

ROADMAP SUSTAINABILITY AMOLF

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CURRENT SITUATION

The following sections briefly describe AMOLF's carbon footprint and the steps AMOLF has already taken to become more sustainable.

Carbon footprint

A carbon footprint is the calculation of the total greenhouse gas emissions emitted by an organization. All activities such as energy use, mobility, transport, construction and air travel release carbon and other greenhouse gases. A carbon footprint shows in an overview which amount of carbon is caused per emission source and which percentages the emission sources contribute to the total emissions of the organization. This gives an organization insight into the main causes of its carbon emissions and can work on an approach to reduce emissions.

AMOLF's carbon footprint for 2019 and 2020

Table 1 shows the CO₂ emission in tons per activity and in total for AMOLF in 2019 and 2020. Figure 1 is a visual representation of the table. Figure 2 shows AMOLF's carbon footprint for 2019 and 2020 in percentages.

AMOLF's total carbon emission in 2019 was 444,3 tons. In 2020 the total carbon emission was 142,6 tons, which is less than a third from the year before. This is mostly due to a significantly lower amount of business travel by airplane and commuting to work. In 2019, airplane travel accounted for 44% of AMOLF's carbon emissions, totaling 194,5 tons CO₂ emitted. In 2020 the emission of business travel by airplane reduced drastically to 41,7 tons CO₂, which accounted for 29% of the total footprint of that year. Natural gas also reduced in absolute value but represented an extra 10% in the carbon footprint of 2020, because of the lower amount of emissions from other sources. Also, in 2020 we gained extra information on commuting by train which was not available for 2019, which accounted for 3% of the total carbon footprint. While 2020 shows a huge reduction in AMOLF's overall carbon footprint, it is a distorted illustration of the normal situation, because of COVID-19. It does however show how AMOLF can continue to keep its carbon footprint reduced in the future.

Source/ activity	CO ₂ -emission 2019 (in ton)	CO ₂ -emission 2020 (in ton)	Percent change 2019/ 2020
Natural gas	35,7	25,7	-28%
Company owned/lease vehicles	2,5	1,8	-28%
Commuting travel by train	-	3,9	N/A
Commuting travel by car	205,1	66,8	-67%
Business travel by car	2,6	2,4	-8%
Business travel by rental car	0,2	-	N/A
Business travel by airplane	194,5	41,7	-79%
Business travel by train	3,1	1,2	-62%
Total carbon emission	444,3	142,6	-68%

