



UT WASTE PLAN

UNIVERSITY OF TWENTE.

COLOFON

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UT Waste plan

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1 INTRODUCTION

Waste is a theme that the University of Twente put particular focus on starting from 2020. During consultation sessions many suggestions centred around waste: coffee cups, cutlery, plastic bottles, flyers and other promotion materials, litter, plastic packaging, excessive packaging, printing, waste at events etc. Waste is a very tangible topic. Everyone comes into contact with it daily. It is visible, it generates irritation. Addressing these visible issues will generate publicity within the University of Twente community, it will build support (possibly also for less popular measures) and quickly contribute to the image of an university that is serious about sustainability. The University of Twente will walk the talk.

The mission of the University of Twente has a core focus on sustainability in general:

*The University of Twente is the ultimate people-first university of technology. We empower society through **sustainable** solutions.*

More specifically it states:

*As a university, we lead by example. We consider **sustainability** to be a **precondition** for **everything we do**, while our diversity nurtures adaptability and resilience.*

The University of Twente strategy Shaping 2030 emphasizes sustainability on waste specifically:

Strategic goal 1: Shaping society describes that by 2030 the 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 Sustainability Policy for operational management aims to work towards a circular campus in 2050. This follows the aim of the government to have a circular economy by 2050.

The implementation plan of the Sustainability Policy has a focus on waste:

Together with the contractor for waste collection, the UT has started discussions on how to stimulate correct waste separation which facilitates the proper recycling of the resources. A second goal is to prevent the creation of waste. The measures proposed on improving recycling and on preventing waste will be accompanied by a communication campaign. Stakeholders range from facility services and users from each building to contractors and users that produce or collect waste. All influence one another. A joint project plan considering all these points of view will be our starting point.

1.1 Goal of this waste plan

This waste plan will link all aspects of waste together, it will ensure that initiatives will enhance each other. For example, in order to have a (single use) plastic-free campus, we also need to increase awareness and create behavioural change. This waste action plan will not only describe the current and desired situation, but it will also describe how this progress is monitored and reported. The main goal is to prevent, reduce and improve waste (recycling).

The waste plan will ensure a coordinated approach to:

- A (single use) plastic-free campus by 2022
- A waste free campus by 2030
- A circular campus by 2050

- Reduce CO₂ emissions resulting from all forms of waste of University of Twente employees and students (15%) by 2023
- Prevent waste
- Reduce the amount of non-recyclable waste
- Improve waste separation
- Increase awareness
- Material flow management and creation of material flow chart

The University of Twente aims to achieve this by applying the 7R's, where the focus is to work as high up the ladder as possible. So, the focus will have to be more on "rethink" and "refuse" and less on "remanufacture" and "recycle.":

- **Rethink:** is it really necessary?
- **Refuse** single use items
- **Reduce** the amount of waste (focus on quality, longevity, durability to reduce the consumption of natural resources)
- **Reuse:** establish a system where surplus items can be donated or sold. Buy second hand or refurbished items
- **Repair:** maintain and repair components and parts instead of buying new products
- **Remanufacture:** work with companies that make new products out of second-hand materials, upcycle
- **Recycle:** separate waste streams properly

1.2 Context of waste plan

This waste plan is written as a result of ambitions set by the University of Twente. These ambitions were developed in a time where increased attention was given to climate change, sustainability and the role of humans in this. This section will briefly describe the context of the terminology concerning sustainability and circular economy.

1.2.1 Sustainability

The Brundtland report¹ defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The three core elements of sustainability are environmental protection, social inclusion and economic growth. The Sustainability Policy for operational management of the University of Twente briefly explains the 5 key dimensions that come from the three core elements as follows:

- **People:** End poverty and hunger and ensure that all people can achieve their potential in an equal, dignified and healthy environment
- **Planet:** Protect the planet against deterioration and focus on actions that counteract climate change and promote sustainable consumption, production and management of resources.
- **Prosperity:** Guarantee that all people can thrive and live a fulfilling life. Safeguard that economic, social and technological process takes place in harmony with nature.
- **Peace:** Stimulate peaceful, just and inclusive societies, free from fear and violence.
- **Partnership:** Be determined to mobilise resources needed to implement the Sustainable Development Goals agenda by giving a renewed impulse to a global partnership for sustainable development, based on worldwide solidarity encompassing all stakeholders and all people.

1.2.2 Circular economy

Most products are currently designed in a linear way: it is produced, used and thrown away. Another option, the circular option, is to design products and their packaging so they can be reused, returned, renewed and recycled indefinitely. Three key principles from the circular economy are:

¹ Brundtland, G. H., Khalid, M., Agnelli, S., Al-Athel, S., & Chidzero, B. J. N. Y. (1987). Our common future. *New York, 8.*

1. Create as little waste and pollution as possible
2. Continuously reuse products and materials
3. Regenerate natural systems²

Some companies do not even sell products any longer, rather they sell a service, for example lighting, instead of selling light bulbs. By the time the light bulbs stop working, they will be returned to the manufacturer so they can repair or renew them.³ This generally increases the lifetime of a product as the manufacturer now has an incentive to use a product as long as possible.

