Carbon Roadmap
2023 - 2030
Aalto operative sustainability and emissions reduction strategy

A flourishing community and carbon neutral campus by 2030
- Carbon neutral by 2030 with regards to energy
- GHG emissions reduced by 50%
- Reduced impact on nature and increased space for biodiversity

Connecting our strengths to create solutions for grand challenges
- Local and global networks for nature positive solutions and data-centric impact tracking

Pioneering sustainable solutions in our operations
- Aalto as a 2030 carbon neutral living lab
Aalto university calculates its carbon emissions **annually** and has a program in place to set and follow actions to increase sustainability of operations and **reduce GHG emissions**.

This calculation is for 2023 and presents the total amount of emissions and a comparison to previous years. Emission categories have stayed the same as in 2022.

Operational processes, GHG calculation methods and emissions data are constantly improved. Some emission factors have been changed to more accurate sources. Changes in emissions and emission categories are explained in the report. Emissions of procurements are calculated using the **spend-based method** with average emission factors for different goods and costs in the reporting year. Emissions calculated this way are in nature more general than emissions based on concrete units such as meals prepared, or electricity consumed.
Calculation methods

GHG Protocol

- The calculation has been conducted according to the internationally widely used GHG Protocol method, covering scopes 1 - 3 of the standard.

- Emission categories in the report are divided into scopes 1-3. Furthermore, scope 3 emission categories have been divided into 15 subcategories.

- Unless otherwise mentioned, all emission are tons of carbon dioxide equivalent (tCO2e). Most emission factors are from Ecoinvent 3.8 (2021) or from Exiobase (2019). Emission factors are mainly regional to Finland, but some are European averages.
Main results

- **Emissions decreased 17%** 2023 compared to 2022

- Main sources of emissions are **business travel, commuting, construction projects, energy and procurement**

- Emissions/FTE decreased from 1,32 tCO2e to **1,04 tCO2e**, while the number of student and staff increased roughly with 1000

- The total GHG emissions were **20400 tCO2e** in 2023

- Calculation categories have been kept the same compared to 2022, but some emission factors have been changed to more accurate sources (mainly commuting, energy procurement)
Main changes 2023 vs. 2022

**Commuting:** more detailed calculation method, taking into account means of public transportation and presence on campus (-62% students, -43% staff)

**Energy procurement:** -32% due to changes in energy producers’ emissions coefficients and decrease in heat and electricity consumption

**Procurement (other):** -13% due to less procurement and more scrutiny

**Renovation:** -65% due to less spending on renovation projects

**Construction:** +86% due to large construction projects (Marsio, Kide)
Total emissions distributions 2023

- Business travel (flights and other travel)
- Construction projects
- Procurements
- Energy procurement (Market-based method)
- Commuting, students
- Commuting, staff
- ICT devices & infrastructure
- Food (staff and student restaurants)
- Renovation and space development projects
- Refrigerants
- Municipal waste
- Energy life cycle emissions (electricity and renewable energy)
- Maintenance projects
- Water
- Energy production
- Owned and leased vehicles

Total 20400 tCO2
Comparison of annual emissions

*Procurements are based on spend-based emission factors. Procurement emission factors have been inflation-adjusted in 2022 and 2023.

<table>
<thead>
<tr>
<th>Year</th>
<th>FTE</th>
<th>Emissions (tCO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>18672</td>
<td>20 400</td>
</tr>
<tr>
<td>2023</td>
<td>19681</td>
<td>24 677</td>
</tr>
</tbody>
</table>

Emissions per FTE
2023: 1.04 tCO₂/FTE (FTE = 19681)
2022: 1.32 tCO₂/FTE (FTE = 18672)

FTE= Full-time equivalent degree students and Aalto employees
84% of Aalto emissions are scope 3 emissions

