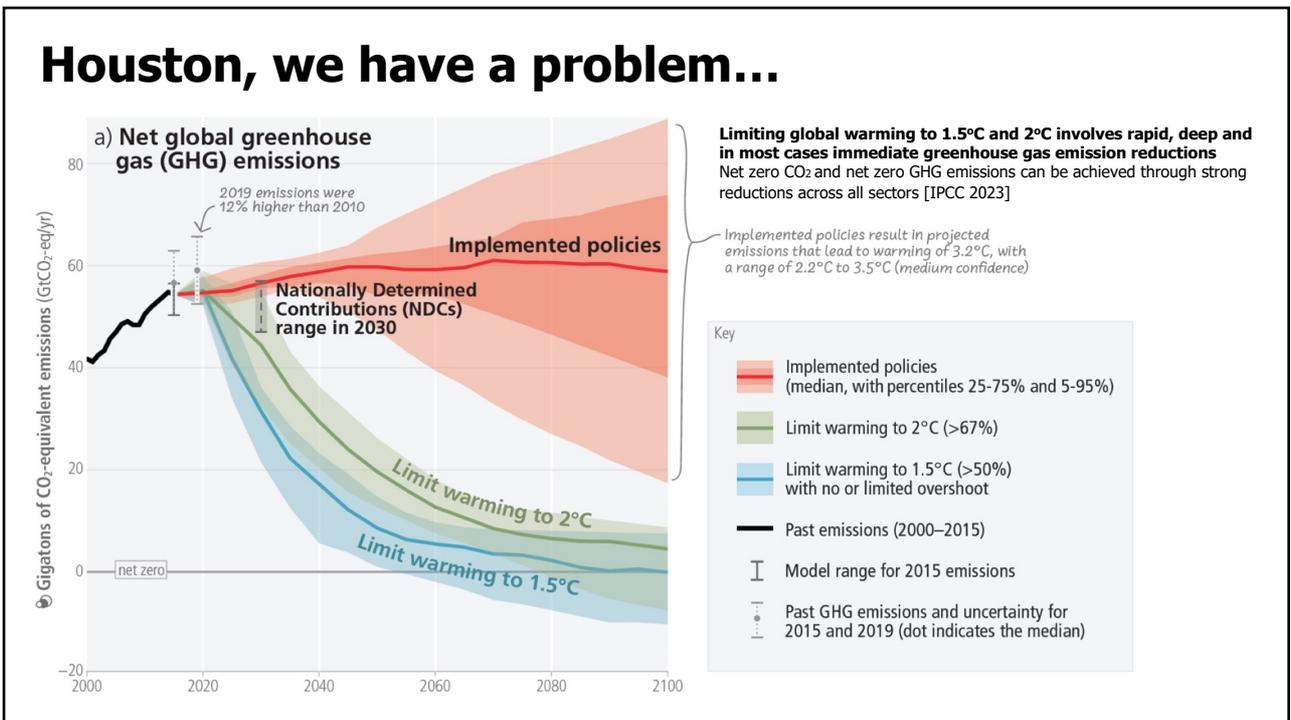


1



2



3

## The Great Sustainability Challenge

- Climate adaptive**  
→ prepare for the new climate
- Carbon neutral**  
→ shift to renewable energy entirely
- Circular**  
→ become part of the circular economy
- Adding value**  
→ contribute to happiness and biodiversity

4

# Personal responsibility

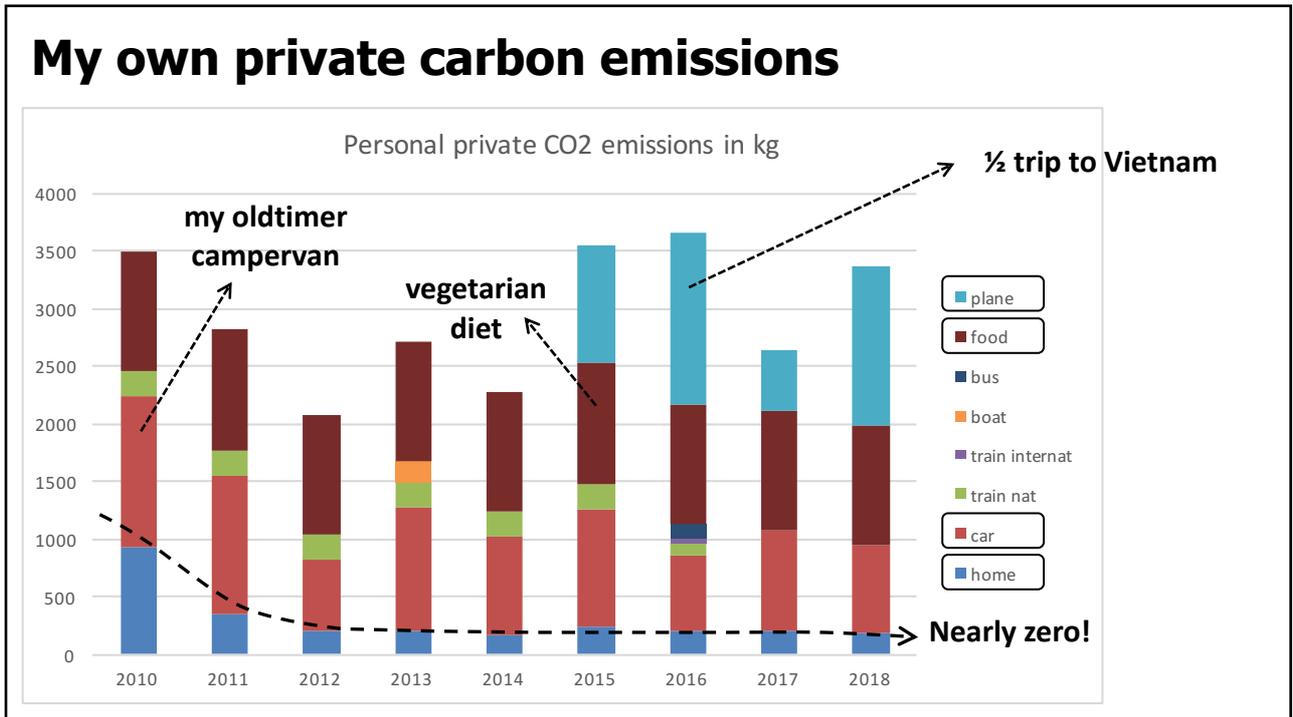
*if we want a sustainable society,  
each one of us needs to live sustainably*

