

CO₂ footprint report 2015

UNIVERSITY OF TWENTE.

Name Client:	University of Twente
Address:	Drienerlolaan 5
City:	Enschede
Performed by:	Zienergie BV
Address:	Dokter Stolteweg 2
City:	Zwolle
Phone:	038 – 85 313 95
E-mail:	info@zienergie.nl
Date of report:	December 5 th 2016
Consultant:	Janjoris van Diepen
E-mail:	j.vandiepen@zienergie.nl



Content

Content.....	2
1. Introduction.....	3
1.1 About this rapport.....	3
1.2 About the University of Twente.....	3
1.3 Verification.....	3
2. CO ₂ footprint design.....	4
2.1 Scopes of the CO ₂ footprint	4
2.2 Organizational boundary.....	5
2.3 Operational boundary.....	6
3. CO ₂ footprint.....	7
3.1 Analysis of the CO ₂ footprint.....	8
3.1.1 Scope 1: direct GHG emissions	8
3.1.2 Scope 2: indirect GHG emissions (purchased energy)	8
3.1.4 Solar Power.....	8
3.1.5 Combustion of biomass	8
3.1.6 GHGs emissions separately.....	9
3.2 Quantification methodology	10
3.3 Influence of measure inaccuracies and uncertainties.....	10
Appendix 1 Reference to ISO 14064 and GHG Protocol	11
Appendix 2 Entities Organization Boundary.....	12
Appendix 3 Map of the university campus.....	14
Appendix 4 CO ₂ emissions energy use per building.....	15

1. Introduction

1.1 About this rapport

This report contains the CO₂ emission inventory (footprint) of the University of Twente (UT) over the year 2015. The CO₂ footprint provides insight in the greenhouse gas emissions caused by activities of the University of Twente. This CO₂ footprint is reported for the year 2015. University of Twente has reported the CO₂ footprint since 2014. 2014 is the base year.

This report is prepared according to the Greenhouse Gas Protocol (GHG) and the ISO 14064-1. The Greenhouse Gas (GHG) Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), sets the global standard for how to measure, manage, and report greenhouse gas emissions.

In appendix 1 you will find a reference table for ISO 14064-1 and the GHG Protocol.

This report is performed under the responsibility of Mariëlle Winkler, Manager Health Safety & Environment and John Susebeek, Energy Coordinator of the Facility Service Center of the University of Twente.

1.2 About the University of Twente

The University of Twente is a young and enterprising university that prepares young people for the future. The UT accomplishes this through innovative, attractive and future-focused education and through fulfilling a global function in technological and social research.

Sustainability in the broad sense is of increasing importance in society. Universities in general and the university of Twente in particular, because of its unique multidisciplinary research, contribute to solutions for social problems. This is also a concern in universities own operations. The UT is trying to improve sustainability of its organization as much as possible in conjunction with its own scientists and students, but also in close cooperation with various parties in the region.

An important part of this process is transparency about sustainability performance of the UT. In this context University of Twente publishes its CO₂ footprint according to the international protocols.

The University of Twente (UT) intends to reduce scope 1 & 2 carbon emission by 20% and scope 3 emissions by 10% by the year 2020 (compared to 2005).

1.3 Verification

The CO₂ footprint report 2015 is prepared by an independent expert. The CO₂ footprint report is not verified by a certified body.

2. CO₂ footprint design

2.1 Scopes of the CO₂ footprint

The CO₂ footprint maps the different kind of sources of greenhouse gas emissions. To draft a CO₂ footprint, all emissions need to be converted into CO₂ equivalents.

To help delineate direct and indirect emission sources, improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals, three “scopes” (scope 1, scope 2, and scope 3) are defined for GHG accounting and reporting purposes (see diagram 1). Scope 1 represents direct GHG emissions and occur from sources that are owned or controlled by the reporting organization. Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated. Scopes 1 and 2 are defined in this standard to ensure that two or more companies will not account for emissions in the same scope. This makes the scopes amenable for use in GHG programs where double counting matters. Scope 3 represents emissions from both suppliers (upstream activities) and consumers, including all use and end of life emissions (downstream activities). Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

Scope 1: Direct emissions

For example: combustion of gas or combustion of fuel in company cars.

Scope 2: Indirect emissions purchased power

For example: purchase of electricity or district heating.

Scope 3: Other indirect emissions

For example: purchase of materials, business travel.

