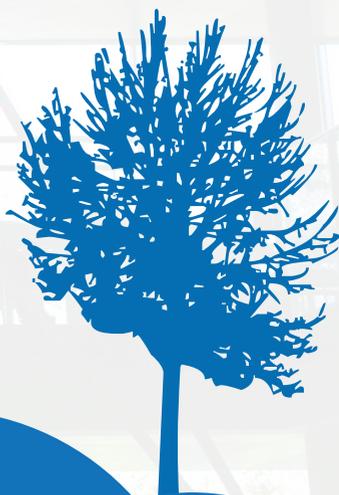


CBS ENVIRONMENTAL REPORT 2013



CBS



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HANDELSHØJSKOLEN

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This report was made possible thanks
to funding by the CBS Sustainability
Platform

Photos: Tao Lytzen

Printing: Grafisk Rådgivning

Published 2013



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FOREWORD

CBS has ambitious goals in relation to sustainability. It is part of the CBS strategy and an obligation derived from our commitment to the UN PRME initiative. This commitment will help make CBS a responsible organization, and we want to develop the impact of business and operations on the environment and climate in an increasingly sustainable way.

Sustainability and accountability thus become core business for CBS. In this context, it is crucial for CBS to know our own situation with regards to the volume of greenhouse gases generated directly or indirectly as a result of CBS' activities. This report conveys an outline of the CBS CO₂e situation today.

The picture is still subject to uncertainties, but the silhouette is emerging. The report is a good starting point when CBS with ever greater precision wishes to prioritize work on the development of the campus in the necessary sustainable direction. At the same time the report collects and disseminates a wealth of knowledge and data, so CBS thereby also might be

Now this is not the end.

It is not even the beginning of the end.
But it is, perhaps, the end of
the beginning.

- Winston Churchill

included as a case study company in education and research.

Last but not least, the report delivers the facts that enable students and staff at CBS to understand where their efforts make a difference and contribute meaningfully, when they assist CBS towards a sustainable campus.

The report is the result of an endeavor that began as a CBS Goes Green project in early 2012. The work is made possible through a grant from the CBS Sustainability Platform, and is an example of how talented CBS students may be a promising alternative to external consulting assistance.

Per Holten-Andersen,
President of CBS

INTRODUCTION

The purpose of this report is to ascertain Copenhagen Business School's (CBS) impact on the environment and especially the CO₂ equivalents (CO₂e) emissions, caused by CBS.



With approximately 20.000 students, 2300 employees and a campus covering a gross area of 118.306 square meters, CBS is a business university that uses a great amount of resources. As a university, CBS affects the environment through energy consumption, water usage, business travel, school excursions, commuting, office materials, food supplied by catering and all waste disposals. Figure 1.0 shows an illustration of the considered processes of a university.



Figure 1.0, J. Meitani, BI environmental report, 2012, p.5

With this report we aim to obtain a transparent picture of CBS' yearly consumption of resources and CO₂e emissions. The report is produced in the beginning of 2013 and is looking back on the years 2008 to 2012. We have attempted to create as transparent a report as possible and in a language so people, without a technical background, can gain an understanding of CBS' efforts and challenge to reduce its CO₂e emissions and the different impacts on the environment caused by CBS.

The report has a critical take on the facts and figures being analyzed. This should all together lead to the report being a contributing factor in CBS' goal of reducing CO₂e emissions caused by CBS with 40% in the year 2020, with a baseline year in 2008.

When it comes to sustainability reporting there are no universal standards, which makes it a challenge to report in a transparent and reliable manner. However, as sustainability reporting has become more acknowledged, some standards have developed and are becoming widely accepted. We have chosen to follow the GHG Protocol standard, as it is one of the most used standards worldwide. The GHG Protocol standard divides emission into three categories, which they call scopes, as seen in figure 1.1.

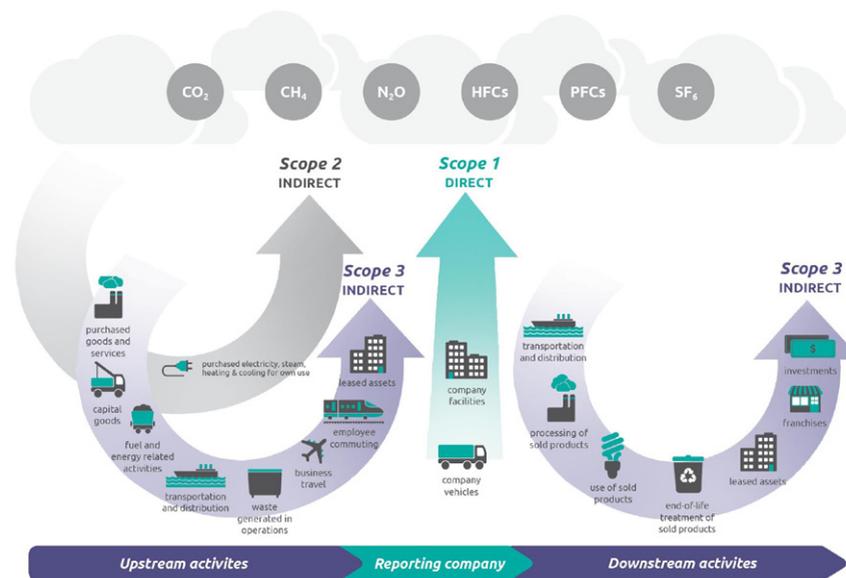


Figure 1.1 copyright GHG Protocol

We have not included all of the activities in this report as some of them are not applicable for CBS, whereas others have been excluded due to a limit in time and resources. Throughout the report the different greenhouse gases have been converted to CO₂e, which will be explained more in depth, together with the choice of standard and activities, in the methods section.

In the following sections we first introduce a brief summary of the findings and then an in depth methods section before we move on to an elaborate section on the different activities and finally end with future perspectives.



IF YOU ONLY HAVE
5 MINUTES

UNDERSTANDING THE DEVELOPMENT

- Despite a 30.8% decrease in CO₂e from electricity, a 22.8% decrease in CO₂e from heat and no longer having a car running on diesel, overall CO₂e emissions have still gone up with 2.6% since 2008. This increase is due solely to the large increase in CO₂e from business travel, which has increased with 62.8% since 2008.
- CBS' CO₂e emissions in 2012 amount to 6774 ton, leaving them 2811 ton from the 40% reduction goal to be reached in 2020. The desired decrease of 2811 ton, is equal to the annual average emissions of 1211 Danish households.

Overall converted CO₂e

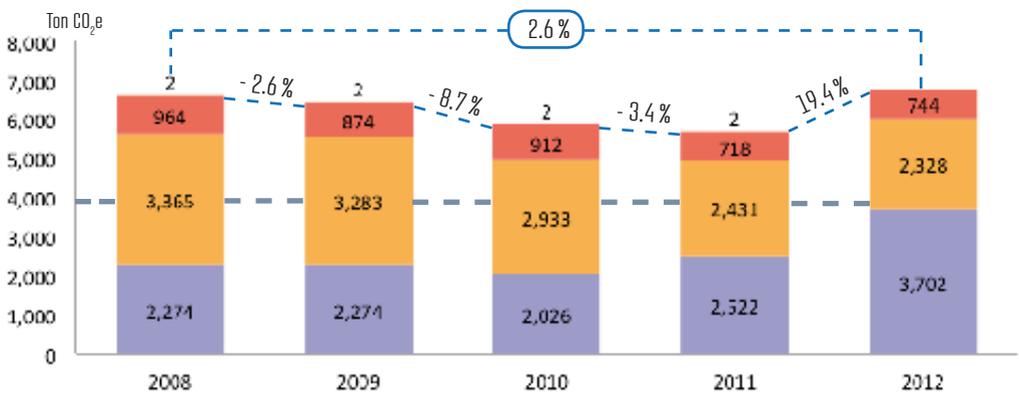


Figure 1.2
 Legend: Flights (purple), Electricity (orange), Heat (red), Diesel car owned by CBS (brown).
 --- 40% reduction goal in 2020



POSSIBLE INITIATIVES FOR CBS

- Solar panels on the roof of Solbjerg and Kilen
- Better automated control of switching off lights in rooms and auditoriums
- Lower the average inside temperature at CBS facilities
- Include the cost of carbon offsetting in all flight activities
- Campaign to encourage more sustainable behavior

Overall converted CO₂e in 2012

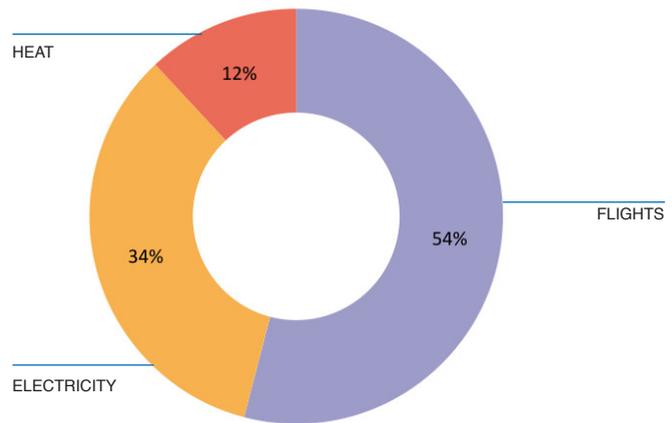
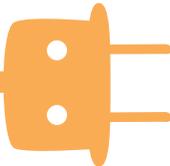


Figure 1.3

SUMMARY OF ELECTRICITY



UNDERSTANDING THE DEVELOPMENT

Negative impacts

- An increased number of students and staff
- New power outlets in auditoriums at Solbjerg Plads
- Fixed cooling system in the library at Solbjerg Plads

Positive impacts

- Investment in more energy efficient ventilation and energy saving light bulbs in 2008
- A cleaner energy mix from DONG accounts for 92.8% of the decrease in CO₂e emissions

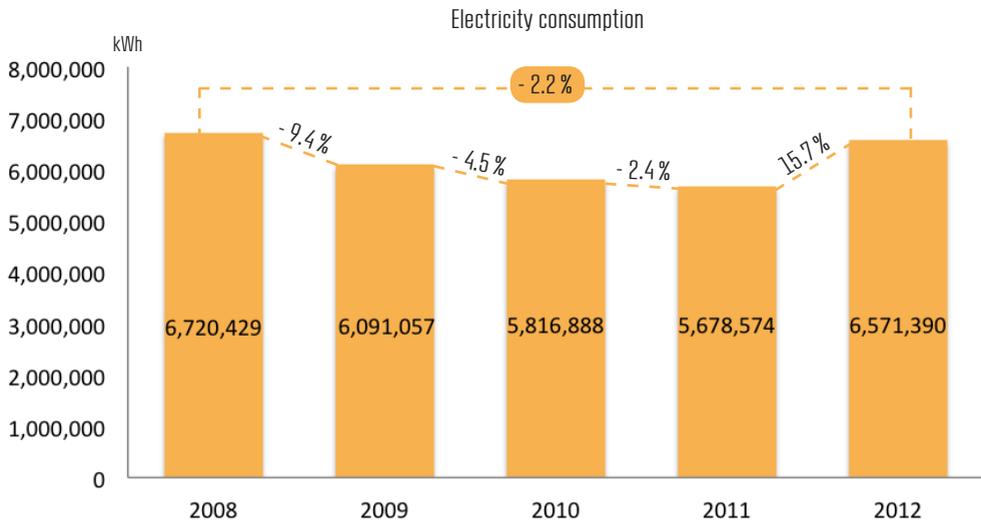


Figure 1.4



POSSIBLE INITIATIVES FOR CBS

- Solar panels
- Accelerate the changing of light bulbs to LED lighting
- Better automated control of switching off lights in rooms and auditoriums
- A campaign to improve the behavior of students and staff
- A technical analysis of the buildings to make them more energy efficient

