	4.386	8.159	9.657	6.723
Refrigerant R134a	kg	0	0	43	0	0
Refrigerant R407c	kg	0	0	9	0	0
Refrigerant R410a	kg	12	6	32	3	3
Total emissions	**tonnes CO_2**	**38**	**26**	**169**	**45**	**35**

Table 2: Fuels and refrigerants and total CO_2 emissions, 2016-2020

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, 2020

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.

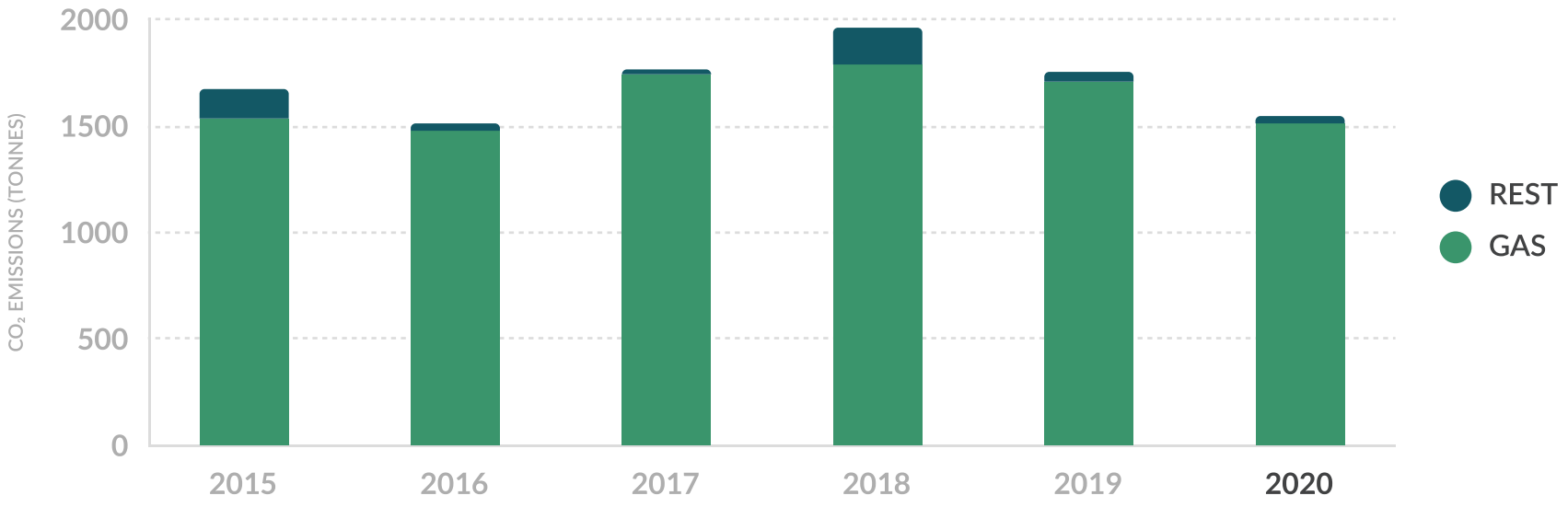

Figure 1: CO_2 emission development scope 1 2015-2020

Category	Unit	2015	2016	2017	2018	2019	2020
Gas	tonnes CO_2	1.536	1.479	1.744	1.788	1.715	1.504
Fuels and refrigerants	tonnes CO_2	137	38	26	169	45	35
Total emissions scope 1	**tonnes CO_2**	**1.673**	**1.517**	**1.770**	**1.958**	**1.760**	**1.540**

Table 3: Scope 1 CO_2 emissions, 2015-2020

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. On top of the drop in consumption due to COVID, the Dutch electricity mix has become less carbon intensive, leading to a significant drop in emissions. In figure 2 the development of scope 2 emissions is shown.