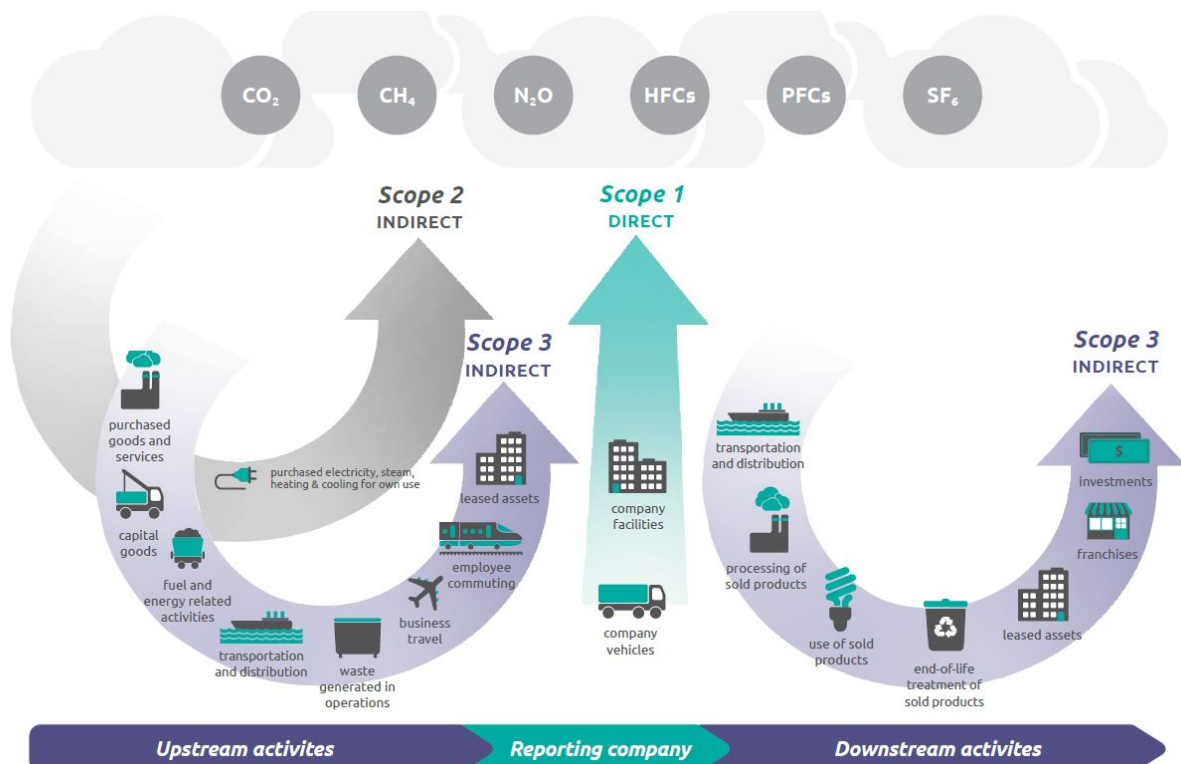


Diagram 1: Scopediagram GHG

According to ISO 14064 and the GHG Protocol, organizations shall separately account for and report on scopes 1 and 2 at a minimum. In this CO₂ footprint, all scope 1 and 2 emission are reported. No sources of CO₂ emissions are excluded. Also some scope 3 emissions are reported.

2.2 Organizational boundary

This CO₂ footprint reports the CO₂ emissions of the University of Twente over 2015.

The Executive Board is the highest executive council of the University of Twente and is charged with the administration and management of the University.

