CO2 pricing and compensation mechanism for air travel

Aim: To implement a CO2 pricing and compensation mechanism in order to

- generate incentives to reduce air travel of UT staff and students
- generate revenues to subsize compensation and mitigation measures on campus (and/or by selected compensation organizations)
- ensure compliance with the legal obligations imposed by the Dutch Climate Law for 2030

Consultation 29 June 2022

Schedule

- 12:15 Walk-in
- 12:30 Introduction
- Climate science (IPCC) is clear: no time to lose
  – Prof. Maarten van Aalst
- Learning to not fly
  – Prof. Jurriaan Schmitz
- Scenarios for CO2 pricing and compensation for UT business flights
  – Prof. Frieder Mugele
- Discussion Q&A – moderated by Brechje Maréchal
- Vote (via online tool wooclap)

Poll questions

1. **How should the UT ensure CO2 emission reductions from business flights?**
   a. Leave it up to the **individual** scientists to reduce their CO2 footprint from travel – no intervention
   b. Implement an **internal CO2 pricing** scheme on flights
   c. Apply a **strict CO2 emissions limit** for UT's business flights per person or collectively.

2. **Considering the proposed CO2 pricing schemes, which one do you prefer?**
   a. Scenario 1: **universal flat-rate overhead of at least 100€.**
   b. Scenario 2: personalized overhead increasing **with every flight** taken (focus on individual travel behaviour).
   c. Scenario 3: fee based on **actual emissions per flight.**

3. **The funds collected through CO2 pricing of flights, what should these be used for?**
   a. Option 1: **subsidize extra costs of train travel**
   b. Option 2: Budget to make the **UT organisation** more sustainable (sustainable initiatives, solar panels, green roofs etc which reduce CO2 emissions.)
   c. Option 3: external **CO2 compensation schemes** such as Gold standard, Treesforall or Climateneutralgroup.
   d. Combination of above.

CO2 pricing and compensation mechanism - proposal

Introduction

The Dutch government signed the climate agreement (Paris agreement 2015) and issued the Dutch Climate law requiring the Netherlands to reduce their CO2 emissions in 2050 by 95% compared to 1990. To achieve this goal, CO2 emissions must be reduced by at least 49% in 2030. Being an academic institution that aims to lead by example, the UT stated in its Sustainability policy the even further reaching **ambition** to become **100% carbon neutral by 2030**. To fulfil the legal obligations and to achieve our own ambitions, clear incentives and measures need to be implemented to discourage activities resulting in high CO2 emissions and simultaneously stimulate CO2-friendly behaviour.

According to the last pre-COVID CO2 footprint analysis, electricity is responsible for the biggest share of the UT's emissions. From 2022 onwards, CO2 emissions for electricity will be compensated by purchasing Certificates of Origin guaranteeing a renewable origin. Compared to other universities, heat and cooling contribute very little to our CO2 emissions thanks to our local district heating network, which operates on carbon-neutral biomass. A new tender procedure for the remaining gas consumption (mainly for air humidification for laboratories) will be initiated in 2022.

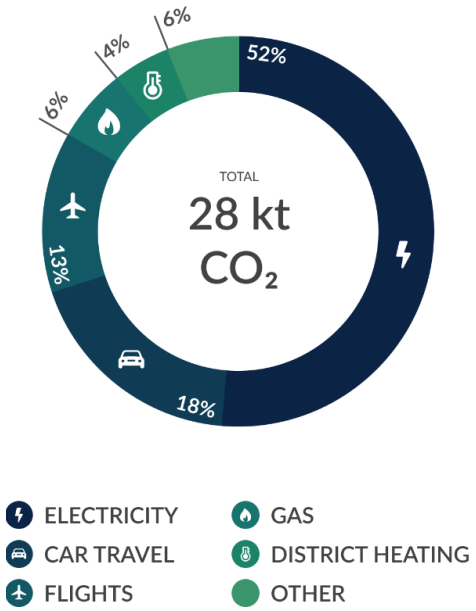

Figure 1. CO2 footprint 2019 (base year)

The remaining largest contribution to the CO2 footprint arises from **mobility**. Emissions arise from two different sources, daily commute of staff and students and business travel for work. Commuting-related emissions are not easy to quantify. They are currently estimated based on a mobility survey amongst staff and students from 2010. These data will be updated in 2022 and combined with anonymised data from the new HR system where staff registers commuting information and the number of days staff work from home. Based on this data, a detailed CO2 emission reduction plan regarding commuting will be developed in 2023.