5

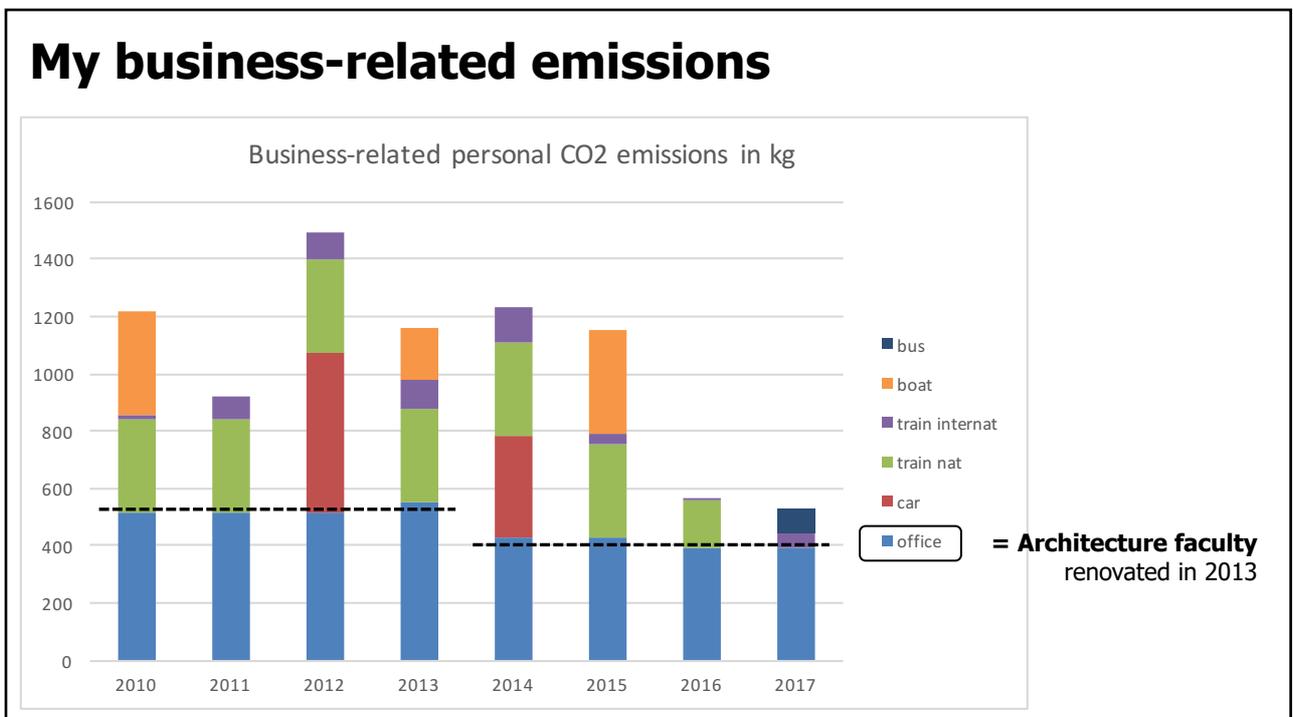
**My house**      **in the middle of my street**