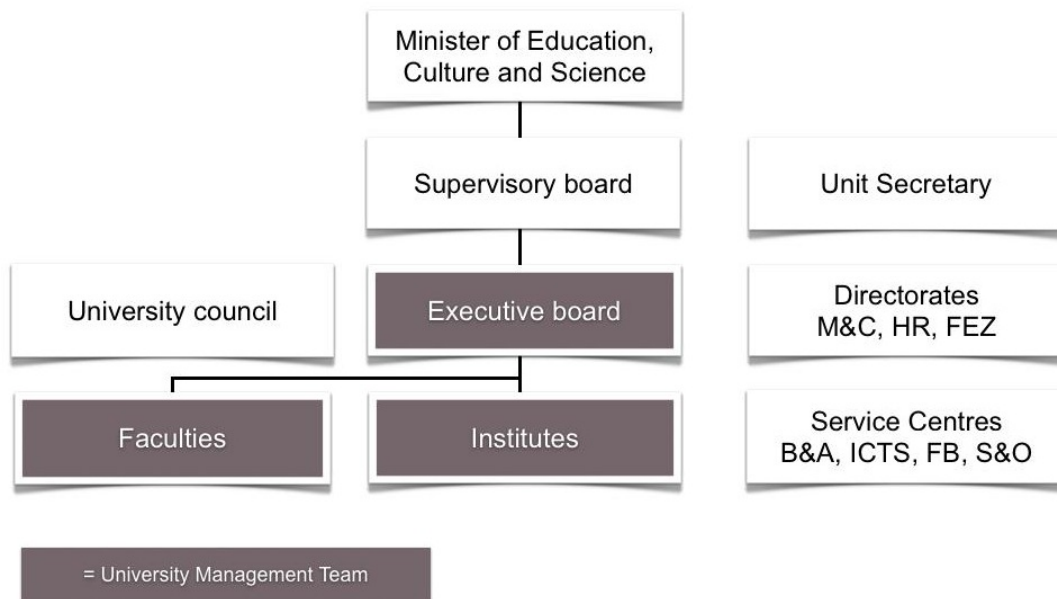


Diagram 1: Organization structure University of Twente

To determine the organizational boundary, the 'operational control' approach is used. Under the control approach, a company accounts for 100 percent of the GHG emissions from operations over which it has control. It does not account for GHG emissions from operations in which it owns an interest but has no control.

In appendix 2 is a list of the entities which are controlled by the University of Twente and are included in the boundary of this CO₂ footprint report. For example, student housing on the campus, owned by Acasa, is not included in the organizational boundary. The ITC buildings outside the campus are disposed in 2015 and not included in the organization boundary anymore.

2.3 Operational boundary

Within the organization boundary of the University of Twente, the following GHG scope 1 emissions have been identified:

- Combustion of gas for heating
- Combustion of fuel in company cars
- Refrigerants in air conditioning

The following GHG scope 2 emissions have been identified:

- Electricity use
- District heating use

No scope 1 or 2 emissions are excluded.

3. CO₂ footprint

Table 1 and Diagram 3 show the CO₂ emissions over 2015 for the University of Twente.

Scope	Emission type	CO ₂ Emission (ton CO ₂ -eq/yr)	%
1	Gas combustion	859	6,2%
1	Fuel combustion UT vehicles	177	1,3%
Total scope 1		1.036	
2	District heating	1.269	9,1%
2	Electricity	11.606	83,4%
Total scope 2		12.874	
Total		13.910	100%