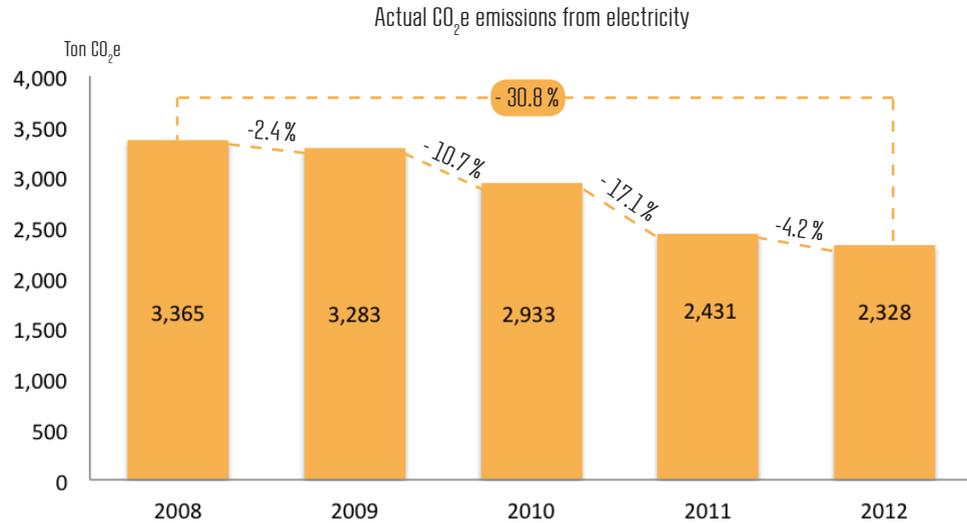


Figure 1.5

SUMMARY OF HEAT



UNDERSTANDING THE DEVELOPMENT

- The weather has a big impact on the heat consumption, as a cold winter increases the heat consumption heavily as seen in the year 2010
- A cleaner energy mix accounts for 83.2% of the 22.8% decrease in CO₂e emissions

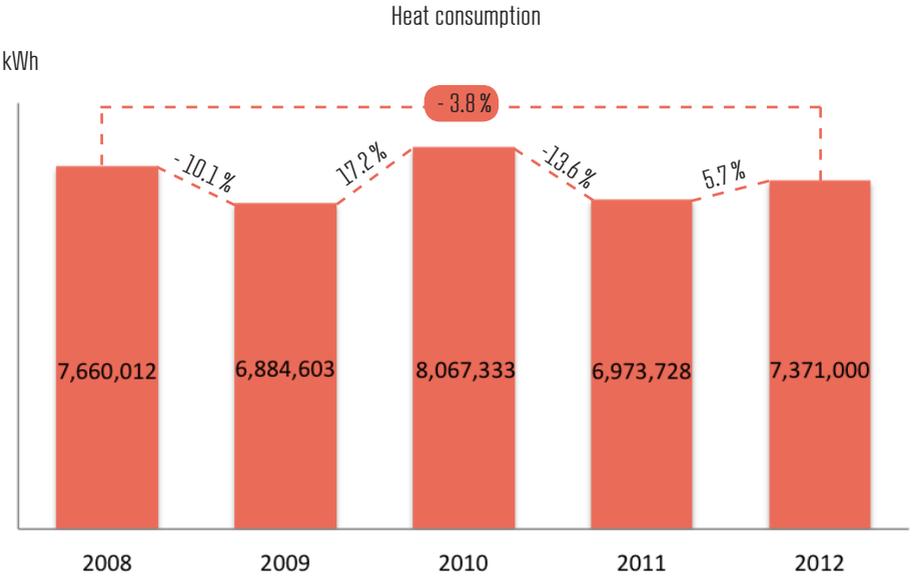


Figure 1.6



POSSIBLE INITIATIVES FOR CBS

- Lower the average inside temperature on campus
- Better overall isolation
- Better isolation of windows. This project will be initiated during 2013

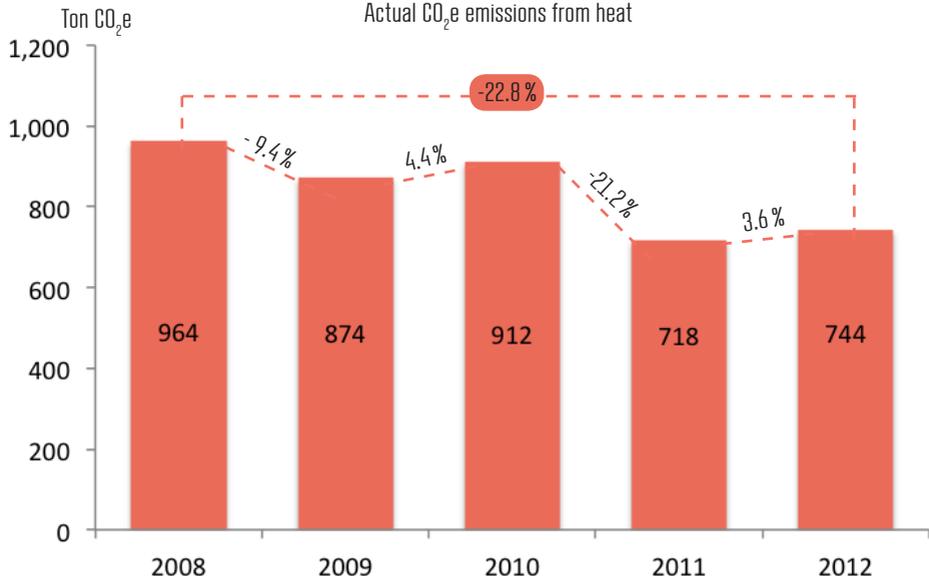


Figure 1.7

SUMMARY OF BUSINESS TRAVEL



UNDERSTANDING THE DEVELOPMENT

- Participating in conferences and symposiums around the world is important for a top university. CBS have, from 2008 to 2012, increased their business travels significantly to strengthen the business and brand.
- The increase in km traveled from 2011 to 2012 is equal to 2282 round trips from Copenhagen to London or 292 round trips to Vancouver in Canada, where CBS work closely with UBC.



POSSIBLE INITIATIVES FOR CBS

- Investment in more and better equipment for teleconferencing
- Encourage employees to use teleconferencing.
- Create incentives for employees to use teleconferencing instead of traveling
- Include the cost of offsetting in all flight activities



Figure 1.8

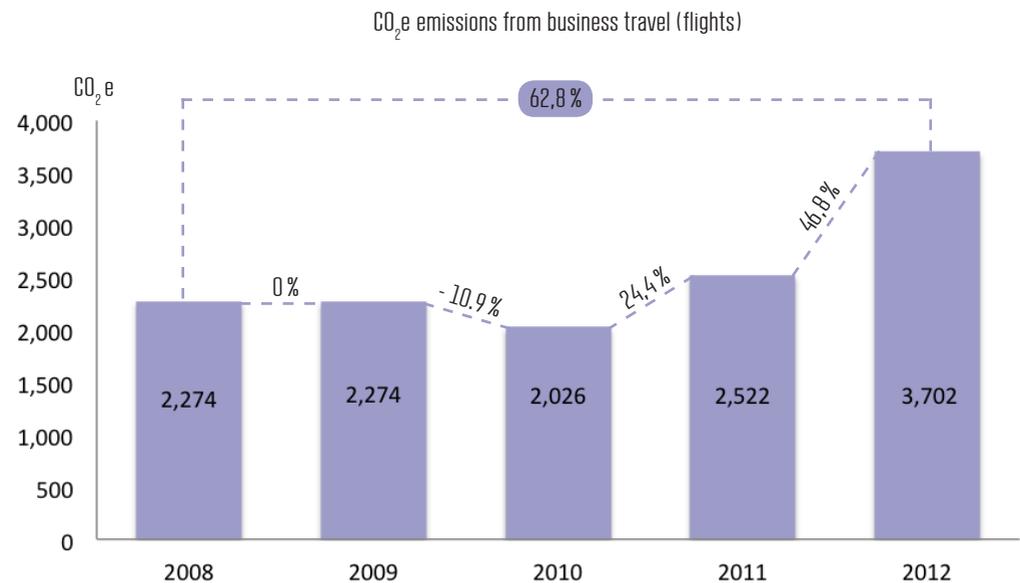


Figure 1.9



UNDERSTANDING THE DEVELOPMENT

- During the past years there has been an increased focus on the gathering of waste data, to increase the understanding of the situation. However, a change in the waste service provider, complicates the gathering and analysis of waste data.
- The lack of a consistent, well-managed and available waste sorting system, on campus, makes it harder to make students sort their waste correctly



POSSIBLE INITIATIVES FOR CBS

- Investment in a new and easily understandable waste sorting system, which should be present throughout the entire CBS campus, is essential
- Increase students' and staffs' understanding of waste sorting
- Campaign to make waste sorting second nature to students and staff