6

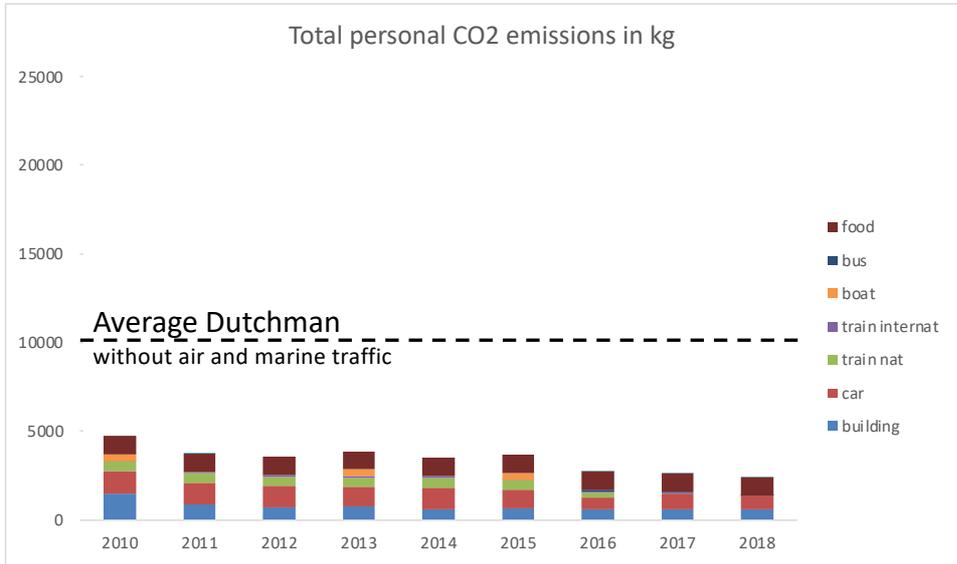


7



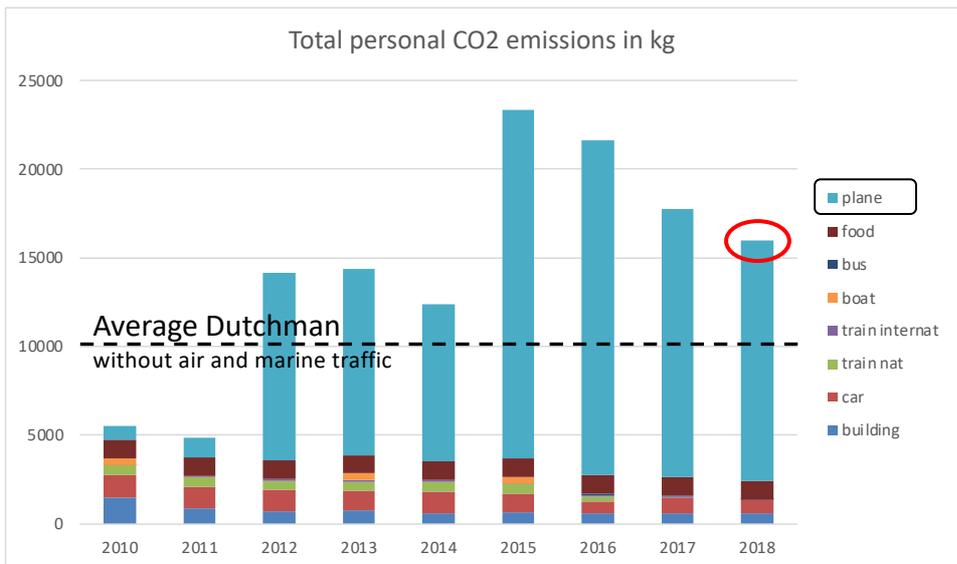
8

# My overall performance

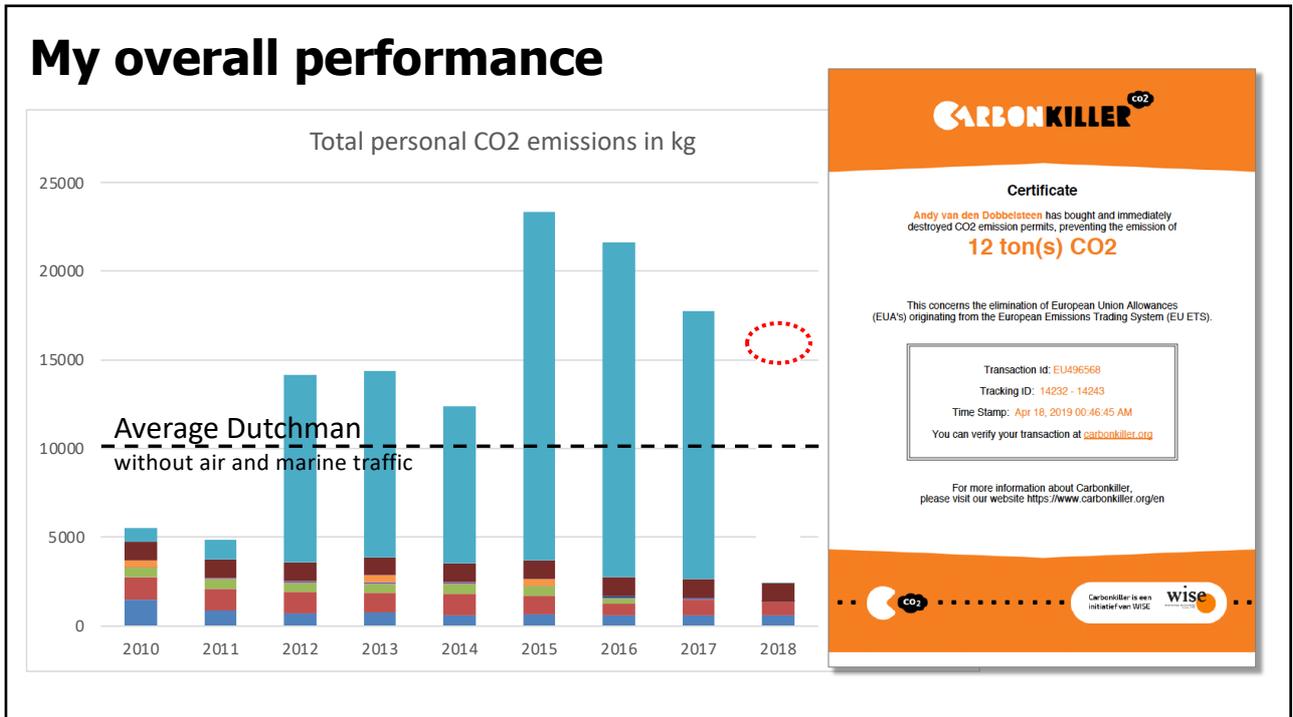


9

# My overall performance



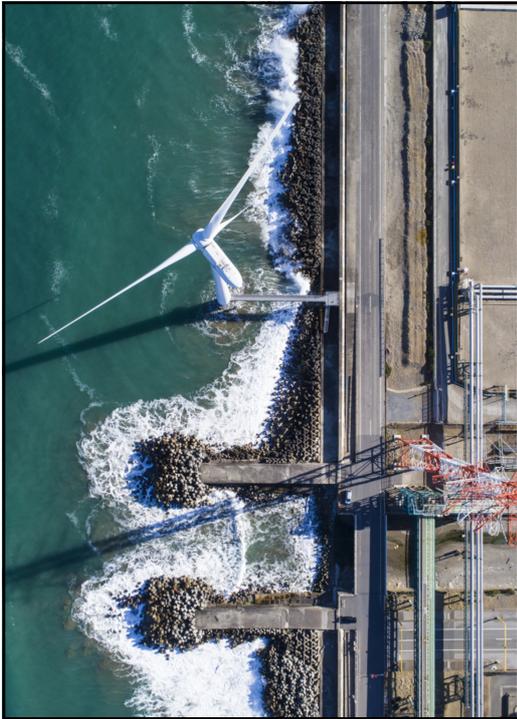
10



11



12



## TU Delft position on Climate Action

The Climate Action mission of TU Delft

There is no doubt that the anthropogenic emissions of greenhouse gases are changing our living environment through their impact on the global climate system. TU Delft will harness its innovative powers to support the world-wide transition to non-fossil energy, and adaptation of the living environment to the consequences of global warming.

13

# TU DELFT CLIMATE ACTION PROGRAMME



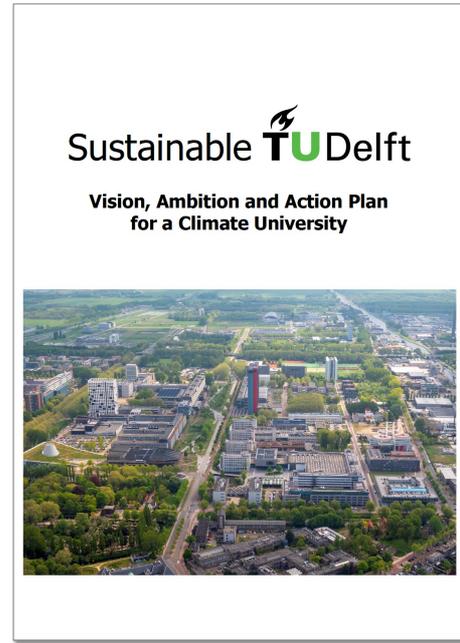
The infographic features a central horizontal row of five hexagonal icons: a factory with smoke, an airplane, a city skyline, a plant growing from soil, and a sun. Below this row are smaller icons for a factory, airplane, city, plant, truck, sun, cloud with rain, and thermometer. To the right, a large green arrow curves upwards, pointing towards a cluster of hexagons containing a thermometer, a cloud with rain, and a sun.

14

# Concrete policy

## Already fixed in decision documents

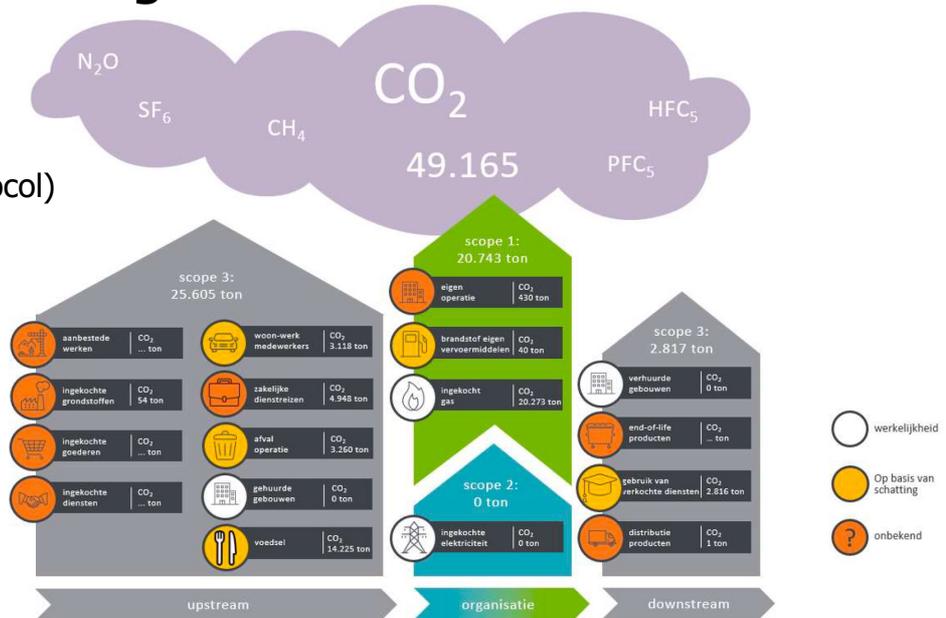
- Vision, Ambition & Action Plan  
*(framework, objectives and actions)*
- Commitment by the Executive Board: 100 M€  
*(ambition and means)*