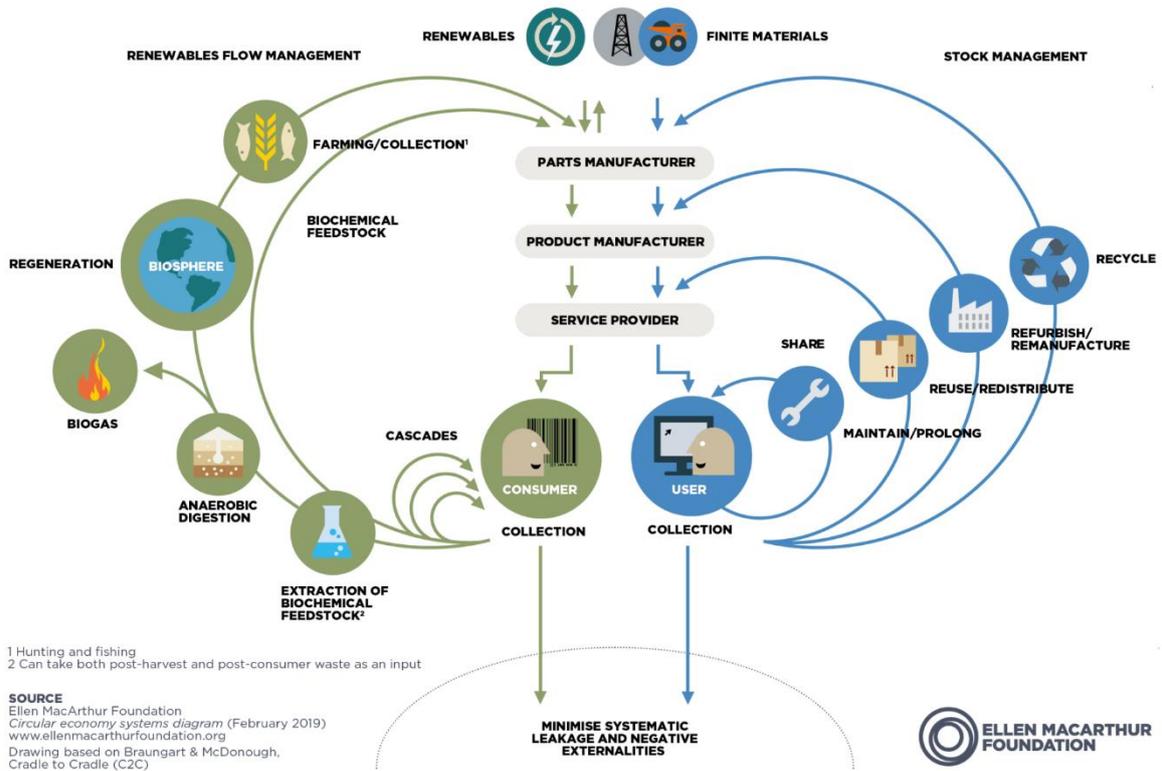


FIGURE 1: CIRCULAR ECONOMY SYSTEMS DIAGRAM - ELLEN MAC ARTHUR FOUNDATION (2019)

² <https://www.ellenmacarthurfoundation.org/circular-economy/concept>

³ <https://www.lighting.philips.nl/systemen/aanbod-van-pakketten/winkels-en-horeca/light-as-a-service-retail>

2 CURRENT SITUATION

At the University of Twente, we aim to prevent waste. Where waste does arise, we try to separate it as much as possible to facilitate recycling and what cannot be recycled, we dispose of properly, safely and responsibly.

2.1 Waste separation

The University of Twente is trying to collect more and more waste streams separately. Since the end of 2017, when the new waste collector started, we have been creating waste islands at central locations in our buildings, enabling us to further separate waste in and around offices and teaching rooms. There are 4 waste streams:

- Paper and cardboard
- PD (Plastic and Beverage containers)
- Fruit and vegetable
- Residual (non-recyclable waste)

Several of the waste islands also feature a separate bin for coffee cups inside the PD part. Additionally, the buildings are also equipped with bins for large pieces of cardboard, glass containers and confidential paper containers. At service desks and at central locations, such as next to elevators, batteries, toners and small chemical waste (from offices) are collected. At labs, plastic film, styrofoam, hard plastics and several types of metals are collected and picked up when full. Hazardous waste from laboratories is collected weekly and disposed of via our waste collection and processing company, according to current legislation and conditions of the environmental permit.

2.1.1 Waste separation facilities

Waste islands: the previously mentioned waste islands, are located in all UT managed buildings on campus. Because the waste is sorted at various central locations in the buildings at the waste islands, there are no longer any waste bins near the desks and in the lecture theatres. Everyone needs to walk a short distance to throw away their waste.

Styrofoam, plastic film and hard plastic frames: frames with large plastic bags can be found at lab facilitates to separate styrofoam, plastic film and hard plastics. This way of collecting waste is more efficient and located closer to the labs. Additionally, these waste streams are picked up, processed and recycled separately.

Containers for study associations: several study associations are located in close proximity from each other and have a common area where students can study or have a break together. Because they thus sometimes create more waste than that fits in the waste islands, these study associations have received 240-liter containers for the four main waste streams.

Storage for surplus items: while the University of Twente has several storage facilities for the faculties and team leaders facility services, the storage spaces are limited in size because of the square meter rental price. Additionally, some bulk items are stored by CFM at the CAD site. Currently the situation can arise that one party buys desks while the other stores of similar ones on the same day. Informal transfer of items does happen sometimes, but not everyone is aware of this possibility yet. Re-use is considered in (some) new tenders.

Bulk waste: at the soil deposit area⁴ bulk waste is stored and separated in at least the following waste streams: white goods, wood, debris, residual waste, soil and bricks.

Metals: for example, old bikes and old iron, are collected by the green maintenance company.

⁴ Gronddepot

Student household waste: since 2020, de Veste has a separate container to be able to monitor student household waste separately from the university's waste.

