

Summary of the University of Copenhagen's green accounts 2008

With its area of around 1 million m² and over 40,000 students and staff who spend their days in its buildings, the University of Copenhagen is a place of work and study with a huge annual turnover of resources. The annual green accounts ensure a thorough insight into the University's use of resources and energy. Therefore, the accounts are an important requirement if the University is to achieve its targets of:

- a 20 % reduction in energy consumption by 2013, and
- a 20 % reduction in the University's CO₂ emissions by 2013.

The base year for both reduction targets is 2006. In order to take changes in the University's activity level into account, the reduction targets are linked to consumption per man year for staff and students.

The University of Copenhagen's green accounts contain data for electricity, heat, transport, CO₂, waste, use of space, man years and benchmarking with other universities. The University of Copenhagen's first green accounts apply to 2006.

The main conclusions of the green accounts for 2008 are presented below. In addition, an insight is provided into the circumstances surrounding the development of the University's consumption of resources between 2006 and 2008.

In 2007, the University of Copenhagen merged with KVL (the Royal Veterinary and Agricultural University) and the Pharmaceutical University (now the Faculty of Life Sciences (Life) and the Faculty of Pharmaceutical Sciences (Farma) respectively). Naturally, this resulted in significant changes to the figures for energy consumption etc. between 2006 and 2007. For the sake of comparison, we have included figures for Life and Farma in the figures for 2006. As no green accounts were prepared for Life and Farma in 2006, the figures for 2007 will be applied. This method provides us with the most realistic overview of the development of the University of Copenhagen's consumption of energy and resources compared to the base year.

The University of Copenhagen 2008 consists of:

- Hum - Faculty of Humanities
- Life - Faculty of Life Sciences
- Sund - Faculty of Health Sciences
- Farma - Faculty of Pharmaceutical Sciences
- Nat - Faculty of Science
- Teo - Faculty of Theology
- Jur – Faculty of Law
- Samf – Faculty of Social Sciences
- FA - University Administration

Key developments

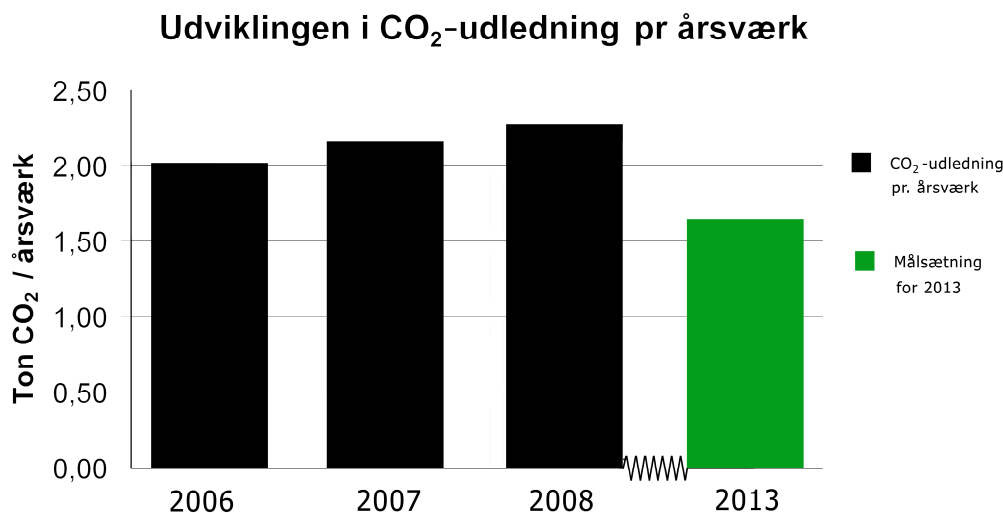
- Total CO₂ emissions from the University of Copenhagen's activities per man year rose by 12 % in the period between 2006 and 2008.
- Total energy consumption per man year increased by 4 % in the period between 2006 and 2008.
- Following a small reduction in heat consumption per man year between 2006 and 2007, the figure for 2008 indicates an increase. Consumption rose by 2% over the whole period.
- Electricity consumption increased from 2006 to 2007 but has since stabilised.
- The disparity in development at the individual faculties is significant.
- Areas showing positive trends varied from faculty to faculty in 2008.