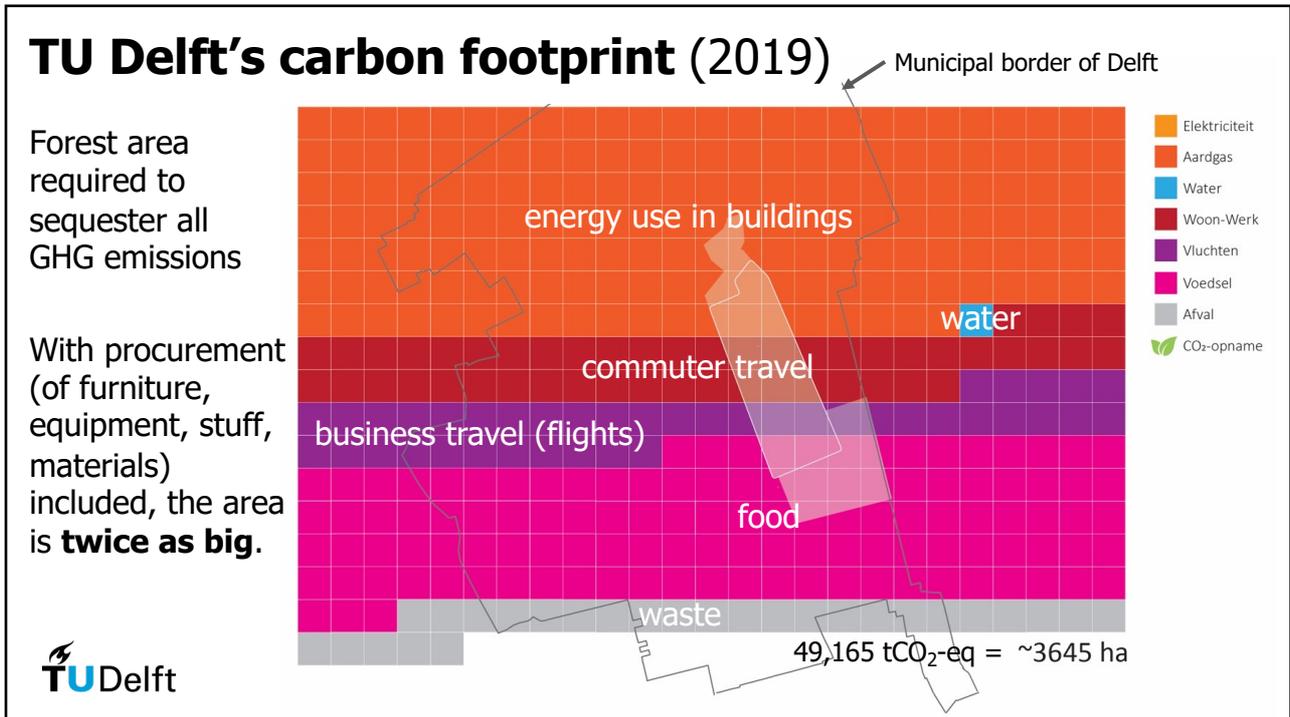
15

# Carbon accounting: the basis

**CO<sub>2</sub>-eq in 2019**  
according to the  
CO<sub>2</sub>-Prestatieladder  
(GHG emission protocol)



16



17

## A new financial approach

### Total Cost of Ownership (TCO)

+ additional CO<sub>2</sub> price\* = **TCO<sub>2</sub>**

- All important financial decisions
- Selection of proposals and partnerships
- Internal carbon tax (e.g. for flying)
- Internal price corrections (e.g. for food)

\* Currently set at €150/tonne of CO<sub>2</sub>-eq; will probably be raised to €1000/tonne

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# TU Delft: practise what we teach & preach

- **Carbon neutral, by 2030**  
related to all activities done on and from the campus
- **Circular, by 2030**  
referring to all resource and waste flows through the campus
- **Climate-adaptive, by 2030**  
dealing with heat, drought, rain, floods, extreme weather
- **Contributing to quality of life**  
aiming at biodiversity, safety, health, inclusiveness, happiness
- **Exposing & testing sustainability**  
accommodating and demonstrating living labs and innovation

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## Quite an organisation...

Coordination:

- **Sustainability Coordinator**
- **Core Team**
- **Theme Teams**
- **LSCs**

All join:

- **Faculties** (coloured petals)
- **Support** (grey petals)
- **Students** (GreenTU)
- **Executive Board** (CvB, stem)

**TU Delft**

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## Action on the campus of a 'climate university'

- **Education for sustainability**  
→ What do engineers of the future absolutely need to know and do?
- **Campus as a living lab (research, valorisation and technology transfer)**  
→ attuned with the Climate Action Programme
- **Sustainable operations**  
→ Themes: EcoCampus; Construction & Renovation; Energy Systems; Mobility; IT, AI & Data Management; Procurement & Waste Management; Food & Beverage
- **Community involvement (cultural & behavioural change)**  
→ Themes: Governance; Social Engagement & Communication; Reporting



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## Sustainability in education

- **Inventory** of all courses addressing sustainability → **database**
- Getting **basic knowledge** of climate change, sustainable design and engineering in the **BSc programmes** of all faculties
- Offering **advanced, more specific knowledge** of sustainability and climate action in more specialised **MSc programmes**
- **Development of a MOOC** (massive open online course) on **sustainability** and one on **climate action**, to be followed by all TU Delft students

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## The Green Village: our experimental space

23



## The Prêt-à-Loger house, at The Green Village

Solar Decathlon 2014 prize winner

24

## The MOR prototype, now at The Green Village

Solar Decathlon 2019 prize winner



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## SUM (Symbiotic Urban Movement), now in Wuppertal

Solar Decathlon Europe 2022



26

## Campus as a living lab: learning from innovations

- € 20 million for sustainable innovations on the campus
- First 7 proposals approved

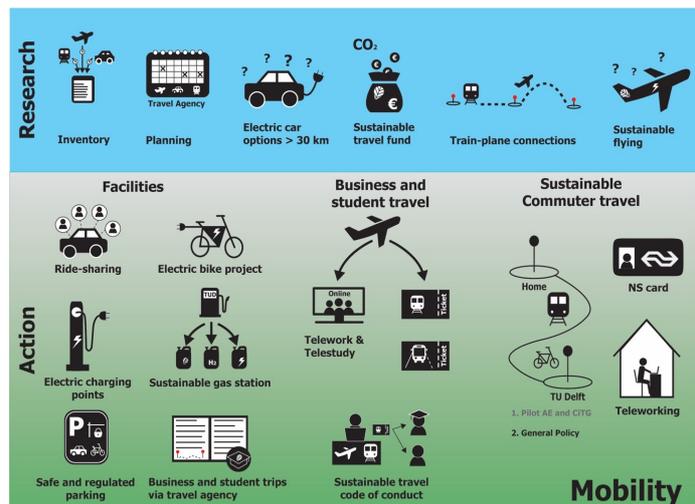


Example: **aquathermal energy pilot** (Firma van Buiten catering on the campus)

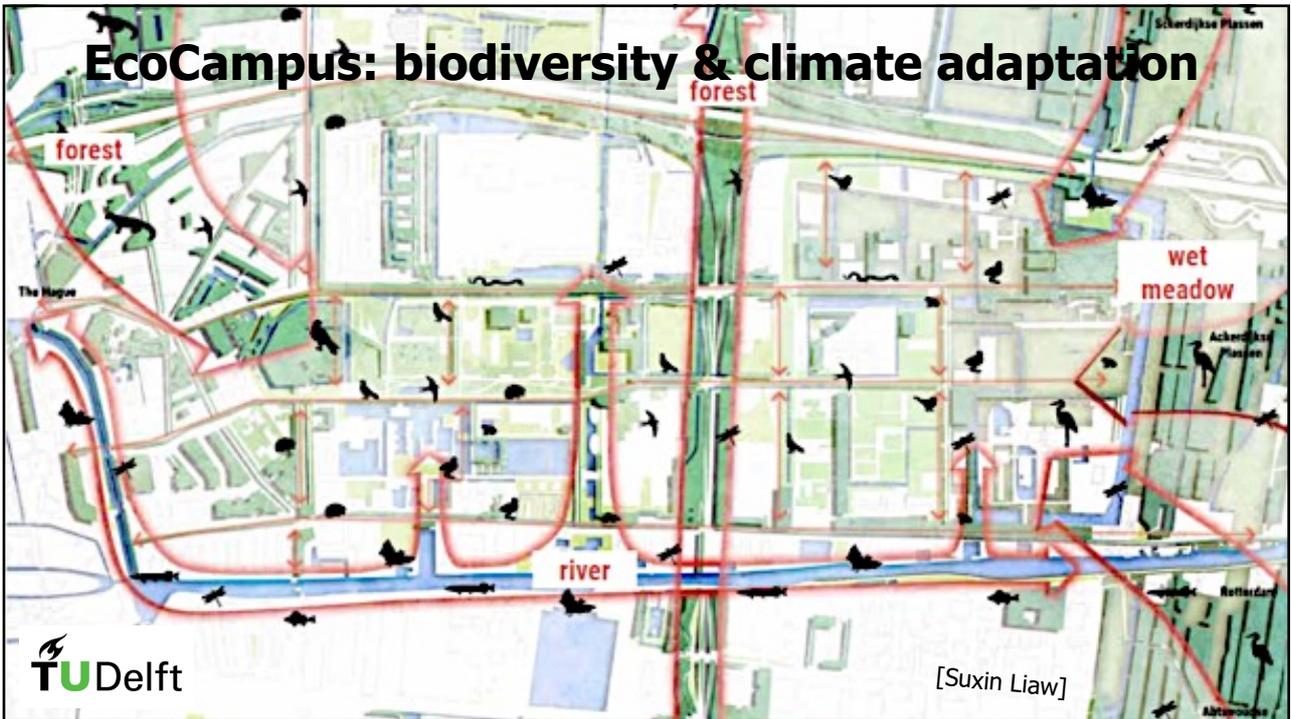
27

## Sustainable operations: the themes we work on

- EcoCampus
- Energy system
- Construction & Renovation
- IT, AI & DM
- Procurement & Waste Management
- Food & Beverage
- Mobility
- Communication & Social Awareness
- Monitoring & Reporting