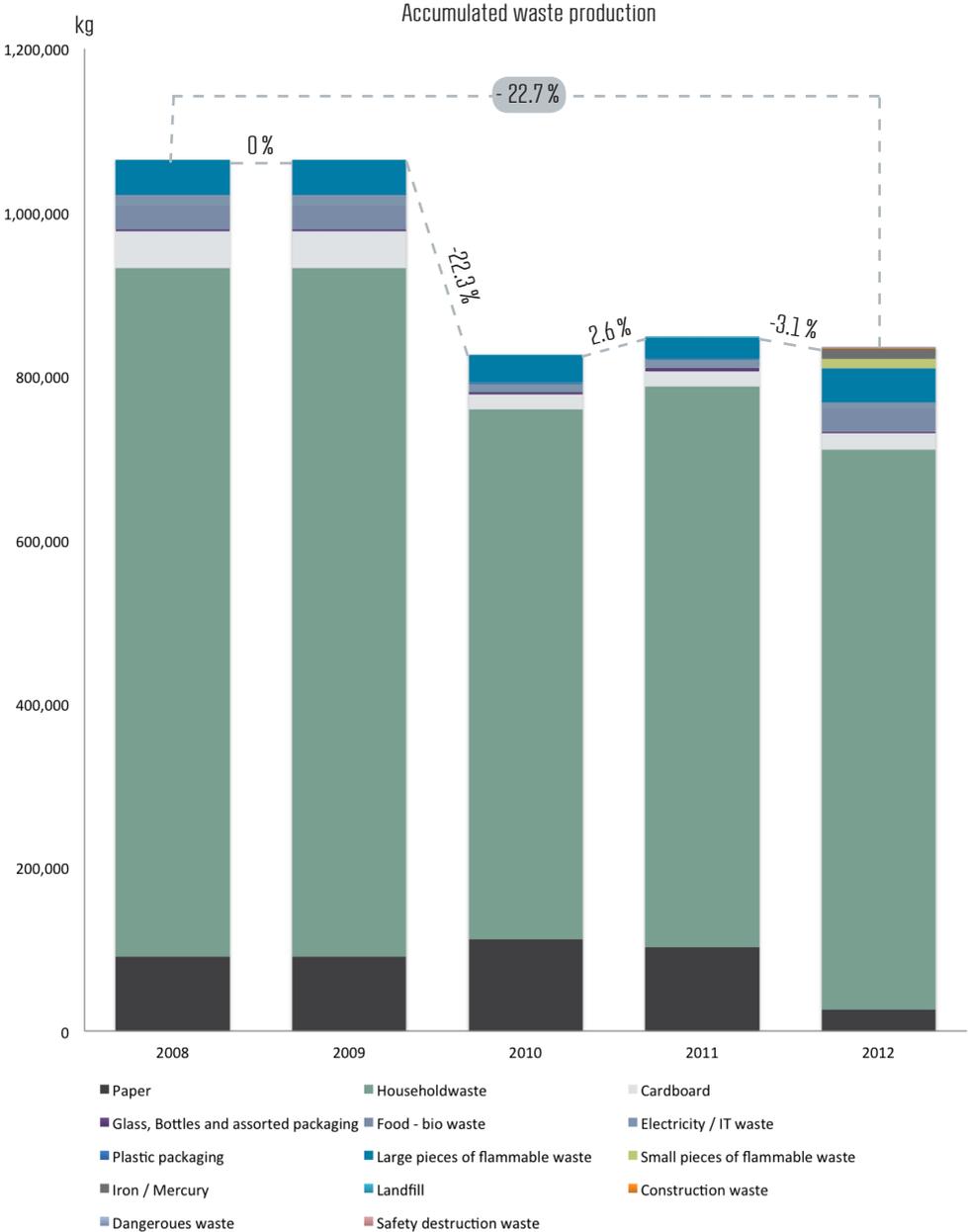


Figure 2.0



UNDERSTANDING THE DEVELOPMENT

- Despite a 22% increase in students the water consumption has gone down with 15.6% from 2008 to 2012.
This is mainly because of investments made by CBS, analyzing which toilets and sinks were leaking and then repairing them. Additionally, improved behavior of students and staff has had a positive impact.
- This is an area that CBS has had great success with. It is also an area that has a clear economic benefit, as one m³ water costs 35.68 DKK which means a total saving of 177,829 DKK in 2012 in relation to 2008.



POSSIBLE INITIATIVES FOR CBS

- Increased focus on the water consumption of the canteen and the cleaning activities
- A campaign to further improve the behavior of students and staff

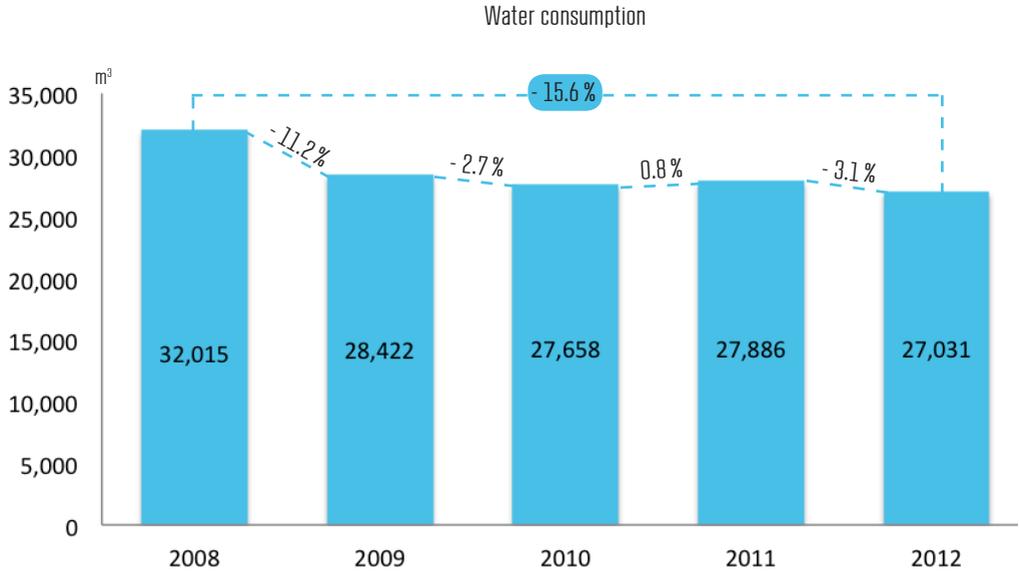
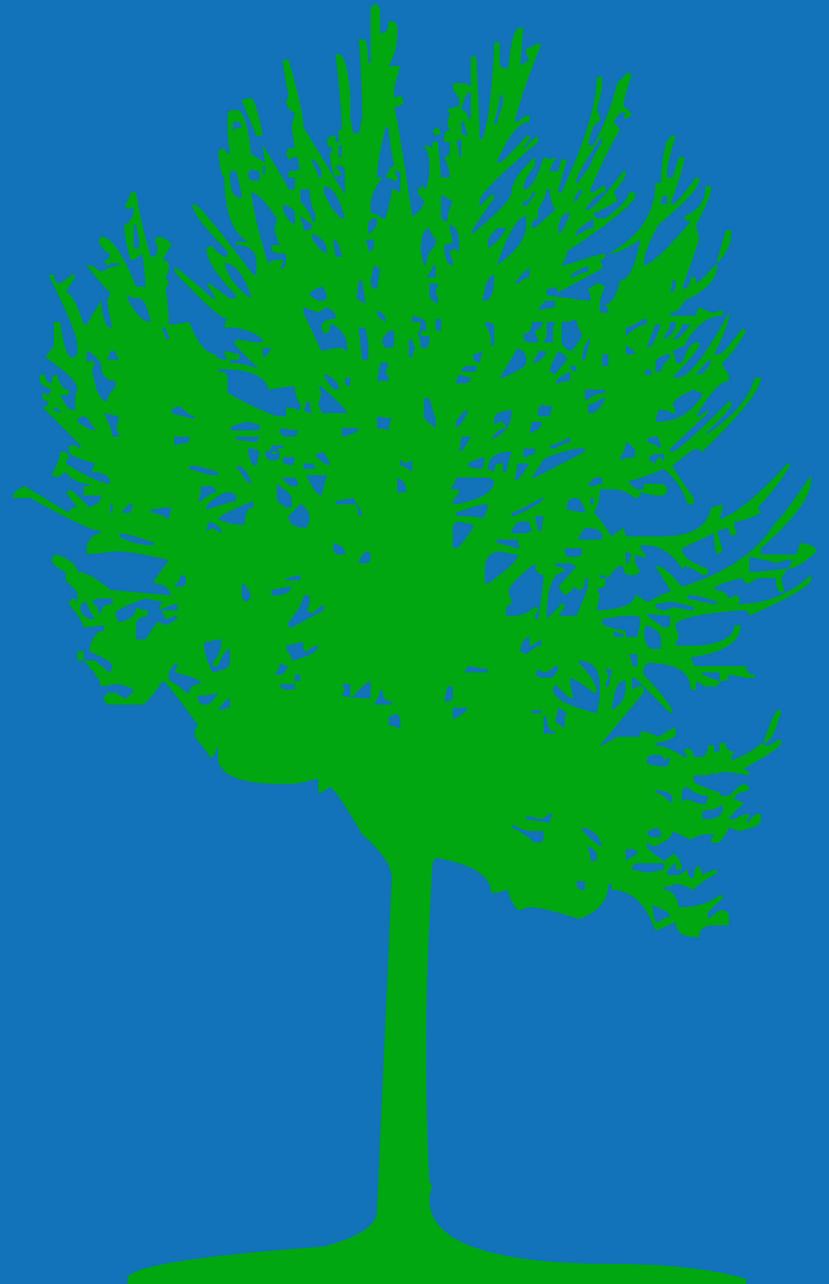
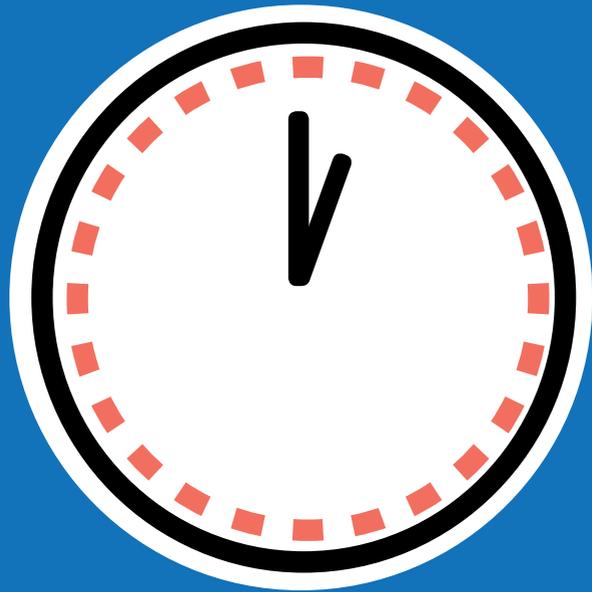


Figure 2.1

TIME TO GO
IN-DEPTH

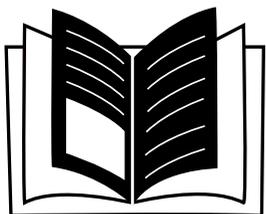


METHODS



There is one thing even more vital to science than intelligent methods; and that is, the sincere desire to find out the truth, whatever it may be.

- Charles Sanders Peirce



There are no universal standards in sustainability reporting, which makes it a challenge to report in a transparent and reliable manner. However, as sustainability reporting has gained more awareness and becomes more acknowledged, some standards have developed and are becoming widely accepted, for instance the GHG Protocol standard. After thorough research, the GHG Protocol standard is chosen for this report, as it seems the most adequate and transparent way to report, and because of the fact that many other institutions make use of it. The GHG Protocol standard divides emissions into three categories as seen in figure 2.2 below:

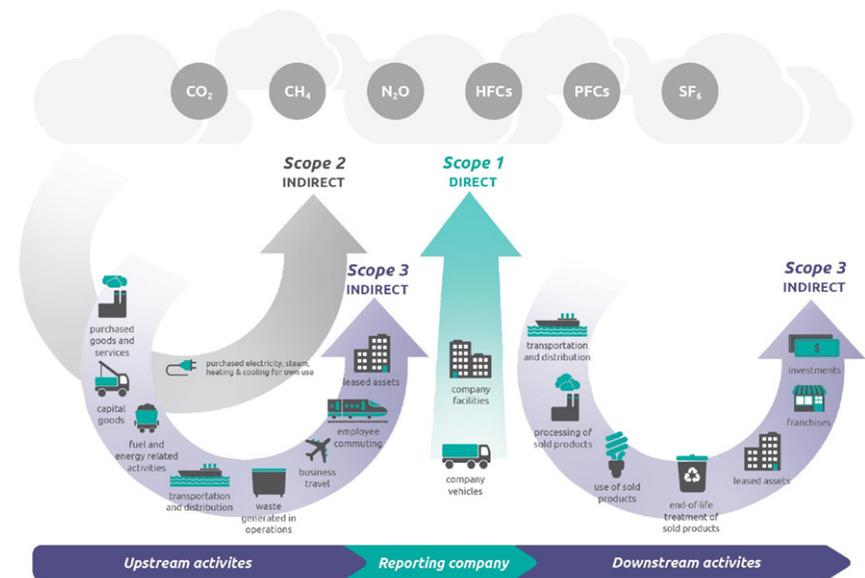


Figure 2.2 copyright GHG Protocol

Scope 1 activities consist of direct emissions, such as in-house production and emissions from vehicles owned by the institution.