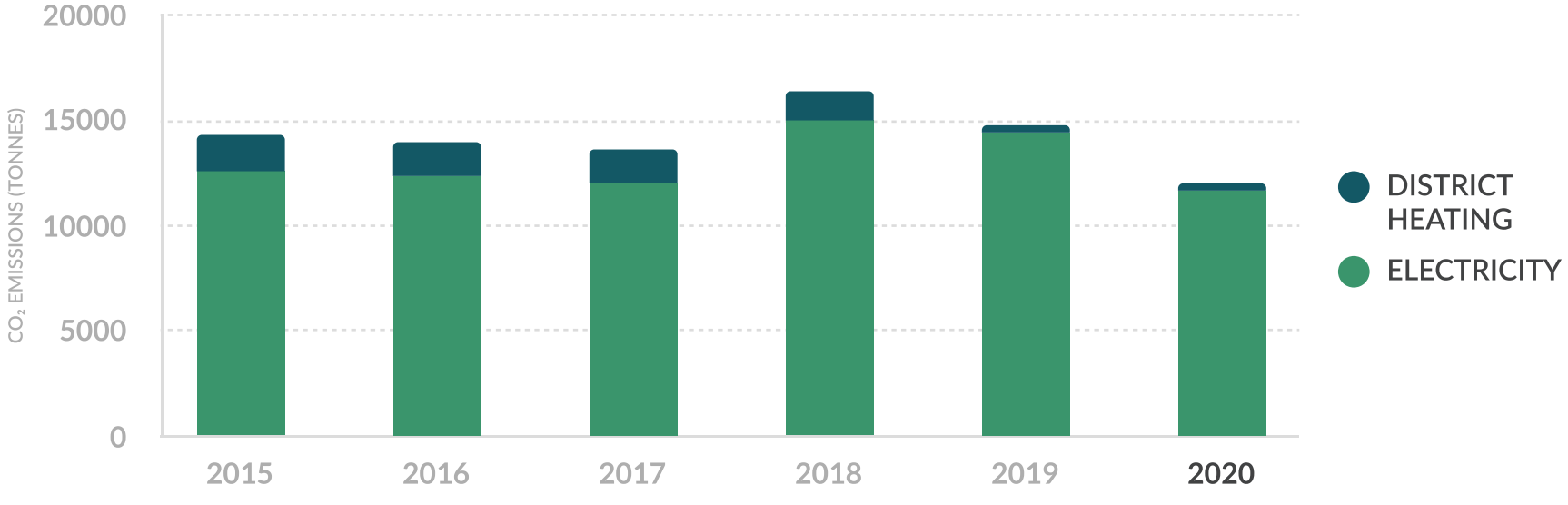

Figure 2: CO_2 emission development scope 2 2015-2020

Category	Unit	2015	2016	2017	2018	2019	2020
Electricity	MWh	23.866	23.300	22.645	23.023	22.220	20.905
Emission factor electricity	*kg CO_2 / MWh*	*526*	*526*	*526*	*649*	*649*	*556*
Emissions electricity	**tonnes CO_2**	**12.554**	**12.256**	**11.911**	**14.942**	**14.421**	**11.623**
District heating	GJ	63.444	62.292	59.783	56.772	54.571	55.593
Emission factor district heating	*kg CO_2 / GJ*	*26,49*	*26,49*	*26,49*	*24,119*	*5,5*	*5,5*
Emissions district heating	**tonnes CO_2**	**1.681**	**1.650**	**1.584**	**1.369**	**300**	**306**
Total emissions scope 2	**tonnes CO_2**	**14.234**	**13.906**	**13.495**	**16.311**	**14.721**	**11.929**

Table 4: Electricity and district heating consumption with CO_2 conversion factors and CO_2 emissions, 2015-2020

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) are up and running.

Category	Unit	2015	2016	2017	2018	2019	2020
Solar panels Horst	kWh	25.886	25.000	24.965	30.529	28.382	28.116
Solar panels Technohal	kWh	-	-	-	-	-	201.298
Emission factor electricity	*kg CO_2 / kWh*	*0,526*	*0,526*	*0,526*	*0,649*	*0,649*	*0,556*
Mitigated emissions	**tonnes CO_2**	**14**	**13**	**13**	**20**	**18**	**128**

Table 5: Energy generation solar panels and CO_2 mitigation, 2015-2020

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.