28



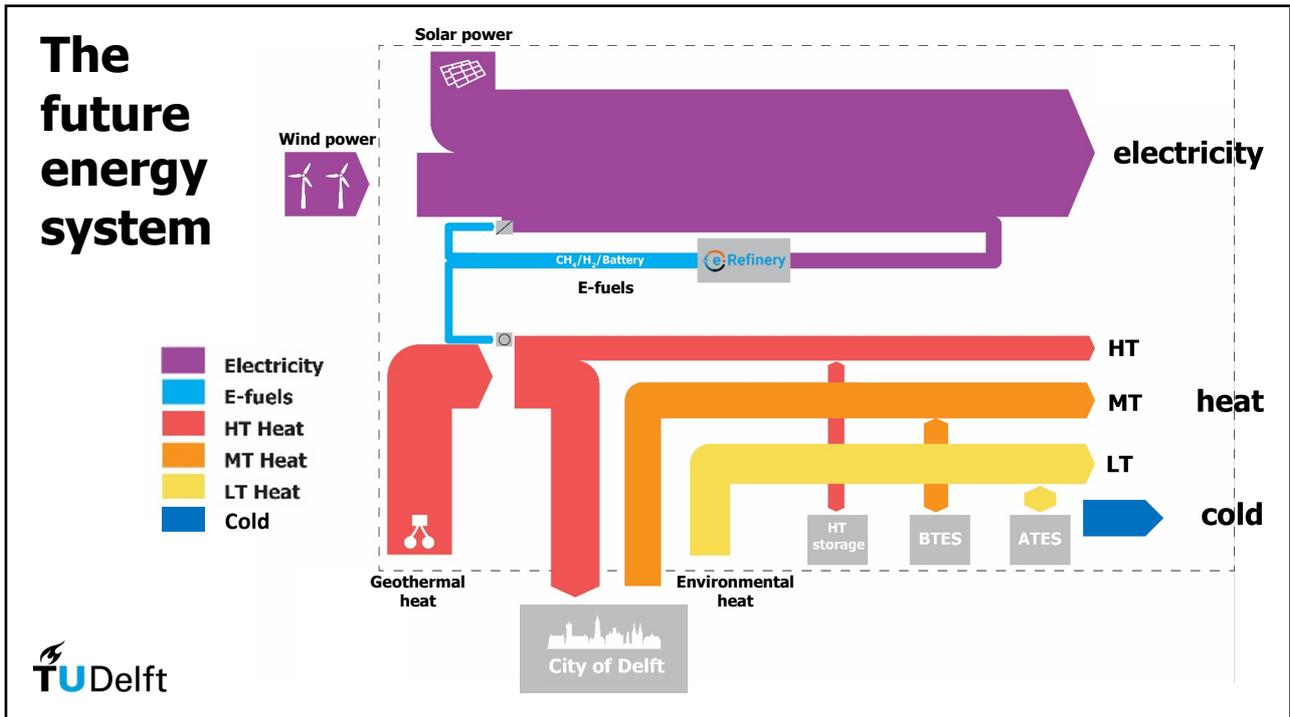
29

**EcoCampus: biodiversity & climate adaptation** [Suxin Liaw]

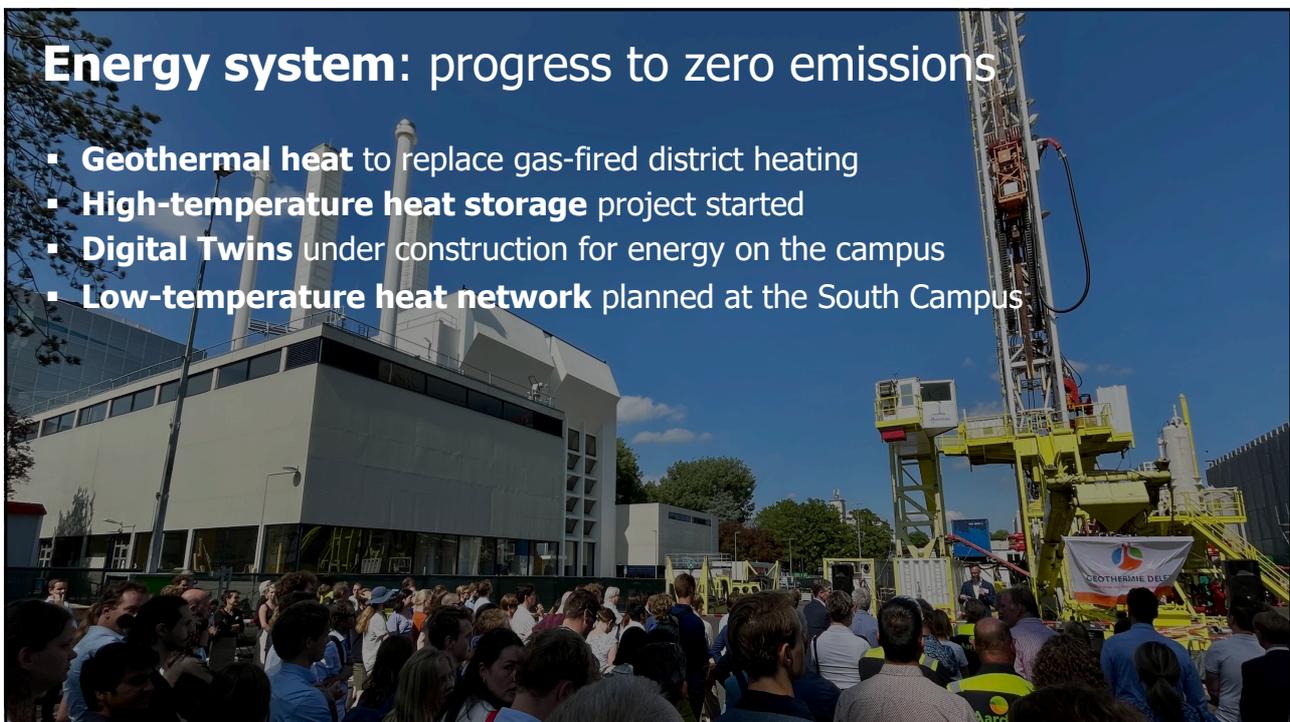
- **TU Delft Hortus** revival
- **Biodiversity 'zero assessment'** done for 2023
- **Biodiversity & climate adaptation** policy document
- **EcoCampus projects** proposed and approved
- **Nature-inclusive designs** on the South Campus
- **National tree-planting day** commitment
- **Saving the bees:** focus on wild bees and honey bees

The slide features a list of updates and a photograph of a jar of honey. The jar is labeled 'TU Delft Honey 2023' and has a gold lid. The TU Delft logo is in the bottom left, and the name '[Suxin Liaw]' is in the top right.

30



31



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## Construction: super-sustainable new buildings

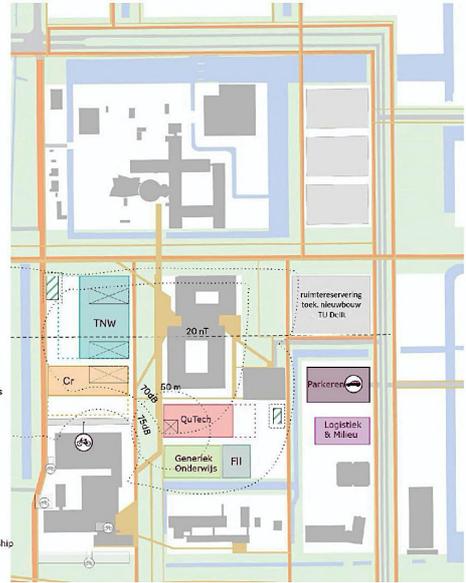
- **ECHO opened** (energy producing, partly circular)
- **Curve opened** (temporary, flexible, circular)
- **Ambitious plans for the South Campus**  
(Physics, Logistiek & Milieu, Q-tech, Cleanroom, General Educational Building, House of Quantum...)