Table 1: CO₂ emission University of Twente 2015

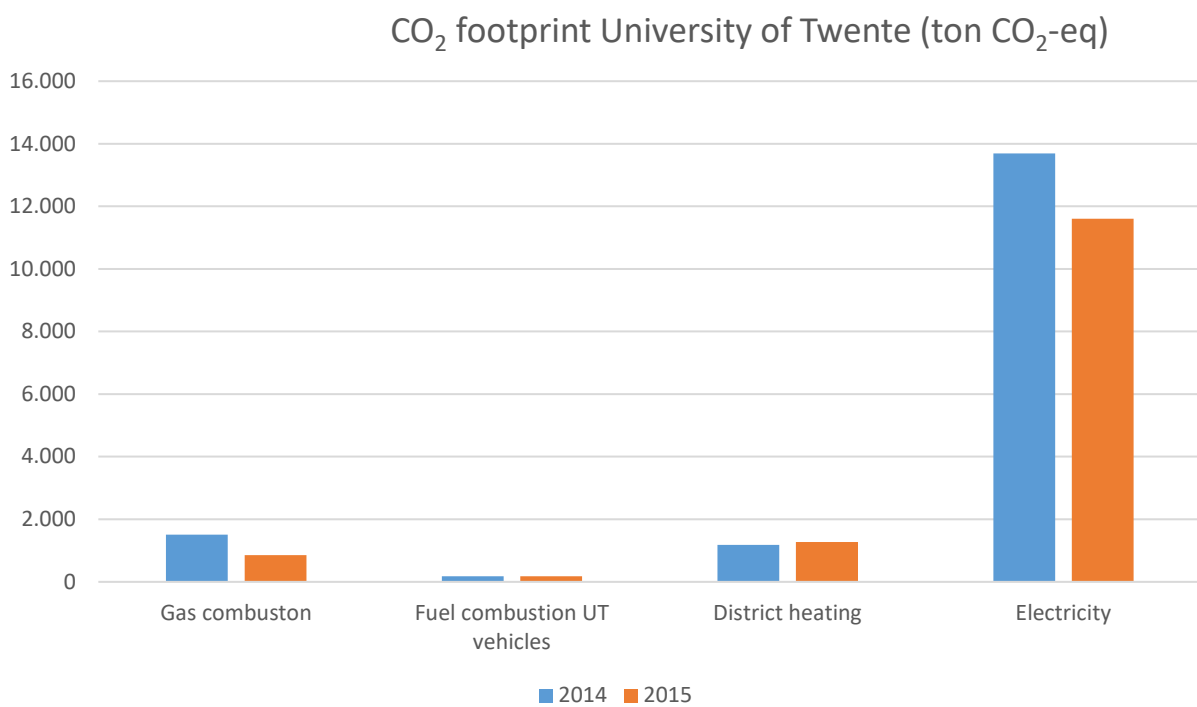


Diagram 3: CO₂ emissions University of Twente 2015 compared to 2014

3.1 Analysis of the CO₂ footprint

The total CO₂ emissions for University of Twente in 2015 is 13.910 ton CO₂-eq for scope 1 and 2 emissions. Electricity use is by far the biggest contributor to the total footprint as you can see in diagram 3 and 4.

3.1.1 Scope 1: direct GHG emissions

The emission caused by gas combustion for heating is 1513 ton CO₂-eq and the biggest contributor of scope 1 emissions.

Emission type			Emission factor		CO ₂ emission	
Gas combustion	455.859	m ³	1,88	kg CO ₂ /m ³	858.838	kg CO ₂

Table 2: CO₂ emission gas combustion 2015

In appendix 3 there is a list of gas used by all UT buildings included in the organizational boundary.

The emissions caused by own vehicles is 177 ton CO₂-eq. In table 3 are shown the different kind of vehicles used and their CO₂ emissions.

Type of vehicle	Distance	Emission factor	CO ₂ emission
Passenger car gasoline (950-1300 gram)	373.786 Km	0,224 kg CO ₂ /km	83.728 kg CO ₂
Passenger car diesel (>1450 gram)	165.600 Km	0,241 kg CO ₂ /km	39.910 kg CO ₂
MPV(Multi-Purpose Van) with gasoline	76.000 Km	0,312 kg CO ₂ /km	23.712 kg CO ₂
MPV(Multi-Purpose Van) with diesel	88.000 Km	0,298 kg CO ₂ /km	26.224 kg CO ₂
Cargo 3.5-10 ton	6.600 Km	0,481 kg CO ₂ /km	3.175 kg CO ₂

Table 3: CO₂ emission fuel combustion own vehicles 2015

No refrigerants were filled up in the air-conditioning systems in 2015.

3.1.2 Scope 2: indirect GHG emissions (purchased energy)

The identified scope 2 emissions are electricity use and the use of district heating.

Emission type			Emission factor		CO ₂ emission	
District heating	63.444	GJ	20	kg CO ₂ /GJ	1.269.888	kg CO ₂
Electricity	22.063.697	kWh	0,526	kg CO ₂ /kWh	11.606.505	kg CO ₂

Table 4: CO₂ emission purchased energy 2015

In appendix 3 there is a list of electricity use and district heating per UT building.

3.1.4 Solar Power

The University has placed PV panels in 2013 on the roof on the Horst building. The production in 2015 was 25.886 kWh. This electricity was delivered to the own net and is discounted for in the total electricity use (see appendix 4 with energy use per building).

3.1.5 Combustion of biomass

No biomass is combusted within the organization boundary.

3.1.6 GHGs emissions separately

Table 7 shows the emissions per GHG type.

GHG emission	ton	ton CO ₂ -eq
CO ₂	18.599	18.599
CH ₄	0	0
N ₂ O	0	0
HFC	0	0
PFC	0	0
SF ₆	0	0

Table 7: GHG emissions 2015

3.2 Quantification methodology

The sources and quantification methods are represented in Table 8. To calculate the CO₂ emissions for scope 1 and 2 emissions, the CO₂ emission factors published on www.CO2emissiefactoren.nl are used. Emission factors on this website are regularly updated and are supported by Dutch Government and relevant NGO's. For some scope 3 emissions which are not available on www.CO2emissiefactoren.nl, other sources are used (as listed in the table below).

Emission type	Source	Quantification method
Gas combustion	Monthly bill energy provider (by building)	Gas volume in m ³ converted to CO ₂ equivalents.
Electricity	Monthly bill energy provider (by building)	Quantity of electricity use in kWh converted to CO ₂ equivalents.
District Heating	Monthly bill energy provider (by building)	Quantity of GJ delivered converted to CO ₂ equivalents. District heating is produced by a waste incineration plant so this emission factor is used. ¹
Fuel combustion of University Vehicles	Yearly kilometer registration facility department (2014 data is used as 2015 data is not available yet)	Quantity of kilometers is converted to CO ₂ equivalents (based on fuel type).