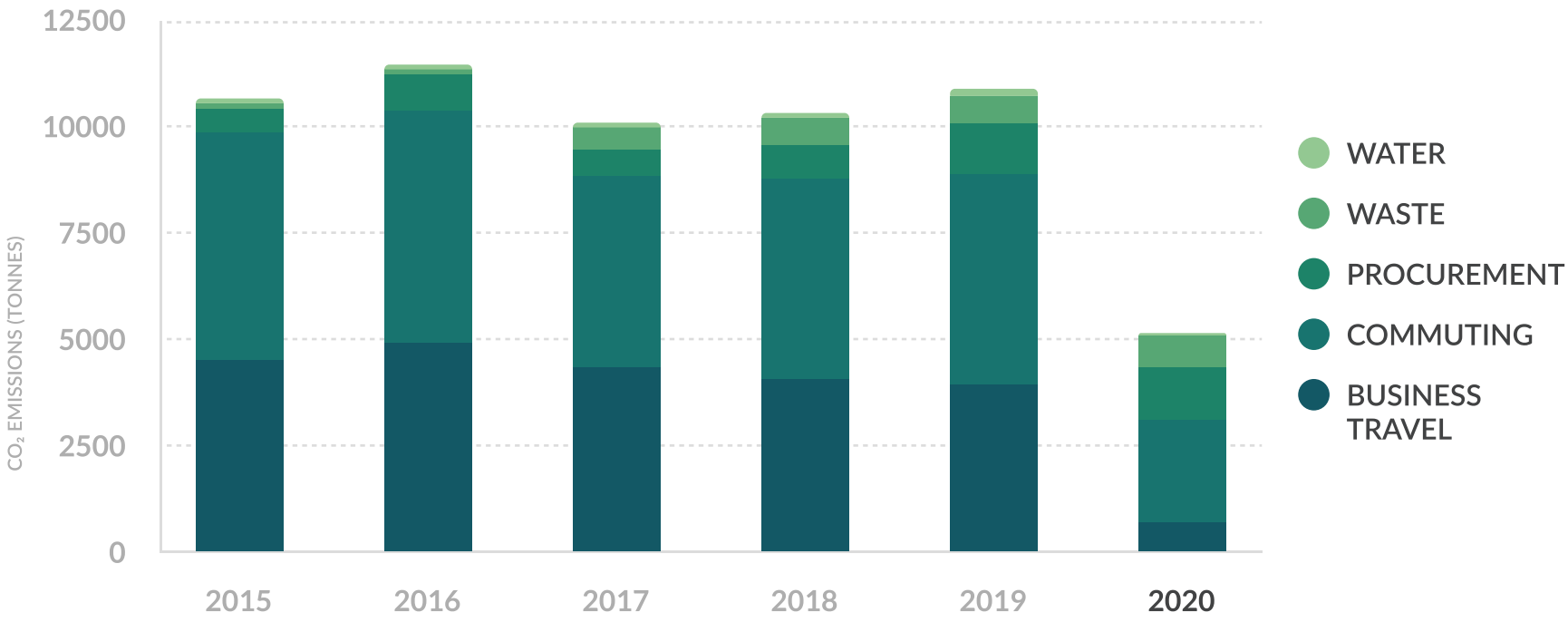

Figure 3: CO_2 emission development scope 3 2015-2020

Category	Unit	2015	2016	2017	2018	2019	2020
Business Travel	tonnes CO_2	4.498	4.924	4.335	4.045	3.938	676
Commuting	tonnes CO_2	5.341	5.453	4.493	4.724	4.976	2.390
Procurement	tonnes CO_2	572	836	641	811	1.219	1.283
Waste	tonnes CO_2	113	133	529	607	631	750
Water	tonnes CO_2	108	107	126	121	150	29
Total emissions scope 3	**tonnes CO_2**	**10.632**	**11.454**	**10.124**	**10.309**	**10.914**	**5.128**

Table 6: Scope 3 CO_2 emissions, 2015-2020

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 monitoring of this ambition uses the same data as is used for the CO_2 footprint. But the emission factors used to calculate the CO_2 emissions of flights are categorised slightly differently: short (<700 km), medium (700-2500 km) and long (>2500 km). The business travel impact by employees 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	1.691.781	0,006	10
Flying short	83.831	0,297	25
Flying medium	390.252	0,2	78
Flying long	3.160.141	0,147	465
Coach rental	3.389	1,043	4
Car rental	96.270	0,1217	12
Car expense claims	426.095	0,195	83
Total emissions			**676**

Table 7: Travel and CO_2 impact, 2020

Category	Unit	2015	2016	2017	2018	2019	2020
Train	tonnes CO_2	138	252	240	25	29	10
Flying short	tonnes CO_2	326	343	72	234	190	25
Flying medium	tonnes CO_2	780	742	587	627	538	78
Flying long	tonnes CO_2	2.971	3.279	3.153	2.883	2.950	465
Coach rental	tonnes CO_2	-	-	-	-	-	4
Car rental	tonnes CO_2	0	61	62	55	31	12
Car expense claims	tonnes CO_2	282	247	221	221	200	83
Total emissions	**tonnes CO_2**	**4.498**	**4.924**	**4.335**	**4.045**	**3.938**	**676**

Table 8: Business travel CO_2 emissions, 2015-2020

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. The flights of the ITC faculty have been removed from the university data.

ITC has compensated 352.07 tonnes of CO_2 for their business travel in 2020.

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. For the year 2020 the commuting distance has been reduced with 50% due to COVID.

Category	Kilometers	kg CO_2 / km	tonnes CO_2
Employees car	4.667.793	0,195	910
Employees train	4.152.577	0,006	25
Students car	6.919.016	0,195	1.349
Students train	17.681.811	0,006	106
Total emissions			**2.390**

Table 9: Commuting and CO_2 impact, 2020

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	113,6
Infrastructure	BAM/Wilmink Oosterveld	30,2
Maintenance	ENGIE/Heijmans	523,3
Cleaning	Peter Korf/Asito	65,1
Catering	Douwe Egberts	21
Hotels	UPark/Broeierd	333,7
Landscaping	Krinkels	3,8
Movers	Mondial	0,3
Mobility hired personnel	Randstad	20,4
Lab supplies	Elis/Bio Connect	6,2
Office supplies	Lyreco/SKO/Gispen	9,7
Printing services	SMG/Zalsman/Ipskamp/ Xerox/Robitex/Sedo	115,1
ICT Hardware	Fidato/Eriks/Conrad	40,2
Total emissions		**1.282,5**

Table 10: Procurement and CO_2 impact, 2020

The impact of paper and cardboard consumption is calculated based on the amount of paper waste produced. The various companies providing services are listed in the various categories as defined in table 10. With the data supplied from these partners in some occasions conversions needed to be made, such as driven kilometers to a carbon equivalent. The university stimulates its suppliers to provide information as detailed as possible as it can also provide insights to the companies themselves where they can achieve most impact in reducing their CO_2 emissions.