Emissions from air travel are known in detail from actual flight bookings. In 2019, air travel was responsible for approximately 3500t CO2. 5% of this amount were the result of short distance flights (< 700km) for which alternative modes of transport (e.g. train) are available. 14% of the air travel emissions arise from intermediate travel distances (700-2500km) and 81% from long distance air travel (>2500km). Since intermediate and long-distance air travel cannot be completely avoided in the scientific world, CO2 neutrality regarding air travel can only be achieved by combining an actual reduction of flight kilometres with CO2 compensation measures for the remaining unavoidable air travel.

Table 1. Flight statistics 2019

	Support departments	BMS	EEMCS	ET	ITC	TNW	Total	2030 target
flight km	0.6mio	3.6mio	3.9mio	2.6mio	7.1mio	4.4mio	22.2mio	11mio
tCO2	104	578	617	419	1072	697	3487	1700
# flights	151	619	603	428	766	641	3208	1600

This document discusses:

I. A general approach (absolute reduction targets, CO2 price level, internal compensation fund)
II. Three alternative pricing scenarios
III. Scenarios for an internal UT CO2 compensation fund
IV. Implementation considerations (consequences, stakeholder opinions, decision processes, internal policies)

I. General approach and choices

Necessity to take action

For the UT, the necessity to reduce its CO2 emissions arises directly from the obligations imposed by the climate law (reflecting the Paris agreement) and from our own ambitions laid down in Shaping 2030 and the Sustainability Policy for operational management. While measures to meet these reduction goals for electricity and heat are being implemented, an equivalent plan for the mobility sector is lacking.

Importance of an absolute reduction target

The climate law requires an emission reduction of 49% in 2030 with respect to 1990. The law does not specify whether emission reductions must be absolute or can be achieved by compensation. Technically speaking, it is therefore legal not to reduce emissions at all and to choose for 100% financial compensation. This, however, is considered morally inacceptable. It would certainly not help to mitigate the climate crisis and it would be incompatible with the UT's ambition to be a sustainable organization that (credibly towards students and society) wants to 'lead by example'. We therefore propose the compromise to aim for a 50% absolute reduction of emissions from flights by 2030 based on 2019 (instead of 1990) as a reference year. All remaining air travel-related measures will be offset financially by compensation measures.

Opting for the year 2019 as reference instead of 1990 is a severe compromise: global air travel increased approximately by a factor of four in this period according to statistics from the World Bank. Assuming a similar increase for UT employees, the 50% reduction target from the climate law would imply an eightfold reduction from 2019 to 2030. It is anticipated that such a target – although intended by the law – would evoke unsurmountable resistance amongst UT members. This conflict is alleviated by opting for 2019 as a reference year. To correct for this pragmatic compromise, it is deemed very important that at least the 50% reduction target is achieved and that a compensation scheme is introduced, which leads to significant actual emission reductions elsewhere (see below section III).