2.1.2 Waste analysis January 2020

On January 23rd, 2020 the current waste collection and processing company analysed waste collected on 4 different locations on campus. Per location, the residual and PD waste bags from two or three bins were collected and analysed. All waste was sorted into the following four waste streams: residual waste, PD, paper & cardboard and fruit & vegetable waste.

The residual waste consisted out of the following waste streams:

Waste type	Total kgs	Weight (%)
Residual waste	2.59	32%
PD	2.56	31.6%
Paper & cardboard	1.45	17.9%
Fruit & vegetable	1.5	18.5%
Total	8.10	100%

TABLE 1. WASTE ANALYSIS - RESIDUAL WASTE

The PD waste consisted out of the following waste streams:

Waste type	Total kgs	Weight (%)
Residual waste	1.21	14.1%
PD	6.7	77.8%
Paper & cardboard	0.62	7.2%
Fruit & vegetable	0.08	0.9%
Total	8.61	100%

TABLE 2. WASTE ANALYSIS - PD WASTE

The two tables above show that the bin for residual waste is being used for all waste streams. Many people might consider it to be a mixed waste bin. Almost 78% of waste in the PD bin is being disposed of correctly. The University of Twente needs to ensure that waste is being thrown away in the correct bins, so the recycling rates could increase.

2.2 Overview waste streams

Though slightly less visible, the following (main) streams are also collected separately at various locations and the amounts of waste per stream in from 2019 can be found in table 1. Because of COVID-19, the waste numbers in 2020 and 2021 have decreased significantly.

Waste stream	2019 (in kg)	2020 (in kg)	2021 (in kg)	2022 (in kg)	Recycling rates
Residual waste	594.024	409.152	431.639	501.427	100% is incinerated with energy recovery
Paper & Cardboard	167.892	104.985	126.691	200.273	100% recycled (95% for new paper & cardboard, 5% for toilet paper and paper towels)
Swill (fruit and vegetable waste)	37.922	17.553	12.150	31.207	100% is fermented with energy recovery
Glass	18.197	7.899	9.204	17.942	100% is recycled
E-waste	14.601	9.128	13.687	7.044	80% is sold/given to employees (not included in these numbers), of the other 20%, only metals and metal compound are re-used. Rest material is incinerated with energy recovery
PMD (Plastic, Metal, Beverage containers)	42.320	6.600	8.605	32.173	85% is recycled (7.5% PET, 7.5%PP, 12.5% PE, 20% plastic film, 40% mixed materials), 15% is incinerated with energy recovery
B-quality wood	46.880	24.920	37.140	34.200	40% is recycled into MDF and chipboard, 60% is shredded and used in Bioenergy Power Plants with energy recovery
Coffee Grounds	4.877	2.392	3.281	14.874	Mostly incinerated with energy recovery, small amounts are reused for circular products (% depends on demand from market)
Construction& demolition	2.200	2.140			100% is recycled
Hazardous waste	37.248	36.714	41.212	42.177	Not applicable
EP (expired products)	11.060	8.229	9.855		75% is fermented with energy recovery, 25% is incinerated with energy recovery
EPS			60	126	
Hard plastics				560	
Other waste streams	7.864	8.227	5.971	21.210	
Total waste	985.085	637.939	699.495	903.213	
Construction& demolition LTSH projects			3.898.650	239.250	100% is recycled

TABLE 3: UNIVERSITY OF TWENTE WASTE STREAMS

In 2019, the total amount of CO₂ emissions from waste of the University of Twente was 631 tonnes CO₂. Because we have a clear overview of the waste separation, we can also measure the impact of our waste improvement projects. This enables us to measure whether or not we are on track to reach our goals for the coming years to reduce CO₂ emissions with 15% by 2023, becoming a waste free campus by 2030 and even becoming a circular campus by 2050. In 2022, the total amount of CO₂ emissions from waste of the University of Twente increased to 1.112 kg. This is a 76% increase which is mainly due to more detailed reporting by the waste collector. The increase due to the inclusion of demolition waste is 75 tonnes CO₂.

2.3 Waste collection and processing

Since the University of Twente has many students and staff members, the waste collection and processing system has to be put in place very well. For sustainability reasons, we have minimized transport movements.

2.3.1 Waste collection

All waste from the waste separation islands is disposed of by the cleaning company. Residual waste and paper and cardboard are disposed of in semi underground containers that are emptied respectively twice and once a week. Fruit and vegetable waste is disposed of in 240 litre containers that are emptied when full. The plastic bags from the PD waste bin are put outside the buildings by the cleaners. The green maintenance company picks up these plastic bags on a daily base and place them in the plastic waste press. This press compacts the waste by removing all air from the plastic waste and when the waste press is almost full, the waste collection and processing company is asked to empty the waste press. Bulk waste is collected once every two weeks and old iron once a week.

From the redundant regular electronics, 80-90% is sold/given to employees and 10-20% is recycled or donated to charity. However, only metals and metal compound are recycled/re-used.

2.3.2 Processing of waste

Waste is recycled where possible and otherwise it is incinerated or fermented with energy recovery (see table 3).

The waste collection company provides information on their website⁵ on how each waste stream is processed.