Table 8: Quantification methodology

3.3 Influence of measure inaccuracies and uncertainties

An organization should complete and document an uncertainty assessment for GHG emissions and removals, including the uncertainty associated with emission and removal factors.

Electricity use, gas volume and district heating quantities are based on the data from the Facility Service Center. Data is collected by reading the meters each month from each facility. These values are checked with the monthly energy bills of the Energy Service Provider. Invoices of suppliers have a very high level of data quality. So inaccuracies and uncertainties will be minimal.

District heating is produced by a waste incineration plant. CO₂ emissions may vary depending on input for the incineration plant. Also, CO₂ emissions of the plant have to be allocated to waste disposal, electricity production and heat production. This could lead to a significant uncertainty for the emission factor used for district heating by a waste incineration plant. Nevertheless, this is the best available emission factor for district heating by a waste incineration plant.

The emission type vehicles is based on yearly kilometer registration. The data for 2015 was not available yet so the same amount of km as 2014 is used. As this emission type is only responsible for less than 1,2% of the total scope 1 and 2 footprint, this inaccuracy is not of great significance on the total footprint.

¹As the emission factor for district heating by a waste incineration plant (AVI) was not available on www.CO2emissiefactoren.nl, instead the emission factor from 'CO₂ Prestatieladder handboek 2.2' is used. This is the latest available emission factor and is also used by the district heating supplier Essent.

Appendix 1 Reference to ISO 14064 and GHG Protocol

Norm part ISO 14064 (paragraph 7.3.1)	GHG Protocol requirement	Reference in this report
a) description of the reporting organization		Paragraph 1.2
b) person responsible		Paragraph 1.1
c) reporting period covered	The reporting period covered.	Paragraph 1.1
d) documentation of organizational boundaries	An outline of the organizational boundaries chosen, including the chosen consolidation approach.	Paragraph 2.2
	An outline of the operational boundaries chosen.	Paragraph 2.3
e) direct GHG emissions, quantified separately for each GHG, in tonnes of CO ₂ -eq.	Total scope 1 and 2 emissions independent of any GHG trades such as sales, purchases, transfers, or banking of allowances. Emissions data separately for each scope.	Table 1
f) a description of how CO ₂ emissions from the combustion of biomass are treated in the GHG inventory	Emissions data for direct CO ₂ emissions from biologically sequestered carbon.	Paragraph 3.1
g) if quantified, GHG removals, quantified in tonnes of CO ₂ -eq;		n.v.t.
h) explanation for the exclusion of any GHG sources or sinks from the quantification	Any specific exclusions of sources, facilities, and / or operations	Paragraph 2.3
i) energy indirect GHG emissions associated with the generation of imported electricity, heat or steam, quantified separately in tonnes of CO ₂ e	Total scope 1 and 2 emissions independent of any GHG trades such as sales, purchases, transfers, or banking of allowances. Emissions data separately for each scope.	Table 1
j) the historical base year selected and the base-year GHG inventory	Year chosen as base year, and an emissions profile over time that is consistent with and clarifies the chosen policy for making base year emissions recalculations.	Paragraph 1.1
k) explanation of any change to the base year or other historical GHG data, and any recalculation of the base year or other historical GHG inventory	Appropriate context for any significant emissions changes that trigger base year emissions recalculation.	N.A.
l) reference to, or description of, quantification methodologies including reasons for their selection	Methodologies used to calculate or measure emissions, providing a reference or link to any calculation tools used	Paragraph 3.2
m) explanation of any change to quantification methodologies previously used;		N.A.
n) reference to, or documentation of, GHG emission or removal factors used ;		Paragraph 3.2
o) description of the impact of uncertainties on the accuracy of the GHG emissions and removals data;		Paragraph 3.3
p) a statement that the GHG report has been prepared in accordance with this part of ISO 14064;		Paragraph 1.1
q) a statement describing whether the GHG inventory, report or assertion has been verified, including the type of verification and level of assurance achieved.	Emissions data for all six GHGs separately (CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆) in metric tonnes and in tonnes of CO ₂ equivalent.	Paragraph 1.3 Paragraph 3.1.6

