

Executive Summary

Today, we are at the brink of a transformation to accelerate our actions on sustainability to act upon climate change. Keeping in accordance with the 17 UN Sustainable Development Goals and the Paris agreement, the Dutch government has committed to reduce its emissions by 49% by 2030. Through its strategic framework for 2018-2024, TU Delft has aligned its vision with these goals and aims to be a 'Flagship university' or 'Civic University' with the motto "Impact for a better society". This report serves to review the current sustainability initiatives at the university and suggest strategies for improvement. The performance of the university is assessed in the following 4 strategic areas: Education, Research, Operations and Social engagement. The assessment and suggestions presented in the report are a culmination of multiple studies and roadmaps backed by a mathematical model to predict future scenarios for carbon emissions in the university.

Sustainability in '**Education**' is essential to the TU Delft motto. TU Delft's strength lies in the world-class infrastructure to support education, access to field experts and practical education. Presently, sustainability is represented in the education offered at TU Delft in several ways. Full master programs, such as Sustainable Energy Technology, are centered around sustainability, with programs such as Industrial Ecology and European Wind

Energy being offered in collaboration with partner universities. There are also several other masters which include the possibility of following a track specialised in sustainability. Additionally, sustainability can be added to any students' curriculum through 12 minors (a quarter of those offered by TU Delft) and around 45 MOOCs (a third of those offered by TU Delft). In the category of '**Research**', all of the university's 4 research-based initiatives focus on sustainability and broadly concentrate on 8 of the UN SDGs. TU Delft consistently ranks high for SDGs 6,7 & 9 in the Elsevier ranking scheme. In addition to regional partnerships (e.g. the 4TU network), TU Delft actively collaborates with international universities and is a member of the International Universities Climate Alliance. The TU Delft Climate institute is active across the 8 faculties and focuses on interdisciplinary research along 5 key themes. Along with Yes!Delft, one of the leading tech incubators in Europe, TU Delft encourages and supports students and researchers to launch start-ups in the field of sustainability. 8 of the student Dream teams and the Symbiotic urban movement have sustainability at the core of their activities and represent the university at international competitions. Through the Green Village's innovation projects, students and researchers can work on implementation of several green solutions and experiment in a real-life setting.

In an **'Operational'** context, TU Delft has stated its goals to be "CO₂ neutral and circular by 2030". Based on the CO₂ roadmap developed by Prof Andy van den Dobbelsteen and Ms. Tess Blom, TU Delft accounts for approximately 47957 tonnes of CO₂ equivalent in the year 2018. The highest emissions come from gas usage for district heating and emissions from food. With respect to energy consumption, the campus consumed 154898 MWh of energy for heating, gas and electricity for TU Delft and third parties. Of the total energy consumption of TU Delft buildings, 53.35% is for electricity, 12.6% for gas and the rest is for heating. Hence, there is a strong need to optimise and cut down on the electricity consumption of TU Delft buildings. As of January 2017, 78% of the total electricity consumed came from wind energy, 1% from rooftop PV panels and the rest from CHP plants. For the future, TU Delft is actively exploring options to expand PV panel installations and use geothermal sources for district heating. Inaugurated in 2018, the PULSE building serves as a template to achieve energy neutrality in the campus. With energy saving schemes and intelligent building management system, it is the first energy neutral building with an A++++ energy label. Soon, ECHO, which is under construction, will be the second building on the campus complying with BREEAM standards. Food consumption accounts for about 29% of TU Delft's net emissions and the main source has been identified as meat consumption. Although this is quite challenging to address, meetings with different stakeholders has led to initiatives such as no meat week, Meatless Mondays and sustainable packaging solutions. Based

on the data from Renewi, in 2018 there was a waste generation of 92.6 kg per person of which 47% is unprocessed. Currently, TU Delft is estimated to be 5-15% circular and several initiatives for waste separation have been piloted. An important next step in the Material flow analysis will be to assess the impact of procurements on emissions and circularity.

'Social engagement' is evaluated across 4 areas, namely: communication, stakeholder engagement, events, and inclusion. The sustainability website, GreenTU social media channels have increased communication internally as well as externally. Major sustainability organisations across the campus collaborate to organise events to engage students in 'sustainability'. A decentralised approach to sustainability is achieved through the faculty specific GreenTeams that identify and address sustainability issues in their respective faculties. The diversity office at the university works towards ensuring inclusivity and creating a safe work environment. SDGs 4, 5 and 17 have also shaped the integrity policy and TU Delft is committed to build an inclusive campus.

A mathematical and behavioural model was built to analyse future scenarios due to increased population on campus, and related adaptation of facilities. The population based model takes into account 6 major factors- electricity, heat, mobility, food, waste, water. The model serves to provide an approximate projection of the future scenarios and guide further policy-making. For a business as usual scenario, there is an expected increase of

about 45% in total CO₂ emissions by the year 2030. The emissions resulting from food consumption surprisingly form a large part of this. Considering a potential carbon tax, such high emission values can have significant financial implications for the university.

The report also lays down several policy recommendations for a greener and sustainable campus. For achieving the carbon neutral target in 2030, it is imperative that a Department of Sustainability be set up in TU Delft, which will be empowered to make sustainable energy policies, oversee the planning, execution and reporting of the clean energy projects within the campus. The Department of Sustainability will ensure effective coordination between different stakeholders of TU Delft and will accelerate the execution of these projects. Along with this, the report lists down a series of other policy recommendations in the field of education,

research, operations and behavioural change.

The report concludes with a rigorous SWOT analysis for the 4 pillars of sustainability. Based on the authors' knowledge in the area, case studies, interviews, and feedback, several strategies have been proposed and supported by results from the behavioural model. The implementation of the above mentioned scenario with small initiatives can reduce the emissions to 50,000 tCO₂-eq from 70,000 tCO₂-eq by 2030. A remote survey conducted to assess student feedback on 'sustainability' yielded encouraging results with about 61% of students highly valuing sustainability and 86% of students ready to integrate 'sustainability' in their research work. Combined with the momentum created in the year 2019-20, TU Delft is well poised to achieve its ambition of carbon neutrality by 2030.