Diagram below: Development in CO₂ emissions per man year

Y-Axis: Tons of CO₂/man year

CO₂-udledning pr. årsværk = CO₂ emissions per man year

Målsætning for 2013 = Target for 2013



The University of Copenhagen's CO₂ emissions

In 2008, the University of Copenhagen emitted 65362 tons of CO₂, equivalent to the average annual CO₂ emission of about 6500 Danish citizens.

The University of Copenhagen's CO₂ emission is calculated based on the consumption of electricity, heat, natural gas and transport. The green accounts for 2008 indicate that the University's CO₂ emissions have risen by 12% in the period between 2006 and 2008. The emission levels of most of the faculties remain relatively stable; however, the Faculty of Science (Nat) and the Faculty of Life Sciences (Life) stand out from the rest with significant increases in their CO₂ emissions.

The general increase in CO₂ emission was to be expected as a number of energy-saving initiatives launched in connection with the University of Copenhagen's climate change efforts will not take effect until next year. In 2008, over 50 energy-saving projects were initiated.

Once these projects have been realised, the total annual reduction in CO₂ emissions will amount to approximately 1700 tons, equivalent to the annual emission of around 170 average Danes. The projects will have an impact on the green accounts for 2009 and beyond.

If the goal to reduce CO₂ emissions by 20% compared to 2006 levels is to be met by 2013, the emission per man year must be reduced to 1.62. In 2008, the level was 2.27; thus, a 20% reduction compared to 2006 emission levels is the equivalent of a reduction of 29% compared to 2008.

A large proportion of the increase in the University of Copenhagen's total CO₂ emissions between 2007 and 2008 can be attributed to a rise in emissions by transport, namely air travel. However, transport figures are highly unreliable due to the fact that a new accounting system was introduced in 2008 and, subsequently, transport was separated from other costs such as board and lodging. Thus, the figures for transport in previous years are estimates and are, therefore, subject to a certain amount of uncertainty.

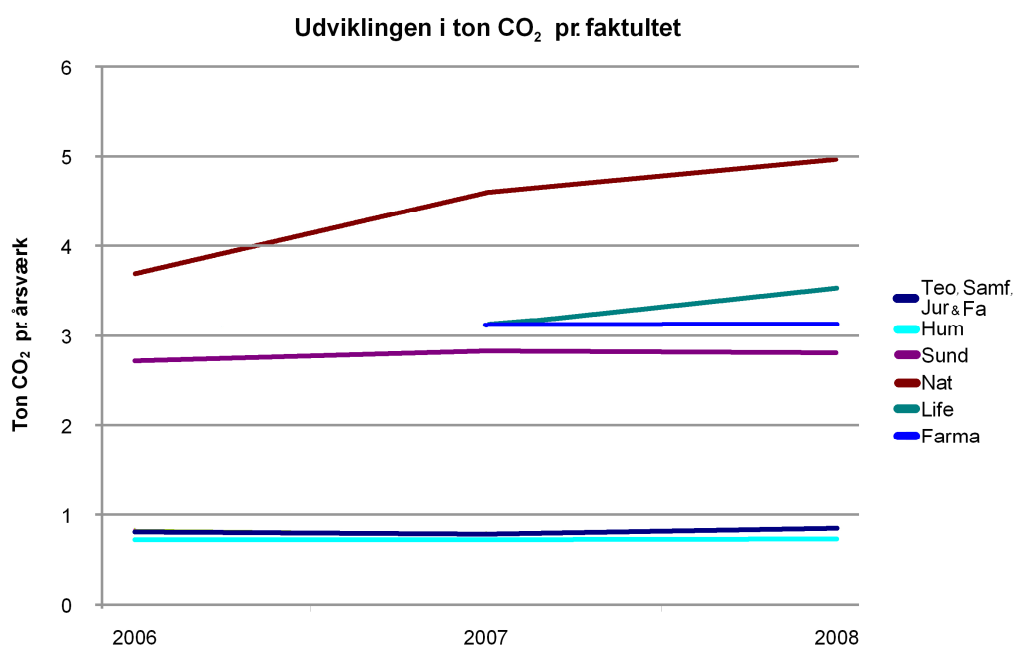
After the green accounts were completed, the figures were investigated yet again and errors were discovered in the 2007 figures for Life, which ought to resemble the 2008 figures to a far greater extent. According to the data on which the accounts are based, Life should have doubled its transport emissions from 2007 to 2008. However, this is not the case. The University of Copenhagen's increase in CO₂ emissions is slightly higher from 2006 to 2007 and slightly lower from 2007 to 2008 but the figures will not be adjusted before 2009's green accounts.