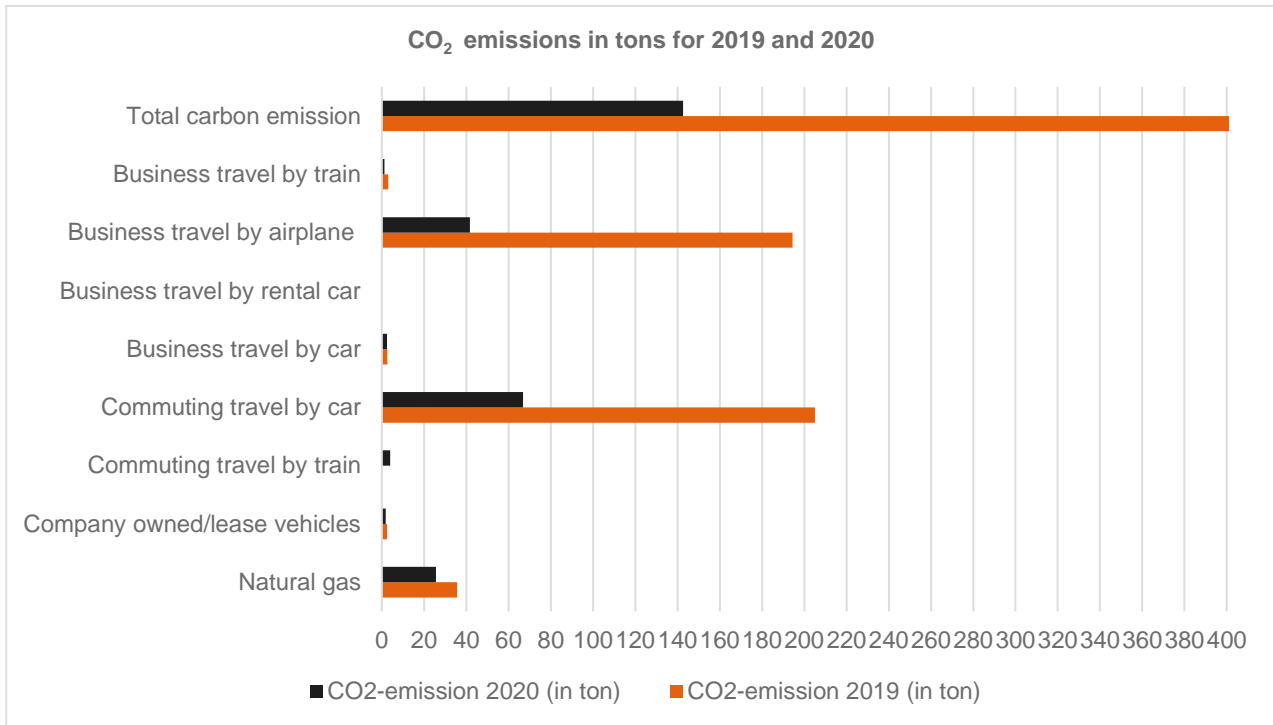


Figure 1 CO₂ emission in tons per activity and in total for AMOLF in 2019 and 2020

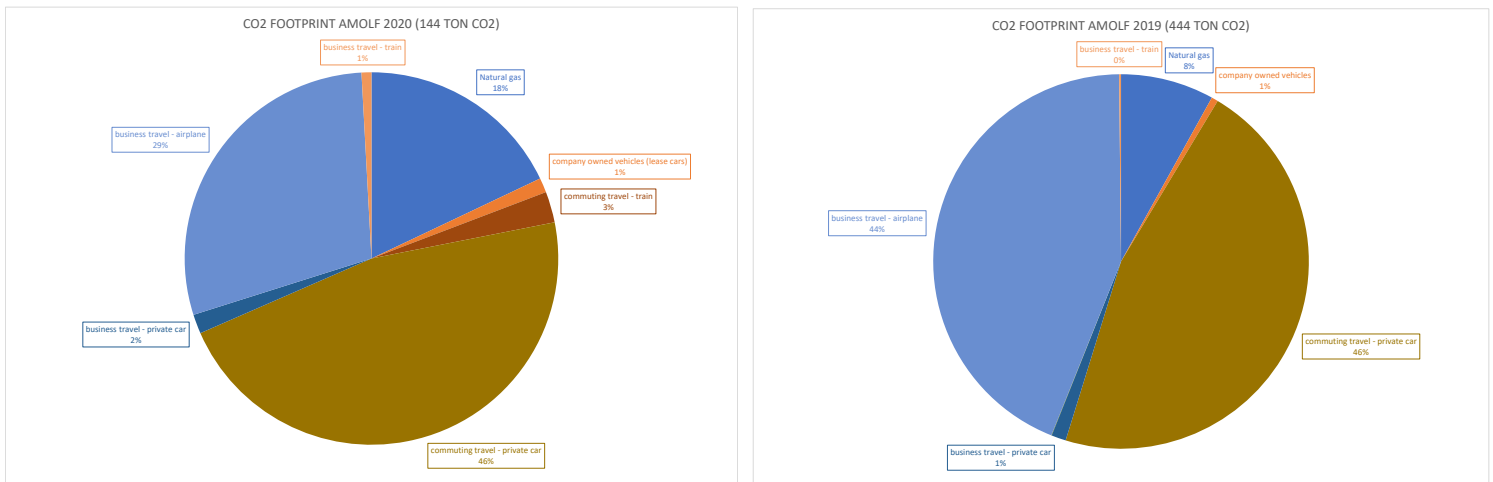


Figure 2 AMOLF's Carbon Footprint for 2019 & 2020 in percentages

What is AMOLF already doing?

Sustainability is not new to AMOLF, but attention to the subject has grown in recent years as with many organizations. Cardboard boxes and packaging chips are already being reused for example, and when using e-follow for printing documents, double sided printing is the standard. In addition, waste separation is already effective for 12 types of waste and all waste types are weighed, with accessible data for 2016-2019. The water consumption is also monitored, with accessible data for the years 2015-2020. AMOLF recently installed an aquifer system for heating and cooling (Warmte Koude Opslag) and is currently replacing all its conventional lighting with LED and energy monitoring will be installed with each upcoming lab renovation. Finally, up until the beginning of 2020, there was an active sustainability group within AMOLF that initiated events on regular basis, created a mailing list, a wiki on sustainability and a SUN storage for documents.