A price-based steering mechanism and monitoring

The most direct manner to achieve a reduction of flight kilometres would be to impose a CO2 budget per person and to deny travel declarations if the maximum is exceeded. While this may eventually be

necessary to achieve the required CO2 targets, it is expected that such a measure would generate substantial resistance within the UT community. Therefore, the primary approach is to introduce a price on air travel to discourage air travel. Different versions of such schemes are proposed below, based either on faculty-wide or personal CO2 emission targets. Common to all approaches is that the CO2 price will be collected upon each flight booking. Moreover, the UT-average minimum price should be at least 100€ per ton emitted CO2 and it should increase if a faculty or individual exceeds emissions target. The minimum price of €100/tCO2 is inspired by the approximate price of CO2 certificates of the European Emission Trading System, ETS. It is thus substantially higher than typical CO2 compensation measures offered by airlines. This higher amount is necessary because compensation schemes via airlines do not reflect the actual damage caused by air travel and would not have any steering function. Nevertheless, even an overhead of €100/flight may turn out to have little steering effect. It is therefore crucial to monitor the efficiency of any measure and adapt price levels if needed. This monitoring can take place quarterly at UT.

UT internal CO2 compensation fund

To make higher prices per trip more acceptable and attractive to the UT community, we propose to introduce a UT-internal CO2 compensation fund, which collects the fees and uses it to directly stimulate CO2 reduction measures on campus and for/by the UT community. Based on the 2019 emissions of 3500 tCO2 this fund is expected to collect fees of approximately 350.000€ p.a. In the course of time, as UT members adapt their travel behaviour towards more sustainable and overall reduced travel activities, the volume of the fund is expected to decrease. Transiently, the volume may also increase if higher prices need to be imposed to reach the desired targets.

Question to the reader: *is it necessary to introduce faculty-dependent reduction targets rather than a general UT-wide 50% reduction target? A lower reduction target could be coupled to a higher compensation price.*

II. Proposed pricing scenarios

The general consideration is that total CO2 emission should decrease linearly from the 2019 level, as specified in table 1 above, to 50% by 2030. This corresponds to an annual reduction of the target maximum emissions by 6.25%.

In all scenarios it is essential for generating awareness by the traveller that flight overheads are paid upon booking (rather than in an anonymous lump sum payment at the end of the year). For all trips with a one-way train travel duration around 10h (e.g. Paris, London, Berlin, Munich) or longer but only 1-2 transfers, the norm is travelling by train. Exceptions will only be allowed in exceptional circumstances. It is essential that this norm is communicated and acted upon by management, leading by example, to ensure the norm will become enforced.

Scenarios

1. A **universal flat-rate overhead of at least 100€.**
2. A personalised overhead increasing **with every flight** taken (focus on individual travel behaviour).
3. A fee based on **actual emissions per flight**.

Scenario 1 charges a **universal flat-rate minimum overhead of 100€** for any flight booking irrespective of the destination. The minimum rate applies as long the faculty in question has not exceeded its annual emission target. Once this target is exceeded, the overhead increases to €200 per flight booking and if the annual emissions exceed even the initial level of 2019, the fee increases to €500 per booking process (see Figure 1). Using a destination-independent fee does obviously not do justice to the actual CO2 emissions, which is, for instance, 40 times higher for a flight to Beijing than to London. Advantage of this scenario are that it is very simple to implement and that it discourages in particular short distance flights for which train travel is possible. Moreover, basing the fee on flight numbers leads to a reasonably balanced burden between all faculties with a minimum of 428 flights (ET) and a maximum of 766 flights (ITC) in 2019. Based on the 2019 flight statistics (see table 1), charging a flat fee of €100 for each flight leads to an average CO2 price of almost €100/t, as desired. As travel habits change, this accidental agreement may no longer hold in the future.

A variant of scenario 1 would be to use twice the fee for long distance flights (≥2500km). This would do some justice to the increased pollution of long-distance flights without creating excessive administrative burdens.

