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Sustainable Mobility Plan

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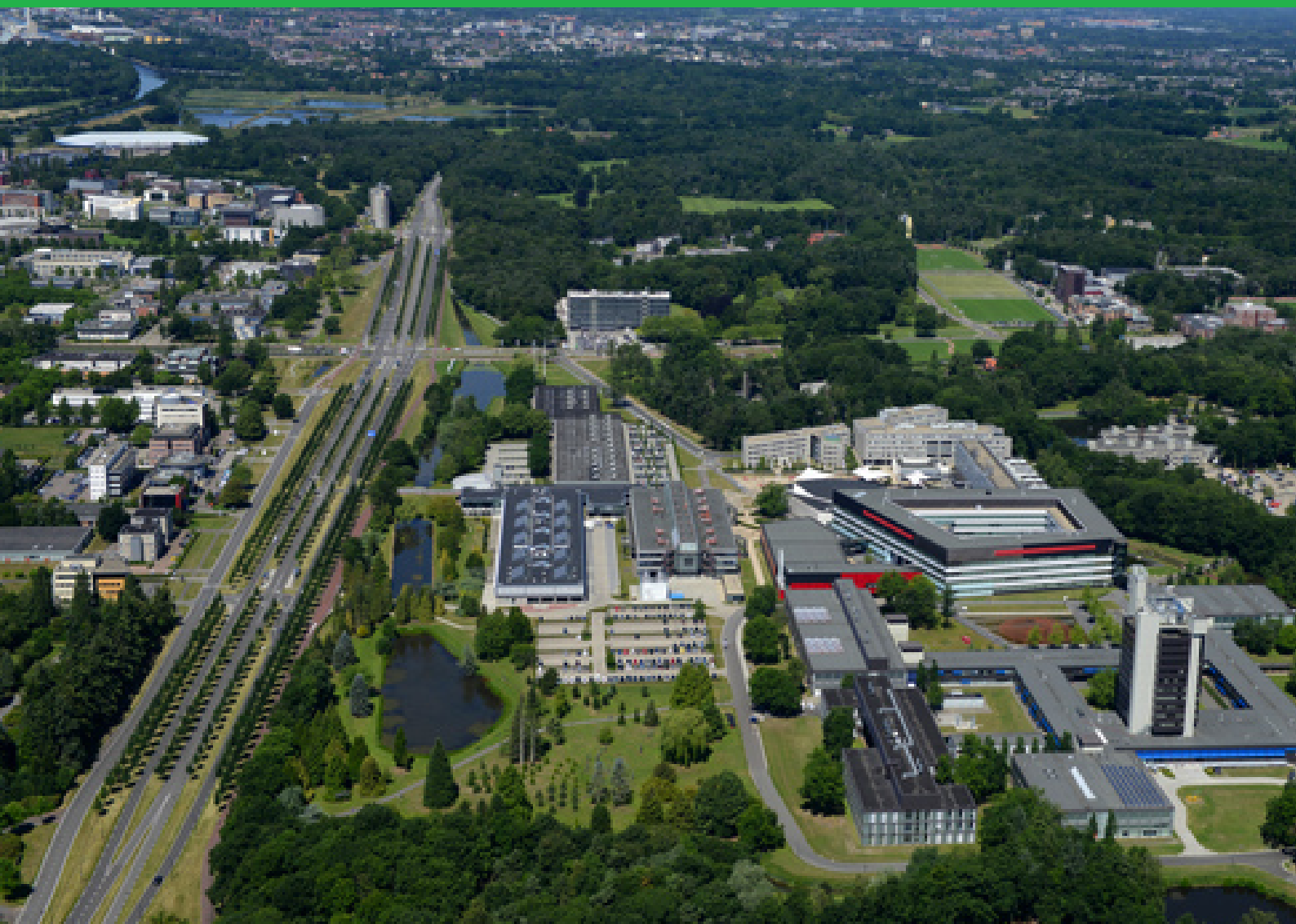
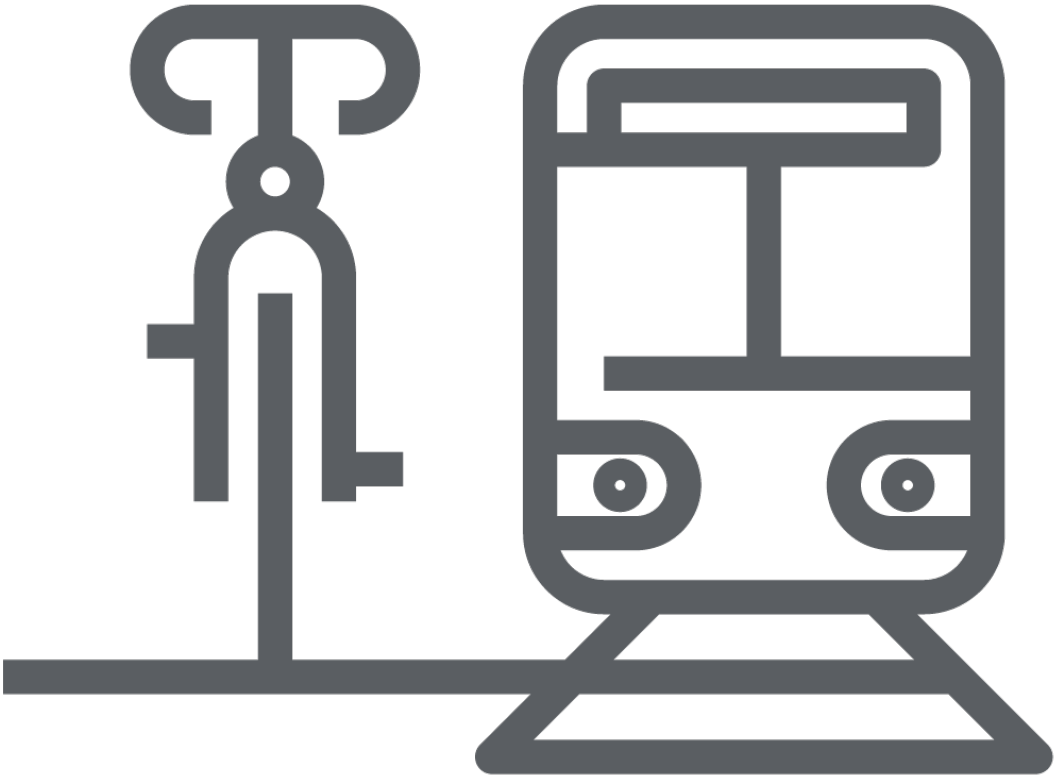


UNIVERSITEIT TWENTE.

MOBILITY AT UT

SUSTAINABILITY

Sustainable Mobility Plan 2021-2030



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AUTHOR
B.Maréchal

PHONE
+31-53 489 1855

E-MAIL
b.marechal@utwente.nl

CONTRIBUTORS
H.M. de Gruijter (Literature review, survey, postcode analysis, 30km/h zone project), C. Hilgeholt, R .Klumpert, H.J.M. de Brouwer, R.H Belt, I.Bos (all CFM), P.W. de Vries (BMS), D. Brinkhof (BMS), A.M. Wiggers (FIN), K.T. Geurs (ET), A.G.M.J. Holterman (HR), L.M. Bloemen (HR), A.P. van den Beukel (ET), I.M. Felius (HR), G.J.M. Gerrits-Oosterlaken (Travel Unit, ITC), T. Thomas (ET), J. Schmitz (EEMCS).

POSTAL ADDRESS
Postbus 217
7500 AE Enschede

WEBSITE
https://www.utwente.nl/sustainability

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DOCUMENT MANAGEMENT

History

VERSION	DATE	AUTHOR(S)	CHANGES	APPROVED NAME
0.1	29 april 2021	B. Maréchal	Initial document	
0.2	25 May 2021	B. Maréchal	Contributions from UT colleagues	SEE SG
0.3	18 June 2021	B. Maréchal	3.1, 4.1 addition of CO_2 footprint mobility	

Distribution

NAME	FUNCTION	ORGANISATION
SG SEE	Steering Group	UT
UCB	Operational Management	UT

EXECUTIVE SUMMARY

The basic principles of sustainable mobility are reducing the CO_2 emissions as a result of all forms of travel by employees and students and promote more sustainable modes of travel. This plan describes the current situation, the desired situation and proposes a planning for the period up to 2023.

Mobility information was scattered across different departments at UT. In 2018, the responsibility for coordinating mobility ambitions was moved from HR to CFM. This report has combined all available information making it possible to identify gaps. It describes the priorities to start with and many other measures and wishes which will need to be prioritised further.

Chapter 5.1 shows the initial timeline in which are included: finalising the mobility plan, sharing the information and plans on the website, preparing and conducting a mobility survey once we have a reasonably representative commuting situation again (depending on measures due to COVID, but expected in autumn 2021), the development of a TravelCheck and its implementation accompanied by a communication campaign on sustainable travel, other initiatives such as e-bike try-out weeks, testing a student developed biking app, pilot a cycling course for internationals and pilot a ride-sharing app. To be followed by a plan for UT wide CO_2 compensation scheme and more.

A project leader will facility this in collaboration with the SEE Programme as well as with scientists and students across UT.

1 INTRODUCTION

Mobility is one of the priority areas to focus on for improving the sustainability of the organisation. Mobility contributes to 31% of UT's CO_2 footprint (2019), of which 13% is linked to flights and 18% to car travel (University of Twente, 2021). By 2023, UT aims to have reduced its carbon footprint by 15%.
Mobility is one of the ten themes described in the Sustainability Policy on Operational Management, which was approved in May 2020. This mobility plan is an implementation plan of the set goals for mobility. It provides a structured overview of the steps (projects and initiatives) that we will take to achieve the set ambitions. This plan will be a flexible guide that will be adapted when necessary to respond to new developments.

The objectives of the mobility plan are:
- To stimulate the use of more sustainable modes of travel, and
- To reduce the CO_2 footprint related to all modes of travel by students and staff, and
- To promote alternatives to travel.

The targets are:
- Reduce the CO_2 footprint related to mobility by 15% in 2023
- Continue to reduce the footprint towards 2030 reaching a 49% reduction
- Increase the number of people travelling to work by bicycle by at least 10%
- Business trips < 800km, train is standard mode of travel

1.1 What is the scope of this mobility plan?

The scope of the mobility plan is broad. It is to ensure alignment between the various elements of mobility which influence one another in order to facilitate and stimulate sustainable travel. Mobility refers to commuting (travel from home to work and back), work travel (national and international) and micro-mobility (travel you do on campus). The way you travel from home to work is likely to be influenced by the facilities present on campus, facilities off-campus such as cycling infrastructure and public transport, and by financial incentives (through tax benefits linked to bicycle purchase, bicycle maintenance, commuting expenses). Your mode of work travel depends on the available options, the ease of booking as well as the perceived comfort. On top of these factors, engaging communication and initiatives can stimulate staff and students to re-consider their usual mode of travel and choose a more sustainable mode.
While transitioning to sustainable mobility, similar questions to those used in the circularity transition can be asked:
- Rethink - Do I need to travel?
- Refuse an invitation (to travel)
- Reduce the number of trips or the number of people travelling
- Choose virtual attendance
- Choose the most sustainable option when travelling, and
- Compensate your emissions

These questions are part of this mobility plan.

1.2 Background

This plan builds on projects and research conducted in the past at UT. It fits in with the current national and regional goals on mobility.

1.2.1 National and Regional goals

The Dutch government aims to reduce its CO_2 footprint by 49% in 2030. Concerning commuting it had set targets to have 200.000 more commuters using a bicycle in the cabinet period up to 2021 as well as expanding the bicycle highway network. On November 5, UT committed to join the cycling mission for Higher Education facilitated by the Ministry of Infrastructure and Water Management to increase the number of people that cycle to UT by 10%. The province of Overijssel stimulates travelling by bicycle (especially below 15km), a high quality and safe cycling network, encourages commuters to avoid the rush hour and stimulates the use of public transport.

1.2.2 Municipal mobility plans

The municipality of Enschede strives for sustainable mobility, with four main goals (Gemeente Enschede, 2020):

1. Improving of the external accessibility of the city center of Enschede, Enschede-West and the Triangle of Innovation ('Innovatiedriehoek' consists of Hart van Zuid, Hengelo, Science and Business Park (Kennispark) Enschede and the UT).
2. Improving the internal accessibility through a modal shift to sustainable modes of transportation.
3. Contributing to an attractive inner city
4. Improving traffic safety.

The city of Enschede would like to stimulate bicycle use the next years. The main goal is an increase of 4% in the modal share of 0 - 7.5 km trips. Additionally, the municipality aims for a 30% reduction in impactful bicycle accidents, 15% increase in bicycle parking facilities and to ensure at least 50% of the most important bicycle connections is in line with the demands of bicycle friendly infrastructure (Gemeente Enschede, 2020).
Concerning innovations in mobility, the municipality of Enschede foresees large transformations. A significant share of transportation modes will be electrified, with a neighbourhood specific investment in charging facilities. Also, a shift from privately owned to publicly shared mobility: smarter and electrified shared vehicles will be offered in larger numbers than currently available (Gemeente Enschede, 2020).

1.2.3 Legislation on Energy / Mobility

A mobility plan is one of the requirements under the MJA agreements[1] as an element of the Energy Efficiency Plan (EEP): 1. Optimize motorized transport movements on campus; 2. Work towards energy neutral commuting. Reducing car use and stimulate bicycle and public transport usage. Both approaches will contribute to lowering the university's CO_2 footprint.

