Background information on the content and calculation methodology on the main emission categories

Procured energy

Heating

Total consumption of heating in 2021 in all properties (both own and rented): 51 189 MWh

- In all rented properties (3049 MWh of the total consumption) the source of heating is district heating. For owned properties, see the division below.

Total consumption of heating in 2021 in own properties (including only the properties on which Aalto has full control over): 48 140 MWh

- Sources of heating in 2021 in owned properties
  - Ground source heating: 6 %
  - Air-to-water- heat pumps: 5 %
  - Fuel oil: <0,5% (* Fuel oil is used only in Kirkkonummi in the Metsähovi space observatory, where full transfer to district heating was not possible due to specific requirements for indoor conditions)
  - District heating 89 %, of which:
    - Fortum's normal district heating product: 70%
    - Fortum's green district heating product: 30%

Note!

-Production of heating from ground source heating and air-to-water-heat-pump-solution is calculated as 0 gCO_2e/kWh.

-The emission coefficient factor for Fortum's green district heating product is 0 gCO_2e/kWh. More information on Fortum Espoo's EkoPlus product (in Finnish): https://www.fortum.fi/yrityksille-ja-yhteisoille/lammitys-ja-jaahdytys/kaukolammon-tuotteet-ja-palvelut-taloyhtioille-FortumEkoplus
-Hence for the part of heating, only the consumption of normal district heating is currently visible (i.e., causes CO_2e-emissions) in Aalto's footprint.
-The emission coefficient factor for Fortum's normal district heating is obtained annually from Fortum (who is obliged to provide this information publicly each year). See (in Finnish): https://www.fortum.fi/yrityksille-ja-taloyhtioille/lammitys-ja-jaahdytys/kaukolampo/kaukolampoa-yha-puhtaammin/kaukolammon-tuotannon-hiilidioksidin-ominaispaastot-ja-tuotantojakauma
-Prediction on the development of Fortum's emission coefficient towards 2030 can be found here (available fully only in Finnish): https://www.fortum.fi/yrityksille-ja-taloyhtioille/lammitys-ja-jaahdytys/kaukolampo/kaukolampoa-yha-puhtaammin/kaukolammon-tuotannon-hiilidioksidin-ominaispaastot-ja-tuotantojakauma
-Controlling or impacting on the form of heating in rented properties is much more complicated than in fully owned properties.

Electricity

Total consumption of electricity in 2021 in all properties (both own and rented): 42 152 MWh

Total consumption of electricity in 2021 in own properties (including only the properties on which Aalto has full control over): 34 975 MWh

- Sources of electricity:
  - Appr. 99% of the electricity is certified wind power (with guarantees of origin) energy bought via a broker
  - Appr. 1% is solar energy from own solar panels
- The production stage emissions from both the certified wind power and from the own solar power is 0 gCO_2e/kWh
- The lifecycle emissions deriving from the wind power (excluding the production stage) are shown under the category "Renewable energy lifecycle emissions"

Air Travel

-This category contains the CO_2e-emissions raising from the air travel. The category contains all flights that are booked through Aalto University's travel booking system Neo.Itin.

-Only the CO_2e-emissions from air travel are currently accounted for. For example, work trips made by train or ferry, or the emissions that derive from the accommodation during the work trip are not currently part of Aalto University's carbon footprint. Primary reason for this is the lack of credible and easily accessible data.

-In Aalto University's carbon footprint, the data from the flights are classified and accounted for as follows:

> The flight data (number of flights and distances per flight) comes from the travel agency. Based on the distance traveled, the flights are divided into four categories: domestic, Nordic, European, intercontinental. Then Defra-based coefficients are used to calculate the total emissions for each category. (See Defra's conversion factors that are updated regularly) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

-Currently, the users of Aalto's travel booking system can see the CO_2e- data related to their flight options, when choosing the flight. The same data is not yet available via the booking system for other travel options, such as for ferries or trains, or for accommodation.

-It is, however, expected, that more wholistic travel data will be available also via the booking systems within the next few years. One goal is to try to impact on widening and deepening the data that the travel agency provides either via co-operation or direct requirements (that must be set when the service is tendered again and enforced contractually).

-One important short-term goal would be to provide the travelers credible and easily understandable data on the CO_2e- emissions from ferries and ground transportation. This would enable them to make informed decisions when choosing the methods of transport especially in short- or medium- distant travels.

Procurement of research infrastructure

-Aalto University's research infrastructure contains the research infrastructure in five schools (CHEM, SCI, ENG, ARTS, ELEC). The category covers everything from ENG's IceTank to the chemicals used by the schools, from space observatory in Metsähovi to fume cub boards, and from acoustics laboratories to different electric devices and small items like test tubes.

-Aalto University does not currently have a wholistic inventory list that would cover all the research infrastructure owned by Aalto. The

-Due to the variety and complexity of the category and the lack of Aalto-level inventory data, defining an exact methodology for the calculation of the emissions from the procurement of research infrastructure is difficult.

-In 2019-2021, the following method, adopted from the University of Turku, has been used:

- A coefficient of 0.47 kg CO2e per EURO has been used. The coefficient has been developed by NTNU (Norwegian University of Science and Technology) based on a EEIO (Environmental Extended Input–Output) modelling that NTNU conducted in 2013 based on its own research infrastructure.