- **Scope 1**: Energy production, refrigerants, fuel burning in owned and leased vehicles
- **Scope 2**: Energy procurement (Market-based method)
- **Scope 3**: Construction and renovation projects, Travel, Procurement, Commuting of staff and students, ICT, Food, Indirect energy life cycle emissions, Water consumption, Waste
<table>
<thead>
<tr>
<th>Emission type</th>
<th>Emissions (tCO2)</th>
<th>Percentage</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business travel (flights and other travel)</td>
<td>3 624</td>
<td>17.77 %</td>
<td>3</td>
</tr>
<tr>
<td>Construction projects</td>
<td>3 570</td>
<td>17.50 %</td>
<td>3</td>
</tr>
<tr>
<td>Procurements</td>
<td>3 182</td>
<td>15.60 %</td>
<td>3</td>
</tr>
<tr>
<td>Energy procurement (Market-based method)</td>
<td>2 941</td>
<td>14.41 %</td>
<td>2</td>
</tr>
<tr>
<td>Commuting, students</td>
<td>1 660</td>
<td>8.14 %</td>
<td>3</td>
</tr>
<tr>
<td>Commuting, staff</td>
<td>1 456</td>
<td>7.14 %</td>
<td>3</td>
</tr>
<tr>
<td>ICT devices &amp; infrastructure</td>
<td>1 274</td>
<td>6.25 %</td>
<td>3</td>
</tr>
<tr>
<td>Food (staff and student restaurants)</td>
<td>1 245</td>
<td>6.10 %</td>
<td>3</td>
</tr>
<tr>
<td>Renovation and space development projects</td>
<td>370</td>
<td>1.81 %</td>
<td>3</td>
</tr>
<tr>
<td>Refrigerants</td>
<td>353</td>
<td>1.73 %</td>
<td>1</td>
</tr>
<tr>
<td>Municipal waste</td>
<td>283</td>
<td>1.39 %</td>
<td>3</td>
</tr>
<tr>
<td>Energy life cycle emissions (electricity and renewable energy)</td>
<td>223</td>
<td>1.10 %</td>
<td>3</td>
</tr>
<tr>
<td>Maintenance projects</td>
<td>150</td>
<td>0.74 %</td>
<td>3</td>
</tr>
<tr>
<td>Water</td>
<td>51</td>
<td>0.25 %</td>
<td>3</td>
</tr>
<tr>
<td>Energy production</td>
<td>12</td>
<td>0.06 %</td>
<td>1</td>
</tr>
<tr>
<td>Owned and leased vehicles</td>
<td>6</td>
<td>0.03 %</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20400</strong></td>
<td><strong>100.00 %</strong></td>
<td></td>
</tr>
</tbody>
</table>
Map of ongoing actions
## Goals

### Energy
- Energy consumption - 20%
- 0 energy emissions

### Construction & renovation
- Reductions in carbon emissions from new construction (-25%) and renovation (-15%) compared to BAU.
- Reduced impact on nature

### Travel
- Reduction of flight travel emissions

### Commuting
- Facilitate sustainable commuting

### Procurement
- Reduced consumption
- Sustainable procurement
- Life cycle thinking

### High-level Actions

<table>
<thead>
<tr>
<th>Energy</th>
<th>Construction &amp; renovation</th>
<th>Travel</th>
<th>Commuting</th>
<th>Procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low carbon energy procurement and production on campus</td>
<td>Efficient use of space and improvement of campus utilization rate</td>
<td>Reduction of emissions through travel policies</td>
<td>Sustainable mobility action plan</td>
<td>Scrutiny of necessity, scope and magnitude of procurements</td>
</tr>
<tr>
<td>Reduction of energy consumption</td>
<td>Low carbon construction policies</td>
<td>Co-operation with academic funders and society to reach sustainable goals</td>
<td>Easily accessible walking campus</td>
<td>General and sector specific sustainable procurement competences</td>
</tr>
<tr>
<td></td>
<td>Reduced impact on nature</td>
<td>Employees embrace responsibility of individual travel choices</td>
<td>Sustainable mobility benefits for staff</td>
<td>Supplier and supply chain dialogue on sustainability practices, reporting and data</td>
</tr>
<tr>
<td></td>
<td>Increasing biodiversity on campus</td>
<td></td>
<td>Bicycle friendly infrastructure and facilities</td>
<td>Sustainable procurement guidelines and networks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sustainability aspects included in relocation services</td>
<td>Sustainability criteria in procurement</td>
</tr>
</tbody>
</table>