1.2.4 Developments concerning sustainable mobility

Most universities have put in place barriers to deal with accessibility issues and to encourage sustainable mobility. One of the interventions is paid parking, with allowances/exceptions for people who have no alternative and a few free days a year.

[1] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/hoger-onderwijs

In 2018, the term flight shame was coined in Sweden, the unease felt by environmentally conscious travelers when flying. Discussions have evolved[2][3] after that among the scientific community about the role scientists play themselves in this issue where the focus is on ending unnecessary travel and ensuring that all decisions to travel by plane are made consciously. The Young Academy conducted a study on the extent of academic flying, what measures universities are taken en how effective these are[4].

1.2.5 UT strategy

The UT strategy Shaping 2030 emphasizes sustainability and in particular mobility. UT's Strategic goal 'Shaping Society' describes that by 2030 UT has become a sustainable organisation. The goal for realizing this ambition is to start by reducing our carbon footprint by 15% in 2023 through the implementation of sustainable solutions in the areas of food, water, waste, travel and energy use. One of the actions to be taken to reach this goal by 2023 is to increase environmental awareness by setting up a Green Hub. The second action point mentioned is: In order to reduce travel, our people will be fully accustomed to using digital technologies for conferencing. When travel is unavoidable, we will no longer use airlines for <800km trips.

1.2.6 UT Policy on Sustainable Operational Management

The Sustainability policy on Operational Management was written to integrate sustainability in the organisation. This means systematically reducing the use of resources, energy and reducing the damaging consequences of the activities of the organisation such as pollution to the air, water and soil. The goals of the Sustainability Policy center around ten themes to facilitate the implementation within the organisation.
Elements of sustainable mobility are reducing travel, more sustainable travel and increasing cycling & the use of public transport. There are many ways how UT can address these aspects. Initial suggestions mentioned in the policy are prioritising sustainable travel options offered by the travel agency, by facilitating electric car sharing, by limiting reimbursements when using unsustainable modes of travel, for commuting or work travel. By offering alternatives to travel such as teleconferencing facilities and software and by compensating CO_2 emissions of work trips. This will be elaborated further in this document.

1.2.7 UT studies on UT mobility

In 2006, a study was conducted by BMD advice on the possibilities to limit staff commuter traffic by car as part of the environmental permit of the UT.

In 2011 a study was conducted by the Transport Engineering and Management department, Faculty ET, on the mobility behaviour of UT staff and students in support of the Mobility Covenant initiated by Twente Mobiel and signed by UT in 2009. This study consisted of three elements: A survey to obtain a baseline with questions on travel times, distances, mode of travel for people's commute; a survey among students on mobility behaviour, existing facilities and possible mobility management measures; and a mobility scan based on the four postal code numbers (PC4) where the potential for sustainable modes of travel (cycling, public transport) was assessed.

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[2] https://www.timetoexplane.com/index.php/the-explane-toolkit/
[3] http://flyinglessresourceguide.info/
[4] https://www.dejongeakademie.nl/shared/resources/documents/rapport-flying-high-but-flying-less-2020.pdf

In 2016, as part of a postdoctoral research a survey was conducted on the factors influencing commuting by bicycle. There was a specific focus on employees and their attitudes towards cycling and public transportation.

In 2019 – 2020 plans for a mobility survey had to be postponed due to COVID. The COVID measures resulted in a situation where few people travel to campus. It was expected that a survey conducted during this time would not result in a representative response. It was decided a survey for a specific target group for whom a faculty dashboard could be used would be conducted instead. This was a survey focused on students living in Germany. Their mode of travel before and during COVID and their view on new modes of transport (ridesharing) were collected.

2 LITERATURE REVIEW

In this chapter, trends in sustainable mobility are explored.

2.1 Sustainable mobility from a scientific perspective

We define sustainable mobility as a *'shift in mobility patterns in such a way that it benefits the environment, personal or public health and simultaneously provides an acceptable level of location-based accessibility.'* (Geurs & van Wee, 2004) (Banister, 2008). In simple words, we would like to see that employees and students of the UT travel with sustainable transportation modes in such a way that it contributes to their health and that the travel time is acceptable. For short distances, we advise to use the (e-)bike. For longer distances a speed pedelec of public transportation. However, public transportation is only a realistic alternative if the travel time is not twice the travel time by car and number of transfers is acceptable.

Mobility has a significant impact on the environment. A so-called sustainable mobility approach (cf. Banister, 2008) reduces the environmental impact of mobility of UT employees and students. This sustainable mobility approach does not solely include technological innovations (such as electrification of the car fleet), but evaluates 'sustainable mobility' in a broader perspective, taken into consideration (Banister, 2008):
1. Reducing the need to travel (substitution)
2. Transport policy measures (modal shift)
3. Land-use policy measures (distance reduction)
4. Technological innovation (efficiency increase)

2.1.1 Substitution – Reducing the need to travel

In its pure form substitution means that a trip is no longer made, as it has either been replaced by a non-travel activity or it has been substituted through technology, for example working from home (Banister, 2008). Recently, the COVID-19 pandemic has highly reduced the home-to-work trips.

2.1.2 Modal shift - Transport policy measures

Transport policy measures can reduce levels of car use through the promotion of walk and cycle and the development of the new transport hierarchy. This can be achieved through slowing down urban traffic and reallocating space to public transport, through parking controls and road pricing, and through making it easier to use public transport. A much wider notion of the street is being

created, as it is no longer only being considered as a road but also as a space for people, green modes and public transport (Banister, 2008).

2.1.3 Distance reduction - Land-use policy measures

These measures address the physical separation of activities and the means by which distance can be reduced. The idea behind distance reduction is to build sustainable mobility into the patterns of urban form and layouts, which in turn may lead to a switch to green modes of transport (Banister, 2008). The implementation of a bicycle-friendly road infrastructure and a 30 km/h zone on all roads on the campus are examples of transport policy implementation measures.

2.1.4 Efficiency increase - Technological innovation

The role of technology is important as it impacts on the efficiency of transport directly through ensuring that the best available technology is being used in terms of engine design, alternative fuels, and the use of renewable energy sources (Banister, 2008). The last 5 years, the following technological innovations have emerged:

- Electrification of cars
- Shared mobility: unimodal or multimodal
- E-bike
- Speed pedelecs

These innovations are discussed in chapter 2.2.

2.2 Innovations in sustainable mobility

2.2.1 Speed pedelecs and E-bikes

One of the most visible trends in mobility is the emergence of the e-bike. This electrified bicycle makes it possible to reach destinations with less physical effort, compared to conventional cycling. Additionally, usage of an e-bike reduces transportation costs and is healthier, compared to car driving or using public transportation (Mayer, 2019). E-bikes are mostly used for recreational purposes, however, from the years 2013-2017, e-bikes are increasingly used for commuting (23% of all kilometres for commuting in 2017). On average, people riding an e-bike travel 40% further than people riding a conventional bike (Kennisinstituut voor Mobiliteitsbeleid, 2019). Between 2014 and 2019 the annual selling of e-bikes has doubled to 420,000 e-bikes in 2019 (RAI vereniging, 2020). The even faster version of the e-bikes, the speed pedelecs, has similar benefits of the e-bike (less physical effort, transportation costs savings and healthier), but has an advantage of a higher cruising speed of max. 45 km/h. In the province of Overijssel, there are an average of 112 speed pedelecs per 100 thousand inhabitants, an increase of 60% in two years (Centraal Bureau voor de Statistiek, 2019).

	Conventional bike	E-bike	Speed pedelec
Total number Netherlands (2019)	22,800,000	1,900,000	12,500
Max. cruising speed	[-]	25 km/h	45 km/h
Helmet obligation	No	No	Yes

TABLE 1 FACTS AND FIGURES OF CONVENTIONAL BIKES, E-BIKES AND SPEED PEDELECS.

2.2.2 Ridesharing

Ridesharing or carpooling is a phenomenon that exists since the emergence of private mobile vehicles. Essentially it is sharing a ride from origin to destination, based on a non-profit principle (Chan & Shaheen, 2012). In 2011, most mentioned motivations among UT employees and students not to use ridesharing are *'no fixed arriving and departing times'*, *'not knowing colleagues to share a ride with'* and *'travel time increase'*. The introduction of a platform to have ridesharing (e.g. a website) would increase the potential to use ridesharing, stated by employees and students in 2011. With the developments in smartphone applications and smartphone use in the last decade, currently a lot of ridesharing applications are available, for example the application Toogethr or Hopon.

With the emergence of smartphone application in the last decade, the potential of ridesharing has increased: it is easier to look for a ride to take or offer and to arrange payments. Ridesharing applications – such as Toogethr – work on the same principle as smartphone dating applications: matches are made on location and personal preferences (e.g. departure time). Important factors that determine the potential of ridesharing are:

- Location (ride sharers live close to each other)
- Time (ride sharers have almost similar working times)
- Flexibility (ride sharers have multiple options to travel from home to work, enabling single-trip ridesharing)
- Costs (persons sensitive to costs of travelling are more eager to participate in ride sharing)
- Social (persons that are more eager to socialize have a higher intention to participate in ride sharing)

2.2.3 Shared mobility

Shared mobility—the shared use of a motor vehicle, bicycle, or other mode—enables travellers to gain short-term access to transportation modes on an as-needed basis. The term "shared mobility" includes the modes of carsharing, personal vehicle sharing (peer-to-peer carsharing and fractional ownership), bicycle sharing, scooter sharing, traditional ridesharing, transportation network companies (or ride sourcing), and e-Hail (taxis). It can also include flexible transit services, including microtransit, which supplement fixed-route bus and rail services. Shared mobility has proliferated in global cities not only as an innovative transportation mode enhancing urban mobility but also as a potential solution for addressing first- and last-mile connectivity with public transit. It can extend the catchment area of public transportation, potentially playing a pivotal role in bridging gaps in the existing transportation network and encouraging multimodality for first- and last-mile trips rather than driving alone. While public transit is often constrained by fixed routes, driver availability, and vehicle scheduling, shared mobility's "on-demand" access provides the flexibility that travellers need to access or egress from a bus or rail "trunk line." Moreover, shared mobility provides an alternative to costly feeder bus services and land-intensive parking infrastructure (Shaheen, 2016).

2.2.4 Mobility as a Service (MaaS) and mobility hubs

Currently, all shared modes available nearby are rented with separate subscriptions and/or separate means of reservation: smartphone application or a physical card. The NS OV-bike and Greenwheels are rented with a physical card (i.e. the *OV-chipcard)*, Go Sharing scooters and Go About campus bikes are rented with a smartphone application. Integration of all these shared modes in one application or physical card could stimulate the use of different shared modes and is called Mobility-as-a-Service (MaaS). This essentially is: '… *a mobility distribution model in which customer's major transportation needs are met over one interface and are offered by a service provider'* (Smith, Sochor, & Karlsson, 2018). One of the core aspects of MaaS is to improve the booking process of shared modes for its users: planning, booking and travelling with one

smartphone application. These shared modes could be combined with rental cars in a so-called mobility hub. In the *'Kennispark Twente Structuurvisie 2030',* a location for a mobility hub near the building Spiegel is proposed (Gemeente Enschede, 2020).

2.2.5 Working from Home

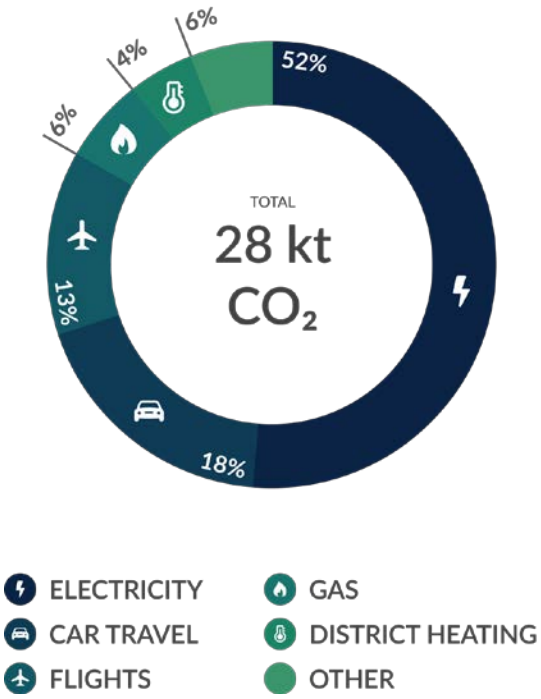
Working from home or 'teleworking' comprises *"… the use of telecommunications technology at home, or at a location close to home, during regular work hours, instead of commuting to a conventional workplace"* (Ravalet & Rerat, 2019). Teleworking represents a way of reducing mobility and, specifically, avoiding commuting. It is viewed as a tool to limit the environmental impacts of mobility and to reduce infrastructure congestion. Teleworkers live further away from the workplace than their colleagues (24.6 km vs. 16.1 km) (Ravalet & Rerat, 2019). In 2011, 50% of the UT employees indicated that flexible working times are important to them, especially for households with children (Geurs, Zaalberg, & van Trijp, Nulmeting quickscan mobiliteit: Universiteit Twente, 2011). Especially due to the developments around the Coronavirus, working from home might be more common in the future. The *Kennisinsituut voor Mobiliteitsbeleid* expects that after the Corona crisis, more employees are willing to work from home. 60% of the 'workers from home' expect to work 1-2 days from home in the future. This does not hold for students: they have fewer positive experiences with working from home, compared to employees (Kennisinstituut voor Mobiliteitsbeleid, 2020).