CO₂ emissions by faculty

As indicated by the graph below, there is a significant disparity between the CO₂ emissions of the various different faculties. Basically, the faculties can be divided into two categories: "Wet" faculties, that typically involve a high level of laboratory activity; and "dry" faculties, that do not generally have so many energy-intensive installations. As a rule of thumb, "wet" faculties use on average five times as much energy as the "dry" faculties.

Diagram below: Development in tons of CO₂ per faculty

Y-axis: Tons of CO₂ per man year



Research and tuition at the University of Copenhagen's "wet" faculties are expected to become increasingly experimental and laboratory-based in the coming years. This development challenges our efforts to meet goals for reducing resource consumption, as a large proportion of the "wet" activities will entail higher CO₂ emissions per man year. The University of Copenhagen's densification efforts can be expected to counteract this trend as more efficient use of space will result in lower energy consumption per man year.

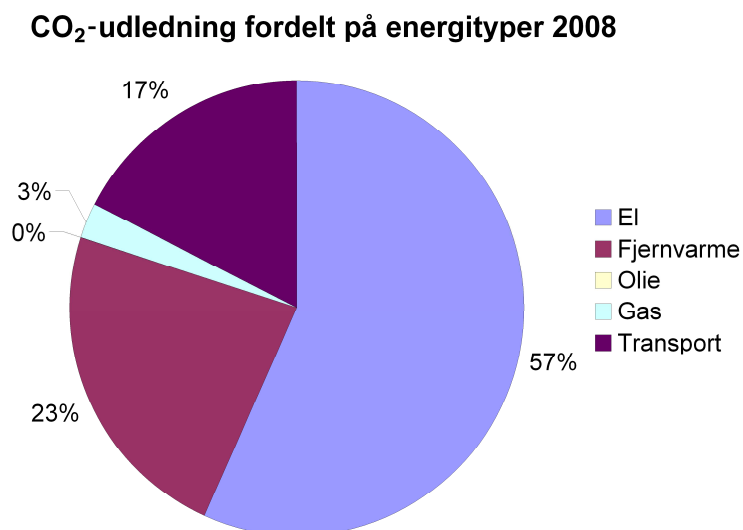
At most of the faculties, the CO₂ curve remained fairly stable between 2006 and 2008. The exceptions are Nat and Life, both of which have recorded large increases. However, a good deal of the increase at Life is due to a doubling of transport activity but, as mentioned above, this figure is flawed. Apart from this, Life has shown a small reduction in electricity consumption per man year but an increase in heat consumption per man year.

Activities that emit CO₂

The University of Copenhagen's CO₂ emission is computed based on the CO₂ emission factor for each type of consumption included in the calculation. For example, the CO₂ emission factor for electricity is significantly higher than the factor for district heating as the CO₂ "cost" of 1 kWh of electricity is approximately 4 times more than the cost of 1 kWh of heating. As the diagram below indicates, electricity consumption is the predominant source of CO₂ emission. This is partly due to its high CO₂ emission factor. District heating accounts for slightly under a quarter whereas emissions by transport - primarily aircraft - accounted for 17% in 2008.