**Kavelindeling**

**Legenda**

	kavel nieuwbouw Pariseren
	L&M kavel nieuwbouw Logistiek & Milieu
	Gen. Ond. kavel nieuwbouw Generiek onderwijs
	QUT kavel nieuwbouw Q-tech
	TNW kavel nieuwbouw TNW - Physics
	Cr ruimtereservering evt. toekomstige Cleanroom
	FIJ ruimtereservering vervanging Fellowship (op termijn)



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## Renovation: large faculty buildings to be done



22



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**Applied Physics (22)**  
**Mech. Engineering (34)**



23



36

**Civil Engineering (23)**  
**Electr. Engineering (36)**

**Done: circular refurbishment of the EEMCS tower**

34

## IT, AI & data management

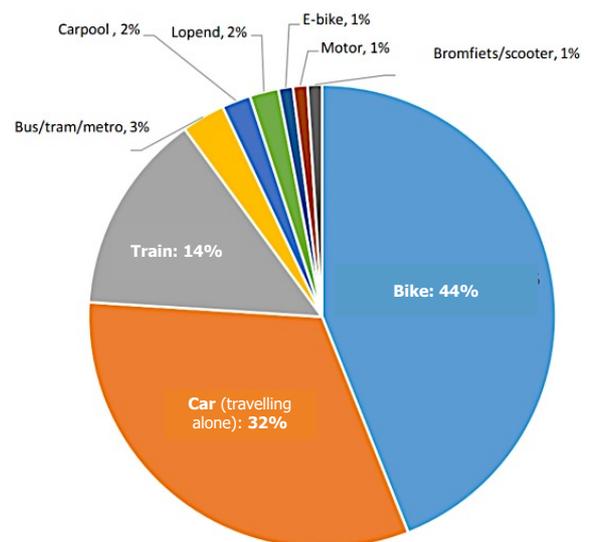
- **Energy efficiency for IT & AI**
  - Effective data usage
  - Better programming
  - New (nano) computing
  - Reusing waste heat from cooling → LT heat network + seasonal storage
- **Use IT and AI to support a smart sustainable campus**
  - Control rooms
  - Machine learning
  - Internet of things
  - Effective data usage

[www.dutchdatacenters.nl]

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## Commuter travel: towards a fossil-free campus

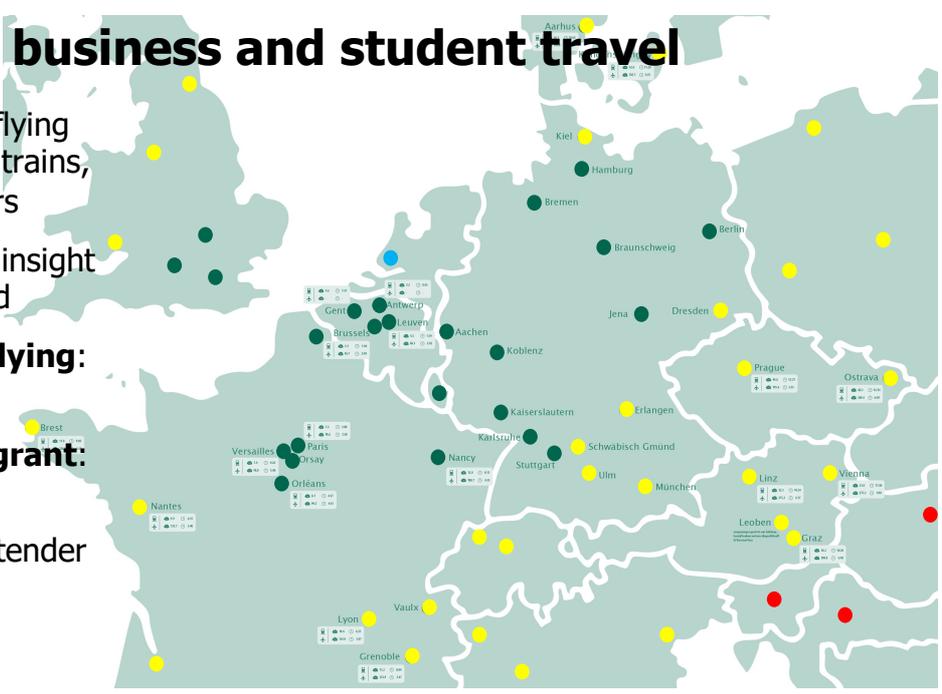
- **New telework policy:**  
20-40% at home, home working facilities
- **Online/hybrid conferences & meetings** through Teams and Zoom
- **New parking policy:** regulated centralised, more charging stations
- **New commuting policy upcoming:** walking/cycling reimbursement, public transport card for all
- **Emission-free vehicles on campus:** service vehicles, company taxis



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## Sustainable business and student travel

- **New policy:** no flying within 800 km → trains, buses, electric cars
- **Student travel:** insight and action needed
- **Carbon tax on flying:** to be proposed
- **Student travel grant:** to be determined
- **Travel agency:** tender upcoming

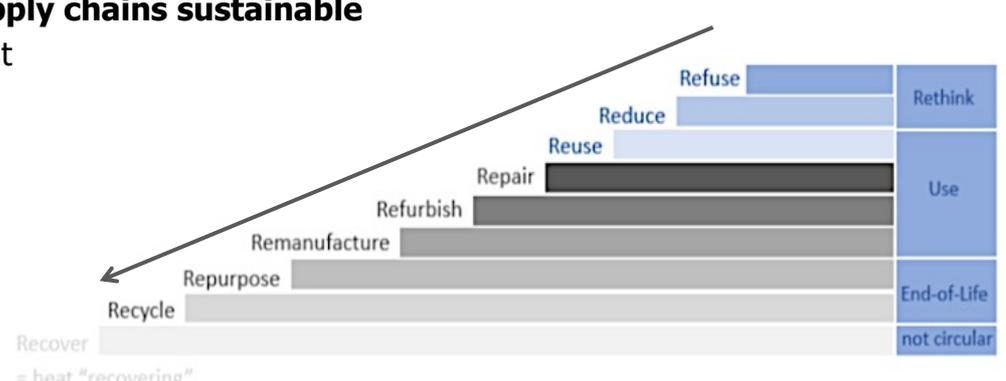


**TU Delft**

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## Sustainable, circular procurement

- **Getting supply chains sustainable**
  - Equipment
  - Furniture
  - Products
  - Materials
  - Services



Recover = heat "recovering"

- Use the **R ladder**

**TU Delft**

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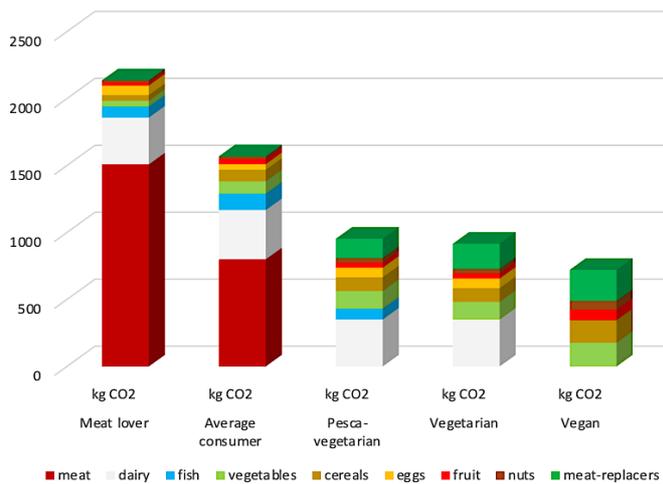
## Procurement & Waste Management: quick action