2.2.6 Electric cars

Electric cars do emit CO_2 in the user phase but do require rare metals that are mined with negative consequences for the local natural environment. These cars are also heavier than small fossil fuel powered cars. The weight has an impact on the energy needed to move, on roads and the required maintenance of roads. A third point to consider is the source of the electricity with which the car is charged. When this comes from renewable sources, the environmental benefits are obviously greater compared to when the electricity is produced by burning fossil fuels. Using vehicles efficiently by reducing the hours a car is standing still (through shared mobility) and using a car with multiple persons (ride-sharing) improves the sustainability score of using electric cars.

3 MOBILITY – CURRENT SITUATION

3.1 CO_2 footprint of mobility



The CO_2 emissions of UT linked to mobility include emissions from commuting, business travel as well as kilometers driven to deliver goods and services to the UT. The kilometers driven by UT's own vehicles contribute to 39 ton CO_2. Kilometers driven by contractors are often not specified separately and are included in the 'other' section of the footprint (scope 3).

FIGURE 1 CO2 FOOTPRINT UNIVERSITY OF TWENTE 2019 (REALISED, 2020)[5]

3.1.1 Calculation CO_2 footprint of commuting

Most employees and students travel to the university by car, train or bike. In 2010, a mobility survey was conducted (Geurs, Zaalberg, & van Trijp, Nulmeting quickscan mobiliteit: Universiteit Twente, 2011). The CO_2 emissions for commuting, provided in table 2, are calculated based on the information from that survey in combination with the adjusted student and employee numbers (Realised, 2020).

Category	Kilometers	Kg CO_2/km	Ton CO_2
Employees car	9,235,897	0.22	2,032
Employees train	8,216,469	0.006	49
Students car	12,951,092	0.22	2,849
Students train	33,097,013	0.006	199
Total emissions			**5,129**

TABLE 2 COMMUTING AND CO_2 IMPACT 2019 (REALISED, 2020)

3.1.2 Calculation of the CO_2 footprint of flying

[5] https://www.utwente.nl/en/sustainability/carbon-footprint/

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 impact of flying is categorised in three categories: short (<700 km), medium (700-2500 km) and long (>2500 km). Based on the data of the Travel Office and the NS management reports the business travel data of employees is shown in table 3.

Category	**Kilometers**	**Kg CO_2/ km**	**Ton CO_2**
Train	4,752,510	0.006	29
Flying short < 700km	638,238	0.297	190
Flying Medium 700-2500km	2,692,438	0.2	538
Flying long > 2500km	20,066,236	0.147	2,950
Car rental	264,100	0.118	31
Car expense claims	909,835	0.22	200
Total emissions			**3,938**

TABLE 3 TRAVEL AND CO_2 IMPACT 2019 (REALISED, 2020)

The CO_2 emission factors used come from https://www.co2emissiefactoren.nl/lijst-emissiefactoren/. This working group indicates that for flying also non-CO_2 emissions (NO_x, PM_{10}, VOS, SO_2) are included into the CO_2 equivalent emission factors mentioned on the website. The emission factors take into consideration differences in emissions at take off, climbing, descending and landing. Climate effect at high altitude, condensation stripes, NOx emissions and influence on cloud formation enhance the greenhouse effect by a factor 2. An average correction factor has been included to attempt to take this into account (Otten, den Boer, & 't Hoen, 2014).

3.2 Commuting – employees

This paragraph includes the most recent data on commuting. Commuting is defined as 'travel some distance between one's home and place of work on a regular basis.'

3.2.1 Comparison UT and Kennispark

In 2020, Twente Mobiel made a comparison of commuting behaviour between UT employees and Kennispark employees. It showed that UT employees use the bicycle significantly more often for short commuting distances (0 – 15 km). However, for medium commuting distances, UT employees more often use the car compared to Kennispark employees, who use public transport more often for distances between 15 and 50 km. For long commuting distances, UT employees significantly more often use public transport and less often the car than Kennispark employees.

Commuting distance	UT employees[1]			Kennispark employees[2]			UT students[1]		
	Car	Public Transport	Bicycle	Car	Public Transport	Bicycle	Car	Public Transport	Bicycle
0 – 15 km	27% ▼	1% ▼	67% ▲	69%	8%	21 %	14%	7%	67%
15 – 50 km	64% ▲	15% ▼	7% ▼	49%	42%	9%	28%	51%	1%
> 50 km	38% ▼	57% ▲	0%	95%	5%	0%	22%	74%	0%

TABLE 4 COMMUTING DISTANCE AND MODE USE. (1) GEURS ET AL. (2011). (2) TWENTE MOBIEL (2020). N.B.

DISTANCE CATEGORIES ARE MERGED FOR BOTH DATASETS, TO COMPARE FOR DISTANCES.

▼ LOWER SHARE COMPARED TO KENNISPARK, POSITIVE WITH RESPECT TO ENVIRONMENT.

▼ LOWER SHARE COMPARED TO KENNISPARK, NEGATIVE WITH RESPECT TO ENVIRONMENT.
▲ HIGHER SHARE COMPARED TO KENNISPARK, POSITIVE WITH RESPECT TO ENVIRONMENT.
▲ HIGHER SHARE COMPARED TO KENNISPARK, NEGATIVE WITH RESPECT TO ENVIRONMENT.

3.2.2 Residence locations (postal code analysis)

In 2019 a mobility scan was conducted using the residential postal codes of all UT employees. The postal codes are used to calculate realistic travel time and travel distance. The scan showed that the average commuting distance is 30.1 km compared to an average commuting distance nation-wide of 22.4 km.
For all employees of the University of Twente residing in the Netherlands, the residence location is known (PC6 location, or Postal 6-digit, e.g. *1234 AB*)[6]. The distances using the existing transport network for all employees and students are calculated using ArcGIS. The same procedure is repeated for UT students[7].

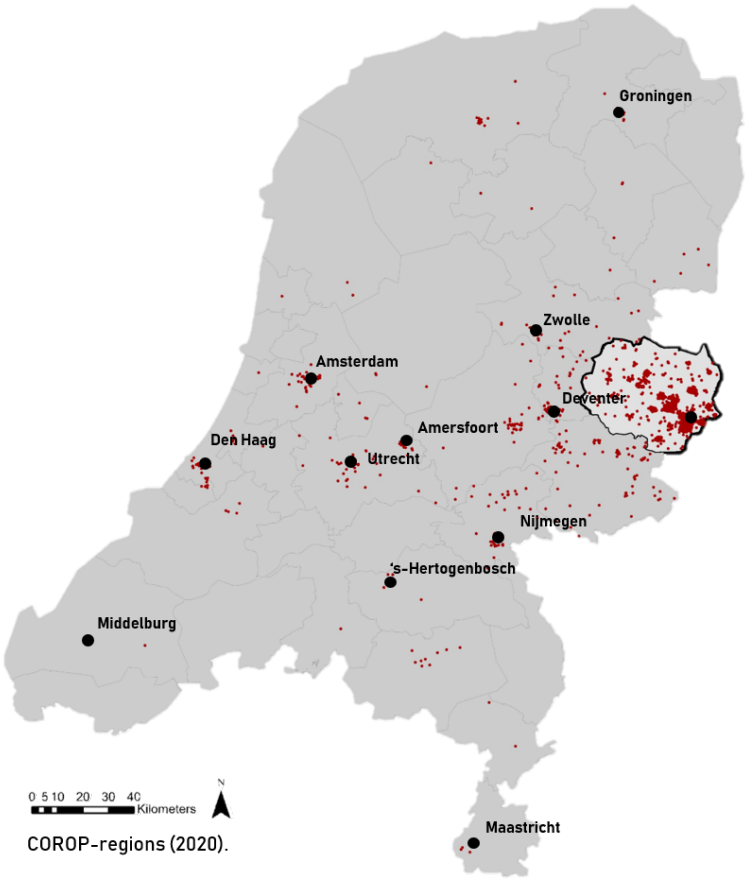


FIGURE 2 RESIDENCE LOCATIONS (PC6) OF UT EMPLOYEES. EACH DOT REPRESENT A PC6 AREA WITH ONE OR MORE EMPLOYEES.

[6] The geographic unit of input is used rather than exact streets and house numbers, due to privacy.
[7] **Disclaimer:** residence locations of students might be biased, since the moment of enrollment, students provide their parent's home address, rather than their student house address. The geographic location of 46% of the German students is known in detail since these postal code data are accurately (5 digits) enough to assign a specific geographic location.

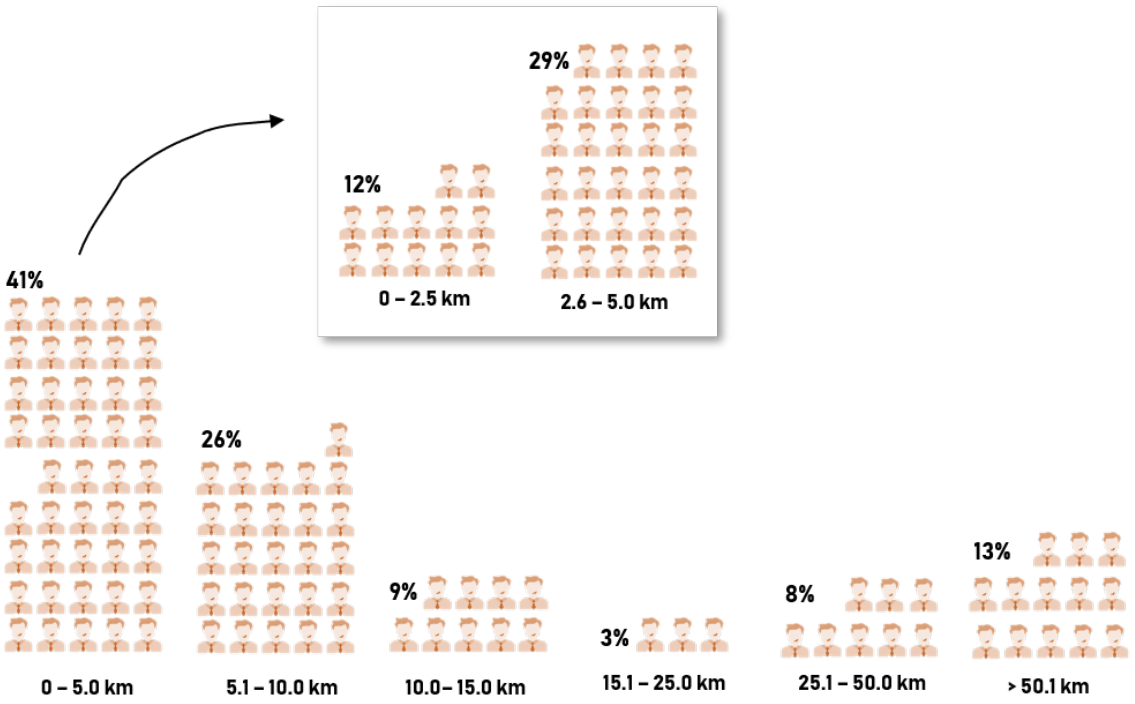


FIGURE 3 COMMUTING DISTANCE UT EMPLOYEES. ONE-WAY TRIP, NETWORK DISTANCE (KM) BASED ON GOOGLE MAPS MODELLING. N = 3157.

UT employees live relatively close to their work location. Almost 80% lives in the Twente region. 67% lives within 10 km of the University. Outside Twente, the spatial distribution of employees is mostly concentrated in medium sized or large cities, close to (intercity) railway stations.
Using the residential location of employees (PC6 areas) and different radii around railway stations, it is concluded that almost a fifth of the UT employees (N=601 or 19%) live within reasonable distance from a railway station (de Gruijter, 2020). Intercity and sprinter stations are distinguished in the analysis, with a radius of 3500m to access the station, which is an acceptable distance to cover by bicycle (Rietveld, 2000).

	Intercity station	**Sprinter station**
Number of employees living 0 – 3500 m from a station	208	393
Percentage of all employees living near a station	6.6%	12.5%

TABLE 5 ACCESS DISTANCES OF UT EMPLOYEES FOR DIFFERENT STATION TYPES (DE GRUIJTER, 2020).

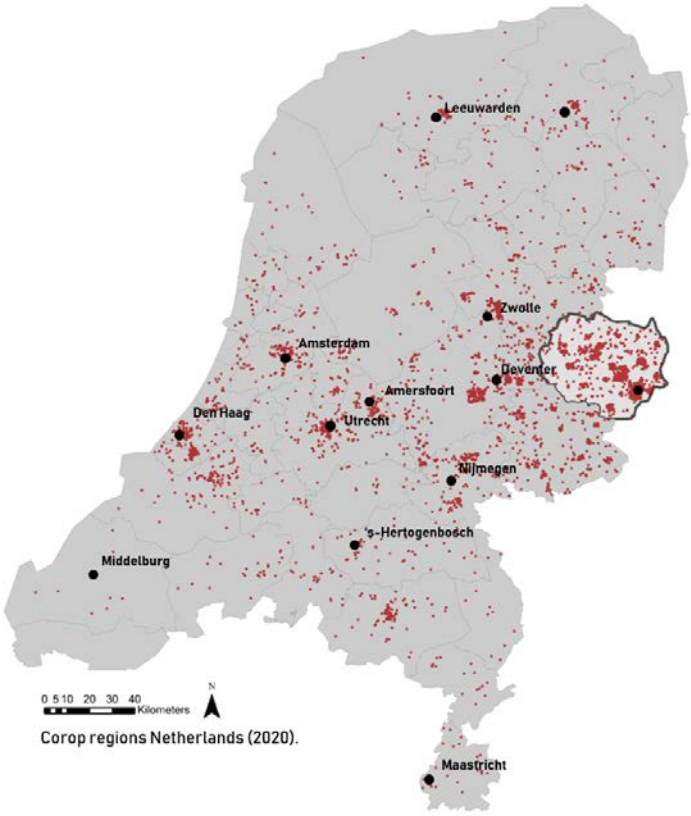


FIGURE 4 RESIDENCE LOCATIONS (PC6) OF UT STUDENTS. EACH DOT REPRESENT A PC6 AREA WITH ONE OR MORE STUDENTS.