Diagram below: CO₂ emissions by energy type, 2008

- El = Electricity
- Fjernvarme = District heating
- Olie = Oil
- Gas = Gas
- Transport =Transport



The University's total energy consumption

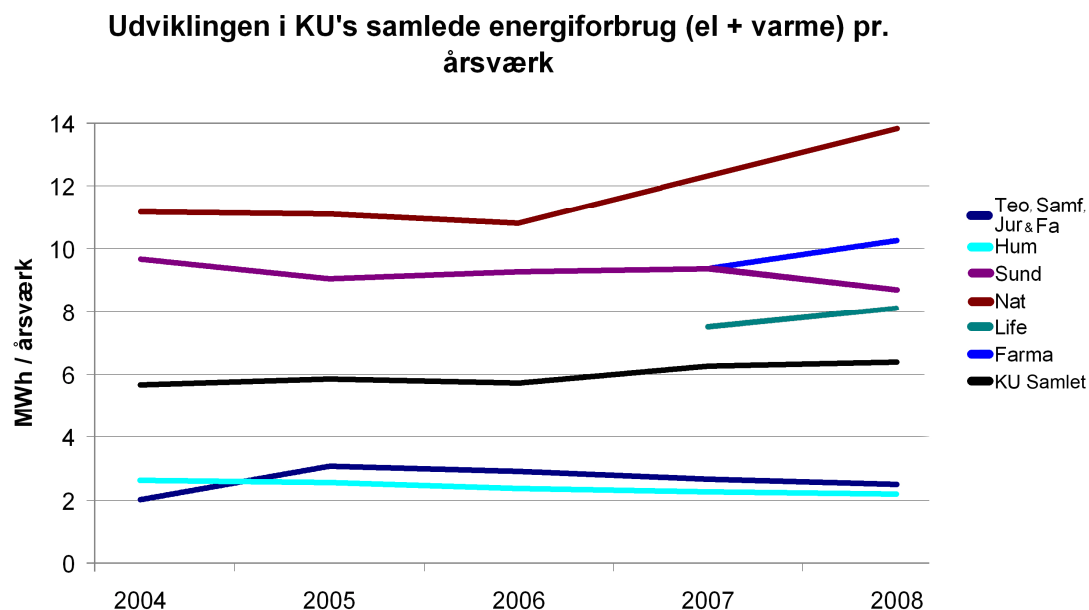
The total energy consumption is composed of the consumption of electricity and heat. The University's total consumption of energy rose by 4% per man year between 2006 and 2008. However, there are great variations in developments from faculty to faculty. It may seem surprising that energy consumption has increased by 4% whereas CO₂ emissions increased by 12%. This is due to the fact that electricity consumption rose more than heat consumption. As the CO₂ emission factor for electricity production is considerably higher than the factor for heat production, CO₂ emissions rose more than energy consumption. Furthermore, transport is included in the figure for CO₂ emissions and an increase was recorded for this item.

In 2008, the University of Copenhagen used 6.39 MWh per man year. This small rise in energy consumption compared to 2006 means that energy consumption must be reduced by 23% compared to 2008 levels if we are to realise our goal of reducing energy consumption by 20% compared to 2006 levels by 2013.

Diagram below: Development in the University of Copenhagen's total energy consumption (electricity + heat) per man year

Y-Axis: MWh / man year

KU Samlet = University total



Overall, the Faculties of Theology, Law and Social Sciences (Teo, Jur and Samf) and University Administration achieved savings of over 14% in energy consumption per man year from 2006 to 2008. The Faculty of Humanities reduced its energy consumption by 8% and the Faculty of Health Sciences (Sund) achieved savings of almost 6%. At the other end of the scale, the Faculty of Science (Nat) recorded an increase in total energy consumption per man year of 28%. The high rise in the Faculty of Science's energy consumption should be seen in the context of the commissioning of new buildings (the Biocentre) which alone account for almost 10% of the University's total electricity consumption. The vacation of other buildings was not able to compensate for this.