- **Bring-your-own-cutlery sets** handed out
- **BillieCups** replacing disposable coffee cups
- **Circular procurement policy** implemented
- **New contracts** based on circular and carbon performance
- **Waste management:** new contractor coming



39

## The carbon impact of food



Bartels J, Onwezen MC, Ronteltap A, Fischer ARH, Kole APW, Vegtel RJFM, van Meussen MIG (2009) Eten van Waarde - Pelling Consument en Voedsel (LEI Rapport 2009-059); WUR, Wageningen

Block Consultants (2017) Environmental impact of foods. In: <https://www.blockconsultants.nl/2017/12/08/facts-figures/?lang=en>. Accessed 2017

Doornwaard GJ, Reijs JW, Beldman ACG, Jager JH, Hoogeveen MW (2017) Sectorrapportage Duurzame Zuivelketen - Prestaties 2017 in perspectief

Environmental Working Group (EWG) (2017) The Meat-Eaters Guide to Climate and Environmental Impacts. <https://www.ewg.org/meateatersguide/a-meat-eaters-guide-to-climate-change-health-what-you-eat-matters/climate-and-environmental-impacts/>. Accessed 2017

EUMOFA (2017) "The EU" Fish Market - 2017 edition. In: <https://www.eumofa.eu/documents/2017/1/108446/The+EU+fish+market+2017.pdf>. Accessed 2017

Eurostat (2017) Fishery statistics. In: [https://ec.europa.eu/eurostat/statistics-explained/index.php/Fishery\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php/Fishery_statistics). Accessed 2017

GfK (2006) Versrapport 2006. In: <https://www.gfk.com/>. Accessed 2017

Milieucentraal (2016) Bewust eten. <https://www.milieucentraal.nl/klimaat-en-aarde/klimaatklappers/bewust-eten/>. Accessed 2017

Productschap Pluimvee and Eieren (2013) Jaarverslag 2013. In: <http://docplayer.nl/14348007-Jaarverslag-2013-productschap-pluimvee-en-eieren.html>. Accessed 2017

Rossam CTM, van Buurma-Rethans EJM, Vennemann FBC, Beukers M, Brands HAM, Boer EJ, de Oude MC (2016) The diet of the Dutch - Results of the first two years of the Dutch National Food Consumption Survey 2012-2016 (RIVM Letter report 2016-0082); RIVM, Bilthoven

Vegetariërsbond (2017) Jaarverslag 2017. In: <https://www.vegetariërs.nl/server/specifiek/default/images/File/Jaarverslagen/jaarverslagVegetariërsbond2017.pdf>. Accessed 2017

Voedingcentrum (2017) Noten. In: <http://www.voedingcentrum.nl/encyclopedie/noten.aspx>. Accessed 2017

WUR (2017) Amsterdam's food flows; carbon footprint, key actors and climate policy. <https://www.wur.nl/en/activity/Amsterdams-Food-Flows-Carbon-footprint-key-actors-and-climate-policy.htm>. Accessed 2017

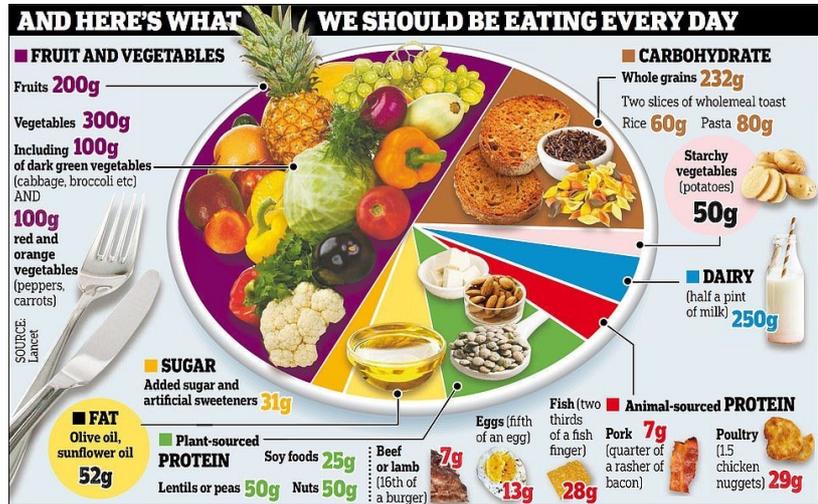


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# Requirements for food on the campus

- Healthy
- Tasty
- Local
- Seasonal
- More vegan
- Less animal-based and if so, animal-friendly
- Bio-organic

Scientific evidence:  
 → **Planetary Health Diet**  
 ('EAT-Lancet')



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# Vegetarian and vegan restaurants



Restaurant of the faculty of Architecture & the Built Environment

Restaurant of ECHO, educational building

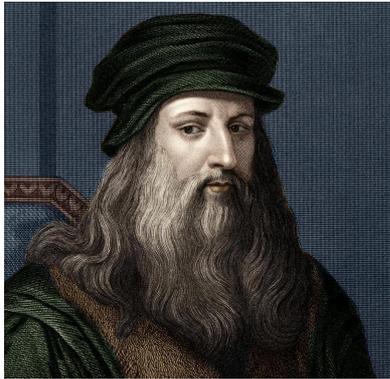


Top-class food in the Faculty Club

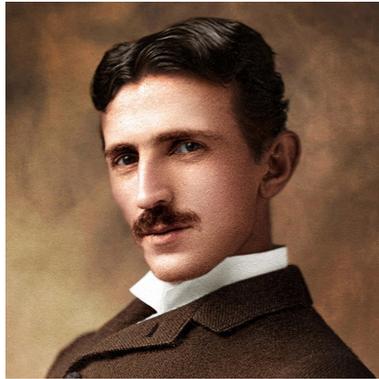


42

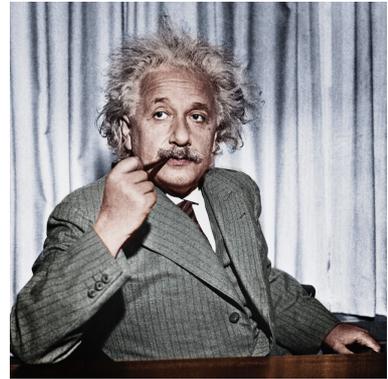
## “Vegetarian food is bad for students’ brains”



Leonardo da Vinci



Nikola Tesla



Albert Einstein



43

## “Veganism is unhealthy”



Jane Goodall



Morrissey



Carl Lewis



44

## Climate action is not without trouble...

- **Everybody likes energy saving and sustainable construction, but when it comes to personal behaviour (food, travel, stuff) it's a different story**
- **Academics understand the need for climate action and sustainability, but the outside world doesn't always and the media love a dogfight...**

University canteen only sells veggie food:  
'A punishment for the meat eater'



▲ John Mesker van snackbar Die Twee (hij runt de tent samen met zijn vrouw) ontvangt studenten die een vleeskroket of broodje tartaar willen met open armen. © Nico Schouten

### Kantine universiteit verkoopt alleen nog vega: 'Een straf voor de vleeseter'

**REAGEER** De kantine van de faculteit Bouwkunde van de TU Delft serveert vanaf deze week als eerste universiteit van Nederland geen vlees.