Scope 2 activities consist of indirect emissions caused by the purchase of electricity and heating.

Scope 3 activities consist of all other indirect emissions and are divided into 15 separate activities, eight upstream activities and seven downstream activities, as seen in figure 2.2

The activities in the scopes emit different greenhouse gasses that need to be accounted for. The GHG Protocol states that especially the six gasses below are to be included in the calculations, with a seventh to follow soon.



Figure 2.3 copyright GHG Protocol

These six gasses are then converted into CO₂e emissions, as this is the most recognized gas. The denomination “CO₂e” is used for the conversion where the “e” stands for equivalent. CO₂e is thus a combined

measure for all the harmful gasses emitted by the different activities, and is used consistently throughout the report.

The next part of the methods section will explain how and which activities in the three scopes we have accounted for and why some have been excluded.

Scope 1 - Direct



Company facilities

This has been accounted for in the report.

CBS does not produce any scope 1 emissions from company facilities, as CBS’ in-house production consists of teaching and research. None of these activities include experiments that directly emit CO₂e.



Company vehicles

This has been accounted for in the report.

Until 2012 CBS owned a single car, running on diesel, which we have accounted for under scope 1 activities. In 2012 CBS replaced the diesel car with an electric car, and its consumption will, therefore, henceforth be accounted for in scope 2 activities, under purchased electricity.

Scope 2 - indirect



Purchased electricity, steam, heating and cooling for own use

This has been accounted for in the report.

CBS' scope 2 activities consist of the purchase of both electricity and heating for own use.

ELECTRICITY

To calculate the CO₂e emissions from electricity consumption, we have used CO₂e factors (gram CO₂e emitted per kWh used).¹ The CO₂e factor changes from year to year, as the contribution of fossil fuels and renewable energy sources, to the provision of 1 kWh, changes from year to year. Furthermore, Denmark also imports and exports electricity. The volume of the imported and exported electricity, combined with the sources from which the imported/exported electricity is generated, also affects the CO₂e factor. The following factors are adjusted for the amount of imported/exported electricity in given years:

¹ www.energinet.dk

CO₂e FACTOR FOR ELECTRICITY

Year	2008	2009	2010	2011	2012
Gram CO ₂ e per kWh	481	518	485	412	341

Figure 2.4

The CO₂e factors from 2006 to 2009 are specific for electricity provided to eastern Denmark, which includes Zealand, Lolland Falster, Bornholm and the surrounding islands. From 2010 and onwards, there is only one CO₂e factor for all of Denmark. This is because of the established direct current connection across Storebaelt in 2010.

When receiving electricity from a provider, some distribution losses will occur; these should also be included when calculating the CO₂e emissions. The distribution losses vary according to geographic location and should be obtained by the specific provider of electricity. However, as our provider, DONG, has not been able to give us a specific distribution loss percentage, we have used DONG's country average of 4%. The inclusion of the distribution loss is counterintuitive as the loss is calculated and then added to

the CO₂e factor (i.e. our CO₂e factor is multiplied with 1.04 to include the distribution loss). This is done because the 4% loss is lost before it reaches CBS and is thus not used, however, we are responsible for its loss and should therefore include it in the calculation of CO₂e emissions.

After regulating for the distribution loss, the factors are as follows:

CO₂e FACTOR FOR ELECTRICITY INCL. FOR 4% DISTRIBUTION LOSS

Year	2008	2009	2010	2011	2012
Gram CO ₂ e per kWh	501	539	504	428	354

Figure 2.5

HEATING

When calculating the CO₂e emissions from heating, we have used CO₂e factors (gram CO₂e emitted per kWh used).² The CO₂e factors are specific to the district heating in Frederiksberg, provided by “Frederiksberg Forsyning”, which is where CBS gets its heating from. The factors are as follows:

² www.ctr.dk

CO₂e FACTOR FOR HEAT

Year	2008	2009	2010	2011	2012
Gram CO ₂ e per kWh	126	127	113	103	101

Figure 2.6

In addition, we have chosen to use some of Energestyrelsen’s tools, for instance when dealing with degree-day-regulation of the heat consumption.

Because of variations in the temperature during different years, and the consequent variation in the heat consumption, so-called “degree-days” are used to normalize data, in order to be able to compare data from year to year. Degree-days measure how cold/hot a specific year has been and by comparing these degree-days to a “normal” year’s degree-days, an adjustment can be made, so the data are comparable. A “normal” year’s degree-days are defined as the average degree-days of the past 40 years, and are updated every 40 years. In this report, a “normal” year’s degree-days is the average of the degree-days from 1941 to 1980.³

The reason for regulating with degree-days is, that people cannot control how cold/hot a year is and in order to make the comparison between different years

³ www.teknologisk.dk

“fair”, an adjustment to a “normal” year is used. However, not all of the heat consumption should be regulated. The heating used to heat water, is not affected by the temperature and should, therefore, be excluded from degree-day regulation. Energistyrelsen The Danish Energy Agency in Denmark has set the DUC (degree-day unaffected consumption) at universities, to be approximately 19% of the total heat consumption. The DAC (degree-day affected consumption) of 81% has been regulated, and the unregulated 19% has then been added in the end to achieve the correct degree-day regulated heat consumption.

In this report we have used the degree-day regulation with caution, as it does not portray the correct consumption of heat, and thus not the correct CO₂e emissions. CO₂e calculations are made on the basis on both degree-day regulated heat consumption and actual heat consumption.

The degree-day regulation is calculated as follows: $DUC_{\text{current year}} + (DAC_{\text{current year}} * \text{Degree-days normal year} / \text{Degree-days current year})$.⁴

There are several different ways of calculating the CO₂e factors, the most common being, the 125% method and the 200% method. When calculating

⁴ Energistyrelsen

CO₂e factors for electricity and heating, it is necessary to divide fuel use and emissions from Combined Heat and Power plants between electricity and heating, as heating is a bi-product of the production of electricity. This is actually an impossible task, and the use of a method on how the allocation, of the effect on the environment, between electricity and heating is, must be chosen. Both the 125% method and the 200% method have their distinct strengths and weaknesses.

Energistyrelsen in Denmark recommends that the 125% method is used. However, it is necessary to be consistent and as the provided CO₂e factors for heating are based on the 200% method, the CO₂e factors for electricity will, therefore, also be based on the 200% method.⁵

Electricity, on average, emits 3.5 times as much CO₂e per kWh than heating (ratio as per 2012. This is, however, subject to change as the CO₂e factors change respectively). This is important to keep in mind, when choosing which areas to focus on, when trying to reduce CO₂e emissions at CBS.

⁵ Source: www.energinet.dk: PDF: “Methods and data basis for environmental report 2011.”

Scope 3 – indirect upstream activities



Purchased goods and services

This has not been accounted for due to complexity and lack of time and resources. This is however something that should be aimed at accounting for in the future, as it has a substantial impact on the overall emissions.



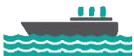
Capital Goods

This has not been accounted for due to complexity and lack of time and resources. This is however something that should be aimed at accounting for in the future, as it has a substantial impact on the overall emissions.



Fuel and energy related activities

This has not been accounted for due to complexity, lack of time and resources and the fact that the activity has a minimal impact on the overall emissions.



Transportation and distribution

This has not been accounted for due to complexity and lack of time and resources. This is however something that should be aimed at accounting for in

the future as it has a considerable impact on the overall emissions.



Waste generated in operations

This has not been accounted for as CO₂e but as actual waste data. We have looked into converting it but have not been able to find a satisfying method, due to complexity and lack of time and resources. This is however something that should be aimed at accounting for in the future as it has a substantial impact on the overall emissions.



Business travel

This has been partially accounted for. Business travel includes all travel by employees at CBS, with regards to work related activities. The contributions of emitted CO₂e from flight activities are accounted for and calculated by Via Egencia Denmark, which is the travel agency CBS uses. However, CBS has other forms of business travel, such as by train, bus, metro, and privately owned vehicles, which are not accounted for. This is due to administrative costs and constraints, and the complexity of the conversion. Furthermore, in the future, the use of taxis, busses, trains and the metro will all be reg-

istered as one activity on the same account, which makes it impossible to differentiate.



Employee commuting

This has not been accounted for due to complexity and lack of time and resources. This is, however, something that should be aimed at accounting for in the future, as it has a considerable impact on the overall emissions.



Leased assets

This has been partially accounted for.

The contributions of emitted CO₂e from leased locations such as, Dalgas Have 15, Porcelænshaven 16-26, Grundtvigsvej 25 B, Grundtvigsvej 37, are accounted for.

However the leased locations such as Falkoner Cinema, Copenhagen Zoo and Amager Strandvej 108B have not been accounted for.

This is however something that should be aimed at accounting for in the future, as it has an impact on the overall emissions.

Scope 3 - indirect downstream activities



Transportation and distribution

CBS does not have any transportation or distribution of sold goods, so this activity is not relevant for the report.



Processing of sold products

CBS does not sell any intermediate products, so this activity is not relevant for the report.



Use of sold products

CBS does not produce or sell any products that release emissions during use, so this is not relevant for the report.



End-of-life treatment of sold products

This has not been accounted for due to complexity and lack of time and resources. However, some of it is accounted for in terms of kilos, as part of the waste data.



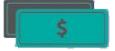
Leased assets

CBS does not lease out assets so this activity is not relevant for the report.



Franchises

CBS does not have any franchises so this activity is not relevant for the report.



Investments

This activity has not been accounted for, as it is not relevant for the report.

ELECTRICITY



A sustainable energy management strategy is the sum of energy efficiency + energy modesty + renewable energy. It is not about favoring one over the other



ELECTRICITY CONSUMPTION

As portrayed in the electricity consumption sum up section, CBS' consumption of electricity since 2008 is as follows:

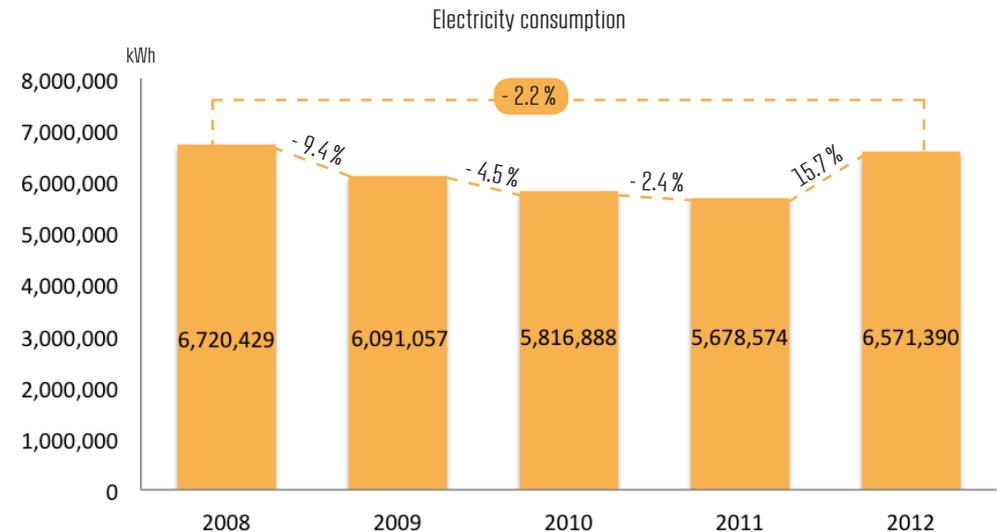


Figure 2.7

WHAT IS INCLUDED

Electricity consumption from the following buildings, which CBS has full control over, includes the main contributors. The following numbers are the consumption from each building in 2012:

- Solbjerg Plads 3 (3,195,080 kWh)
- Porcelænsøen 16-26 (1,564,898 kWh)
- Porcelænsøen 22 (150,819 kWh)
- Dalgas Have 15 (967,499 kWh)
- Kilen (537,464 kWh)
- Howitzvej 60 (102,273 kWh)
- Howitzvej 11-13 (39,667 kWh)
- Grundtvigsvej 25 B (1,194 kWh)
- Grundtvigsvej 37 (12,496 kWh)

Electricity consumption from the following buildings is not included:

- Steen Blichersvej 22
- Porcelænsøen 7
- Rooms used for teaching at Copenhagen Zoo
- Rooms used for teaching at Falkoner Cinema
- Amager Strandvej 108B (exam location)

It has not been possible to get records of the electricity consumption from Steen Blichersvej 22 and Porcelænsøen 7, but these buildings are smaller buildings and do not affect the overall consumption significantly. It would, of course, have been better if these numbers were included.