64% of students live at < 10km distance from the university of whom 51% < 5km. This data is not accurately enough as many students are formally registered at their parents address but live nearer.

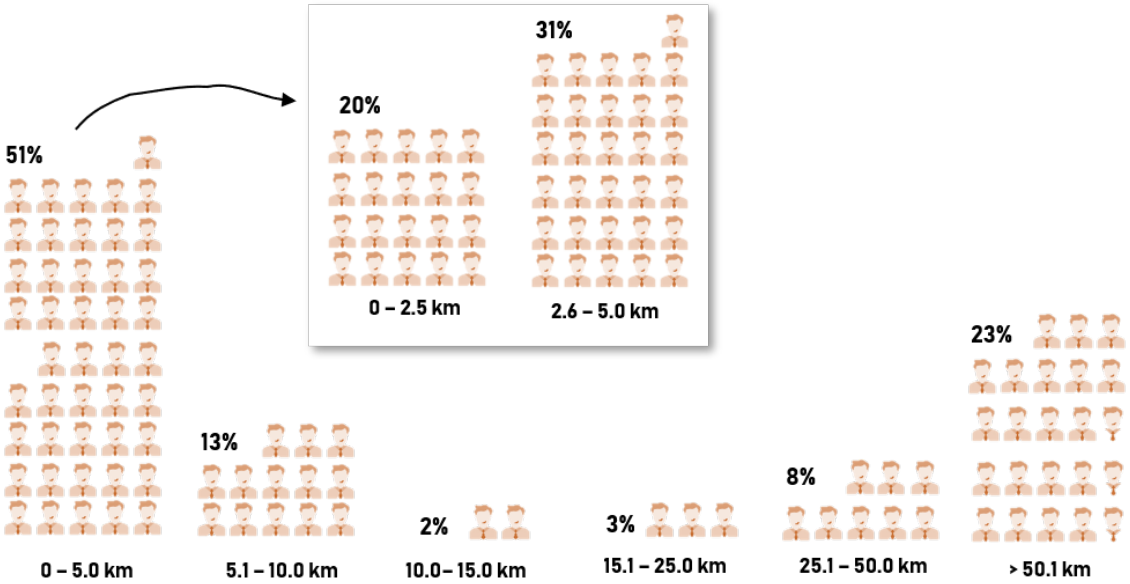


FIGURE 5 COMMUTING DISTANCE STUDENTS: ONE-WAY TRIP, NETWORK DISTANCE (KM) BASED ON GOOGLE MAPS MODELLING. N=10.731

3.2.3 The modal split of commuting (use of means of transportation)

In this paragraph, the use of means of transportation and travel distance are explored in detail.

The figures below provides the 2011 overview of the use of means of transportation to reach the UT. Figure 4 displays the modal split for employees. Figure 5 shows the main modes of transportation for students.

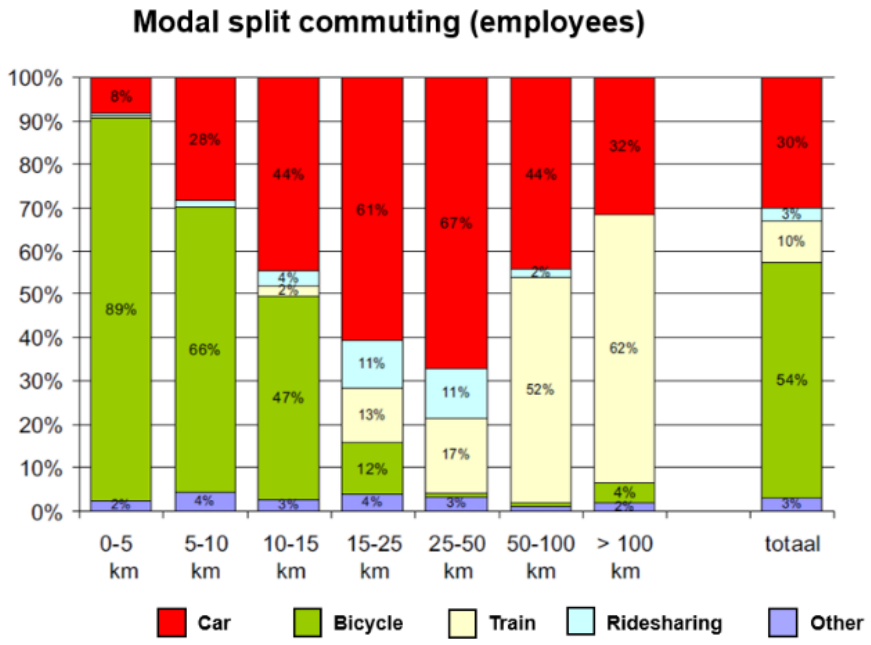


FIGURE 6 MODAL SPLIT EMPLOYEES (GEURS, ZAALBERG, & VAN TRIJP, 2011).

A mobility survey will be conducted once the corona measures will be lifted. In 2020 a focused survey was done on students living in Germany.
The UT has a significant share of students (853 students, 7% of the total) who are based in Germany. There is no data on how these students travel to UT. 12% of the students of the University of Twente living in Germany travel by car between their home address and the university. Especially for distances larger than 10 kilometres, the modal share of the car is between 20 and 30%. For some commuting trips, using a car is inevitable since origins are located in (distant) peripheral areas with insufficient public transportation connections.

The commuting pattern of students from Germany is characterized by most use of the car (as driver) and train to reach the University of Twente. There is a significant reduction of car and train use, comparing the situation before COVID-19 and during COVID-19. It is expected that car and train use will significantly increase after COVID-19. The vast majority of students (90.5% ±8%) possess a car driver's license. 73 of the 100 respondents indicate that they have a (electric) car available to commute to the UT.

It is concluded that most German students evaluate a fast and reliable public transportation connection as important. The current public transportation connection is evaluated negatively by a large share of the respondents (54% ± 8%) and an improvement would lead to an increase in use of public transportation for almost half of the respondents (45% ± 8%). These improvements comprise reduced transfers, lower fees and higher frequencies of public transportation. See Annex II for more details.

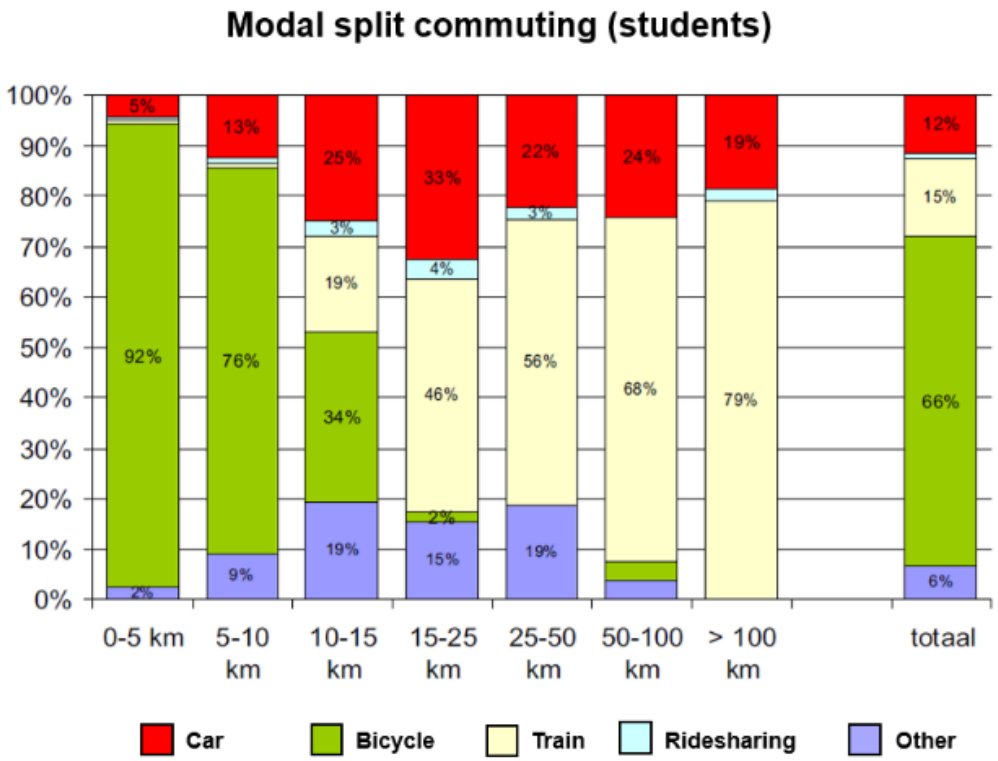


FIGURE 7 MODAL SPLIT COMMUTING STUDENTS (GEURS, ZAALBERG, & VAN TRIJP, 2011).

3.2.4 Bicycle use

In 2016, UT employees use slightly more often the bicycle compared to other companies in the Twente region (68% vs 65%), significantly more often the train (13% vs 3%) and significantly less the car (42% vs 52%) (Fioreze, 2016). Motivations to use the bicycle for commuting are the benefit for personal health and the environment, inexpensive means of transportation and the easy and comfortable way of travelling. The most important motivation *not* to choose the bicycle are bad weather conditions, long travel distance and long travel time. Financial stimuli and safe cycle routes to work would stimulate to choose the bicycle according to UT employees (Fioreze, 2016).

Motivations to use the bicycle	[%]
Cycling is beneficial for my personal health	79%
Cycling is beneficial for the environment	44%
Cycling is an inexpensive means of transport	39%
Cycling is the easiest / most comfortable way of travelling	35%
Cycling has a shorter travel time than other transport modes	32%
I do not possess a car	18%
It is easy to park my bicycle	10%

TABLE 6 MOTIVATIONS MENTIONED BY UT'S EMPLOYEES TO USE THE CAR (FIOREZE, 2016).

3.1.4.1 Speed pedelec

Twente Mobiel (2019) has piloted the use of speed pedelec (a fast electric bicycle) among 65 employees working in Enschede. The participants have used a speed pedelec for 7 days for home-

to-work trips. The aim was a shift from car use to use of a speed pedelec, for commuting distances between 8 and 15 km one-way distance. The majority of participants in the trial (80%) have a commuting distance over 15 km: 35% between 15-20 km and 40% between 20-40 km. After the trial period, 16% of the participants had an intention to buy a speed pedelec, most mentioned motivations *not* to buy a speed pedelec are 'high costs' and 'preference to buy a conventional e-bike' (Twente Mobiel, 2019).

3.2.5 Car use

In 2016 UT employees significantly make less use of a car compared to other companies in the Twente region (42% vs 52%) (Fioreze, 2016). Motivations to use the car are a shorter travel time compared to other modes, comfort (especially during bad weather conditions), combination of different spatiotemporal activities and a to large distance to cycle or walk.

Motivations to use the car	[%]
Car driving has a shorter travel time compared to other modes	50%
Car driving is comfortable during bad weather conditions	50%
Car driving enables the combination of multiple spatiotemporal activities	49%
The distance is too large to cycle or walk	38%
Car driving is the easiest / most comfortable way of travelling	32%
Car driving enables to take along personal belongings	23%

TABLE 7 MOTIVATIONS MENTIONED BY UT'S EMPLOYEES TO USE THE CAR (FIOREZE, 2016).

3.2.5.1 Ridesharing

In November 2020, the ridesharing potential among German students from the faculty BMS was investigated as part of a mobility survey. Looking at the attitude towards a ridesharing pilot 89% ± 8% is (very) positive towards a ridesharing pilot after COVID-19.

Comparing October 2020 with February 2020 (before and during COVID), it is concluded that the magnitude of ridesharing has decreased. The majority of respondents (63% ± 8%) states that it is (very) likely that they will try a ridesharing application for their trip between home and the university. A point reward system is positively evaluated by 43% ± 10% of the students. A money distribution system is evaluated significantly more positive than expected ($\chi^2(\mathrm{df} = 2) = 111.5,\ \mathrm{p} < 0.00$). The majority (92% ± 8%) would like to split the costs. The intention to use ridesharing is mostly explained by positive attitudes towards ridesharing. Somewhat less strong, but still statistically significant, environmental sensitiveness and (the intention to) travel environmentally friendly explain the intention to use ridesharing. Environmental sensitiveness includes the variables derived from the Norm Activation Theory.

3.2.6 Public Transport

The University can be reached by public transport from Enschede Central Station: 15 minutes by bike or around 12 minutes using bus 1, from station Kennispark: 20 min walk, 5 min bike ride or bus 1 (1 min) or from Hengelo station: 10 minutes by bus 8 en 9, 20 minutes by bike.