Goals 2030 and intermediate goals 2025

Ambition: climate neutral 2030

Energy



Mobility



Waste & Circularity



Behaviour & attitude



Purchasing



2030

Energy use in labs is decreased with 25%

Amolf leads the way in novel forms of online conferences

No residual waste

Amolf profiles itself as sustainable

Sustainability is part of every purchase

10% own produced energy

Emissions due to commuting is reduced by 75%

25% reduction of unused chemicals per group

Sustainability is an integral part of the actions of employees

All packaging is being recycled

No usage of natural gas

Emissions due to business travel are reduced by 50% (2019)

2025

Energy use of labs is measured individually

All AMOLF conferences are hybrid and virtually accessible. Online formats for conferences are organized and encouraged. are organized and encouraged

50% reduction of residual waste

All AMOLF emissions are measured and communicated transparently

Locally sourced products are preferred

Solar panels are installed on the AMOLF roof

Emissions due to commuting is reduced by 30%

Central composting system for Sciencepark

Regular trainings for employees on how to be more sustainable are given

Checklist for sustainable purchasing is implemented

Emissions due to business travel are reduced by 25% (2019)

10% reduction of unused chemicals

50% of all packaging is recycled

ACTIONPLAN PER THEME

The actions per sustainability theme are described below. These actions, as well as the formulated ambitions, should be evaluated and adjusted regularly. With these regular updates, the roadmap should reflect the state of the technology which is available to reach the stated goals. The roadmap sustainability is a living document that reflects current needs, ambitions and possibilities on sustainability!

1. Energy

Energy	Goal 1
2030	Energy usage in labs is decreased with 25%
2025	Energy usage of labs is measured individually
Indicator	Energy consumption of labs

What are we going to do?

1. Create awareness to shut down equipment when not in use

First actions: Create and hang posters in the work areas. Tell people how much energy can be saved by shutting down equipment

2. Submetering of the important energy flows

First actions: list the main energy flows and make a monitoring plan

3. Set sustainable requirements for new equipment: high energy efficiency and water chillers

First actions: Inform group leaders and other employees about new requirements (as high as possible) on energy efficiency and cooling methods.

3. Replace all lights for LED – First main area, later all lights

First actions: Create a business case to replace all lights at AMOLF with LED lightning

Energy	Goal 2
2030	10% of energy usage is produced by AMOLF
2025	Installation of solar panels on the roof of the AMOLF building
Indicator	<ul style="list-style-type: none">• Energy consumption (general and submetering)• Local produced renewable energy

What are we going to do?

1. Install solar panels on the roof of AMOLF

First actions:

- Make an aggregate calculation of the construction and output of solar panels
- Investigate possibilities to start a pilot with setups from the PV departments,
- Make business case and look for an investment funds to finance the panels space of €100.000

Energy	Goal 3
2030	No usage of natural gas
2025	-
Indicator	Natural gas consumption

What are we going to do?

1. Explore sustainable options for steam production to replace natural gas

First action: Look for natural timepoints for replacement of natural gas usage in the building. Subsequently make investment plan for replacement with alternatives and look for an investment space.

2. Mobility

Mobility	Goal 1
2030	AMOLF leads the way in novel forms of online conferences
2025	All AMOLF conferences are (only) virtually accessible. Online formats for conferences are organized and encouraged.
Indicator	<ul style="list-style-type: none">Average rate on digital conferences organized by AMOLFNumber of online conferences/pilots with new digital concepts

What are we going to do?

1. Try new forms of online conferences

First actions: Roll out a pilot for VR meetings within LMPV groups. If successful, roll out to other groups.

2. Organize AMOLF events online

*First actions: Make an inventory of the video and audio improvements that are needed to organize **online and hybrid** AMOLF events.*

Mobility	Goal 2
2030	Emissions due to commuting is reduced by 75%
2025	Emissions due to commuting is reduced by 30%
Indicator	<ul style="list-style-type: none">Emissions due to commutingUsage of electric vehicle charging point

What are we going to do?