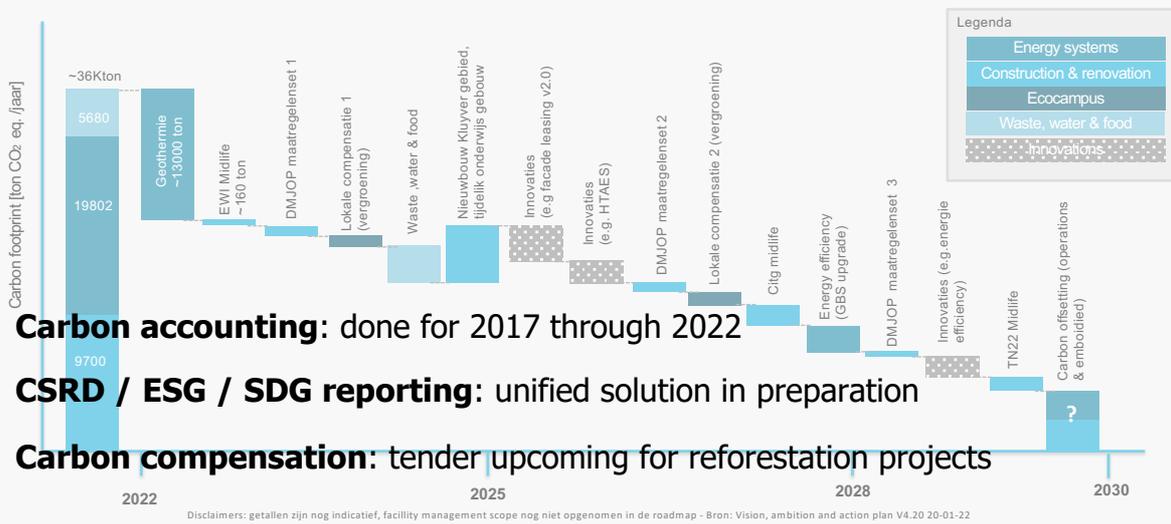
## A process of engagement...

- 21/06/21: AE townhall (online)
- 24/06/21: Utrecht University (online)
- 13/07/21: Collegelunch (Lijm & Cultuur, in person)
- 14/07/21: ASR Real Estate (online)
- 14/07/21: Delft Startup Community (online)
- 03/08/21: OWEE (Aula, recordings, online later)
- 20/08/21: CEG MT (online)
- 25/08/21: IDEA League Summerschool, Aachen (online)
- 31/08/21: ABE MT (ABE, in person)
- 03/09/21: Opening Academic Year (Aula, online)
- 02/09/21: CRE College (online)
- 14/09/21: UvA masterclass (online)
- 28/09/21: TPM MT (online)
- 28/09/21: 3mE MT (online)
- 29/09/21: KLM catering (ABE in person/online)
- 04/10/21: IDE MT (IDE, in person)
- 05/10/21: Stadsakkoord Utrecht (Utrecht, in person)
- 06/10/21: Urban Energy Institute (3ME, in person/online)
- 07/10/21: AS MT (AS, in person)
- 08/10/21: Polytechnic University of Valencia, ES (online)
- 13/10/21: GreenTU (TU Delft Library, in person)

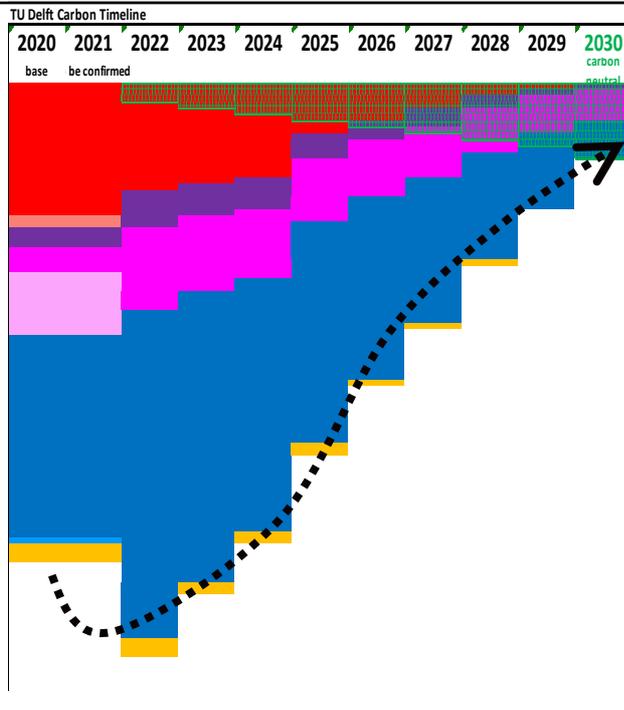
- 14/10/21: QIR international conference (Jakarta, online)
- 22/10/21: Masterclass FAUP, University of Porto (Porto, P)
- 25/10/21: Groepsraad (AS, in person)
- 02/11/21: Prometheus (TGV, in person)
- 03/11/21: Wonen Midden-Delfland (Maasland, in person)
- 09/11/21: COP26 Climate Drinks (TGV, in person)
- 12/11/21: NOC-NSF / Chef de Emission symposium (TGV, in person)
- 15/11/21: Nachhaltige Hochschulen (Detmold, D, online)
- 19/11/21: Smart WorkPlace 'Energietransitie op de campus' (online)
- 30/11/21: Drenthe Woont Circulair (Assen, online)
- 06/12/21: Finance MT (online)
- 09/12/21: ICT-FM MT (online)
- 09/12/21: ICSBE2 conference (Eindhoven, online)
- 15/12/21: CRE project leaders (online)
- 21/12/21: Let's talk about X podcast (X, online in January 2022)
- 25/01/22: GroenLinks Delft (online)
- 03/02/22: European Climate Alliance (online)
- 14/02/22: Raad van Toezicht (WAD Delft, in person)
- 22/02/22: Ecocity World Summit (ABE, online)
- 24/02/22: Olympic Games 2024 (Aula TU Delft, in person)
- 09/03/22: FSW Leiden University (Leiden, online)
- 10/03/22: OR (ABE, in person)
- 15/03/22: Department heads (Art Centre Delft, in person)
- 22/03/22: Building the future symposium (Zwolle, in person)



## Monitoring & Reporting: the proof of the pudding



- **Carbon accounting:** done for 2017 through 2022
- **CSRD / ESG / SDG reporting:** unified solution in preparation
- **Carbon compensation:** tender upcoming for reforestation projects



## Towards net zero carbon

- **Carbon price** included in decisions
- Energy system based on **geothermal** energy and **renewable** production
- Energy **retrofit** of existing buildings
- **Supersustainable**, climate-adaptive, circular, nature-inclusive new buildings
- **Circular contracting**, circular procurement & waste management
- **Fossil-free**, emission-free campus
- **Sustainable travel**, or carbon taxed
- **Sustainable food** in restaurants
- Emission compensation by **forestation**

The image shows the top section of the TU Delft Sustainability website. At the top left is the TU Delft logo. To its right is a navigation menu with links for Home, Vision, Education, Research, Operations, and Community. Further right are language selection buttons for NL and EN, and a search icon. Below the navigation is a large banner image of a TU Delft campus with the text "Sustainability at TU Delft" and the email "sustainability@tudelft.nl" and website "www.sustainability.tudelft.nl". Below the banner are four blue buttons: "Get involved", "EcoCampus", "Construction & Renovation", and "Energy Systems". To the right of these buttons is a section titled "Climate action on campus" with a sub-header "By 2030, TU Delft aims to be operating in a completely sustainable manner. All activities on and from the campus will then be carbon neutral, circular, climate adaptive and contributing to the quality of life for its users and for nature." Below this is a "Dashboard 2020 baseline" link. To the right is a "News" section with a photo of people and the headline "Duurzaam ontwerp gaat niet alleen over het materiaal". At the bottom of the page is a secondary navigation menu identical to the one at the top.

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The image displays the cover and first pages of a report titled "Universities taking action". The cover features a large blue and red graphic with the text "Sustainability and Climate Action on Campuses" and "Working Group on Climate and Sustainability". It lists the participating institutions: IDEA League, TU Delft, ETH Zurich, RWTH Aachen, Chalmers, and Politecnico di Milano. The report's table of contents is visible on the left, showing sections like "Part A - Call to Action", "Part B - Learn", and "Part C - Getting it Done". The main content area includes a photo of students, a photo of a solar panel array on a building roof, and text describing carbon-neutral fuels and a solar mini-utility.

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