3.2.6.1 Train use

In 2016, UT employees take the train significantly more often compared to other companies in the Twente region (13% vs 3%). The most important motivations *not* to choose public transportation are long travel times, high costs and a high number of transfers. Higher transit

frequencies and direct bus connections to the university would stimulate to choose transit to reach the University of Twente (Fioreze, 2016).

3.2.6.2 Bus use

Data for the first and second month of 2020 combined are provided here (months during the Corona crisis are excluded). Bus stops with relatively low number of check-ins and check-outs are:

- UT/ Westerbegraafplaats in: 24 | out: 16
- UT/Sportcentrum in: 61 | out:5
- UT/Hoofdingang in: 867 | out: 772
- UT/Drienerbeeklaan in: 867 | out: 1135

Bus stops with relatively high number of check-ins and check-outs are:

- UT/Hallenweg in: 3182 | out: 3021
- Langenkampweg in: 2842 | out: 2754

3.3 Business travel – employees

3.3.1 Flights

A third of all employees travelling for business indicate that they never fly for business trips. Approximately 30% indicates a single flight per year, 22% fly 2-3 times per year, 7% fly 4-5 times per year and 3% fly 6-9 times a year. Less than 1% of the employees flies more than 10 times a year. A large share of the CO_2 footprint is a result of air travel (13%), especially for long-distance flights (10%) (Realised, 2020).

Transportation aspect		**Total number of kilometres**	**Estimated CO_2 footprint (ton kg)**	**% of total UT CO_2 footprint**
Business travel – flights[2]	< 800 km	1.020.468	303	1,1%
	800 – 2500 km	2.310.208	462	1,6%
	> 2500 km	20.066.236	2949	10,3%

TABLE 8 OVERVIEW BUSINESS TRIPS BY PLANE 2019 (2 REALISED (2020) BASED ON VCK (2019)).

3.3.2 Train

Concerning national public transportation, employees travelled 4.752.510 km by train. 67% travel with a 1st class ticket, 33% with a 2nd class ticket. Most employees travel outside rush hours (46%), 29% in morning rush hours and 25% in afternoon rush hours (Nederlandse Spoorwegen, 2020).

Transportation aspect	**Total number of kilometres**	**Estimated CO_2 footprint (ton kg)**	**% of total UT CO_2 footprint**
Business travel – national train	4.752.510	194	0,7%
Business travel – international train[4]	11.535	0.5	<0.1%

TABLE 9 OVERVIEW BUSINESS TRIPS TRAIN 2019. DE GRUIJTER (2020) BASED ON HR (2019).

(4) VCK (2019). N.B. not all international train travel is included, most international trips are booked using the NS business card, some through VCK.

3.3.3 Private car kilometer reimbursement

Kilometres declarations from the use of staff's private car were submitted 4.110 times in 2019: 78% for two-way trips, 22% for one-way trips. The total costs of these kilometre declarations are €172.940, for 909.835 driven kilometres. The average distance per declaration is 221 kilometres.

Remarkable is relative high amount of short distance declarations: 22.4% of the declarations is below 10 km.

Transportation aspect	Total number of kilometres	Estimated CO_2 footprint (ton kg)	% of total UT CO_2 footprint
Business travel – declaration	909.835	155	0,5%

TABLE 10 OVERVIEW BUSINESS TRIPS OWN CAR 2019

3.3.4 Rental car

In 2019, rental cars were hired 599 times. The total costs of hiring these cars is €93.903, used for 264.100 km of driving. The average distance per rental period is 425 kilometres.

Transportation aspect	Total number of kilometres	Estimated CO_2 footprint (ton kg)	% of total UT CO_2 footprint
Business travel – rental cars	264.100	45	0,2%

TABLE 11 OVERVIEW BUSINESS TRIPS RENTED CARS 2019

As from January 2021, electric cars and hybrid cars are the option on offer when renting a car for work travel. To overcome the barriers to the transition of a fossil fuel car to an electric car a day was organised to test an electric car of which a promotional video was made.

3.3.5 CO_2 Compensation

From October 2018, faculty ITC compensates its flights[8]. In 2019 this was done through the funding of sustainable projects in Rwanda with €22.000[9].
In 2019, through the sustainable scientist initiative[10] of Albert van de Berg and Guus Rijnders compensated 300.000 flown kilometers by having 43 ton CO_2 absorbed through the use of greenSands[11], olivine mineral that captures CO_2 when it weathers in humid conditions.

3.4 Study travel – students

There is currently no data available on study travel.

3.5 Mobility on campus

This paragraph describes all relevant subjects related to mobility **on** campus. This includes for example physical infrastructure, but also mobility services available on campus.

3.5.1 Micro mobility: Travel on campus between buildings

Currently, there is no exact data on movements between buildings which are done on foot, by bicycle and by car.

3.5.2 Micro mobility: Movement within buildings

[8] https://www.itc.nl/news/2021/1/945861/itc-offsets-co2-emissions-from-flights
[9] https://www.utoday.nl/news/69449/faculteit-itc-compenseert-uitstoot-vliegreizen
[10] https://www.utoday.nl/news/67473/bomen-planten-in-plaats-van-vliegen
[11] https://www.utoday.nl/news/66767/ut-leerstoel-compenseert-co-uitstoot-vliegreizen

In buildings with multiple floors, there is no specific encouragement to take the stairs instead of the lift. In building Spiegel the walking route facilitates people taking the lift as you need make more of an effort to take the stairs as there is a physical barrier (door).

3.5.3 Transport movements

All non-food items ordered by University employees are received centrally, at Central Reception Goods to minimize transport movements across campus. All incoming goods are registered and stored in a container destined for a specific building. These containers are delivered to the buildings on a daily basis.
The waste containers from the University buildings on campus are semi-underground. These bins have a large capacity and only have to be emptied two times a week compared to three times a week when smaller containers were used. This has reduced the transport movements on campus.
Waste collection for the student houses is done by Twente Milieu. Buildings on campus that are not managed by UT have their own waste collection contract and collection schedule.
In tender contracts sustainability criteria are included. Often these refer to reducing the number of transport movements by combining orders for delivery on-site or making use of electric vehicles.
Fewer transport movements reduces CO_2 emissions, makes the campus safer and causes fewer tremblings which especially affect the research at Nanolab.

3.5.4 Healthy Campus Program

The Healthy Campus program creates an interdisciplinary system that focuses on the wellbeing of all campus users. We aim to bring together all separate initiatives in the area of wellbeing in one platform. Students and employees can obtain their information here as well as share their experiences. Healthy Campus is an inspiring and motivating environment for everyone who lives, works or studies on campus. It will stimulate and motivate the entire community to make healthy choices. The continual development of the program and realising collaboration with faculties, studies, support departments and partners, enables the Young professional to contribute to the Healthy Campus Community.

The Healthy Campus program will focus on the physical and mental health of the UT community. The available sports facilities, courses as well as lunch walks and encouragements to regularly get up from your desk contribute to the vitality and health of the UT community. Both programmes can benefit from alignment and joint promotion of sustainable behaviour.
There is a well-being page for staff[12] and for students[13]
During COVID for example 10 minute workouts to stimulate a break from deskwork have been promoted[14]. Also personal life style checks are offered online[15] to stimulate staff to focus on well-being.

3.5.5 Facilities and services on campus

3.4.5.1 Bicycle parking

[12] https://www.utwente.nl/en/service-portal/health-safety/coronavirus-covid-19/well-being
[13] https://www.utwente.nl/en/ces/sacc/wellbeing/
[14] https://www.utwente.nl/en/sport/news/2021/2/551324/corona-workouts-keep-on-moving-with-our-online-offer
[15] https://www.utwente.nl/en/sport/wellbeing-employees/

Bicycle racks are located at all buildings. For staff these are covered, secure facilities, for students and visitors open-air. At around 12 locations there is covered parking, at 6 locations the capacity has been increased through the use of two level bike storage.

In 2011, 57% of the UT employees and students indicated it to be (very) important to increase the capacity of bicycle parking facilities (Geurs, Zaalberg, & van Trijp, Nulmeting quickscan mobiliteit: Universiteit Twente, 2011).

The current capacity caters for 9441 bicycles.

3.5.5.1 E-bike charging points

Employees of the UT can charge their bicycle at the (covered) employee bicycle parking areas at the Sportcenter, Vrijhof, Spiegel, Paviljoen, Citadel, Waaier and Horst. Outside at the Spiegel building, everyone can charge their bicycle using solar energy. The Campus app can guide you to the nearest e-bike charging facility. There are 32 charging points.

3.5.5.2 Departmental bikes

Several departments have a few bicycles to use for staff that can be used for trips across campus. During sustainability consultations in 2019, people mentioned to use these more frequently if they have a basket or bike bags to be able to carry their things (to a meeting). At the moment there is no UT wide overview of the number of departmental bikes, how frequently these are used, how their maintenance is facilitated nor the state these are in.

3.4.5.4 Car parking and barriers

UT provides all car drivers with a free parking space. Currently, there are around 2551 car parking spaces, 11 motor parking spaces and 31 scooter parking spaces. There are 13 parking spaces for the disabled. The main entrance to the campus is accessible to all, the rear entrance at Horstlindelaan is access-only for employees living that side of UT. There are contractors who need to park in places where there are no regular car parking spaces, they are given a permit to park at permit only spaces. There are 37 permit holder parking spaces.

Several car parks have parking sensors indicating the available free spaces when entering the car park. UT is testing parking sensors and vehicle detection loops at several car parks at the campus. The sensors work better but not all car parks are equipped with these sensors, some have detection loops and others do not (yet) have any form of measurement. The idea behind using sensors or loops is to avoid unnecessary vehicle movements looking for spaces as vacant parking spaces could be made visible in the campus app.

The landscape plan of the campus shows that the designated locations of the car parks are around the edges of the terrain, which may contribute to discouraging car use.

3.5.5.5 Charging stations cars

There are 31 charging stations for electric cars (2020). These are charging at a rate of 11kWh, 21kWh and 22kWh. There are various places to charge your electric car on campus, and you can find charging stations at the GP practice, the Linde, Faculty Club, Spiegel and Garage buildings, P2 at Cubicus and carpark The Es. In order to charge your car, you will need a charging card. Charging costs € 0.25 per kWh.

3.5.5.6 Bike repair shop

The UT campus has a bike repair shop called “De Versnelling” (Building Box). This bike repair shop is a place where young people with an intellectual impairment learn and work in the workshop under supervision.

3.5.5.7 Shower facilities

On campus the Sports Centre has many shower facilities that are accessible to all.

3.5.5.8 Public transport facilities

The route of bus 1 goes across the campus. Bus route 8 and 9 have a stop at the entrance of UT.

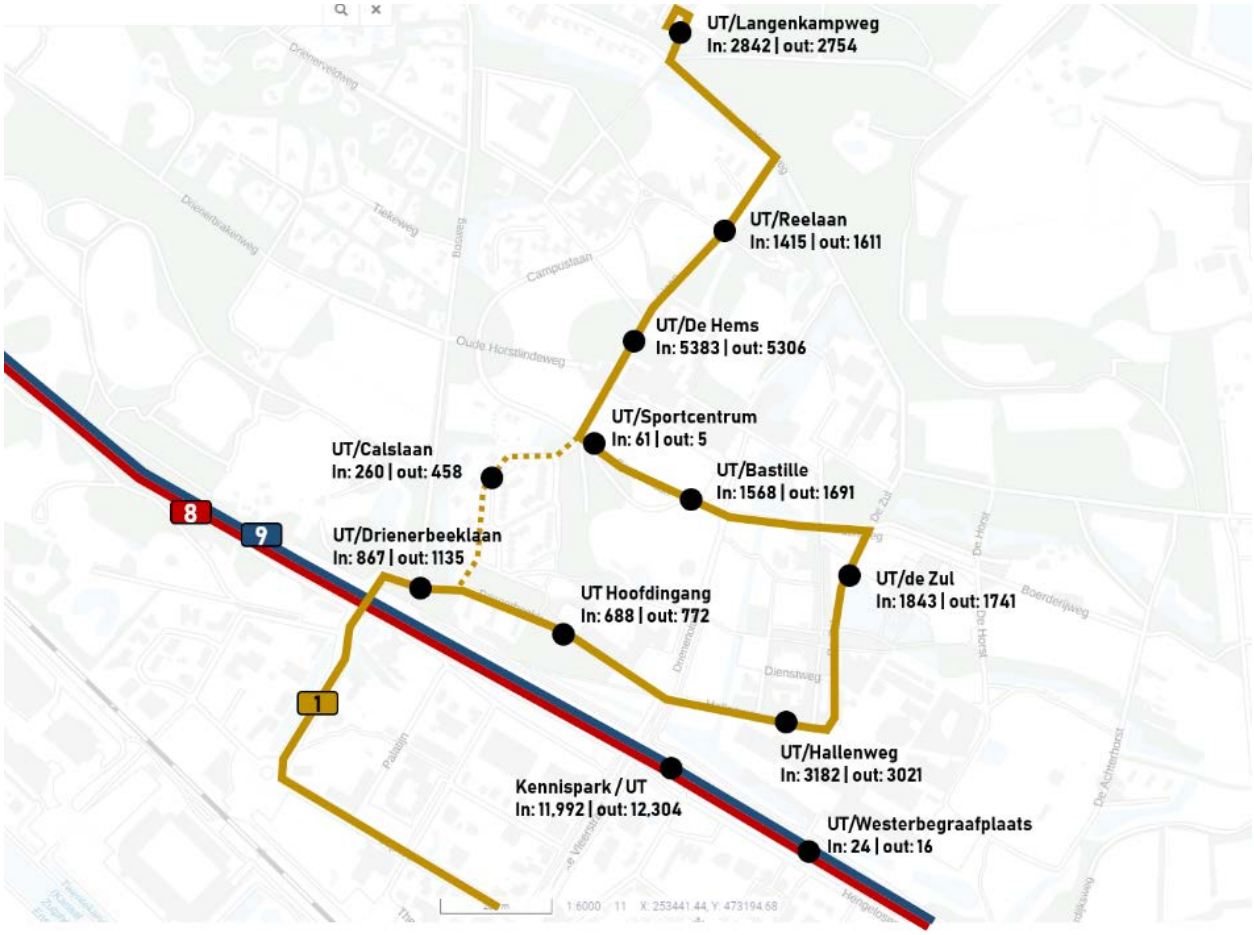


FIGURE 8 BUS STOPS ON CAMPUS

3.5.5.9 Shared mobility on campus

Currently, the following shared mobility options are available in the neighbourhood of the University of Twente campus:

- Go About campus bicycle: shared bicycles in blocks of 4 hours to rent (0-4h: free / 4-8h: €2)
- NS OV-fiets: shared bicycles in blocks of 24 hours to rent (0-24h: €3,85)
- GO Sharing scooters: shared electric scooters to rent per minute (1 min.: €0,29) from mid-2020
- Greenwheels: shared cars to rent per hour and per kilometre (1h: €4 + 1 km.: €0,29).