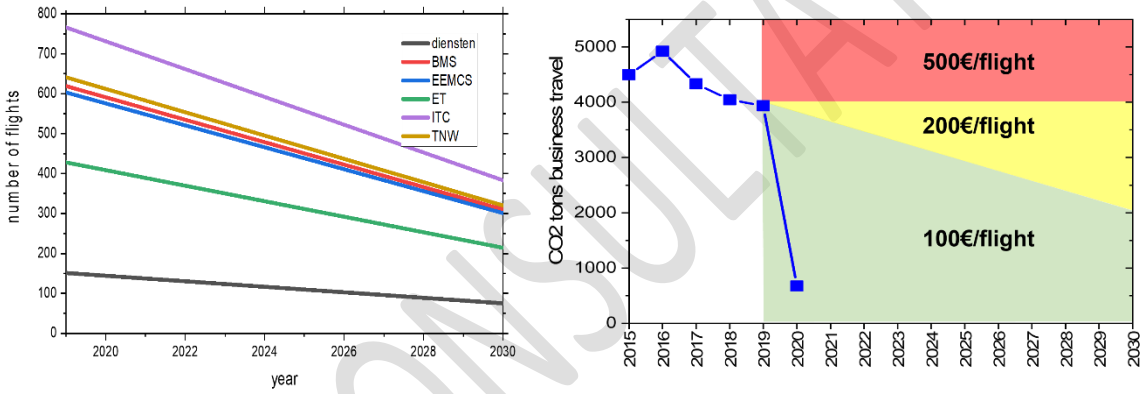

Figure 1. Illustration scenario 1. Left: Example based on 50% reduction targets on flight numbers per faculty until 2030. Right: CO2 pricing per flight according to scenario 1 using the linear reduction target. (blue symbols: total flight number UT)

Scenario 2 is based on the travel behaviour of individual employees. For each employee, the **fee per flight increases with every flight** taken. The fee for the first flight is 100€, for the second 200€, for the third and all subsequent flights €400, irrespective of the destination. (Similarly to scenario 1 a variant is conceivable that distinguishes between short/medium vs. long distance flights.) Advantage of this scenario is that it leaves the costs for non-frequent flyers (typically PhD students) at a moderate level and discourages frequent flying on an individual level. Since frequent flyers are usually well-established senior researchers, they would contribute most to the CO2 reduction measures of the UT.

Scenario 3 tries to assess **actual emissions per flight** based on – technically available – detailed flight information such as exact destinations, type of aircraft, flight altitude. Again, a standard rate of €100/tCO2 will be implemented as long as a faculty is below the annual emission target, with increases to €200 and €500 for excess emissions, as described above. Scenario 2 has the obvious advantage of doing justice to the actual emissions caused any specific flight. Disadvantages are the substantially increased administrative effort for each booking and the fact that there is no generally accepted

manner of calculating the actual emissions of flights. The climate impact is known to depend on flight altitude, humidity, temperature, wind. Moreover, emissions of water vapor, NOx and CH4 need to be converted to 'effective' CO2 emissions. For intercontinental flights, this leads to a substantial enhancement factor (2-4) compared to bare CO2 emissions. UT scientists could become involved in developing this scenario. (Note that the CO2 emissions in table 1 do not include this enhancement factor.) An option is to start with a simple scenario while simultaneously developing the detailed one to see if this detailed method is feasible while not delaying the CO2 pricing method.

Additional admin
The aim is to keep additional administrative work to a minimum. It is however not entirely unavoidable. Registering flights per person will also need to be AVG proof. It is estimated 0.5 fte is needed to register this properly.

Questions to the reader: *the challenge of all measures is to achieve sufficient support from employees and sufficient incentives to actually change travel behaviour at the same time. Are the additional costs sufficient to stimulate behavioural change? Or, alternatively, are the generated funds sufficient to allow for sufficient mitigation? (A typical travel budget for a 4 year PhD project is €5000.) Would it be reasonable in scenarios 1 and 2 to distinguish between short/medium and long distance flights by doubling the rates for long distance flights? Is this sufficient to eliminate the need for the laborious scenario 3?*
Unfortunately, it is to be expected that the consequences of climate change will become more dire in the years to come. This will probably lead to discussions about CO2 budgets for individuals. Scenario 2 already anticipates such developments and would make it easier to respond to upcoming changes. Is this an important argument in favour of scenario 2?