Appendix 2 Entities Organization Boundary

Nr	Buildings on campus	Building ID	Use	CAT*	Part of EMS	Organization Boundary
2	Spiegel	SP	Lectures + offices	A	V	YES
3	Vleugel	VL	Offices	A	Spiegel	YES
4	Carillon	CN	Technical Room	B	V	YES
5	Garage	GA	Offices	B	V	YES
6	Paviljoen	PA	Offices	A	V	YES
7	Seinhuis	SH	Server space	A	V	YES
8	Hogedruklab	HD	Lab	B	V	YES
9	Citadel	CI	Offices + lectures	B	V	YES
10	Ravelijn	RA	Lectures +office	A	V	YES
11	Zilverling	ZI	Offices + ICT lab	A	V	YES
12	Waaier	WA	Lectures + horeca	A	V	YES
14	Teehuis	TH	Server space	A	V	YES
16	Nanolab	NL	Lab & offices	A	V	YES
17	The Gallery	GY		C		NO
18	Technohal	TH		C		NO
48	Bastille	BA	Offices	A	V	YES
63	Blokhutten	BL	Horeca	B	Boerderij Bosch	YES
32	BMC	BI	Offices	B	V	YES
62	Boerderij Bosch	BB	Horeca	B	V	YES
53	Box	BO		C		NO
29	Buitenhorst	BH	Offices	A	Horstcomplex	YES
15	Carré	CR	Lab & offices	A	V	YES
41	Cubicus	CU	Lectures + office	A	V	YES
44	Drienerburght	DR	Hotel	C		NO
40	Erve Holzik	ER	Offices	B	V	YES
42	Faculty Club	FC	Horeca	B	V	YES
13	Hal B	HB	Offices	B	Hallen	YES
46	High Tech Factory	HTF	Lab + office	C		NO
45	Hogekamp***	HO	Offices + lab	B	V	YES
21	Horstring	HR	Offices	A	Horstcomplex	YES
20	Horsttoren	HT	Offices + lectures	A	Horstcomplex	YES
75	ITC****	ITC	Offices +lectures		Buiten campus	
75	ITC hotel****	ITC	Lodging		Buiten campus	
30	Keet	KT	Offices	B	Windpark	YES
23	Kleinhorst	KH	Offices + lab	A	Horstcomplex	YES
61	Linde	LI		C		NO
65	Logica	LO		C		NO
27	Meander	ME	Lab	A	Horstcomplex	YES
59	Mondriaan	MO		C		NO
24	Noordhorst	NH	Offices + lectures	A	Horstcomplex	YES
26	Oosthorst	OH	Offices + labs	A	Horstcomplex	YES
56	Openluchttheater	OUT	Theater			YES