The Zoo and the cinema are the new leased buildings used for lectures. These buildings are, however, only being leased some hours on weekdays and CBS does not have full control over them. It is not possible to get an exact number of their consumption, but a rough estimate could have been calculated with more time and resources.

Amager Strandvej 108B, which is the new exam building, only has one electricity meter. The building is shared with other users, and the electricity consumptions are gathered by one single meter, as one number. It is, therefore, not possible to get an exact number of the consumption but a rough estimate could have been calculated, with more time and resources.

THE DEVELOPMENT

It is clear from the development in the electricity consumption, that the technical analysis and improvements of CBS' buildings in 2008, initially had a positive effect on the development.

The overall development of the electricity consumption adds up to a 2.2% decrease in the consumption from 2008 to 2012.

As the decrease from 2008 to 2011 can be explained due to the technical analysis and improvements of CBS' buildings, the following very large increase remains more uncertain.

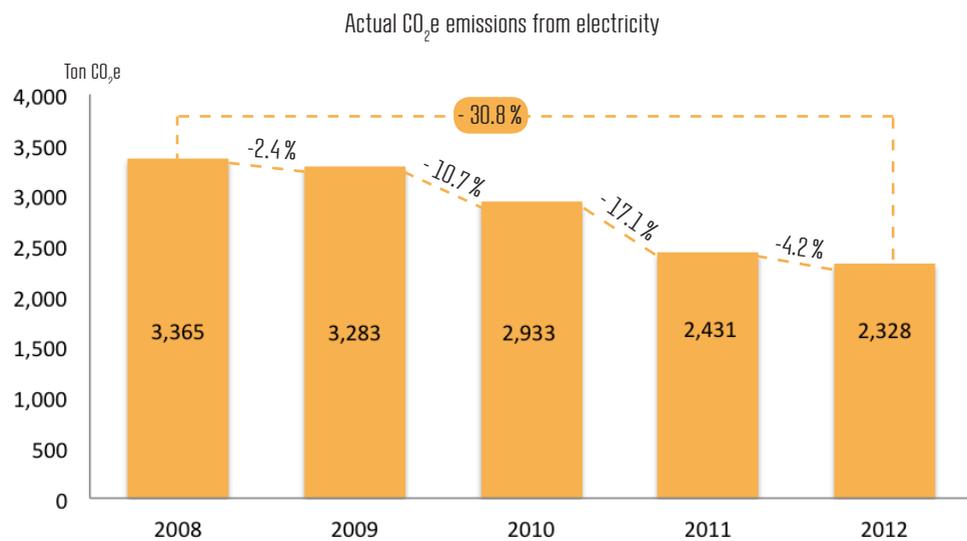


Figure 2.8

As noted earlier there has been a 2.2% decrease in the consumption but as it can be seen from the graph above, there has been a 37% decrease in CO₂e emissions from 2008 to 2012. This big difference between the decrease in the consumption and CO₂e emissions is due to a cleaner energy mix from Dong Energy.

Of the 1037 tons CO₂e that have been reduced, 92.8% is due to the cleaner energy mix from DONG and 7.2% is due to initiatives by CBS.

The graph below shows how the CO₂e emissions have gone down and how it would have looked without the positive impact from DONG.

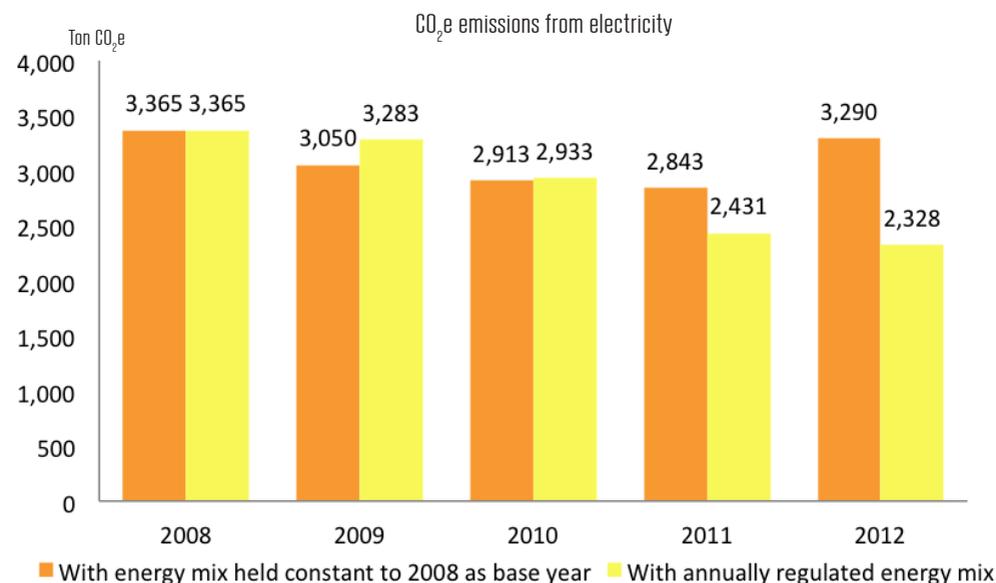


Figure 2.9

Looking at the development per student it looks even more positive:

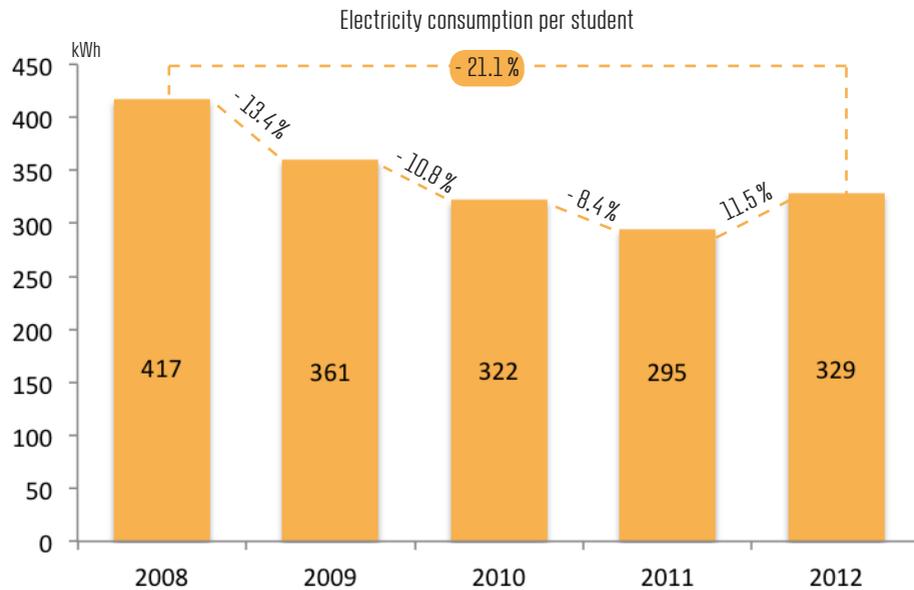


Figure 3.0

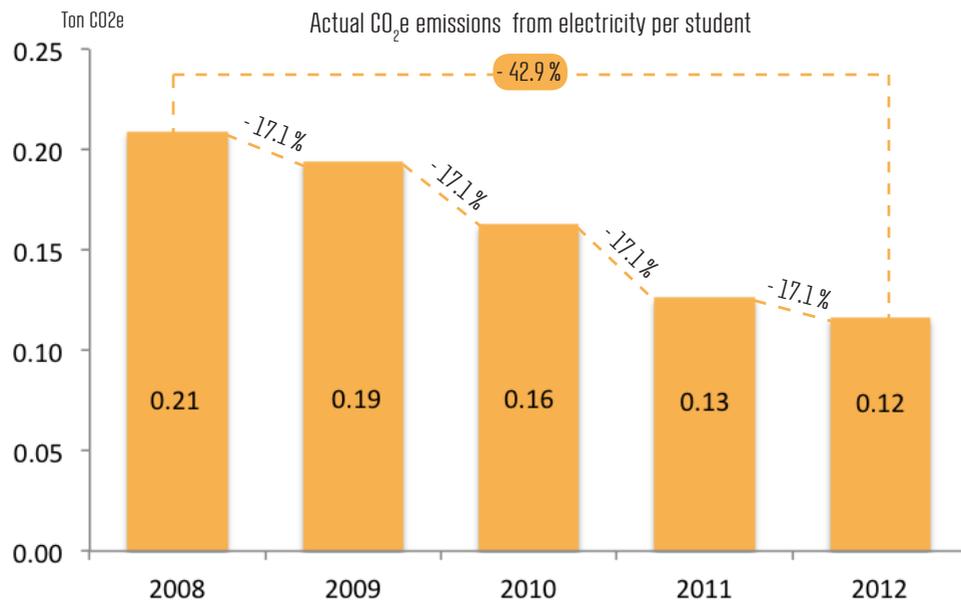


Figure 3.1



POSSIBLE INITIATIVES FOR CBS

CBS has since 2008 put an effort into changing all the light bulbs on campus to LED lights, which use significantly less energy and saves money. It has had a positive effect on the electricity consumption, which can also be seen on the development during the first few years after 2008. However, the process has slowed down recently and it would be beneficial to speed it up again to finish it completely.

These types of projects have a relatively short pay-back period, usually between 1 and 4 years.

Some of the automatic light systems have been around for many years and no longer function optimally. It would, therefore, be effective to change the older systems and install automatic light systems the places where they do not currently exist. This would save a high amount of energy and money as there often is observed empty rooms with the lights turned on. Some of these rooms have the lights turned on because of technical errors in the old automatic systems. It is easier to change the systems than the behavior of all the staff.

However, there can also be contributed to improving the staffs behavior when it comes to the areas where

they can effect the energy consumption. A campaign to inform and encourage good environmental stewardship such as turning off the lights when leaving a room, turning off standby electronics etc. would be beneficial for the environment and costs.

Both Solbjerg Plads 3 and Kilen provide great opportunities for the installment of solar panels on their roofs. The payback period for solar panels is normally 8 to 12 years. An offer from 2011, concerning Solbjerg Plads, guaranteed an annual production of 58,221 kWh. However, the technology has improved since then, so a higher annual production could be expected with today's technology.