- **Residual waste:** if waste has been recycled into the other waste streams, only waste that cannot be re-used ends up in the residual waste stream. Residual waste is incinerated which creates steam that drives a turbine. This generates electricity and heat; the steam will eventually cool down to water and will be reused in this process. The ashes that are left, are cleaned and reused, for example as raw material for concrete.
- **PD:** PD waste will be sorted at the waste processing site because the different types of PD waste and plastics cannot be recycled together. Afterwards the waste is shredded, cleaned and sorted again. All waste streams are then individually turned into small plastic pellets. These pellets are re-used into new packaging and products.
- **Paper and Cardboard:** at the waste processing site, all paper and cardboard are sorted, and other materials are removed. Water is added and materials like staples, are sifted out. If needed, ink will also be removed and to create white paper, the material will be bleached. The waste this creates is used in the concrete and brick industry. The material will now be pressed, dried and reused for paper or cardboard. This cycle can be repeated for a maximum of five to seven times.

⁵ <https://www.suez.nl/nl-nl/naar-zero-waste/afvalstromen>

- **Fruit and vegetable waste:** the fruit and vegetable waste will first be sorted into 6 different types of waste, and pollution like plastics, glass and metals will be removed. The waste will then be fermented, this process creates compost and biogas that is used as green gas or electricity. Ten kilograms of swill waste result in three to four kilograms of compost that can be used to grow crops.

Transparency on how much of -for example- the University of Twente's PD waste is processed as PD and used for recycling is important in order to reach the targets of a waste free campus through the reduction of non-recyclable waste and increasing the recycling percentages.

Collected waste from the campus can for example be recycled into the packaging from Seepje or KarTent (festival tents made from cardboard).

2.3.3 Transport movements

The green maintenance company picks up PD waste on campus every day. The cleaning company drives an electric car. The waste collection and processing company picks up different waste streams every day of the week.

2.4 Waste water

The campus of the University of Twente has the following sources of waste water: residential, sewage from the buildings, from laboratory activities, water used for cooling installations, humidification systems and for deferrization⁶, commercial activities (restaurants, cafes), sports and agricultural activities and some rainwater⁷. The sewage system transports all to the pumping station near the Drienerbeeklaan. From there the waste water goes to the treatment plants of The Vechtstromen Water Board. There are additional sampling locations near labs, but these are currently not used for sampling.

Waste water needs to comply with specific conditions in order not to disturb the treatment plant processes. Waste water is monitored quarterly, where five samples are taken during the course of a week to determine the amount of oxygen-binding substances (chemical oxygen demand and the sum of nitrogen bound in organic substances, nitrogen in ammonia and in ammonium) and one sample for metals (chrome, copper, lead, nickel, zinc). This is calculated into a pollution load determining the fees paid for the waste water treatment.

Currently, there is no legislation to monitor or assess the amount of microplastics or medicines in waste water.

Under the HogeKamp square several sources of waste water are kept separately in order to test water filtering membranes by researchers from the faculty TNW (rainwater, sewage water (lab and residential), water filtered through a reedbed filter).

2.5 Circularity

Currently circularity is considered incidentally, mainly concerning furniture, with renovations and in the choice of materials used in the outdoor area on campus.

Examples of circularity at the University of Twente are:

⁶ Water needed for the iron (Fe) removal process

⁷ Most drainpipes are disconnected from the sewage systems for rainwater to flow into the surface water ponds.

- **New furniture:** by re-upholstering furniture and modifying tables or adding acoustic panels, furniture has been made suitable for reuse in the Technohal, whilst creating a uniform appearance in keeping with the style of the building. Any surplus material, such as non-reusable table tops, are used for the permanent furniture, if possible. For the new ITC building Langezijds circularity is considered in a similar way. Circularity and re-use of furniture is also considered in the new furniture tender.
- **New Hogekamp square:** the old pavement has been recycled into the bricks of the new square.
- **Rainbow bench:** in 2020, the University of Twente placed a rainbow bench close to the entrance of the campus, in support of the diversity day. This bench has been made by a 3D printer that used recycled plastic.
- **Toilet paper:** the University of Twente uses toilet paper made from recycled paper that is also biodegradable and CO₂ neutral.

The University of Twente has to have a circular campus by 2050, so in the upcoming years more and more steps towards a circular campus have to be made.

2.6 Stakeholders

The stakeholders of University of Twente waste are:

- Procurement/purchasing department:
 - In the initial stages of the tender contractors will be asked on how they can contribute to reducing waste and reaching the university's ambitions on this theme, a 15% reduction in waste related CO₂ emissions.
 - Where possible consider the service economy: paying for services rather than owning products (example Phillips: buy lighting as a service instead of lightbulbs).
 - Consider circularity were possible.
- Students & employees:
 - Inform and stimulate students and employees to minimize the waste they create and to correctly recycle their waste.
- Cleaning company (incl. emptying waste islands):
 - Inform staff on proper waste separation of waste islands.
- Waste collection and processing company:
 - Clear communication to employees and students at the University of Twente about what happens with the collected waste, in order to stimulate (correct) recycling.
- Caterer (& vending machines):
 - Caterers can minimize waste by purchasing the right amounts of food, reuse leftovers or sell them for a discounted price. The current caterer uses the Too Good to Go app to minimize food waste.
 - Plates, cups and cutlery should be reusable as much as possible to reduce waste. Correctly instruct customers on how to dispose food packaging.
- Green maintenance:
 - Collects green waste were needed, and compost, ferment and recycle it.
 - Collecting PD waste on campus in waste press, monitors PD amounts and arranges pick-up.
- Contract managers:
 - Awareness of facility managers on sustainability topics related to their contracts. Regularly discuss sustainability criteria, compliance and progress with the contractors.
- Team leader facility services:
 - The team leaders facility services see what happens within the buildings and can help localize issues related to waste and help solving or preventing them. For

instance, by having close contact with the different departments and study associations.