-The coefficient is multiplied by the number of annual depreciations of the research infrastructure procurement (taken from accounting)

-During 2022, based on internal discussions both with the financial department and the technology managers at schools that the current calculation methodology gives only a very rough estimate on the true emissions deriving from the procurement of research infrastructure and this must be clearly stated in the reporting. The coefficient that is been used may be partly outdated and its exact suitability for Aalto's research infrastructure is not clear. EUR-based approach and the use of depreciations may also cause some inaccuracies.

-Development of a more exact calculation methodology for this is a clearly recognized development item. There are, however, no good, publicly available reference methodologies available.

-The most accurate method would be to use verified carbon footprint data from the manufacturers of the research infrastructure. Currently, however, this type of data is not available/offered by the manufacturers. Requesting CO2e-emission information as a voluntary requirement in tendering is a potential development item for future.

Renewable energy lifecycle emissions

-This category contains the life cycle emissions of wind electricity (the main source of electricity used currently at Aalto University's properties).

-The amount of procured wind power (in kWh or MWh) is multiplied by 24,6 kgCO2e/kWh. The source for the estimate on the indirect wind electricity CO2 emissions was the IPCC 2011 report on Renewable energy sources and climate change mitigation, chapter 7: Wind Energy page 571.

Note!

-Currently the life cycle emissions (excluding the production phase) are not accounted for other sources of electricity. This deficit will be corrected in the calculation for 2022.

IT procurement and use

Calculation of the IT carbon footprint is based on Aalto device stock data, device manufacturers' lifecycle impact data, energy source and energy consumption of all main device categories as well as Otakaari 1 and Keilaranta 10 data centers.

Additionally, data from cloud service providers have been included in calculations. Calculation of the IT footprint has been done on a more detailed level than most other Aalto consumption categories. Calculation approach and learnings from the IT domain will be taken into use where applicable in other Aalto calculation categories as well.

Commuting, students / Commuting, staff

-This category contains the CO_2e-emissions raising from the trips that the students and the staff members make between home and the campus. The information on the distribution of the methods of commuting are gathered from the Aalto community via Leesman-survey that is conducted once a year.

-In the survey, the respondents are asked for their preferred method of transportation separately for wintertime and for other seasons of the year. The methods of transport are divided into five categories: using own car / using public transportation / bicycling / walking / other. It is assumed that the respondents of the Leesman survey represent the whole Aalto community.

-The average distances travelled are calculated based on the postal codes of all Aalto staff and divided into five categories based on their length.

-The number of working/school days per year is calculated each year from the calendar excluding holidays and festivals. The amount of distant working days is taken from the Leesman- survey and deducted from the total number of working days. In 2020 and 2021, Covid-restriction were also considered in the calculation.

-Different methods of transport have different emission coefficient per kilometer as follows:

Method of transportation	**gCO_2e/km**
Walking	-
Bicycling	-
Public transportation	53
Own car	152
Other	51

-The emissions from the commuting by the students and by the staff are separated in the survey and in the calculation because the mobility profiles of the two groups differ substantially.

Construction (including new construction, renovation projects, maintenance)

-In 2019-2021, the emissions from the construction projects (new construction & renovation projects & maintenance projects) have been calculated with an EUR-based method.

-Following coefficients have been used: 0.11 CO2e per EURO for new construction, 0.04 CO2e per EURO for renovation projects and 0.05 CO2e per EURO for maintenance projects. The coefficients are obtained from a pool of statistical data on Finnish building projects that the consultant that has done the GHG-calculations in 2019-2021 is gathering and maintaining.

-Starting from 2023, the life-cycle carbon footprint of construction projects commencing in 2023 will be calculated as part of the construction projects. This means that in the forthcoming years, exact, Aalto-specific data will be used in this category instead of an EUR-based approximation. The construction-specific footprint calculations will also be used to guide low carbon construction in the projects.

Furniture

-The emission from the procurement of furniture is calculated with an EUR-based method. The annual number of investments in furniture (in EUR) is multiplied by a coefficient of 0.5 kg CO2e per EUR. The coefficient is taken from the carbon footprint calculation model of Turku University.

Waste

-The non-hazardous waste is divided into 11 sub-categories and the emissions are calculated with the following emission factors based on WWF's Ilmastolaskuri- tool: https://www.ilmastolaskuri.fi/.

Type of non-hazardous waste	Emission factor (gCO2e/kg)
Biowaste	69
Energy	410
Paper	1050
Cardboard and carton	60
Glass	570
Metal	130

Plastic packages	70
Mixed waste	410
Construction waste	43,6
Wood waste	500
Confidential waste	1050

-The hazardous waste (in tons) is divided into 31 sub-categories. The emissions are calculated with emission-type specific factors that come from WWF's Ilmastolaskuri- tool: https://www.ilmastolaskuri.fi/.

Food

-Following data is gathered annually from the campus restaurants offering student priced meals: 1) total number of sold meals and 2) the share of vegetarian meals of the total meals.

-Following coefficients are used to calculate the total emissions (the coefficients are taken from the carbon footprint calculation model of Turku University):

Meal type	**Emission factor**		
Meal, other	1,03	kgCO2eq/meal	
Meal, vegetarian	0,53	kgCO2eq/meal	