1. Install an EV & ebike charging point in the parking lot

First actions:

- Investigate the purchase costs for installing a charging point for electrical cars and e-bikes.*
- Discuss the various options in the parking lot with the facility manager.*
- Increase the mobility charging*

2. Stimulate the use of bikes and public transportation

First actions: Investigate how a CO₂-emission calculation per group could be implemented. For example with CO₂-gamification e.g., a league table.

Mobility	Goal 3
2030	Emissions due to business travel are reduced by 50% (2019)
2025	Emissions due to business travel are reduced by 25% (2019)

Indicator

- (Average and total) CO₂ emissions from booked flights *
 - Average and total CO₂ emissions from booked domestic and foreign train journeys*
 - CO₂ consumption total business travel
- * per department, per type of activity, per function
-

What are we going to do?

1. Encourage local (within EU) conferences

First actions: Create a list of European conferences per area of expertise and share this with the group leaders and PhD students. Also explain the necessity.

2. Encourage to limit number of overseas conferences

First actions: Investigate how many overseas conferences are attended and by whom.

3. Encourage direct flights and train travel

First actions: Adjust the travel policy (UVR); direct flights are the standard, travel by train when travel time is less than 8h

4. Make electric car renting possible for national conferences

First actions: Make a list of car rental companies that are sustainable and provide electrical vehicles, with the possibility to compare them.

3. Waste and Circularity

Waste and Circularity	Goal 1
2030	No residual waste
2025	<ul style="list-style-type: none">• 50% reduction of residual waste• 50% reduction of paper use• Central composting system for science park
Indicator	<ul style="list-style-type: none">• Volumes of different waste streams• Number of items borrowed• Number of pages and theses printed per person• Number of double-sided prints

What are we going to do?

1. Add a waste collection information sheet in the general 'instruction and training' document

First actions: Make an appointment with the environment officer and discuss what is needed to add the sheet on the general dashboard on the 2nd floor and 2/3 other physical spaces in the AMOLF building

2. Realize an optimal waste separation

First actions:

- Prepare a waste separation proposal/ advice for WCW terrain, including a compost collection
- Decide on pre or post separation and if compost collection is inside WCW or provided through an external company
- Draw up and implement the waste concept

3. Create a dashboard for borrowing/ lending amongst employees

First actions: Create a list of items that can be borrowed and write down the procedure. Invite employees to come up with ideas for the list.

4. Install a cabinet with mugs and an accessible dishwasher near the coffee machine

First actions: Explore and discuss the possibilities with facility management for installing a cabinet and a dishwasher, search for an energy and water efficient dishwasher and motivate the installation by providing information on the life cycle of a plastic/paper cup.

5. Reduce printing in general, printing of theses, and the number of printed AMOLF News magazine copies

First actions:

- Investigate how insight can be gained and shared in the number of prints (personal consumption + all @AMOLF consumption)
- Investigate the willingness of PhD students to reduce the number of thesis prints
- Investigate with communication (Erny & Petra) what the alternatives are for printing the AMOLF News magazine and how many copies can be reduced
- Organize a pilot for digital theses. Allow a small number of printed thesis and make one digital version. Example of thesis: <https://www.lmpv.nl/theses/neder/>. Generate a mailing list per department to send thesis by email
- Collect and share good examples of digital theses with PhD students
- Ask ICT to program double sided printing as standard

Waste and Circularity	Goal 2
2030	25 % reduction of unused chemicals per group
2025	10 % reduction of unused chemicals
Indicator	% unused chemicals

What are we going to do?

1. Combine purchasing of equipment & chemicals

First actions: Organize a session with the purchase officer and chemical staff to make a list of items that can be bought collectively.

4. Behaviour and Attitude

Behaviour and Attitude	Goal 1
2030	AMOLF profiles itself as sustainable
2025	All AMOLF emissions are measured and communicated transparently
Indicator	<ul style="list-style-type: none"> • Number of measured and communicated emissions • Number of communications (newsletters/ announcements etc.) about sustainability • Sustainability rate given by prospective AMOLF students AMOLF

What are we going to do?

1. Inform colleagues about energy usage of certain devices and how to reduce it

First actions: Organize a workshop, where the power-hungry devices at AMOLF can be identified, calculate and estimate energy consumption of flying (e.g. train vs plane as function of distance), paper cups vs. own cup

2. Set up a newsletter and inform colleagues regularly about the progress of the sustainability group at AMOLF

First actions: Decide on what the best medium is to communicate (regular emails, meetings or a weekly announcement), collect progress on different sustainability topics and write a newsletter once every 2-3 months.