- LISA & data centre:
 - Reuse products as much as possible and recycle them correctly afterwards. Purchase products that can be refurbished/recycled as much as possible.
 - LISA aims to minimize e-waste at the University of Twente and they allow you to take over redundant personal electronics like laptops and phones.⁸
- Everyone who organises events:
 - Events should be organized in a plastic free (by 2023 latest) and circular (by 2050 the latest) way.
- External parties on the campus:
 - Aim to communicate on proper waste disposal, where possible improve waste collection system and minimize waste.
- New built and renovation projects LTSH:
 - Inventory of waste per project per year.

⁸ <https://www.utwente.nl/en/service-portal/hardware-software-network/hardware/redundant-electronic-equipment-e-waste>

3 DESIRED FUTURE SITUATION

In the desired situation, the University of Twente prevents, reduces and improves her waste (recycling). By using products in a smarter way, or by (re) using it for a longer timeframe, we aim to create less waste. Where possible, the goal should be to process waste in a circular way instead of aiming to recycle it.

Several goals have been set by the government and by the University of Twente to reach the final goal to have a circular campus by 2050. All goals are visualized in the timeline below.

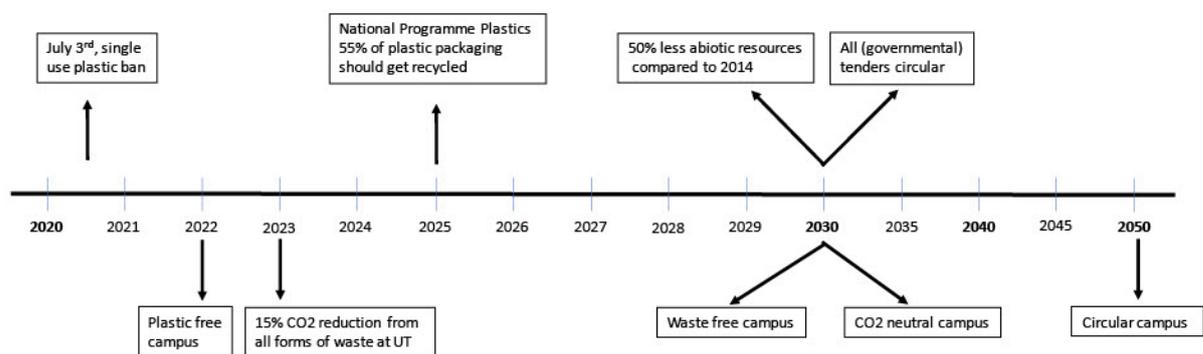


FIGURE 2. TIMETABLE UNIVERSITY OF TWENTE WASTE GOALS

Legislation to decrease waste:

- 01-07-2021: deposit scheme on all plastic bottles
- 03-07-2021: ban on certain types of single use plastics (plates, cutlery, straws)
- 01-04-2023: deposit scheme for cans
- 01-07-2023: free plastic disposables prohibited (advice price 0.25)⁹
- 01-01-2024: plastic disposables prohibited in offices/canteens
- 2024: >75% of plastic disposables should be recycled in high quality¹⁰
- 2027: >90% of plastic disposables should be recycled in high quality¹¹

We can divide the University of Twente waste into three categories:

1. General waste (furniture, electronics, office supplies, everything thrown away in the waste separation islands etc.)
2. Buildings (renovation/demolition)
3. Waste specifically needed for research and education

3.1 General waste

All targets as defined in this document relate to the general waste stream. The main waste streams at the University of Twente and their desired situation can be found below.

3.1.1 Residual waste

⁹ <https://vangbuitenshuis.nl/nieuws-agenda/nieuws/2022/weg-wegwerpplastics-gaat-hoger-onderwijs/>

¹⁰ <https://vangbuitenshuis.nl/nieuws-agenda/nieuws/2022/weg-wegwerpplastics-gaat-hoger-onderwijs/>

¹¹ <https://vangbuitenshuis.nl/nieuws-agenda/nieuws/2022/weg-wegwerpplastics-gaat-hoger-onderwijs/>

Desired situation: prevent residual waste from coming to campus and increase waste separation rates to decrease the amount of residual waste to 10.5kg per person per year.

In line with the regional goal to have a waste free Twente by 2030, the University of Twente set the goal to become a waste free campus by 2030. Waste free in this sense does not mean that we expect to create zero kg of waste by 2030. For the Twente region, the goal has been quantified to a maximum of 50kg of non-recyclable waste per person per year and a recycling rate of 90%. For the University of Twente these numbers will be lowered because of the amount of time spent on campus and people thus create less waste on campus. If we assume that people spend an average of 2-4 days a week on campus, considering working from home will be continued. Based on this presence on campus, targets are set by which to reduce the amount of no-recyclable waste. This is around 1/7th to 2/7th of average hours a week people have 'time' to 'create waste'.

This is, on average, 21% of the time, they should also create a maximum of 21% of the waste of the regional set goal on campus. Therefore the goal of the University of Twente is to have a maximum of 10.5kg of non-recyclable waste (including residual waste) per person per year by 2030. To compare, in 2019 the University of Twente had 15.057 students and staff members who created 647.213 kg of non-recyclable waste. This gives an average of 43kgs per person per year, a number that should thus drop significantly in the next years. One way of lowering the residual waste is by improving the recycling rates.

3.1.2 Plastic (PD)

Desired situation: phase out unnecessary plastic usage, reduce plastic waste to 2kg per person per year of which 0.1 kg that cannot be recycled in 2030, and improve recycling rates.