Investment in solar panels this size costs between 1 and 1.5 million DKK, depending on the supplier.

This would not only have an impact on the CO₂e emissions but would also send a very strong symbolic message to all stakeholders.

In 2008 a technical analysis of some of CBS' buildings was performed to make them more energy effective. Especially the ventilation systems were optimized and the results can clearly be seen in the fall in the electricity consumption after 2008.

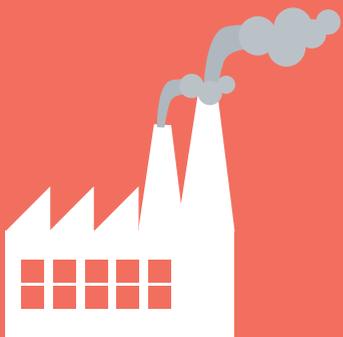
This is already five years ago now, and a new technical analysis could be beneficial to CBS.

New technology and a more elaborate analysis of the buildings could contribute to lowering CBS' energy consumption even more.

HEAT

I can't change the direction of the wind, but I can adjust my sails to always reach my destination

- Jimmy Dean



HEAT CONSUMPTION

As portrayed in the heat consumption sum up section, CBS' consumption of heat since 2008 is as follows:

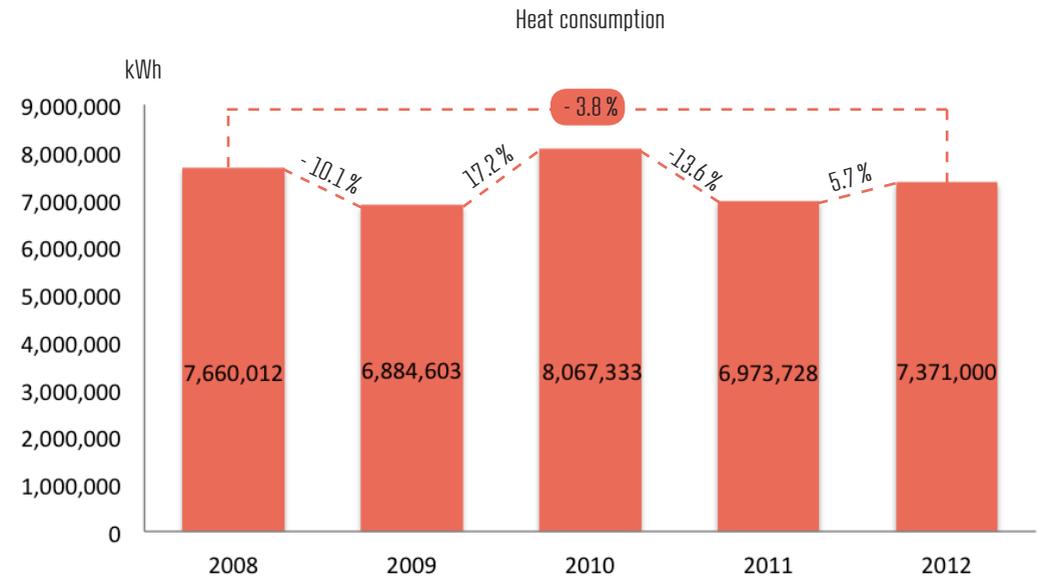


Figure 3.2

WHAT IS INCLUDED

Heat consumption from the following buildings, which CBS has full control over, includes the main contributors. The following numbers are the consumption from each building in 2012:

- Solbjerg Plads 3 (2,534,000 KWh)
- Porcelænsøen 16-26 (1,732,000 KWh)
- Porcelænsøen 22 (154,000 KWh)
- Dalgas Have 15 (1,386,000 KWh)
- Kilen (866,000 KWh)
- Howitzvej 60 (314,000 KWh)
- Howitzvej 11-13 (348,000 KWh)
- Grundtvigsvej 37 (38,000 KWh)

Heat consumption from the following buildings is not included:

- Steen Blichersvej 22
- Grundtvigsvej 25 B
- Porcelænsøen 7
- Rooms used for teaching at Copenhagen Zoo
- Rooms used for teaching at Falkoner Cinema
- Amager Strandvej 108B (exam location)

It has not been possible to get records of the heat consumption from Steen Blichersvej 22, Grundtvigsvej 25 B and Porcelænsøen 7, but these buildings are smaller buildings and do not affect the overall consumption significantly. It would, of course, have been better if these numbers were included.

The Zoo and the cinema are the new leased buildings for lectures. These buildings are, however, only being leased some hours on weekdays and CBS does not have full control over them. It is not possible to get an exact number of their consumption but a rough estimate could have been calculated with more time and resources.

Amager Strandvej 108B, which is the new exam building, only has one heat meter. The building is shared with other users, and the heat consumption is gathered by one single meter as one number. It is, therefore, not possible to get an exact number of the consumption but a rough estimate could have been calculated with more time and resources.

THE DEVELOPMENT

The heat consumption has fluctuated from year to year, with an overall decrease from 2008 to 2012 of 3.8%.

The heat consumption will always vary from year to year, as it depends on the weather.

To account for this force majeure, degree-day regulations are made, which normalize the data to make a “fair” comparison between the different years. This also makes it easier to see what the direct effect of

CBS' actions has been. The method and calculation for degree-day regulations can be found in the methods section.

The degree-day regulated heat consumption by CBS is as follows:

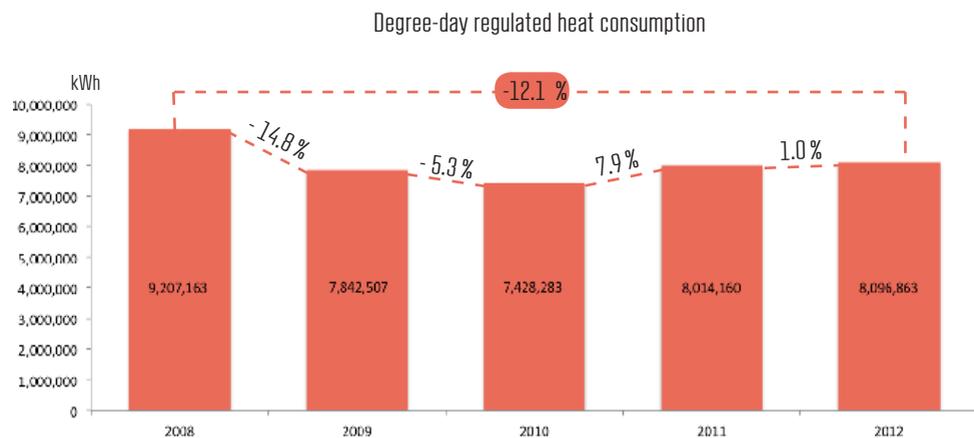


Figure 3.3

The overall change in the degree-day regulated heat consumption from 2008 to 2012 is 12.1%.

It has not been possible to find any plausible reason for this 12.1% decrease in the degree-day regulated heat consumption, but it is assumed that a greater focus on the heat consumption by CBS is a large contributing factor.

OVERALL CO₂e DEVELOPMENT

As noted earlier, there has been a decrease in the actual heat consumption of 3.8% from 2008 to 2012. Converted to CO₂e emissions, with constant and annually regulated energy mix respectively, it looks as follows:

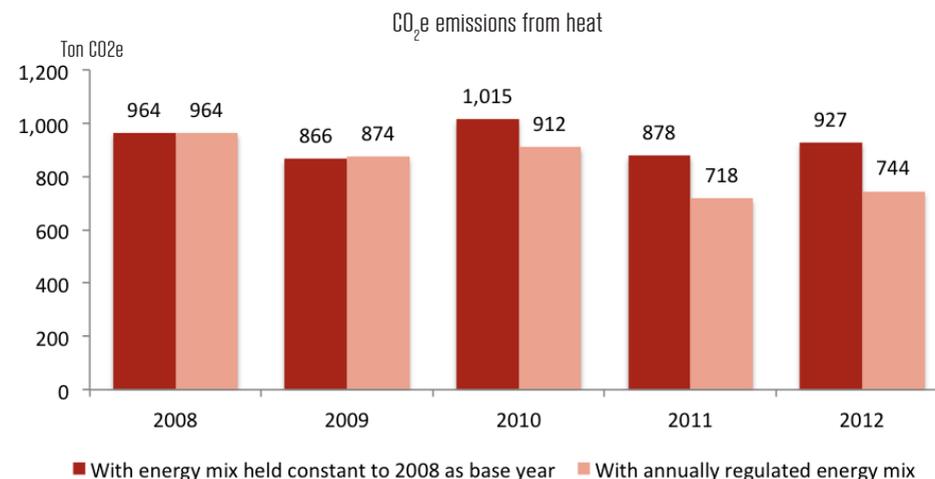


Figure 3.4

This portrays the CO₂e emissions without degree-day regulations. It could, however, be argued that this is rather unfair, as the weather is an uncontrollable factor and it is, therefore, always important to look at actual heat consumption as well as degree-day regulated heat consumption.

Including degree-day regulation of the heat consumption and again with constant and annually regulated energy mix respectively, the CO₂e emissions look as follows:

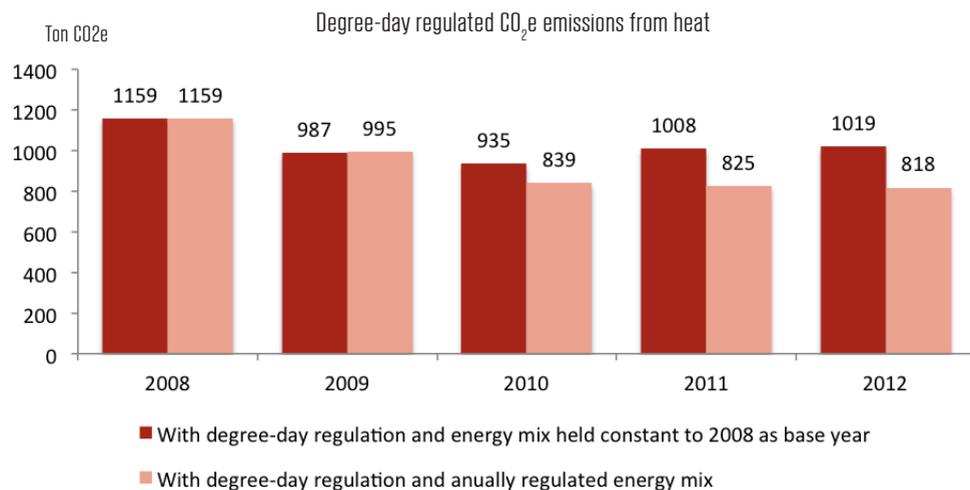


Figure 3.5

At first glance it can look quite confusing with four different ways of looking at CBS' CO₂e emissions from the heat consumption but when broken down it gets more understandable.

It all comes down to what the question sought answered is. If the actual CO₂e emissions by CBS are important, then figure 3.4 is the bar chart that should be interpreted.

If, on the other hand, force majeure is to be excluded

from the equation, and only the effects of CBS' actions are to be seen, figure 3.5 is most relevant.

Taking departure in figure 3.4 we see that CBS' CO₂e emissions, with an annually regulated energy mix (the actual CO₂e emissions), have decreased from 964 to 744 ton in the period from 2008 to 2012. This is a significant decrease of 22.8%, which, of course, is a positive development. However, this is including an annually regulated energy mix, which accounts for the majority of the decrease. In fact, taking the contributing energy mix into account, calculations show that CBS' actions account for 16.8% of the total decrease in actual CO₂e emissions.