It is worth noting that all of the “dry” faculties have recorded a slight reduction in energy consumption. On the other hand, consumption at the “wet” faculties, and in particular at the Faculty of Science, has risen. However, there is one bright spot: the “wet” Faculty of Health Sciences (Sund) effected savings of 6% between 2006 and 2008. During this period, the Faculty of Health Sciences worked dedicatedly towards reducing energy consumption. The Faculty has a well-developed energy management system with numerous metres and has employed an energy controller who has concentrated on identifying potential savings. In addition to locating isolated faults that would result in significant annual savings if corrected, the Faculty of Health Sciences has launched a broad range of projects that may help reduce energy consumption even further. The Faculty has been particularly successful in reducing heat consumption, which has fallen by 11% per man year.

At the beginning of 2009, the energy-saving campaign Green Action was launched. This will have a positive impact on the green accounts for 2009. One of the focal points of the campaign was the use of energy-intensive laboratory equipment which will hopefully help reverse the trend at the other “wet” faculties. While the campaign was running, we were able to reduce heat consumption by approximately 10% and electricity consumption by about 1%.

The Faculty of Humanities (Hum) achieved savings in electricity consumption in the period between 2006 and 2008. Similarly, the Faculty of Pharmaceutical Sciences (Farma) and the Faculty of Life Sciences (Life) reduced their electricity consumption in 2007 and 2008. However, the positive trend in electricity consumption at Farma and Life is offset by significant increases in heat consumption.

Waste, water and transport

The University of Copenhagen's total volume of waste fell slightly between 2007 and 2008. At the same time, the proportion of waste sent for recycling increased and this is important from an environmental perspective. There has been positive development at the Faculty of Life Sciences, in particular, and the Faculty succeeded in reducing its total volume of waste considerably. To a large extent, figures for 2006 are based on estimates and, therefore, are not included here.

In overall terms, water consumption fell between 2007 and 2008. The Faculties of Humanities (-10 %), Health Sciences (-16 %) and Pharmaceutical Sciences (-17 %) achieved large savings whereas consumption at the Faculties of Science and Life Sciences rose by 4.2% and 10.8% respectively. Only data for 2007 have been included as previous years' data are based on financial data. Data for 2007 are based on metre readings and, thus, are more credible. The new and improved data logging procedure provides an excellent basis for establishing targets for water consumption at a later stage.

The University of Copenhagen's CO₂ emissions by transport rose from 8541 to 11374 tons from 2007 to 2008. However, as mentioned earlier, these figures are subject to some uncertainty due to changes to accounting principles and a comparison of the figures may, therefore, be unreliable. In addition, errors were identified in the Faculty of Life Sciences' figures, which were far too low in 2007. Farma was the only faculty to succeed in reducing emissions by transport.

The University of Copenhagen and the others

In comparison with the University of Southern Denmark, Roskilde University and Aalborg University, the University of Copenhagen holds a respectable place in the middle of the field for water and electricity.

The fact that the University of Copenhagen's electricity consumption is normal compared to the other Danish universities is no poor achievement as the University of Copenhagen has a higher proportion of wet research areas than the other universities. Following the merger with Life and Farma in 2007, the University of Copenhagen now houses around half of all of the university laboratories in Denmark.

While the University has succeeded in curbing its electricity consumption, its heat consumption is higher than that of the other Danish universities. This is partly due to the fact that the University of Copenhagen is decentralised and is located in a large number of old buildings. In addition, the University has a high proportion of "wet" activities.

The second wave of the University of Copenhagen's energy action plan, which focuses on existing building complexes with the same types of energy-related challenges, is expected to reduce the University of Copenhagen's energy consumption once the initiatives have been implemented. The report will be finalised during the summer of 2009 and initiatives will then be prioritised, approved and implemented. It is hoped that it will already be possible to launch some of the initiatives in the autumn of 2009 so that savings will become visible from 2010.

Green Campus, University of Copenhagen, July, 2009.