In Europe, we produce 58 million tonnes of plastic every year. 25 million tonnes of which end up as plastic waste. Only 30% of the total plastic waste in Europe is being recycled, 39% is incinerated and 31% ends up in landfills. More than 60% of the plastic waste comes from packaging, and of this packaging waste, only 40% is recycled.¹² This is why the European Union will ban many single-use plastic items and why the Dutch government has put a deposit on small plastic bottles and cans.

The University of Twente would like to be a plastic free campus by 2023 and a circular campus by 2030. For the goal in 2023 plastic free means that we would like to minimize plastic usage and plastic waste as much as possible. Some types of plastics (like plastic cups, coffee cups, plastic food packaging, straws and stirrers) are not allowed to be used. To being able to measure whether we reach this goal, we have quantified this goal to a maximum of 2.5 kg of plastic waste per person per year on campus. By 2030 the PD waste stream should have decreased to 2kg per person per year of which a maximum of 0.1kg¹³ of PD waste that cannot be recycled. This should not result in increasing the residual waste stream. This should be realised by a combination of preventing PD waste and improving (high-quality) recycling of the waste processing company.

To compare, in 2019, the University of Twente created 42.320kgs of PD waste with 15.057 students and staff members. This gives an average of 2.8kgs per person per year. Since the focus also lays on better waste separation, numbers are expected to increase without a communication campaign to create awareness on waste reduction.

3.1.3 Paper and cardboard

¹² <https://ec.europa.eu/environment/waste/pdf/pan-european-factsheet.pdf>

¹³ To compare, in 2019 the UT had 2.8kg of PD waste per person of which 85% was recycled, this led to 0.42kg of waste per person that wasn't recycled.

Desired situation: digitally reading materials are the norm, if printing is absolutely necessary people should aim to print double sided and 2 pages per side.

A significant part of all paper and cardboard waste comes from printing paper. In total in 2019, 4.780 packs of printing paper have been purchased. In 2020 this was even 5.100 packs. All packs contain 500 sheets of paper. At the University of Twente, using environmentally friendly paper is very important. In 2019 and 2020, all paper purchased has an EU Ecolabel or is even CO₂ neutral (300 packs in 2020). This means that the trees and paper are produced in a more environmentally friendly way. The University of Twente does not yet purchase recycled printing paper. Reading materials digitally should become the norm, as well as handing in student assignment online rather than printed.

3.1.4 Swill/coffee

Desired situation: all coffee grounds at the University of Twente are collected and recycled, other organic waste streams should be collected and recycled as much as possible.

Since 2022 all coffee grounds at the University of Twente are collected so they can be reused as much as possible in products like soap or to grow mushrooms. Similarly, the University of Twente will research possibilities to collect orange peels and other waste streams to recycle into new products like soap. By 2030 more organic products should be collected in a monostream and recycled in high-quality.

3.1.5 Glass

Desired situation: still to be determined.

3.1.6 E-waste

Desired situation: reduce e-waste, extent lifetime of products, monitor e-waste streams and improving high-quality recycling of e-waste.

E-waste at the University of Twente consists of two main aspects: regular electronics used by employees or by students in the buildings and specific electronics used in the data centres.

From the redundant regular electronics, 80-90% is sold/given to employees and 10-20% is recycled or donated to charity. However, only metals and metal compound are recycled/re-used. At the University of Twente, we should aim to use products for a longer period before the electronics are written off. The e-waste that is still created should have an increased percentage that is recycled. For example, not only the metal parts should be recycled but the plastics and glass as well. By 2030, the recycling rates of should increase to what is possible in the market. Additionally, high-quality recycling is needed for as many components as possible, rather than just the metal components.

To reduce her e-waste, the University of Twente should give staff an incentive to use their electronics for a longer time. They could for example give staff some extra hours/days off for every six months that staff will use their electronics after the standard lifetime. Products should also be repaired were possible before considering them as e-waste. Also, people should be allowed to use their work phone and computer for private as well. This prevents staff from, for example, walking around with two phones and thus also prevents half of the e-waste.

Currently, everyone should return their phones, tablets, computers etc. after a certain number of years or when people stop working for the University of Twente. However, this is not monitored well, and it could very well be the case that not all electronics are being returned. This should be better monitored. Also, electronics that are donated to charity should be monitored as it is currently

unsure exactly how much is donate yearly. Additionally, a system should be put in place to remind staff to return their electronics when they stop working for the University of Twente or when they receive new ones. If we are monitoring when people return their electronics, secretaries or LISA could send reminder e-mails to staff who forgot to return their products.

The data centres are currently not able to extend the lifetime of their electronics. Normally the lifetime of the equipment in data centres is around five years, the University of Twente is currently using their equipment between five and ten years. A very small percentage of the equipment could still be used by others and is donated to student associations. The University of Twente should research possibilities for pilot projects with external companies who refurbish these electronics or who re-use it at other companies. However, energy usages should always be kept in mind. After a few years, new servers are so much more energy efficient and faster that it is better to use this new quality than to extend the lifetime of older products or buying refurbished electronics. Because the data centres use lots of energy, the possibilities for low energy, sustainable data centres should be investigated. This could be in done in collaboration with the Centre for Energy Innovations from the University of Twente. At the moment, were possible, more efficient cooling systems and more energy efficient servers are being bought.

3.1.7 Wood

Desired situation: still to be determined.

3.1.8 Hazardous waste

Desired situation: UT aims to assess where hazardous waste can be reduced, where processing of the waste can be optimised and how the usage of Substances of Very High Concern (CVS in Dutch) can be minimized.