However, as mentioned before, the weather is an uncontrollable factor, which has not been accounted for in figure 3.4. In figure 3.5 on the other hand, the underlying heat consumption data, have been normalized to exclude the weather factor from the equation. This means that the heat consumption here has been adjusted to how it would have been, had all the years had an equal average temperature (see figure 3.3 for degree-day regulated heat consumption and the method section for an elaborate explanation). Here the decrease in CO₂e emissions equals 29.4% but again this includes a positively contributing en-

ergy mix. Calculations here show that 40.1% of the decrease is due to actions by CBS and 59.9% is due to a cleaner energy mix.

Even with the weather factor excluded, CBS' actions still account for less than half of the decrease in CO₂e emissions.

In conclusion, a 22.8% decrease in actual CO₂e emissions and a 29.4% decrease in degree-day regulated CO₂e emissions is a positive development for CBS. However only 40.1% of the decrease, in degree-day regulated CO₂e emissions, is due to actions by CBS. This is also equal to an actual 12.1% decrease in degree-day regulated CO₂e emissions, which goes hand in hand with the 12.1% decrease in the degree-day regulated heat consumption, as mentioned earlier.

A 12.1% decrease caused by CBS is quite impressive considering what CBS has actually done to decrease the heat consumption. As mentioned earlier it has not been possible to find a direct reason for this decrease, however, increased focus from CBS on its heat consumption is a plausible explanation. Looking at the development per student it looks even more positive:

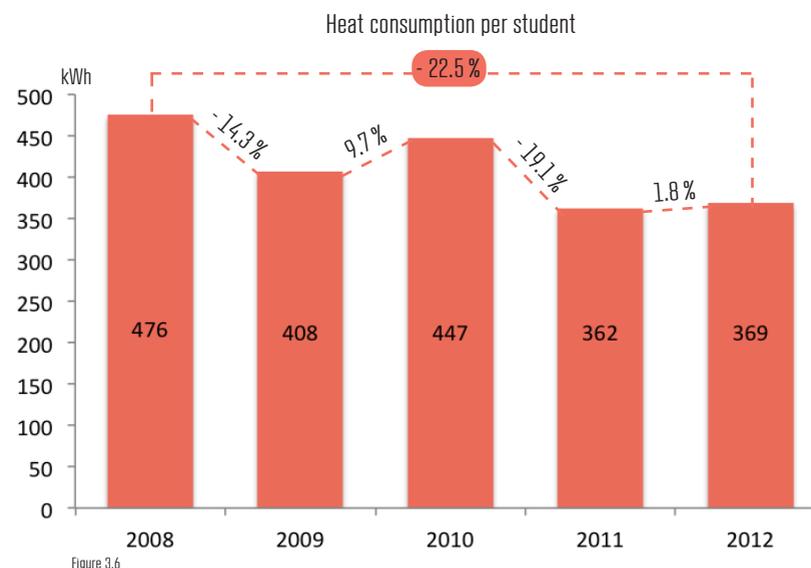


Figure 3.6

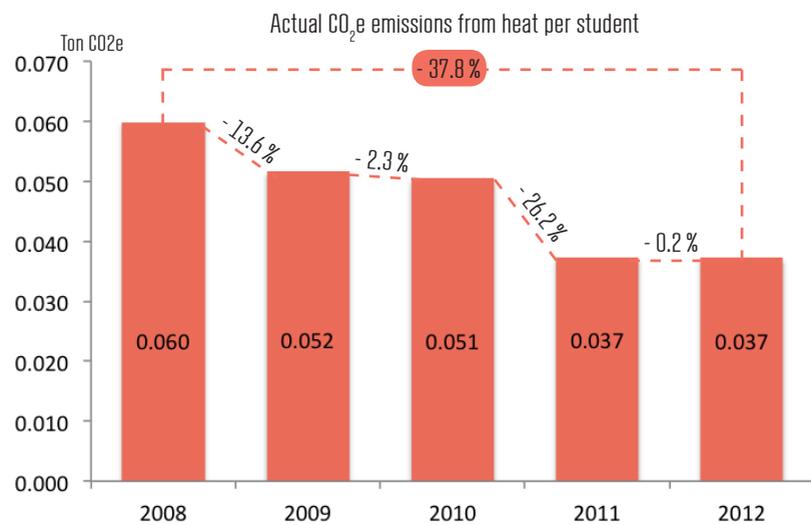


Figure 3.7



POSSIBLE INITIATIVES FOR CBS

An easy possible initiative for CBS is to lower the heat consumption, by lowering the average temperature on campus. This would save a lot of energy. Real life examples show that energy saving changes, such as turning of unnecessary lights, are often not noticed by the people using the buildings, unless they are told. CBS could do a one-month trial and then evaluate on eventual feedback.

Better overall isolation would, of course, also lower the heat consumption, and the intensity of the winters would have less of an impact, as CBS' buildings would be better equipped for dealing with the cold.

Better isolated windows is a focus area that is especially important when talking isolation, as it often is here a lot of heat is lost, compared to brick walls. CBS will, during 2013, initiate a project focused on improving the isolation of windows to save energy and, thereby, also money.

BUSINESS TRAVEL



The price of greatness
is responsibility

- Winston Churchill



Business travel

As portrayed in the business travel sum up section, CBS' business travel since 2008 is as follows:



Figure 3.8

What is included

Business travel includes all flight activities by employees at CBS, with regards to work related activities.

The figures concerning CBS' use of flight activities in 2010, 2011 and 2012 are compiled by Via Egenzia. Unfortunately, the figures from 2008 and 2009 were not available. These figures are consequently

assumed by averaging the two figures from 2010 and 2011.

THE DEVELOPMENT

CBS' flight activities have gone up significantly as seen on figure 3.8. As participating in conferences and symposiums around the world is important for a top university, CBS has, from 2008 to 2012, increased its flight activities significantly.

To understand the distance traveled by plane better, we have converted the km traveled to round trips from Copenhagen to London and Vancouver in Canada, where CBS has a close collaboration with UBC. The 13,960,998 km traveled in 2012 is equal to 7,123 round trips from Copenhagen to London or 911 round trips to Vancouver. The increase in km traveled from 2011 to 2012 is equal to 2,282 round trips from Copenhagen to London or 292 round trips to Vancouver in Canada.

CO₂e emissions from business travel (flight)



Figure 3.9

Looking at km flown and CO₂e emissions per staff at CBS, it looks as follows:

Business travel (flight) per staff



Figure 4.0



Figure 4.1

However, CBS also has other forms of business travel, such as by train, bus, metro, and privately owned vehicles, which are not accounted for. This is due to administrative costs, constraints and the complexity of the conversion. Furthermore, in the future, the use of taxis, busses, trains and the metro will all be registered as one activity on the same account, which makes it impossible to differentiate.

CBS owned an old Fiat, which drove less than 10 km on a liter of diesel. On average, the car had been driving approximately 8000 km per year since 2008. This results in CO₂e emissions of 2.36 ton per year, which has been accounted for.

In 2012 CBS replaced the diesel car with an electric

car, and its consumption is therefore included in the electricity consumption.



POSSIBLE INITIATIVES FOR CBS

As participating in conferences, symposiums and collaborations around the world are crucial for a top university, CBS will always have travel activities. The face-to-face meeting is an important part of getting to know someone and build personal relationships. There is no perfect substitute for psychical meetings as they perform a function that sometimes cannot be replicated by telephone calls or even the latest video conferencing technology.

However some travel is unnecessary and very expensive in terms of time, money and CO₂e. Improvements in low cost telecommunication tools make it possible to reduce travel with a fair amount.

Some of the most common ways of using telecommunications to reduce travel are mentioned in the following.

Teleconferencing with more than two participants

Telephone calls between multiple people are now cheap and simple to organize.

Users call a number and can hear and speak to all the other people participating in the conference call. It saves time, money and CO₂e if participants otherwise had to travel.

Teleconference with webcams

All modern laptops can provide basic video-conferencing tools. All that is needed is a good internet connection and some simple software. Skype is just one of many providers, who provides free person-to-person video-conferencing.

The video quality on some services is poor and has a time lag, which can be annoying and disrupting. However, the quality has improved a lot in recent years, making it a serious substitute to physical meetings. It saves time, money and CO₂e if participants otherwise had to travel.

Shared computer screens alongside audio-conferencing

It can be very effective if there are documents or a presentation to discuss. It is especially effective for collaboration on academic papers. It saves time, money and CO₂e if participants otherwise had to travel.

Video conferencing rooms

Specially designed rooms can be used with more expensive equipment to ensure better quality of picture and sound. This can be really effective when several people attend a meeting and non verbal aspects are important. It saves time, money and CO₂e if participants otherwise had to travel.

The abovementioned is why the following initiatives could be very effective for CBS:

Investment in more and better equipment for teleconferencing.

Encouraging employees to use the current teleconferencing equipment. CBS' intranet, Share, can be a useful platform to communicate the possibilities of using teleconferencing.

Giving employees incentives to use teleconferencing instead of flying.

However teleconferencing can never substitute all meetings and, as mentioned earlier, the face to face interaction is important for building personal relationships and most conferences are still being held with participants being physical present and CBS cannot change this alone.

Because of this, CBS has to invest in carbon offsetting to be able to reach the goal of a 40% reduction in 2020, as business travel now accounts for over 50% of the overall CO₂e. There has been a lot of critique of offsetting the last few years. However, offsetting has become more accepted as the offsetting industry has become more professional and improved the quality of the carbon-reduction projects around the world. This is why the approach “Do your best and offset the rest” has grown in recent years. CBS can therefore begin to include carbon offsetting in all future flight activities. Without an initiative as offsetting it is very unlikely that CBS will be able to reach the 2020 goal.