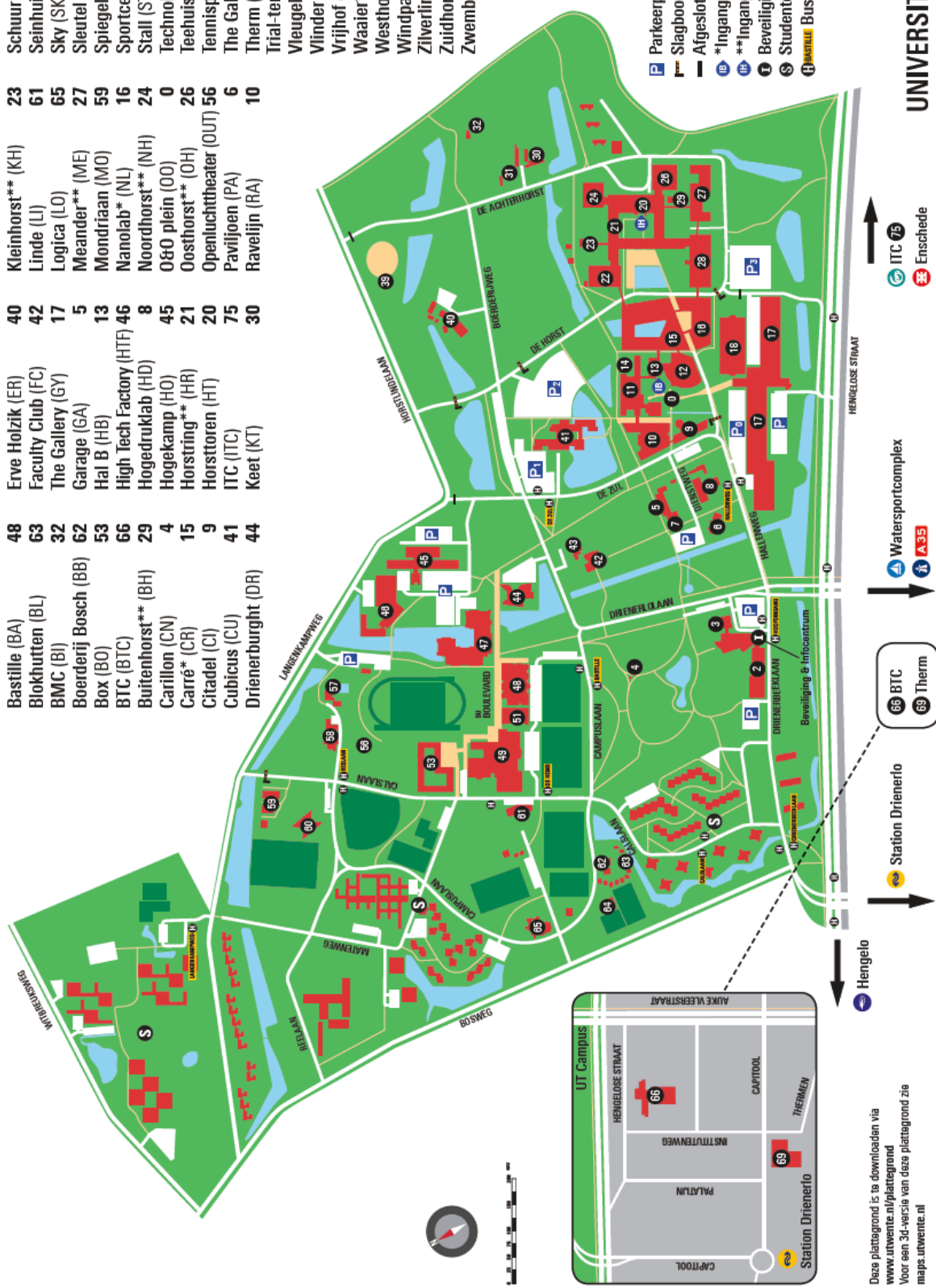
43	Schuur	SR	Kitchen	B	Boerderij Bosch	YES
51	Sky	SK		C		NO
58	Sleutel	SL		C		NO
49	Sportcentrum	SC	Sports	A	V	YES
63	Stall	ST	Horeca	B	V	YES
64	Tennispark	TP	Horeca	B	V	YES
39	Trial-Terrein	TT		B	**	YES
60	Vlinder	VI		C		NO
47	Vrijhof	VR	Horeca	A	V	YES
22	Westhorst	WH	Offices	A	Horstcomplex	YES
31	Windpark	WP	Offices	B	V	YES
28	Zuidhorst	ZH	Offices	A	Horstcomplex	YES
57	Zwembad	ZW	Swimming pool	A	V	YES
-	Chalet***		Offices	A	V	YES
-	Koelcirkel		Technical room	B	V	YES
-	Afvalstoffendepot			B	V	YES
-	Boortoren		Horeca	B	V	YES
-	Hoogspannings- verdeelstation		Technical room	B	V	YES
-	Kwekhuus		Horeca	B	V	YES
-	Openbare verlichting		Lighting	B	V	YES
-	KPN tussenstation		Technical room	B	V	YES
-	Rioolgemaal		Technical room	B	V	YES
-	Reinwaterkelder		Storage	B	V	YES
-	Sportvelden		Sports	B	V	YES
-	Summercampus		Lodging	B	Boerderij Bosch	YES
-	Evenementenveld		Events	B	V	YES

*

- Category A = UT buildings for education
Category B = UT buildings for facilities
Category C = Buildings on campus controlled by third party
** Not registered as energy user
*** Not in use anymore
**** Buildings disposed in 2015, ITC will move to campus