Together with the suppliers, the UT should investigate which Substances of Very High Concern can be replaced by safer alternatives. Perhaps no alternatives can be found that can be used in all situations, but in some situations, it is likely that several substances have similar features. The found alternative substances should be communicated to the lab users and this should be repeated when these Substances of Very High Concern will be purchases. Together with the suppliers, the UT should check whether it is possible to create a pop-up with the alternative substances and information about when the alternative can be used. This way, the UT can hopefully lower her use of Substances of Very High Concern, without compromising on the quality of education and research.

3.1.9 Purchasing

Desired situation: consider waste reduction, prevention and circularity in all tender processes by 2030.

- Products that last longer.
- Buy products with less packaging or return the packaging to the supplier.
- Products that can be re-constructed/modular.
- Buy product-as-a-service (PaaS), For example lighting instead of lightbulbs.
- Use multifunctional products (for example the University of Twente's print-scan-copy-fax machines).
- Refrain from product use (for example: no more desktops for students and employees, instead only individual laptops that could be used everywhere).
- Prevent green washing by suppliers.

- Buy products that can be returned/sold to the supplier after user phase¹⁴.
- Include Extended Producer Responsibility (EPR) in tender.
- Buy one product type where possible, instead of several similar products from different materials. This reduces waste streams.
- Don't only look at the price but also at what needs to be purchased. It could, for example, be only a bit more expensive to order twice the amount of flyers/business cards as needed. However, if you don't need the flyers/business cards, you will have to dispose of them and pay for this as well.
- Buy circular products made from the University of Twente waste streams. For example, hand soap made from orange peels that were made out of waste from the University of Twente.

3.1.10 Circularity

Desired situation: working towards a circular economy requires the University of Twente to consider circularity criteria in its tender contracts as a standard element by 2030 the latest. Another focus point is to prevent waste by enabling and considering a second life for products that are no longer used.

Where possible the University of Twente should aim to store redundant products to reuse at a later time/for a later faculty. Faculties and team leaders facility services already have small storage rooms where they keep redundant desks, cabinets and chairs. These could be used to decorate new offices in the future. In the desired situation, all employees are aware of the storage rooms and people will first check if they can use redundant furniture before ordering new ones. Although suppliers already re-use materials were possible, ordering new furniture should be minimized were possible. Every faculty will have a large enough storage room, for which prices per meter for storage rooms might need to be lowered.

Scientific equipment: during consultations a researcher mentioned that when equipment bought for a project is no longer used because the project is finished, while perhaps other researchers or students (at the University of Twente or another university) could benefit from it. To match demand and supply, a quite specialised kind of e-bay set up with fellow universities is required.

Additional to this waste plan, the UT is writing a vision on circularity.

3.1.11 Waste free events

Desired situation: less waste, no plastic waste. Insight in data on waste of events.

Events should be organized in a plastic free (since 2022) and circular (by 2050 latest) way. For example, by having reusable cups that could be received after paying a deposit fee or by high-quality recycling the single use soft cups. Both ways, we have to prevent cups ending up in residual waste streams. This is also mandatory by EU law since July 1st, 2023.

3.2 Buildings

Desired situation: Monitor and report on waste resulting from renovations (large and small-scale).

At the University of Twente, the renovation and demolition waste from buildings is not yet monitored, but around 95% of construction and demolition waste is currently being reused or recycled. The WUR has calculated that waste from buildings results to 81% of the total and

¹⁴ Koop-terugkoop regeling

accounts 47% of its CO₂ footprint¹⁵. If you can only decrease the waste from buildings with a small percentage (for example 10%), this can make a high impact and can result in reaching waste reduction goals faster. For future projects, construction companies are asked to monitor this type of waste stream. Since 2021 the UT includes the amount of waste from renovations and demolition to calculate the CO₂ footprint and define separate goals for decreasing waste from buildings.

3.3 Waste from products specifically needed for research and education

Desired situation: Consider proper waste management infrequently used materials.

Products that are needed for research and education are more complicated to change. As an educational institution our focus lays at research and education. Where possible, the University of Twente should aim to choose more sustainable options and extent lifetime were possible. Also, aspects like energy usage and end of life recycling should be considered were possible.

Currently several waste streams are already being separated at the lab's facilities: styrofoam and plastic film is collected at several locations throughout the campus. Stainless steel, coper and aluminium are collected at only some facilities. To process the products as well as possible after usage, we should research possibilities to separate more waste streams. For example, several types of metals and plastics. Research (by students) should take place to investigate all waste streams from the labs and see which waste streams could be collected and disposed separately. Also issues from waste from the labs should be researched and solutions should be found. For example, for the ISOgen trays. Currently dozens of plastic bags with these small trays are stored in the basement. The supplier will pick them up as a onetime solution, but a long-term solution should still be found.

3.4 Desired situation waste separation and processing

Although several steps have been made to make waste separation and processing more sustainable, there are still ways to improve this.

3.4.1 Waste separation

Desired situation: Everyone on campus is aware of how and why to separate their waste, resulting in better recycling rates.

In order to increase the recycling rates, the University of Twente should start a communication campaign to inform students and staff about how to dispose of their waste. This should include information about what the waste processing companies do with the waste that directly come from the University of Twente. This could reduce the pollution caused by truck loads that get rejected. Some students and staff have the feeling that recycling waste is not needed because they believe that it will be all disposed of together anyways. Clear communication can help to minimize this feeling.