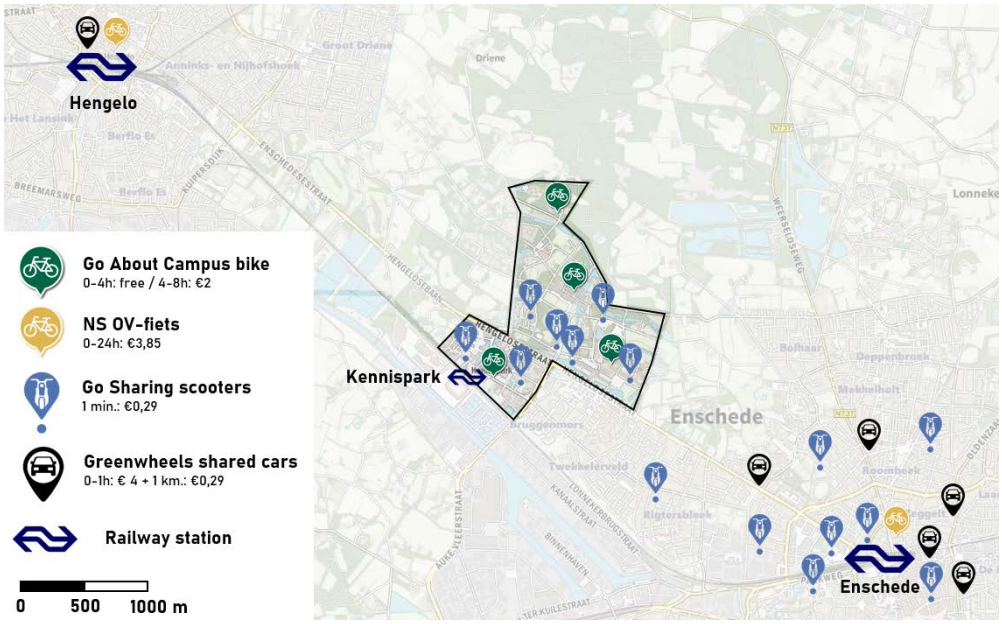


FIGURE 9 LOCATIONS OF SHARED MOBILITY IN THE NEIGHBOURHOOD OF THE UT CAMPUS.

In 2011, 22% of the UT employees thought it is (very) important to have 'pool cars' (I.e. shared cars) available. 25% of the UT students and 17% of the UT employees thought it (very) important to introduce a bicycle sharing facility (Geurs, Zaalberg, & van Trijp, Nulmeting quickscan mobiliteit: Universiteit Twente, 2011).

3.4.5.10 Campus lay-out

The campus infrastructure is divided into roads, bike lanes and walking paths. The O&O square and the Hogekamp square are traffic free.

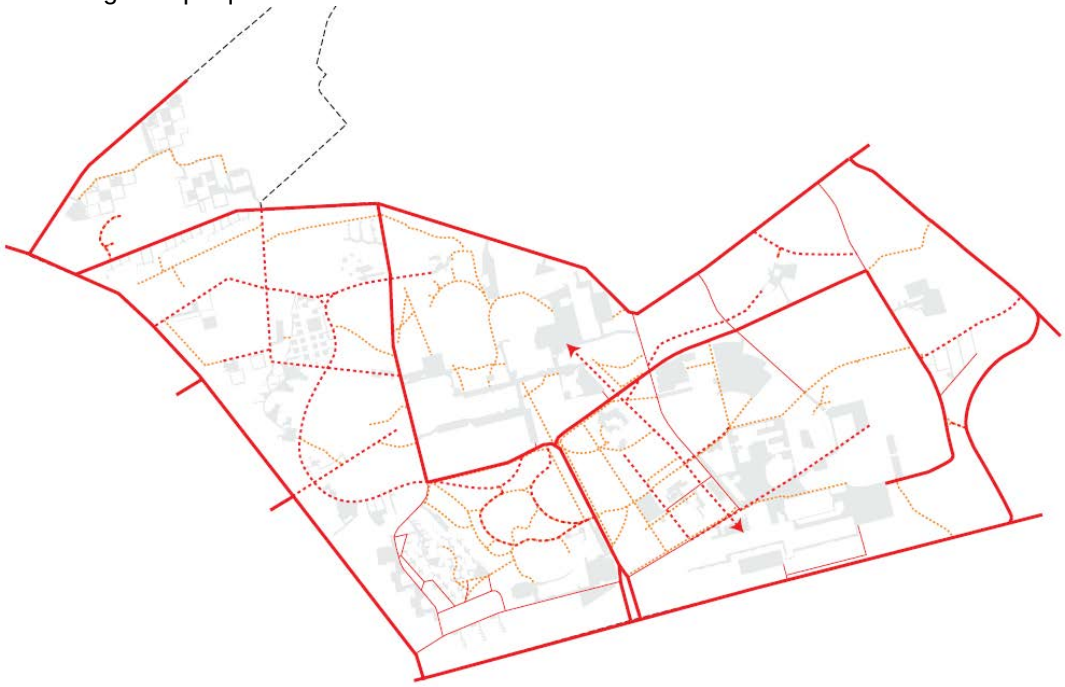


FIGURE 10 INFRASTRUCTURE UT CAMPUS (RED:ROADS; DOTTED RED LINE: BIKE LANES; ORANGE DOTTED LINE:WALKING PATHS).

Plans to change the speed limit of the campus from 50km/h to 30km/h have been approved. The UT aims to redesign the roads on the campus in a more bicycle and pedestrian friendly way. Research shows that a significant proportion of motorists speed on campus roads. This is mainly due to the spatial image: straight, sleek and wide asphalt roads that invite you to drive fast. UT wants the speed on the roads to decrease, so that cyclists and pedestrians can move around the campus safely and comfortably. That is why the roads will be optically narrowed by bicycle suggestion lanes and braking elements will be placed to slow down traffic.

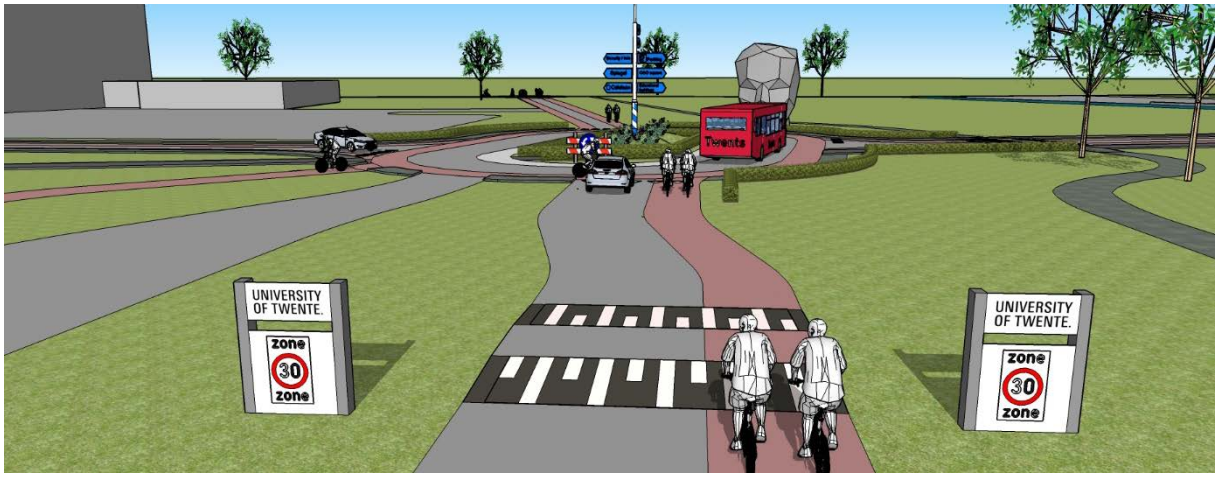


FIGURE 11 IMPRESSION OF THE 30 KM/H ZONE AND BICYCLE FRIENDLY INFRASTRUCTURE.

The 30 km/h zone and bicycle friendly infrastructure is broadly supported by employees, students and institutions like the municipality of Enschede, Police Twente, bus company Keolis and spatial planner Peter Vermeulen. In June 2020, a digital questionnaire among UT students and employees is held to retrieve the public support for a 30 km/h zone, 818 respondents completed the survey. 80% of the respondents is (very) positive towards the implementation of a 30 km/h zone. 78% of the students and 85% of the employees is (very) positive. 18% of the students and 7% of the employees is (very) negative towards the implementation of a 30 km/h zone. Almost half of the respondents (48%) think that the redesign of the crossing will improve the safety for cyclists and 46% of the respondents think that the redesign will improve the clarity of the crossing.

3.5.6 Regulations at UT related to mobility

The optional model and the employment conditions contain several regulations related to mobility.

3.4.6.1 Optional Model for Employment Conditions

The optional model for employment conditions also offers tax benefits related to mobility. There are fiscal advantages to buy a bike, for bike maintenance and - under certain conditions - you can opt for a tax exchange for commuting expenses.

The conditions have slightly changed temporarily due to the COVID measures when staff are working at home. There used to be the option for a fixed commuting allowance for staff who live more than 1 kilometre from work and are **not** eligible for any other travel allowance for commuter travel. In 2021 there is no commuting allowance allowed in the optional model. An alternative is being offered for staff who have to be at the Campus because of the kind of work they do. There also used to be the option for an internet allowance within the Optional Model. Because of the

Corona Measures this is temporarily replaced by a monthly internet allowance of €30[16] outside of the Optional Model.

Fiscal rules give UT the opportunity (based on fiscal space for around 350 bikes) to enable staff to use €1500 gross salary, holiday hours or holiday/end of year allowance to purchase a (e-)bike (or bike + insurance) once every four years (updated amount as of 2021). The net benefit is dependent on the tax bracket someone's in as no wage tax is paid (if you pay 50% tax and use €1500 out of your salary to buy a bike, the net benefit is €750).

3.4.6.2 Terms of Employment

A new member of staff can apply for a relocation allowance when moving nearer the work place[17]. An employee who lives outside the place of work (more than 25 km from the place where the work is deemed to take place) on the work commencement date, and moves to the place of work within a period of two years, is eligible for a relocation allowance. This is upon condition that the distance between the new home and the work location decreases by at least 60%.

An employee who is appointed on a temporary basis, or who has an off-site post, and is unable to commute on a daily basis, due to the travel distance, i.e. travel time, is eligible for an allowance towards temporary accommodation costs (at the supervisor's discretion).

A temporary employee who resides outside the place of work is eligible for an allowance towards commuting costs. Therefore the employee who resides in the Netherlands will be able to use the NS-Business Card to commute, in second class. Only temporary employees for whom the use of public transport is unsuitable, will receive a kilometre allowance of € 0.19 per kilometre for their commuter travel.

For most positions flexible working hours can be agreed facilitating time needed to travel in a sustainable way to UT.

For business travel, all staff travelling for work can make use of a NS Business Card and travel 1st class enabling staff to work. At the destination a OV bike can be rented with this card. If the superior has given permission prior to the business trip, the staff member is allowed to use the NS Business Card also for a (train)taxi ride from the station to his or her destination and for using the Q-Park P+R car parks. The use of any other services of the NS Business Card is not allowed.[18]

Vitality: All staff can use the sports centre for free with fees charged for membership sports clubs or group lessons. Students pay €50 for a union card[19].

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[16] https://www.utoday.nl/news/69783/internet-allowance-with-april-salary

[17] https://www.utwente.nl/en/hr/terms-of-employment/downloads-staffmanual/regulations/relocation-commuting.pdf

[18] NS Business Card | Terms of use NS Business Card UT 2014 | Human Resources (utwente.nl)

[19] https://su.utwente.nl/en/union-services/student/unioncard/prices/

4 MOBILITY – DESIRED SITUATION

This section describes the desired situation of all aspects of mobility and shows the comparison to the current situation.
The objectives of the mobility plan are:

- To stimulate the use of more sustainable modes of travel, and
- To reduce the CO_2 footprint related to all modes of travel by students and staff, and
- To promote alternatives to travel.