III. Internal CO2-compensation fund

What should the fund be used for?
The goal of the compensation fund is to achieve actual CO2 emission reductions to mitigate the consequences of the flight-induced emissions. Any measure subsidized by the fund should therefore guarantee CO2 reduction (preferably in a quantifiable amount). Since the source of the fund is mobility, it is proposed the primary target to be to stimulate CO2-reduced modes of travelling. Other targets for CO2-compensating measures on campus and elsewhere are also conceivable. Similar to the pricing scheme, the desire is to keep the administrative burden of compensation schemes at a minimum. Below three options are elaborated.

Option 1. Stimulation of CO2-reduced modes of travel. Train trips are often more expensive and take longer than air travel. To compensate the extra investment, a stimulation regime is proposed that subsidized train trips that would otherwise have been done by plane. An example would be that any train trip with a one-way travel time of 8-12h is eligible for a subsidy of 250€. For a travel time beyond 12h, up to 500€ of compensation can be requested. This measure would strongly stimulate train travel to meetings within Europe.

Option 2: UT sustainability fund. This fund focuses on making UT's operations more sustainable. In addition to direct CO2 reduction measures (shared mobility facilities, energy efficiency measures for buildings, energy generation, electrical charging stations), it is also conceivable to support

sustainability measures in a broader sense, any measure meeting the sustainability goals for operational management. One example would be to promote vegetarian and/or vegan food in collaboration with the caterer. While such a measure definitely improves awareness and stimulates more sustainable behaviour, quantifying the consequences is more difficult. (General estimates indicate that replacing a full meal from meet to fully vegetarian leads to CO2 reductions of 3-5kg per serving. According to these figures, compensation of one return flight to Beijing requires approximately 1000 meat meals to be replaced by vegetarian.) Measures of this kind would be an option but require cooperation by the external partners, in this case the caterer. Similar considerations apply to other targets of a broad sustainability fund.

Option 3. External CO2 compensation schemes: In addition to internal compensation measures, revenues can also be used for external compensation schemes. Such schemes include accepted projects (e.g. forestation; socio-economic projects in third world countries) according to accepted (gold) standards or for example the development of clean jet fuel (possibly in combination with research collaborations). In this case, faculties can indicate once per year the desired compensation target or combination of targets.

> ***Questions to the reader:*** *How important do we consider the direct link of the target to quantifiable emission reductions? Do you find it essential to calculate the CO2 avoiding or CO2 capture capacity of a project as a pre-condition to provide funds? Or is it sufficient if a project, an intervention, contributes to reduced emissions based on science stating that for example a vegan diet has fewer emissions than a non-vegan diet?*

IV. Implementation considerations

Feasibility and expected consequences

All scenarios and options described above are technically feasible and can be implemented with more or less administrative effort, as indicated. Reduction of air travel will require choices from scientists. Participation at conferences as well as travel for projects involving international partners are traditionally perceived as important in the scientific world. The COVID pandemic demonstrated that a part of such trips for conferences and project meetings can be replaced by online meetings without substantial losses in quality. Other aspects such as networking and personal contacts are harder to replace. The same applies to projects that require actual physical presence at partner locations, as frequently encountered in projects of the ITC faculty. Nevertheless, total air travel can be reduced by making conscious and deliberate choices. The requested decrease of 6.25% per year can be realized by gradually reducing the number of physically present participants from one (sub)organization at conferences while others participate online. Holding online progress meetings of running projects not only reduces emissions but also reduces travel time at little cost in information transfer. For project requiring physical presence at partner locations, frequent short trips should be replaced fewer more extended visits wherever possible. Such a shift will have to be implemented in the planning phase of any future project. Also the budgeting of new projects should take into account additional cost for more sustainable travel. Scientists involved in organising conferences need to be pro-active in ensuring hybrid attendance possibilities. These are examples of what is necessary to change habits.