Additionally, a clear workflow for emptying the bins should be ensured. This to have a successful handover during holiday period and prevent that plastic bags from the waste separation islands are disposed of in the wrong semi-underground containers.

All waste separation islands and bins need to have one of the two types of stickers on the front, explaining how to recycle your waste to create uniformity.

3.4.2 Waste processing

Desired situation: The University of Twente knows exactly how all her waste is being recycled and clearly communicates about this.

¹⁵ Presentation WUR: Workshop Afvalmanagement by Annet de Haas on October 9th, 2020

Simultaneously to the communication campaign, we should set KPI's on the amount of (PD) waste that is actually recycled. Clear communication is needed about the recycling rates and products made from the waste from the University of Twente.

Where possible, recycling rates should be increased. For example, research possibilities to recycle not only metal parts from e-waste but also other materials.

3.4.3 Transport movements

Desired situation: Combined pick-up of waste streams and where possible, electric vehicles should be used.

Transportation movements to and from the UT should be minimized as much as possible. Where possible the pick-up of waste streams should be combined to minimize transportation movements. At a later stage the options to further minimize transportation movements should be investigated. For example, by combining transport to the University of Twente with the residents' waste and waste from external companies on campus as well as with nearby companies is an option to minimize transport movements.

4 THE APPROACH

The focus off everything that derives from this waste plan will lay on **visibility, impact and effort**. Impact consists of low hanging fruit, its impact on the CO₂ footprint and its impact on reducing the amount of waste.

Next to this, the waste plan will show alignment between the various actions/themes and collaborations with other universities, Rijkswaterstaat and the Green Hub Twente.

4.1 Green Hub Twente and CFM

The collaboration with the Green Hub Twente needs some extra clarifications to ensure double work at the University of Twente will be prevented and to ensure that the different roles of the UT CFM and the UT Green Hub will be clear.

CFM will write this waste plan and any policies and general implementation resulting from this waste plan. The Green Hub in turn, will execute several small projects that could be realized within a few months and that are in line with the goals of this waste plan. For example, one of the goals of this waste plan is to improve communication of the University of Twente waste separation and processing. The Green Hub will make a video or an infographic to inform people about what happens with your waste after you throw it away. Clear understanding of how the waste is recycled will help people understand the importance of waste separation.

Additionally, the Green Hub might create partnerships with sustainable/circular waste start-ups, like Plaex. While these collaborations can give the University of Twente more knowledge and research opportunities for students, the Green Hub will not take over the role of facility management or the SEE program in any way. Purchasing new waste bins, European Tenders for new contracts and the decision-making process for pilot projects will remain at Campus and Facility Management. The Green Hub can, however, give advice if needed or give their opinion if they believe it is necessary.

4.2 Communication and behavioural change

In collaboration with the SEE communication advisor, a general SEE communication plan has been written. Sources state that reducing waste and increasing recycling rates is for 30% related to operational management and for 70% to behaviour/psychology¹⁶. It is thus very important that the University of Twente creates rules, structures (waste separation islands with clear indicators on how to separate) and enforcement of the rules, but behavioural interventions are much more important. We should research how we can inform, stimulate, visualize, convince and nudge people to correctly separate their waste.

Generally, people do not like changes, therefore all changes need to be made very simplistic, visual and logical. After a while, the new situation becomes normal again and people get comfortable with it. People use shortcuts to make decisions, therefore, visual information is processed easier than texts. At waste bins, we should thus include pictures of a glass bottle on glass bins instead of the word "glass". Adding signs for the closest waste bins are unlikely to work but placing footsteps on the floor towards the next waste bins do often work.

¹⁶ Presentation HVA/UVA: Afval & Circulair, July 3rd, 2020

Communication about waste on the website and service portal should only be done to inform interested people, not to inform the broader public as text do not really work. But people are inclined to do what other people are also doing. Thus, texts like 90% of people correctly separate their waste on campus could help stimulate people to correctly separate their waste as well. People are also more inclined to successfully separate waste if they are reminded of the importance of waste separation at the moment they want to throw it out. For example, putting signs next to the waste bins that state what percentage of waste is re-used might work better than placing a video of the waste separation process online.

The plans on interventions for behavioural change will be developed in collaboration with the BMS cluster Multidisciplinary Working Group Energy Transition & Behavioural Change.

5 REPORTING

5.1 Monitoring and reporting on progress

The progress of this waste plan will be monitored in several ways:

1. Via the CO₂ footprint, which reports on the total waste of the University of Twente and its CO₂ equivalent.
2. The website¹⁷ will continuously be updated about the progress and new initiatives regarding the University of Twente's waste.
3. Creation of a waste dashboard to report on waste streams.
4. The SEE annual report and implementation plan will both contain the achievements of that year.

Data sharing platform

University of Twente start-up Realised has built a carbon data platform for the University of Twente. This platform will contain monthly information of the four biggest waste streams at the University of Twente: residual waste, PD, fruit and vegetable waste and paper/cardboard.

Future plans: material flow management

The University of Twente already started getting more insight in their material flow management by calculating the yearly CO₂ footprint, for which all suppliers are contacted to submit data. However, this data could be much more specific and preferably be visualized in a material flow diagram. For example, information throughout the supply chain, about semi-finished products from subcontractors and the recycling process are often missing. Getting more information about the material flow at the University of Twente, will also help to make more sustainable decisions, like reusing products more often, extending a products lifetime and depreciation time. Additionally, a regularly updated material flow diagram will be a great start for conversation with suppliers and contractors about creating more sustainable alternatives.

¹⁷ <https://www.utwente.nl/en/sustainability/initiatives/waste/>