

Operations - Summary

TU Delft values its position in building a sustainable future, with a central theme '**impact for a better society**'. This impact should also be reflected in the daily operations of the campus. With the UN SDGs in mind, TU Delft is committed to transition to a CO₂-neutral and circular campus by the year 2030. The first steps taken as part of contributing to this change is the development of the [CO₂ roadmap of TU Delft](#) by Prof.dr.ir. Andy van der Dobbelsesteen, the current sustainability coordinator of TU Delft, and Ir. Tess Blom. In addition to this, Campus & Real Estate (CRE) has written a [Roadmap for Circular Campus 2030](#). This summary provides an overview of these efforts.

Circularity

The main goal of circularity is to reduce material waste to zero and enable full utilization of resources. Currently, the campus is on a linear economy and it is important to make sure that the transition is to be achieved towards circularity. The new materials contracted or purchased have to be in such a way that they are utilized for their lifetime without harmful emissions to the environment. Currently, based on the Roadmap for Circular Campus 2030 by CRE, TU Delft is estimated to be about 5-15% circular.

- **Scope 2:** purchased electricity for internal use (indirect emissions).
- **Scope 3:** emissions arising from outside sources, but at service of TU Delft, such as employee travel and waste management.

The [Paris Agreement](#) calls for immediate action to reduce emissions to pre-industrial levels in order to combat climate change. At the moment, CO₂ neutrality is mostly measured in terms of Scopes 1 and 2 emissions, but it is important to also consider Scope 3 emissions.

CO₂ neutrality

CO₂ neutrality refers to the greenhouse gas potential of the activities associated with the campus. For neutrality to be achieved, the overall greenhouse gas potential must be reduced to zero. For accounting purposes, emissions are divided into three scopes:

- **Scope 1:** combustion of fuel in own plants (direct emissions).

Current state of CO₂ emissions

Many initiatives have been taken to improve sustainability on campus by CRE, the caterer (CirFood), and GreenTU. The various sources of CO₂ emissions are shown and current attempts to reduce these are explained in brief. According to the estimates, TU Delft contributes to emissions accounting to 47,957 tonnes of CO₂

equivalent. The contributors for these emissions are shown in table 1.

Table 1 Various contributors and their emissions in TU Delft

Contributors to emissions	Tonnes of CO ₂ equivalent emissions
Food	13,797
Gas	13,361
Electricity	8,379
Water	98
Waste Management	908
Business Travel	6,667
Procurement	Currently unavailable
Total	47,957

The TU Delft campus consumes 154,898 MWh of energy including gas, heating, and electricity purposes for all the buildings and third parties. 56% of electricity is estimated for academic purposes and remaining 44%

for research purposes. About 30% of the total electricity is consumed for lightning.

Electricity

As of January 2017, 78% of the electricity used on campus is from the offshore wind power plants acquired through distributor Eneco. 1% of electricity is obtained from PV panels on the roofs of TU buildings and the rest from combined heat and power (CHP) plants. In addition to this, researchers are exploring options to increase the number and production of energy from various renewable sources. Currently, TU Delft has 4,000 solar plants installed on roofs with a capacity of 1.1 MWp.

Heating

Three gas-fired boilers and two CHP boilers are used for district heating. Only 41% of the energy used for heating is generated with the help of CHP plants (switched on only when the temperature falls below 85°C). An affirmative decision was made in July 2018 to pursue the implementation of a geothermal heating source. TU Delft has 13 functional thermal storage systems excluding, PULSE and ECHO, which delivered a total of 24,600 GJ for heating and 31,300 GJ for cooling in 2017.

Energy Neutral buildings

Opened in 2018, PULSE is TU Delft's first energy neutral building with an A++++ energy label. It is equipped with around 490 solar panels with a yearly yield of 150,000 kWh, an intelligent building-management system, underground thermal storage, and insulating glass facade. A second energy-neutral building, ECHO, is under construction and will be completely sustainable according to BREEAM standards.

Food

Due to lack of rigorous data, calculations are done based on the emission of the average Dutch diet (1,575 kg CO₂-eq per person). Assuming that 50% of this is consumed during working hours, the campus has an overall footprint of 13,800 t CO₂-eq per year (29% of total emissions). Meat-based diets are the largest contributor.

Mobility

Based on data available from the travel agency of TU Delft, university-related travel amounted to about 33 million km in 2018 alone: around 6,667 t CO₂ emissions. This is a conservative figure and the actual numbers could be significantly higher. Although concrete data on daily commute emissions is unavailable, approximations estimate about 3,378 (employees) and 1,585 (students) t CO₂-eq.

Waste

Based on data from Renewi, the waste management company of TU Delft, a total of 2,788,757 kg of waste is produced yearly, of which 47% is unprocessed waste. This translates to 92.6 kg per person. In addition to special bins around the campus for waste separation, a pilot program of replacing bins with recycling islands has been started. The recycling islands will separate paper, PCO (plastic, cans and drink cartons), and other waste.

Circular TU Delft

Addressing scope 3 emissions is key to achieving TU Delft's vision for a circular campus by 2030. The roadmap CRE commissioned evaluates circularity across 6 KPIs: general, buildings, procurement, infra & mobility, biomass & food, and water. Major inflows are in education/research, computer equipment, packaged food/drinks, and paper and printing. The highest outflow is through residual waste, which is not separated on campus. At present, the campus is 5-15% circular.