BAU = Business As Usual
<table>
<thead>
<tr>
<th>ICT</th>
<th>Food</th>
<th>Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Resource optimization</td>
<td>• Sustainable practices in operations and meal planning</td>
<td>• 68% recycling rate (2025)</td>
</tr>
<tr>
<td>• Lifecycle management</td>
<td>• Encouraging sustainable dietary choices</td>
<td>• Lower incineration waste rates</td>
</tr>
<tr>
<td>• Green ICT practices</td>
<td></td>
<td>• Lower waste/m2 rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed ICT emissions calculation</td>
<td>Sustainable policy principles for student restaurants</td>
<td>Streamlining and optimizing logistics</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>Sustainable event guidelines</td>
<td>Carbon neutral waste transport</td>
</tr>
<tr>
<td>Resource optimization</td>
<td>Sustainability in operations and meal planning</td>
<td>Plastics recycling</td>
</tr>
<tr>
<td>Recycling, repurposing and extension of</td>
<td>Information on carbon footprint and climate friendly</td>
<td>Extending recycling to partner organisations</td>
</tr>
<tr>
<td>device lifetime</td>
<td>options</td>
<td></td>
</tr>
<tr>
<td>Management of data lifecycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green coding practices</td>
<td>Customer engagement, sustainability awareness and dialogues</td>
<td></td>
</tr>
<tr>
<td>Sharing of infrastructure</td>
<td>Minimize food waste</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Emissions by category
Ongoing actions, identified new actions and estimated reduction potential by 2030
Travel

- **Business travel** is the biggest emissions category, dominated by flight travel.
- Business travel has slightly increased since 2022, but is drastically **lower than pre-covid**.
- Aalto travel policies guide users in evaluating the need for travel, the possibilities to replace the trip with alternative meeting methods. The climate-friendliness of different travel options are evaluated using a decision tree.
- Discussions with academic funders on means to emphasize common sustainability goals are ongoing.

- Further means to lower emissions include: setting carbon quotas to schools, banning domestic flights, decreasing the number of long-haul flights and participants per event, using only direct flights.
- 2030 emissions reduction potential vs. 2023, **-25%**.

![Flight km 2019-2022](image)

![tCO2 and % of tickets](image)
Construction and Renovation

- The amount of space used for university activities has stayed the same even though the Aalto community has grown.
- Ongoing monitoring and thoughtful improvement of the utilization rate of space increases **space efficiency** and enables **new ways of working** and studying on campus.
- Upcoming legislation requires carbon calculation from new construction. Similarly, material listings are required to be produced.
  - These advancements generate a basis for future carbon goal-setting as well as recycling of building materials
  - Aalto aims for **-15%**-**25%** reductions in carbon emissions of construction activities compared to a business as usual scenario
- Evaluation of the impact on nature and actions to increase biodiversity are included in campus development plans.

- Further emissions savings can be achieved by restricting new construction and through constant improvement of utilization rates.
- 2030 emissions reduction potential vs. 2023: **-55%**
Procurement

- Sustainability in procurements is driven by legal frameworks, Aalto code of conduct, procurement guidelines, sustainability requirements and sustainability dialogues with suppliers.
- Scrutiny of necessity, scope and magnitude of procurements support the achievement of sustainability goals.
- Effort is put on the development of Aalto procurement and supplier processes, guidelines and sector specific competences. Aalto is also developing sustainability practices in co-operation with the Finn-ARMA and other networks.
- Emissions of different goods and services are mainly calculated using spend-based method based on accounting data. Emissions are based on average emissions factors, which create a high degree of uncertainty especially in the non-material and service category.
- Current emissions calculation includes research infrastructure and furnishings and is comparable with previous years. Reference calculations have also been made for other material and non-material procurements. Emissions factors for non-material procurements include a very high degree of uncertainty and need to be developed before taken into use.

- Emissions can be further reduced through continued scrutiny of procurements, life cycle thinking and stricter sustainability criteria including certificates and ecolabels.
- 2030 emissions reduction potential vs. 2023: -20%
Energy Consumption

- Annual carbon dioxide emissions from energy consumption have halved since 2012. 14% decline in heat consumption and 3.6% decline in electricity consumption was achieved 2023 vs. 2022.

- **Energy savings** are done in three broad categories: upgrades on building technology, optimizing the technology control logic and energy-conserving habits of the building users.

- The use of ground source heat pumps and solar power is incrementally expanded. In premises owned by Aalto, roughly 1% of the total electricity need is generated by 4 solar power plants. Geoenergy used amounts to 5% of the total heating need and is produced in two sites. The Aalto Works low-temperature heating network in collaboration with Fortum collects excess heat from research processes and combines this with air-to-water heat pumps, covering roughly 6% of the total campus heating needs and releasing 0 GHG emissions.