3. Make a communication plan on sustainability for AMOLF

First actions: Make an appointment with the communication department and share ideas for a communication plan: an article for the bi-yearly AMOLF journal, write monthly posts on twitter, have an intranet page on sustainability at AMOLF, communicate progress to colleagues in newsletters and events (like the New Year's speech).

4. Inform colleagues about the total energy consumption, flights, and CO₂-emissions at AMOLF

First actions: Discuss with ICT to install a display and accumulate content over time. Start with the carbon footprint and energy & water consumption, and provide a general advice: (e.g., switch off your computer, reminders on waste separation). Expand the numbers with numbers which are more intuitive for people, like number of threes

Behaviour and Attitude	Goal 2
2030	Sustainability is an integrated part of the actions of employees
2025	There are regular trainings for employees on how to be more sustainable
Indicator	<ul style="list-style-type: none"> • Experienced awareness and competence regarding sustainability by students and staff members • Number of colloquiums and events on sustainability • Number of training and evaluation of training on sustainability

What are we going to do?

1. Invite speakers on sustainability for colloquium

First actions: Make a shortlist of good speakers, invite AMOLF employees to do suggestions and invite the speakers.

2. Initiate a training program for employees at AMOLF on how to be more sustainable

First actions: Add a slide on sustainability in the general safety training. Also, decide how long, which format and what the content should be of the training program. Suggestion: 1-2 hours for all employees of AMOLF. First presentation from the sustainability group, then workshops in small groups on different topics: calculating energy consumption at AMOLF and how to reduce it, learn about waste. Have groups present their results to each other and create output: posters, article for intranet.

3. Organize events for employees at AMOLF on sustainability

First actions: Organize regular meetings on sustainability, book clubs and events like competitions (E.g., clothing swap, vegan bake off.) First step is to ask Personeelsvereniging (PV) whether sustainability could systematically be included in their events (for example: best vegetarian / vegan recipe during the baking contest and international lunch, reusable plates and glasses washed at parties, have a clothes swapping point at each Christmas party, etc).

4. Share the Mural with sustainability ideas with all AMOLF employees

First actions: Create a pdf of the Mural with sustainability ideas for AMOLF, print it and post it within the AMOLF building. Provide a pen and sticky notes for colleagues to add ideas.

5. Purchasing

Purchasing	Goal 1
2030	Sustainability is part of every purchase
2025	Locally sourced products are preferred, a checklist for sustainable purchasing is implemented
Indicators	<ul style="list-style-type: none"> • Number of joint orders • Number of locally purchased products • Number of permissions received to postpone orders with a few days • Number of checklists completed for sustainable purchasing

What are we going to do?

1. Use the checklist for sustainable purchasing for purchases related to projects and facilities

First actions: Inform and instruct colleagues about the sustainable purchase checklist

2. Organize bundled purchases for non-urgent orders

First actions: Consult with purchase about the new procedure. Create a standard email for purchase which says: Could we place your order a few days later so we can bundle your order with other orders?

3. Start a discussion with WCW participants about joint purchasing of goods and consumables

First action: Prepare a proposal for joint purchasing with environmental officers of the participants

4. Create a list of most used items from the stock room with the amount of CO₂ emitted from its production

First actions: Collect information about the most frequently used items from the stock room, investigate how much CO₂ is emitted in their production and classify accordingly.

Purchasing	Goal 2
2030	All packaging is being recycled
2025	50% of all packaging is recycled
Indicator	% recycled packaging

What are we going to do?

1. Create waste collection points for packaging materials

Concrete actions: Communicate about the waste collection points for packaging materials (cardboard and plastic) and inform colleagues why it is important to separate waste.

IMPLEMENTATION OF ACTION PLANS

Implementation plan

For a successful and sustainable implementation of the action plans, it is important that a good communication plan is drawn up, a planning is made with clear milestones and a monitoring plan with attention to data collection is in place.

Communication and awareness

Communication is crucial in order to involve people to contribute to the desired change and actually realize different behavior. Below is a description of how AMOLF's colleagues can be informed about the goals and actions in the sustainability roadmap, how they can be inspired and involved in the changes.