PLATTEGROND UNIVERSITEIT TWENTE

Bastille (BA)	48	Erve Holzik (ER)	40	Kleinhorst** (KH)	23	Schuur (SR)	43
Biokhutten (BL)	63	Faculty Club (FC)	42	Linde (LI)	61	Seinhuis (SH)	7
BMC (BI)	32	The Gallery (GY)	17	Logica (LO)	65	Sky (SK)	51
Boerderij Bosch (BB)	62	Garage (GA)	5	Meander** (ME)	27	Sleutel (SL)	58
Box (BO)	53	Hal B (HB)	13	Mondriaan (MO)	59	Spiegel (SP)	2
BTC (BTC)	66	High Tech Factory (HTF)	46	Nanolab* (NL)	16	Sportcentrum (SC)	49
Buithorst** (BH)	29	Hogedruklab (HD)	8	Noordhorst** (NH)	24	Stall (ST)	63
Carillon (CN)	4	Hogekamp (HO)	45	O&O plein (OO)	0	Technohal (TH)	18
Carré* (CR)	15	Horstring** (HR)	21	Oosthorst** (OH)	26	Teehuis (TH)	14
Citadel (CI)	9	Horsttoeren (HT)	20	Openluchttheater (OUT)	56	Tennispark (TP)	64
Cubicus (CU)	41	ITC (ITC)	75	Paviljoen (PA)	6	The Gallery (GY)	17
Drienerburght (DR)	44	Keet (KT)	30	Ravelijn (RA)	10	Therm (TM)	69
						Trial-terrein (TT)	39
						Vleugel (VL)	3
						Vinder (VI)	60
						Vrijhof (VR)	47
						Waaiert* (WA)	12
						Westhorst** (WH)	22
						Windpark (WP)	31
						Zilverling (ZI)	11
						Zuidhorst** (ZH)	28
						Zwembad (ZW)	57



Deze plattegrond is te downloaden via www.utwente.nl/plattegrond
 Voor een 3d-versie van deze plattegrond zie maps.utwente.nl

Appendix 4 CO₂ emissions energy use per building

ID	Building Name	Emission streams			CO ₂ emissions (ton CO ₂ eq)		
		Heat (GJ)	Electricity (kwh)	Natural gas (m3)	Heat	Electricity	Natural gas
BA	Bastille	2.687	475.141	0	54	250	0
CR	Carré	13.703	3.417.290	180.590	274	1.797	340
CHA	Chalet	0	0	0	0	0	0
CU	Cubicus	3.763	346.720	0	75	182	0
HR	Horstcomplex	19.177	6.468.393	105.970	384	3.402	200
NL	Nanolab	3.975	3.815.714	38.531	80	2.007	73
PA	Paviljoen	0	24.939	10.443	0	13	20
RA	Ravelijn	2.013	416.393	0	40	219	0
SH	Seinhuis	0	589.182	2.285	0	310	4
SP	Spiegel	4.115	572.009	0	82	301	0
SC	Sportcentrum	3.438	567.511	16.252	69	299	31
TH	Teehuis	0	1.035.128	0	0	544	0
VR	Vrijhof	4.398	953.741	0	88	502	0
WA	Waaier	422	560.527	0	8	295	0
ZI	Zilverling	3.798	724.352	0	76	381	0
KOC	Koelcirkel	0	1.207.254	0	0	635	0
ASD	Afvalstoffendepot	0	8.322	1.114	0	4	2
BI	BMC	0	4.764	2.148	0	3	4
BB	Boerderij Bosch	0	11.273	3.385	0	6	6
BOT	Boortoren	0	10.219	1.888	0	5	4
CN	Carillon	0	6.041	0	0	0	0
CI	Citadel	0	165.272	25.654	0	3	0
ER	Erve Holzik - kantoren	0	29.236	9.710	0	0	0
ER	Erve Holzik - schuren	0	11.941	0	0	87	48
ER	Erve Holzik - woonhuis	0	351	0	0	15	18
FC	Faculty Club & Schuur	1.309	193.377	66	0	6	0
GA	Garage	0	24.091	14.033	0	0	0
HB?	Hallen	0	0	0	26	102	0
HD	Hogedruklab	647	87.246	3.394	0	13	26
HO	Hogekamp	0	0	0	0	0	0
HSV	Hoogspanningsverdeelstation	0	1.506	0	13	46	6
KWH	Kwekhoes	0	1.311	3.191	0	0	0
GY?	Langezijds (gebouw A)	0	0	0	0	1	0
OUT	Open Luchttheater	0	495	0	0	1	6
OPV	Openbare verlichting	0	160.674	0	0	0	0
PTT	PTT tussenstation	0	7.503	0	0	0	0
RIG	Rioolgemaal	0	6.985	0	0	85	0
RWK	Reinwaterkelder RWK	0	47.950	2.877	0	4	0
SPV	Sportvelden	0	42.740	0	0	4	0
ST	Stall	0	2.758	2.402	0	25	5
SUM	Summercampus	0	17.265	0	0	22	0
TP	Tennispaviljoen	0	28.909	3.824	0	15	7
WP	Windpark	0	9.588	1.217	0	5	2
ZW	Zwembad	0	32.898	26.885	0	17	51
EVE	Evenementenveld	0	2.574	0	0	1	0
PVP	PV Panelen	0	-25.886	0	0	-14	0
TOTAL		63.444	22.063.697	455.859	1.269	11.606	859