Considerate choices should also be made to balance the interest of younger vs. more senior researchers. In this respect, the personalized pricing scenario 2 is particularly attractive. It keeps costs for younger researchers with less travel activity low and puts more burden on (typically more senior)

more frequently flying, researchers. Moreover, younger researchers are expected to benefit more from the direct support for long distance train travel.

Reducing resistance by a transparent public discussion

Change always tends to generate resistance. Yet, universities are organizations that are generally considered as leaders of innovation that provide inspiration and guidance for the future. University members are highly educated and many of our students will be the decision makers of the future. The general level of awareness for the climate crisis as well as the desire for change are rather high. This is demonstrated e.g. by the numerous signatories of the call for action by Scientists for Future Twente in 2021. Nevertheless, the translation of abstract ambitions to concrete behavioural change in daily and professional life is difficult. Nevertheless, we anticipate that the general acceptance for reasonable measures will be high, even if some tough choices will have to be made. Involving researchers and other employees in a broad discussion of the measures is expected to increase acceptance. We therefore call for discussion meetings with scientific staff members of all faculties to reach a broadly supported consensus amongst UT members. Broad approval from students is also anticipated and will definitely improve cohesion and team spirit of the UT as a whole. Generating broad support will also help to overcome the unavoidable resistance of the few, who do not recognize the necessity for change even if expressed by law.

Leading by example is a high and also rewarding ambition that will help us gain the respect of our students, as well as society in general.

Alignment with tender business travel

The 2017 tender process for business travel initially included the requirement of 100% CO2 compensation. Currently, only the ITC faculty (as well as a few research groups – though no numbers available) systematically compensate emissions from business travel. Experiences and more ambitious sustainability criteria will be taken into account by the project team for the new tender for business travel starting September 2022.

Financial process

The Finance department does not expect that the internal fee on a flight ticket of €100 will lead to behavioural change. The Finance department advises to use the consultation meeting on June 29 to create awareness and explore how the UT community wants to deal with this important issue. The allocation of funds generated by this fee (expected to be €300,000 in 2023) should also be discussed.

The Finance department proposes not to set up a separate organisation for the CO2 pricing and to focus on making it as simple as possible. This proposal should be included in the 2023 budget. The scenarios are all quite laborious, of which the €100.00 per ticket seems the least complicated.

Finally, the compensation (whichever scenario is chosen) should not be booked on the 2nd and 3rd funding sources (geldstromen).

Evaluation and monitoring

Monitoring of flight bookings will be done by means of quarterly reports provided by the travel agency. Every two years, emission reductions will be evaluated. Should the measures in place fail to achieve the reduction targets, pricing schemes as well as compensation options will have to be adapted and other interventions may have to be proposed.

Consultation process

The success of this proposal relies on support within the organisation. To obtain support we aim to consult the UT community. After initiation by the UT sustainable mobility group and discussion with the SEE steering group this document this document will be discussed shared with deans and directors of faculties and service departments. An invitation is also shared to join a consultation session on June 29 from 12:15-13:00h in Waaier 2. Feedback from these meetings will be incorporated to reach a final proposal for the EB. This consultation session on June 29 and is open to everyone of the UT community.

More information:

2026: CO2 limit per employee for work travel and for commuting: https://www.volkskrant.nl/economie/werkgevers-krijgen-een-co2-meetplicht-hoeveel-stoot-het-personeel-uit-op-weg-naar-het-werk~bf81185d/

Waterschap beprijst CO2 intern: https://unievanwaterschappen.nl/waterschappen-zetten-een-prijs-op-co2/ Het verminderen van de uitstoot van broeikasgassen krijgt hiermee een financiële waarde.

https://unievanwaterschappen.nl/wp-content/uploads/2022/04/Handreiking-Werken-met-interne-CO2-beprijzing.pdf

https://www.dejongeakademie.nl/en/projects/2042160.aspx Flying less in academia - Towards a carbon-neutral academic climate'.