- Actions towards carbon neutrality are described in the Aalto University planning guidelines.

- Switching to green electricity enables significant emissions savings in the future
- 2030 emissions reduction potential vs. 2023: -100%
Commuting

Aalto aims to be a pioneer in sustainable mobility. The campus is easily reached by sustainable means of transport and has easy access to cycling and walking paths. Recreation and wildlife is also taken into consideration in the Aalto sustainable mobility action plan.

- The majority of Aalto community commutes using public transportation
- Emissions of commuting are calculated based on distance, frequency and means of travel (surveyed).
- Staff emissions are higher/FTE mainly due to higher use of cars

- Emissions reduction potential: increased public transport benefits, metered parking, electric cycling benefits and increased number of storage facilities
- 2030 emissions reduction potential vs. 2023: -35%
Devices make up **over 80% of the emissions.** The biggest emissions categories include screens, TVs, laptops and desktops.

- Reuse and recycling of devices is actively encouraged.
- Utilization rates of data centers managed by Aalto are high.
- Heat recovery is in use in Otakaari data center.
- Energy consumption is measured and optimized.
- Emissions of cloud services are monitored.
- Tools to optimize web site traffic in use.
- Methodologies and tools to calculate ICT emissions have been developed in Aalto.

- Reductions can be achieved by switching to green electricity in data centers, heat uptake in all data centers, optimization of stock, green coding practices and optimization of heavy processing and storage.
- 2030 emissions reduction potential vs. 2023: **-15%**
The cornerstones of campus restaurants are sustainability, variety of meals and wellbeing. Student restaurants emphasize high sustainability standards and certificates in their operations and supply chains and have set ambitious carbon reduction goals. Operations are guided by the providers' own sustainability programs and the Policy principles of student restaurants on campus | Aalto University.

Sustainability awareness is promoted through campaigns and restaurant users are guided towards sustainable meal choices. Climate friendly options are marked clearly and information on the carbon footprint of meal options is available.

Sustainably produced, local and vegetarian ingredients are extensively used. The use of energy and water and the amount of food waste is tracked. Possibility to buy leftover food is available in some restaurants.

Sustainability is promoted in catering services and guided by the Aalto event planning guideline.

- Emissions can further be reduced by increasing user awareness, greening dietary choices, operations and supply chains.
- 2030 emissions reduction potential vs. 2023: -30%

Meals in student restaurants

- Meat/Fish/Broiler: 72%
- Vegetarian: 19%
- Vegan: 9%
Emissions reduction potential
## 2030 emissions reduction potential

<table>
<thead>
<tr>
<th>Category</th>
<th>Change vs. 2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>-100 %</td>
</tr>
<tr>
<td>Construction and renovation</td>
<td>-55 %</td>
</tr>
<tr>
<td>Commuting</td>
<td>-35 %</td>
</tr>
<tr>
<td>Other (food, waste, refrigerants)</td>
<td>-30 %</td>
</tr>
<tr>
<td>Travel</td>
<td>-25 %</td>
</tr>
<tr>
<td>Other material procurement</td>
<td>-20 %</td>
</tr>
<tr>
<td>Research infra, furniture</td>
<td>-20 %</td>
</tr>
<tr>
<td>ICT equipment, data centers</td>
<td>-15 %</td>
</tr>
</tbody>
</table>

* other material procurement not currently included in published 2023 CO2e numbers
Main scenario assumptions

- Current, planned and recommended reduction actions in use
- Move towards fossil free energy. Emissions from energy consumption reduced to 0
- Mobility plan in effect, overall further greening of transportation, staff incentives encouraging the use of sustainable means of transportation.
- Little or no new construction and emissions from construction and renovation significantly reduced (-25% new construction, -15% renovation) compared to BAU.
- Sustainable travel policies and reduction of travel. Hybrid ways of working broadly used.
- Reduction of procurement. Procurement guidelines emphasizing scrutiny and consolidation. Life cycle thinking and sustainability requirements in procurement requirements broadly used.
- Greening of operations, production and supply chains (food, waste, water, cars, refrigerants etc.)
- Increasingly sustainable restaurant services and adoption of sustainable diets
- Green ICT practices in use, resource efficient device, network and data management.
Kiitos
aalto.fi