One of the secondary objectives is that commuting by bicycle or taking the stairs has health benefits and contributes to the vitality of the staff and students.

4.1 CO_2 footprint of mobility

The current calculation of the CO_2 footprint of mobility includes estimations and incomplete data. For example, the commuting data from the 2010 survey needs updating and more detail needs to be collected to be able to account more specifically for the number of working days employees commute and the distance of the commute. Calculation of the number of commuting trips rather than the number of people that commute will provide more accurate data and takes into account whether people work fulltime or parttime.

As this is expected to be influenced by the new working at home habits due to COVID, it is expected to need to conduct a survey a few years in a row to obtain a stable situation which is reliable to be used for the CO_2 footprint.

Following on from the issue described in 3.1.2, on the additional factors enhancing the greenhouse effect besides CO_2, UT would like to apply more accurate data in its carbon footprint analysis, when further research leads to an improved estimation of the emission factors for flights.

4.2 Commuting

Taking sustainability mobility into account, we advise to use the following main transportation modes per distance category:

0 – 7.5 km:	bicycle/E-bike/speed pedelec
7.5 – 20.0 km:	bicycle/E-bike/speed pedelec and public transportation
> 20.0 km:	public transportation
peripheral areas:	ridesharing[20]

[20] Ridesharing = travelling together in a car. More information see paragraph 0.

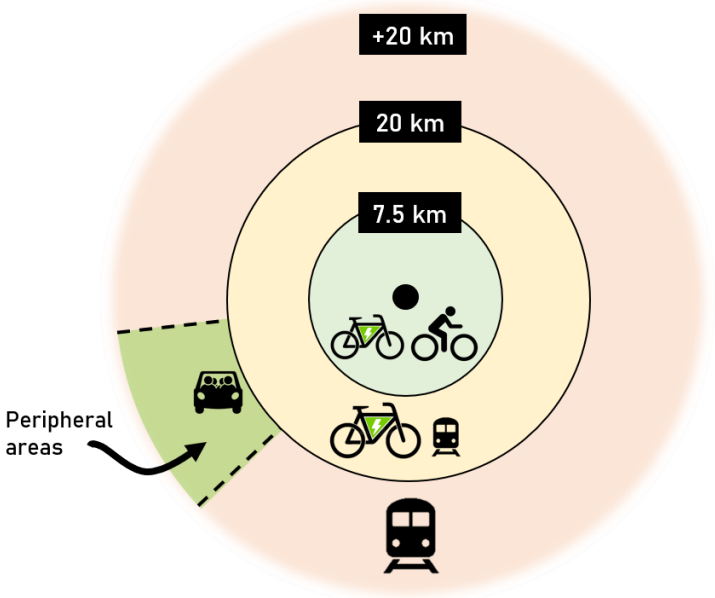

FIGURE 12 DESIRED SITUATION OF TRANSPORTATION MODE USE BY UT EMPLOYEES AND STUDENTS

Commuting – employees (n = 3.100, 2019)					
Current situation			**Desired situation**		
The 2011 survey shows that 33% of employees travel to work by car, 53% cycle and 10% commute using the train (CO_2 footprint calculations are based on survey of 2011). The CO_2 footprint of 2019[21] shows that in total 18% of the UT CO_2 footprint comes from commuting.			Employees living <15km away from their workplace will cycle to work instead of driving. This will contribute to at least a 10% increase in cyclists and 15% reduction in CO_2 emissions. This will also contribute to the vitality and health of employees.		
Transport mode	**Kilometers (2019 CO_2 footprint)**	**Estimated ton kg CO_2 (% of total UT footprint 2019)**	**Transport mode**	**Kilometers**	**Estimated ton kg CO_2 (% of total UT footprint)**
Car	4.654.459	796 (2.8%)	Car	**-15%**	
Train	4.301.750	176 (0.6%)	Train	**+5%**	
Bicycle	1.593.196	0 (0.0%)	Bicycle	**+10%**	
Working from home	N/A	N/A	Working from home		

Infrequent working from home by most	An initial assumption is made that 1/3 works from home and that 90% of the people can cycle from a distance of 15km (assume that 10% cannot combine cycling at max 15km with care or other activities. Based on these numbers interventions will be designed.

[21] https://www.utwente.nl/en/sustainability/carbon-footprint/

Commuting – students (n = 11.000)					
Students cycle, use public transport and use the car coming to campus. An increase in German cars (from students) has been observed on campus.			Students living <7.5km away from their workplace will cycle to campus. This will also contribute to the vitality and health of students. German students travel in fewer cars to campus, instead they ride-share or use public transport.		
Current situation			**Desired situation**		
Transport mode	**Kilometers**	**Estimated ton kg CO_2 (% of total UT footprint)**	**Transport mode**	**Kilometers**	**Estimated ton kg CO_2 (% of total UT footprint)**
Car	4.763.330	814 (2.8%)	Car	**-15%**	
Train	12.368.785	507 (1.8%)	Train	**+5%**	
Bicycle	3.617.900	0 (0.0%)	Bicycle	**+10%**	
Virtual classroom	N/A	0	Virtual classroom		

4.2.1 Potential actions/ initiatives / projects on commuting

In 2021 a mobility survey will be conducted. This will provide us with updated information on the mode of travel to UT. This updated information will enable us to specify which measures will be most suitable to promote sustainable travel to and from UT in order to reduce the CO_2 footprint of UT.
Some initiatives currently being considered are:

- Ridesharing pilot for students living in peripheral areas with significant longer travel time by public transport compared to the car. We aim to conduct a pilot early 2022.
- Initiatives such as e-bike / speed pedelec try-out weeks
- Changes to the Optional Model for Employment Conditions to facilitate sustainable travel (availability e-mobility for work trips enabling a person to cycle instead of travelling by car as the car is no longer needed for the work trip)[22] and a financial compensation when cycling increasing depending on the distance.
- Information and communication campaign, including an overview of all facilities bicycle parking map (incl. covered/uncovered, charging point for e-bike staff/visitors), attention to changes to the optional model, sharing stories on cycling routes etc..
- Inventory for work/study schedule adjustment for a reduction in travelling by train in the “hyperspits” (peak rush hour between 8.00 and 9.00 h)
- Collaboration with Twente Mobiel, the Province of Overijssel and Kennispark on sustainable mobility
- Courses twice a year to learn how to confidently ride a bicycle in the Netherlands: Develop a cycling skills program with Student Union (to reduce transport movements, car, bus), and as a service provided by the most welcoming university. Students have mentioned there is demand for it. Students are embarrassed to admit they cannot cycle or are not confident to do so. A CreaTe student is developing an app/decision tree model (prototype) to encourage and facilitate cycling in 2021.

[22] Possible changes in employee regulations regarding Business travel, Commuter travel and/or the Optional Model of Employment Conditions do take time. E.g. agreement with the trade unions is always necessary. Also there can be provisions or restriction in the Collective Labour Agreement of in the Law that need to be taking in account.

Also, attention will be given to socio-technological innovations of the last decade, such as shared mobility, electrification of modes, environmental impact awareness of mobility and working from home as well as continued perception of current facilities. Details of the mobility survey are elaborated further in Annex II.
Due to COVID teaching moved online and this is likely to continue or change to a hybrid setting. All lecture rooms will have a webcam to enable students to follow lectures from home. This may reduce travel due to commuting and will be researched further in the future.

4.3 Business travel – employees

Some travel (abroad) is inevitable when collaborating internationally as scientists. There are however ways to facilitate people travelling with taking the most sustainable option. That option can also be attending virtually, choosing a more sustainable mode of travel, travel less or travel with fewer people. When travel is inevitable, the negative impact will be compensated to account for the true cost of the trip. Using these options, UT aims to reduce its CO_2 footprint from travel by reaching a situation where a person travelling takes a conscious decision on whether he will travel, how he will travel and how he will compensate the negative impact of the trip.

Project proposals or collaborative research plans could add sustainability as an important focal point by emphasizing the possibility to travel to the associated events of the project by train instead of flying.

We can adopt 3R's for academic travel: Replace with video calls where possible, Reduce the number of trips, Refine by planning your trip so it is really worthwhile (combining multiple purposes).

Business travel – employees (n = 3.100)					
Current situation			**Desired situation**		
No guideline on mode of travel for work travel. No guideline on reimbursements of short trips.			Work travel <800km is done by train. Work trips by car <5km are reduced by 10%		
Type of travel	**Kilometers**	**Estimated ton kg CO_2 (% of total UT footprint)**	**Transport mode**	**Kilometers**	**Estimated ton kg CO_2 (% of total UT footprint)**
Flights (<800 km)	1.020.468	303 (1.1%)	Flights (<800 km)	**-20%**[23]	
Flights (801 – 2500 km)	2.310.208	462 (1.6%)	Flights (801 – 2500 km)	**-10%**	
Flights (>2501 km	20.066.236	2949 (10.3%)	Flights (>2501 km	**-5%**	
Rental cars	264.100	45 (0.2%)	Rental cars	**-5%**	
Rental cars for distance < 10km	47		Rental cars for distance < 10km	**-50%**	
Reimbursement mileage private car	909.835	155 (0.5%)	Reimbursement mileage private car	**-5%**	

[23] Other possibilities are to set targets for specific countries or emphasize travel time and number of transfers (convenience) in order to reduce the number of flights and lower the CO_2 impact.

Declarations < 10km	290		Declarations < 10km	**-50%**	
National train	4.752.510	194 (0.7%)	National train	**+10%**	
International train	N/A	N/A	International train	*substitution of <800 km flights	
Train journeys are booked by the traveler through the NS business card platform (for staff who have a personalized NS business card)			Discuss options for **travel unit to also facilitate train trips** (they used to) to provide an equal service to travelers for both train journeys and flights and to be able to recommend the lowest CO2 option (in Dutch: 'ontzorgen')		
Requests for travel options are provided by the travel office or VCK without specific reference to its impact			Include a **reference to emails** that by choosing the lowest CO2 options, you contribute to achieving the UT ambition to lower its CO2 footprint by xx % (Partially via travel unit, also contact with secretaries required)		
A secretary that is asked to book a straightforward trip books the trip with VCK directly. Complicated trips are booked through UT's travel office.			For both ways a decision tree (a **travel check**) is available guiding the users to the most sustainable mode of travel.		
Each individual needs to make an effort to find the most sustainable way to travel			A traveler is guided through means of a decision tree (a **travel check**) to the most sustainable option for travel		
			There is a **train zone map** showing the most common destinations that can be reached by train, with a comparison for time, CO2 emissions and number of transfers.		
Quotation offered when making a travel request			Person considering work travel: 1. consults travel check If travel is unavoidable: 2. VCK provides travel options with lowest CO2 emissions at top (travel agency indicate CO2 emissions and prioritise routes with fewer emissions: train option first, then more efficient planes and direct routes) 3. This quotation is accompanied by a statement: if you choose this option you contribute to minimizing UT's CO2 footprint. 4. CO2 compensation is contributed to a fund for projects UT staff and students conduct related to sustainability societal challenges		
Faculty ITC, MESA+ and individual travellers compensate their CO2 emissions.			There is a UT wide **CO2 compensation scheme** for unavoidable travel where staff can choose from several options to compensate the emissions resulting from their travel.		
A high percentage of kilometre reimbursements (use of own car) is for distances < 10km Current Regulation on declaring expenses[24] states that you use the NS business card for business travel and only			**Shared e-mobility** is available for work trips below 10km (e-car and e-bike). Adjusting Regulation on declaring expenses accordingly to support its implementation.		

[24] https://www.utwente.nl/en/hr/terms-of-employment/business-travel/

when this it is impossible or inefficient to reach the destination by public transport you can use your own car[25].	
Rare stories on sustainable mobility on UT website or UToday	**Stories are shared** on sustainable modes of travel by staff and students of UT (communication campaign) in order to inspire fellow members of the UT community.

4.3.1 Potential actions, initiatives, projects on business travel

Together with BSc students from CreaTe a travel check will be developed in 2021. This travel check will build on existing travel checks, such as the one from Utrecht, Groningen and Ghent. The aim is to facilitate sustainable travel by guiding people towards sustainable choices. The Travel Office can play a facilitating role in this by when they provide travel options they put the most sustainable option first and include train travel options.

Together with Saxion and CreaTe a train zone map will be developed which will show the travel time from airport to destination, including travel from home to airport, check-in, customs and airport to final destination compared to train travel time. Train travel will be first class to enable a comfortable working environment during the journey. And a 25% time loss will be acceptable due to travelling by train.
An information, communication and awareness campaign will be developed (#changethedefault) to increase the knowledge and feeling of importance on the reasons behind this change. Specific groups, such as the secretariat of faculties and departments, will be invited for information and feedback sessions.
A future CO2 compensation scheme will need to meet the needs of the people compensating their trips. An assessment will be made for the options for CO2 compensation that are currently being used and other options.

Another assessment will be done on how to create an incentive for people to actively reduce their trips and the CO2 emissions of their trips.

In short:

- travel check
- train zone map
- Information, communication campaign and materials
- CO2 compensation scheme
- Pilot shared e-mobility
- Feasibility study booking train trips through travel office
- NS – option for discount

4.4 Optional model and employment conditions – employees

The Optional Model for Employment Conditions[26] enables staff to exchange gross salary to buy a bike, claim commuting allowance and bicycle maintenance. Employment conditions differ for staff with a fixed-term or open-ended contract. The optional model and Terms of Emplyment can be used to stimulate and facilitate sustainable travel.