Transport & Distribution

In the years 2014-2018 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 previous estimate unreliable. In the coming years research will be conducted 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. The amount of waste reduced from 880 tonnes in 2019 to 624 tonnes in 2020, but due to more detailed reporting by SUEZ the CO2 emissions have increased.

Category	Unit	2015	2016	2017	2018	2019	2020
Waste	tonnes CO_2	113	133	529	607	631	750

Table 11: Waste and CO_2 impact, 2015-2020

Water

The GHG emissions of water for this year are based on figures supplied by the water supplier Vitens. The campus-specific study of 2010 that was used previously has been replaced, as these figures better reflect the current situation. From 2019 onwards water consumption of the ITC hotel has been included, this causes an increase in water consumption, as this was not done between previously. Building specific consumption can be viewed in the appendix and on the Energy Data Platform.

Category	Unit	2015	2016	2017	2018	2019	2020
Water	m^3	71.892	71.365	84.129	80.979	100.022	72.788
Emission factor water	*kg CO_2 / m^3*	*1,5*	*1,5*	*1,5*	*1,5*	*1,5*	*0,397*
Total emissions	**tonnes CO_2**	**108**	**107**	**126**	**121**	**150**	**29**

Table 12: Water CO_2 emissions, 2015-2020

Appendix

1 - Energy consumption of buildings

Building	Gas (m^3)	Electricity (kWh)	District heating (GJ)	Water (m^3)
Afvalstoffendepot	776	1.343	0	4
Bastille	0	314.127	1.695	1.480
BMC	1.931	4.359	0	33
Boerderij Bosch	2.197	6.798	0	15
Boortoren	647	6.525	0	277
Carillon	0	3.262	0	0
Carré	193.961	2.787.482	11.491	10.273
Citadel	29.780	122.992	0	208
Cubicus	0	249.770	3.163	462
Erve Holzik - kantoren	10.304	14.187	0	89
Erve Holzik - schuren	0	12.127	0	0
Erve Holzik - woonhuis	0	979	0	0
Evenementenveld	0	-23	0	0
Faculty Club & Schuur	2	98.508	815	355
Garage	11.188	16.634	0	59
Hangar	0	54.993	0	28
Hogedruklab	3.477	259.268	1.821	1.941
Hoogspanningsverdeelstation	0	1.629	0	0
Horstcomplex	140.911	4.723.611	11.591	12.836
ITC	131.102	797.100	0	2.369
ITC Hotel	131.130	629.458	3.514	18.995
Koelcirkel	0	1.903.587	0	5.291
Kwekhoes	1.008	1.606	0	65
Logica	3.128	43.598	0	627
Nanolab	38.427	3.981.043	3.191	1.620
Openluchttheater	0	4.115	0	0
Openbare verlichting	0	135.659	0	0
Pakkerij	36.574	210.344	0	1.803
Paviljoen	11.141	22.447	0	55
PTT Tussenstation (U-kast)	0	3.291	0	0

Building	Gas (m^3)	Electricity (kWh)	District heating (GJ)	Water (m^3)
Ravelijn	0	222.615	2.020	1.015
Reinwaterkelder RWK	1.886	51.936	0	0
Rioolgemaal	0	6.389	0	0
Seinhuis	1.243	776.350	0	37
Spiegel	0	455.381	4.121	1.022
Sportcentrum	9.377	404.083	2.817	4.549
Sportvelden	0	16.585	0	0
Stall	590	1.714	0	0
Summercampus	0	13.663	0	0
Technohal	0	453.164	2.227	517
Teehuis	0	738.853	0	32
Tennispaviljoen	3.786	28.073	0	144
Vrijhof	0	526.464	2.897	1.406
Waaier	0	312.279	986	1.141
Walstraat (SU)	12.194	6.127	0	15
Watersportcomplex	7.452	33.765	0	456
Windpark	634	4.478	0	35
Zilverling	0	442.373	3.244	758
Zwembad	13.691	0	0	2.776
Total	**798.537**	**20.905.111**	**55.593**	**72.788**

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 district heating different values have been used. District heating is localised and the supplier Ennatuurlijk provides the emission factor.