Inform and inspire colleagues

- Provide information about new working methods and supporting tools, for example:
 - o Provide options for the organization of online events
 - o Inform about the new waste collection points for packaging materials
 - o Display the energy consumption of flights, electrical equipment, and overall CO₂-emissions at AMOLF
- Communicate what AMOLF does; making small- and medium-sized actions visible, for example:
 - o Create a newsletter for the sustainable work group containing status updates on the sustainability topics
 - o Inform about the status of pilots and experiments such as the VR conferences and installation of solar panels
- Organize knowledge and inspiration sessions
 - o With keynote speakers
 - o Initiate a training program for employees at AMOLF on how to be more sustainable

Involve colleagues

- Host regular meetings and events on sustainability such as competitions (vegan bake off), book clubs, clothing swap etc.
- Investigate the willingness of PhD students to reduce the number of thesis prints and other measures. Also inform on ways to positively motivate the PhD students to become more sustainable.
- Invite employees to come up with borrowing options such as tools and lab devices, between colleagues.
- Use gamification as a tool to create awareness and reduce the carbon footprint
- Create a pdf of the Mural, print it and post it within the AMOLF building. Also provide a pen and sticky notes for colleagues to add ideas

Global planning

t.b.d. by the assigned project leader

Monitoring, evaluation, and reporting

In order to actually achieve the goals for 2025 and 2030, it is important that they are periodically and systematically measured, evaluated and adjusted if necessary. The table below shows the indicators for the five sustainability themes that are part of AMOLF's sustainability roadmap.

Theme	Indicator
<ul style="list-style-type: none">• Energy	<ul style="list-style-type: none">• Energy consumption of labs• Energy consumption (general and submetering)• Own energy generation• Natural gas consumption
<ul style="list-style-type: none">• Waste & Circularity	<ul style="list-style-type: none">• Volumes of different waste streams• Number of items borrowed• Number of pages and theses printed per person• Number of double-sided prints

	<ul style="list-style-type: none"> • % unused chemicals
<ul style="list-style-type: none"> • Behaviour and attitude 	<ul style="list-style-type: none"> • Number of measured and communicated emissions • Number of communications (newsletters/ announcements etc.) about sustainability • Sustainability rate given byof prospective AMOLF students on sustainability at AMOLF (image) Experienced awareness and competence regarding sustainability by students and staff members • Number of colloquiums and events on sustainability • Number of training and evaluation of training on sustainability
<ul style="list-style-type: none"> • Mobility 	<ul style="list-style-type: none"> • Average rate on digital conferences organized by AMOLF • Number of online conferences /pilots with new digital concepts • Emissions due to commuting • Usage of electric vehicle charging point • (Average and total) CO₂ emissions from booked flights * • Average and total CO₂ emissions from booked domestic and foreign train journeys* • CO₂ consumption total business travel <p>* per department, per type of activity, per function</p>
<ul style="list-style-type: none"> • Purchasing 	<ul style="list-style-type: none"> • Number of joint orders • Number of locally purchased products • Number of received permissions to postpone orders with a few days • Number of completed checklists for sustainable purchasing • % recycled packaging

Success factors and risks for implementation at AMOLF

In addition to the general success factors and risks for the implementation of the actions in the roadmap as described in chapter, specific points for attention for the implementation at AMOLF are described below.

Critical success factors for implementation

1. The more the actions will be integrated within the existing procedures, the more likely they will succeed
2. Positive encouragement towards actions, instead of restrictive measures
3. Motivate each action and provide details; explain why it is necessary etc.
4. Breaking down large actions into small tasks and seduce employees to participate (for example let employees subscribe for an action and reward them)
5. 1/4 of employees leaves AMOLF per year therefore, create an accessible, flexible and simple implementation plan

Risks and challenges

There is a risk that the implementation of the various action plans will be delayed due to a large number of stakeholders that are involved and have a saying. Moreover, there are concerns that the roadmap will cause resistance from employees and students due to inadequate support from group leaders, among others. Insufficient communication and access to data could also slow down the process and have a negative impact on the project. In addition, the actions rely on significant participation of the employees, but the workload is already high for many employees and students. Sustainability can therefore feel like something extra that must be done on top of the existing work and may therefore not have enough attention. Finally, behavioral change is challenging especially for traditions like printed theses, it takes small steps and patience.