[25] https://www.utwente.nl/en/hr/terms-of-employment/downloads-staffmanual/regulations/declaring-expenses.pdf article 8, 8
[26] https://www.utwente.nl/en/hr/terms-of-employment/optional-model-for-employment-conditions/

Optional model for Employment Conditions and Terms of Employment	
Current situation	**Desired situation**
Staff can use €1500 gross salary, holiday hours or holiday/end of year allowance to purchase a (e-)bike (or bike + insurance) once every four years.	Maintain this situation and investigate if this amount can also be used for a private lease contract for an e-bike or speed pedelec the employee can enter into with a provider.
Commuting expenses whether car or bike can be exchanged for fiscal advantage through the optional model, 0.19ct/km (only for people who do not qualify for any other commuting allowance) up to a distance of 75km.	Only sustainable modes of travel will be eligible for kilometre compensation of 19ct/km. Commuting by car is discouraged. (Wageningen provides this allowance only till a distance of 30km[27]).
Only staff with a temporary contract who live more than 25 km from UT may use the NS business card for commuting 2nd class.	Continue public transport allowance for temporary and permanent staff
Only staff with a temporary contract receive a NS business card 2nd class for commuting.	All staff can make use of an NS business card for commuting when living > 25km from UT.
Employees that receive NS business card 2nd class for commuting need to change card to 1st class travel for work trips (hassle).	Different faculties have different preferences (HR advice option 1): 1) all employees living >25km from UT may use a 1st class NS business card for commuting 2) all employees may use a 1st class NS business card for commuting. A personal contribution is asked for first 25km via optional model. 3) No change - all employees living >25km from UT may use a 2nd class NS business card for commuting (necessary to change card settings between work trips and commuting).
	Attractive train commuter package consisting of a laptop, phone and good internet (data).
All staff travelling for work can use a NS business card, there is no discount for UT.	When more and more travel is done by train, UT should investigate whether it is possible to arrange a discount with NS.
Most NS business cards have no discount option for travelling outside peak hours	Link NS business cards to flex-subscription (cost saving)
Working from home: allowance for internet connection	More standard package for extra costs incurred by working from home for electricity and heating (and losing out on kilometre allowance). This will most likely be assessed by the working group on hybrid way of working.
No interest free loans scheme by employer	Feasibility for interest-free loans from employer to employee towards the purchase of an (e-) bike, speed pedelec or e-car to promote sustainable travel.

COVID impact
Due to COVID the discussions on making the NS business card available for commuting for all staff has been paused. This is one of the first issues to continue working on coordinated by HR. The working group on Hybrid Working is expected to come up with suggestions on how to facilitate this. From a sustainable mobility perspective, this is to be encouraged to reduce the kilometres driven for commuting.

[27] https://www.wur.nl/en/show/Mobility.htm

4.5 Study travel – students

At the moment, no data is being recorded on study trips nor individual student travel for internship or thesis work.

Study travel students (n = 11.000)	
Current situation	**Desired situation**
No data is currently collected centrally on student study travel	Through mobility surveys this data is kept up-to-date
	Students use travel check and train zone map to choose the lowest impact option for unavoidable travel.
	UT scholarships take into account allowance for sustainable travel modes
	Communication and information campaign sharing stories of best practices.
	Study associations register their study trips to account for the CO2 emissions for UT's CO2 footprint. A plan is made on how to automatize the registration of this information for individual students.
	A CO_2 compensation fund is established in order to be able to compensate for the study travel emissions.

4.5.1 Potential actions, initiatives, projects on study travel

Student travel is facilitated in many different ways across UT. People and departments playing a role are: The institutional Erasmus coordinator for all UT Erasmus students, the UT Let's Go fair, the coordinator of mobility meeting with all UT internship/exchange coordinators and the coordinator of the network for students who conduct their thesis abroad.
All these people can play a role in informing students on sustainable study travel. It could become an element in the pre-departure meetings held with the students.
Also, the scholarships office from UT and the University Fund can allocate funds to enable sustainable study travel.
Making funds available is an important aspect as currently travelling by train is often more expensive than a flight with a low-cost airline. It would be important to work towards a situation where scholarships take into account the true costs of travel and enable travelling by train within Europe. Erasmus has identified sustainability as one of their priorities. A close look will be kept on best practices from the Erasmus programme and other universities in order to consider the implementation of these at UT as well.

In other places scholarship funds are discussing this as well as they also want to improve their sustainability credentials without limiting students to obtain international experiences.

UT can start with registering this information and communicating about this in a transparent way.

Information on sustainable mobility will be shared with students in 2021 during the Let's Go Fair.

4.6 Mobility on campus

4.6.1 Micro-mobility

Micro-mobility	
Current situation	**Desired situation**
Limited car use on campus, to travel between buildings for meetings	To strengthen the concept of a low-traffic campus, car use on campus is actively discouraged. Instead, department bicycles are widely available with basket/bags to carry your belongings. Also walking is encouraged by connecting existing foot paths.
No nudging to use stairs above lifts	Use nudging and design to promote use of stairs (till floor 5) above using the lift
No guideline on using departmental bicycles for on-campus use	Active promotion for the use of department bicycles
No unwritten rule for not using car to move between buildings	Discourage use of private car to move from one building to the next.

4.6.2 Transport movements

Current situation	**Desired situation**
Transport movement reduction	
All Packages and deliveries go to Central Reception Goods (Garage) from where they are distributed to each building	Optimise post and logistics movements to further reduce transport movements. 1. Combine deliveries from the same supplier as much as possible (through establishment of fixed delivery days, for example 2 instead of daily) ➔ Procurement (include in tender packages should be grouped and sent twice a week instead of every small items separately immediately ➔ In running contracts consider the option to combine deliveries to reduce transport movements (how ? do need all clients be asked?) ➔ Ordering – include possibility to include a range of days within which you need to receive your item as a customer.
Waste collection separate for UT buildings and buildings not managed by UT	Joint tender to reduce transport movements on campus
	Create a better overview which companies and which delivery companies come to UT most, with what kind of vehicles. Which bring most voluminous items. Most likely only way to collect this data is manually - Student assignment
	Explore plans with the Council of Enschede on a transport Hub where all goods are collected and distributed using electric vehicles to their final destination.

4.6.3 Healthy campus

Current situation	Desired / expected
	The goals of the Healthy Campus Platform are: 1. Support and recommend a healthy lifestyle in such a way that a;; aspects of health are promoted. 2. Share knowledge and connect local parties. 3. Promote inclusivity, connect health programs and make these accessible for the entire campus community. 4. Use own branding for the platform to ensure people find the program. 5. Link with the international label FISU 'healthy campus' for universities. 6. Share knowledge with universities in the Netherlands and abroad. **7.** Join the challenge 'most vital company in Overijssel'
During Corona: Tips and facilities: Utwente.nl/homeworkplace Order products: selfservice.utwente.nl Well-being: http://www.utwente.nl/employee-wellbeing or utwente.nl/student-wellbeing	Integrate micro-mobility ideas into the well-being and Healthy Campus Program.
Broad range of sport facilities on campus	Healthy campus program (under development) to promote facilities under the UT community.
People sit still too much[28]	Promote moving/getting up regularly.

[28] https://www.samengezond.nl/zitten-is-het-nieuwe-roken/?sqzl_id=d659217a-8cc5-4f30-ba98-c161f941a996

4.6.4 Facilities and services on campus

4.5.4.1 Facilities for cyclists

Current situation	Desired / expected
Facilities	
Bicycle racks capacity is considered insufficient by some users	Satisfaction of 75% of cyclists on the bicycle parking facilities.
O&O square messy and insufficient bike parking facilities	O&O square bicycle free with large facilities around the square.
Location bicycle parking	More cycling (sufficient and satisfactory bicycle storage (covered?) / charging points for e-bikes (consideration for safety when placed in basements) / and parking your bicycle should be easier or nearer than parking a car).
	Bike stewards – Regular checks on proper usage of bike parking facilities in the month September and February at the start of the new year to ensure students know the rules. Bikes will receive a warning in week 1, from week 2-4 bikes will be removed. Capacity will be made available to remove the bikes and return them to their owners again at fixed times. Stewards need to be mandated to be allowed to enforce rules.
Inclusion	
One-off bicycle riding lessons ITC as part of introduction week.	Structured course twice a year for internationals to become more comfortable with cycling on Dutch roads (confident and safe cycling skills).
	Agreement with a company like SWAP fiets to provide a good offer so all international students have a bicycle from day 1 to gain full NL experience.
	Consult university fund if they are interested to include it in their scholarship.

4.5.4.2 Facilities for cars

Parking	
Current situation	**Desired situation**
Parking free of charge	Policy on parking to reduce car usage (subject to feasibility study and survey among UT community) including for example max. number of days a year free parking (parking credit) and ‘social norm’: parking only for commuting distances larger than 20 km.
Car Parking spaces meet the daily number of users and facilitates as an overflow car park during events and football matches in the nearby stadium.	Car parking spaces at the edges of campus to discourage car use, especially on campus. Landscaping plans to consider reducing the number of parking spaces.

There are 31 charging stations for electric cars. These are charging at a rate of 11kWh, 21kWh and 22kWh.	Efficient use of charging stations of electric cars when owners are notified when car is full.
One solar carport installed at carpark near building Paviljoen (in 2021)	Several car parks covered with solar panels.

4.5.4.3 Facilities for public transport users

There are 18 bus stops on campus. The Province Overijssel is planning to install Dynamic Travel Information Systems (DRIS) at ten stops based on the numbers of users of the specific bus stops mid-2022. This live information of bus times contributes to traveler satisfaction and may contribute to increased usage of buses.

4.5.4.4 Shared mobility

Current situation	**Desired situation**
Bicycle sharing schemes: Campus bicycle and flow bicycle	Availability e-bikes for work trips
Departmental bikes available but not known how well these are used overall.	More information on departmental bikes, improved service (basket/bags/bike pump) and promotion.

4.5.4.5 Campus lay-out

30km zone	
Current situation	**Desired situation**
The Executive Board expressed an interest for a 30km/h zone to become a low-traffic campus. The plans have been approved	The 30km/h zone infrastructural works are scheduled to be carried out in 2021/22.

4.7 Communication and behavioural change campaign plan

A plan will be developed to promote the most sustainable modes of travel. This will refer to all plans mentioned in the previous chapters.

5 TIMELINE

5.1 Timeline until 2023

In order to meet these objectives (desired situation), a timeline is developed. It is important to have a long term plan to keep this data up-to-date. Propose to update every two years as changes occur in personnel, facilities, infrastructure and new mobility initiatives.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Sept ’20 – April ‘21	May ’21 – Sept ‘21	Oct ’21 – Dec ‘21	Jan ‘22 – June ‘22	Sept ‘22- Dec ‘22
Mobility Plan	Preparation Mobility survey	Mobility Survey	Pilot ride-sharing (start Feb/Mrt) 1 yr	Repeat mobility survey or conduct physical counting commuting modes
Mobility webpage	Travel check (with CreaTe students)	Communication campaign ‘sustainable travel’	Roll-out initiatives: For example Try out weeks e-bikes	Feasibility study impact and implementation paid parking
	Inventory possible initiatives	Implementation travel check		
	Involvement stakeholders	Implementation cycling app		
		Development initiatives		

5.2 Looking ahead

The sustainable mobility plan sets out the scope and first steps on how mobility can contribute to becoming a sustainable organisation. All departments and faculties have a role to play in this process and we would like to roll out the plans in collaboration. While working on the described plans in the coming years we will also take note of future developments that will be needed to advance our performance as a university on sustainable mobility. This will be included in the reporting schedule.

6 REPORTING AND BUDGET

6.1 Reporting

Reporting on the progress will be done through the existing reporting schedule June and January) to the Steering Group of the SEE Programme. We also aim to share information via the communication campaign via the LED screens and via de website / Green hub newsletter and social media channels.

6.2 Budget

In the SEE programme budget as well as in the MJA budget there is some space for initiatives on mobility. The 30km/h zone is budgeted for by the Real Estate and Maintenance department.

In the SEE budget of €421.000 approved in May 2020, a reservation has been made for training & development aspects on mobility (project leader, survey) and a budget for the campaign (and tool development) on promoting sustainable travel, especially to reach the ambition to stop flying to locations nearer than 800km.

The implementation of the plans UT wide requires service departments and faculties to commit resources as well, for example with regards to CO_2 compensation, the provision of first class NS Business cards for commuting etc..

6.2.1 Required capacity

For the successful implementation of the sustainable mobility plan a project leader is needed to fulfill the following tasks:

- Carry out a UT wide mobility survey (staff and students) including promotion to obtain high response rate.
- Regularly carry out smaller surveys, develop a mobility panel for these.
- Organize small pilots on mobility such a try-out weeks for e-bikes, incl. promotion.
- Organize a pilot on ride-sharing in collaboration with Netmobiel (UT, Saxion collaboration).
- Inform and collaborate with stakeholders UT (see names contributors of this report).
- Implement Travel Check and Train Zone Map in collaboration with CreaTe students, ensure transition prototype to implementation phase.
- Develop a CO2 compensation plan with a variety of options to suit the different faculties'
- Collaborate with communications advisor on sustainability to develop a communication campaign on sustainable mobility (including external expertise if required).
- Inform programme manager SEE on progress and provide a twice yearly written update for the annual evaluation (December) and half-yearly update (June).

This project leader mobility would need to be a 2 day a week long term position. This can be an in-house part-time or a consultancy position.

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