WASTE

When you
refuse to reuse
it's our earth
you abuse



WASTE PRODUCTION

As portrayed in the waste production sum up section, CBS' production of waste since 2008 is as follows:

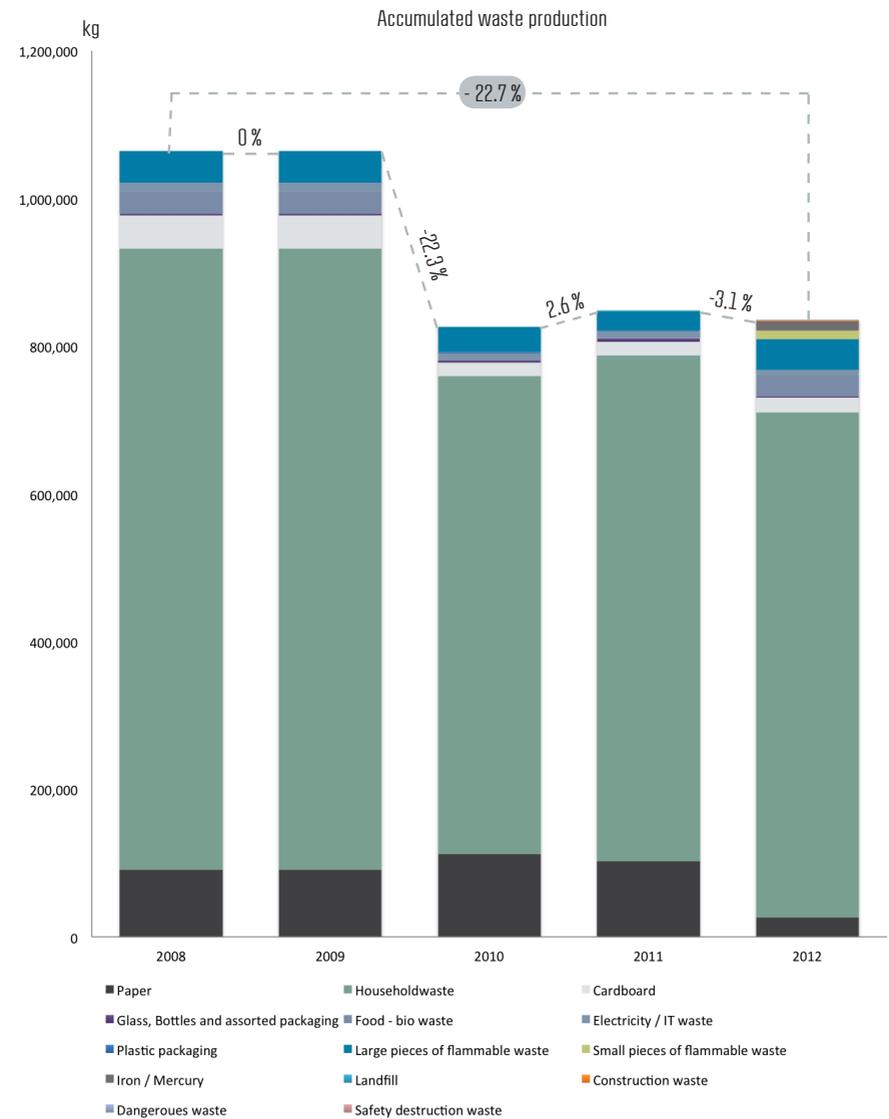


Figure 4.2

WHAT IS INCLUDED

Waste production from the following buildings is included in the waste production data:

- Solbjerg Plads 3
- Porcelænshaven 18
- Dalgas Have 15
- Kilen
- Howitzvej 11-13
- Howitzvej 60
- Steen Blichersvej 22
- Grundtvigsvej 37
- Amager Strandvej 108

Waste production from the following buildings is not included:

- The rest of the Porcelænshaven buildings
- Grundtvigsvej 25B
- Room used for teaching at Copenhagen Zoo
- Rooms used for teaching at Falkonér Cinema

It has not been possible to get records of the waste data from Grundtvigsvej 25 B and the rest of the Porcelænshaven buildings.

The Zoo and the cinema are the new leased buildings for lectures. These buildings are, however, only being leased some hours on weekdays and CBS does not have full control over them. It is not possible to get an exact number of their waste production.

THE DEVELOPMENT

Analyzing the development is fraught with difficulties, one being the fact that there is a constant change in the waste service provider. This complicates the gathering and analysis of the waste data, as different service providers have different ways of categorizing data. This makes it harder to get a consistent picture of how the development is.

Furthermore, the data from 2008 and 2009 are combined to one number, which means that it is not possible to get the exact numbers from these years. Consequently, these numbers are obtained by dividing the overall number from 2008/2009 in two. A degree of uncertainty is therefore to be expected.

There has recently been a change in the waste service provider, which results in the discontinuation of some of the 2008 to 2011 categories and the creation of new categories. Some assumptions have, there-

fore, been made to account for how these discontinued categories are now being accounted for. Correct information on how it has actually been done, has not been possible to obtain.

Last, but not least, the development in some of the categories does not seem plausible.

It is important to note that not all of the following categories are available on campus for the students at CBS to sort by. Only the categories: Household waste, paper, plastic, batteries and organic waste are available sorting categories for the students at a few locations on campus.

Waste per category

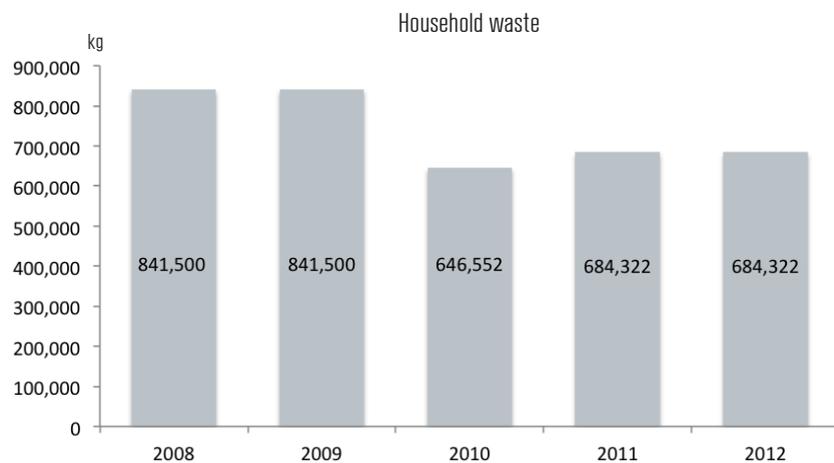


Figure 4.3

Household waste, or general waste, has kept constant during the last year, but decreased since 2008. Household waste is a special category, not only because it by far is the largest, but also because the data can seem misleading. It works the way that CBS has a number of containers only containing household waste. All these containers are emptied on a regular basis, regardless of contents. This means, that even if a container is only half full, it will still be emptied and counted as if it were full to the brim with waste. This gives a somewhat misleading picture of CBS' household waste production and unfortunately there are no figures that portray the precise household waste production.

This is also why the household waste data is often the exact same from year to year. The only way CBS can lower it, is to permanently remove some of the containers at CBS.

The reduction of containers can mean two things. One, it could be a sign of a minimized consumption of household waste, or two, it could be because of better sorting by CBS, both being positive developments. Some containers have been permanently removed since 2008, which explains the decrease in the household waste consumption.

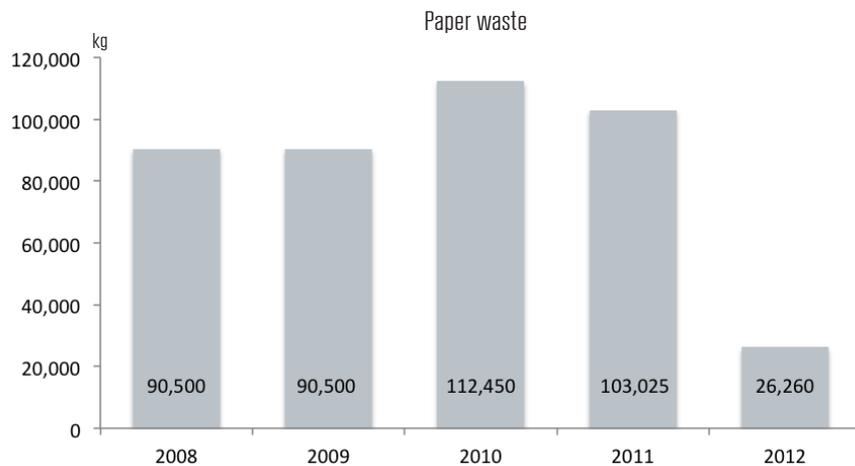


Figure 4.4

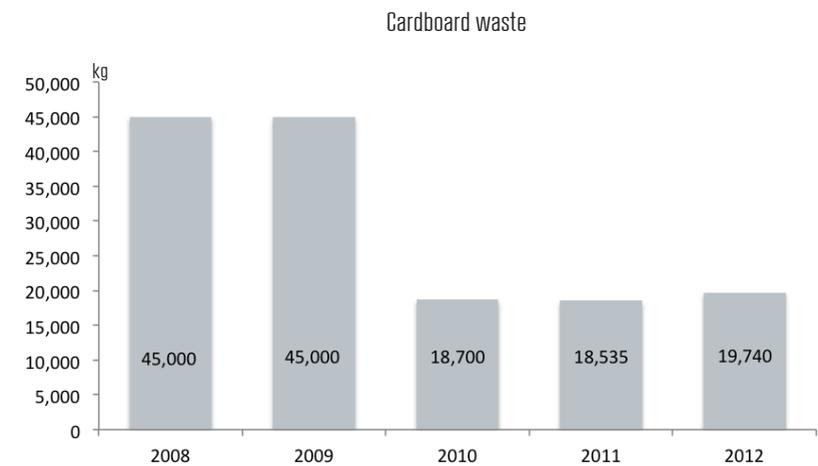


Figure 4.5

The paper category consists of two subcategories, assorted paper and shredded paper.

The sorted paper has remained at an even level from 2008 to 2011, until 2012 where it decreased significantly with 74.5%.

CBS has experienced a large decrease in the amount of incoming post, approximately 50%, which explains part of the decrease. However, this cannot possibly explain the entire decrease. The remaining decrease could be explained by less sorting of paper and more paper going to household waste.

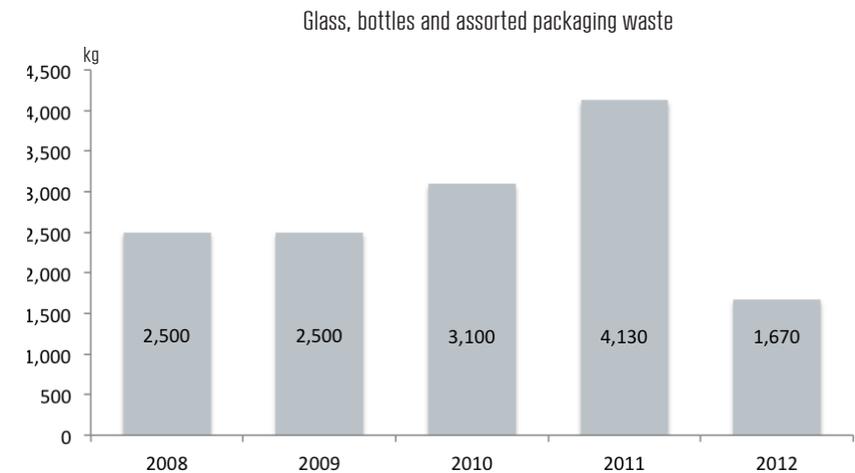
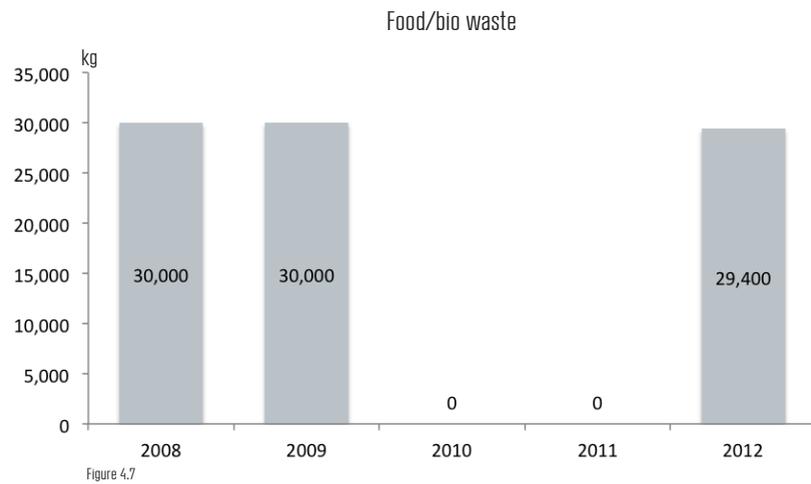
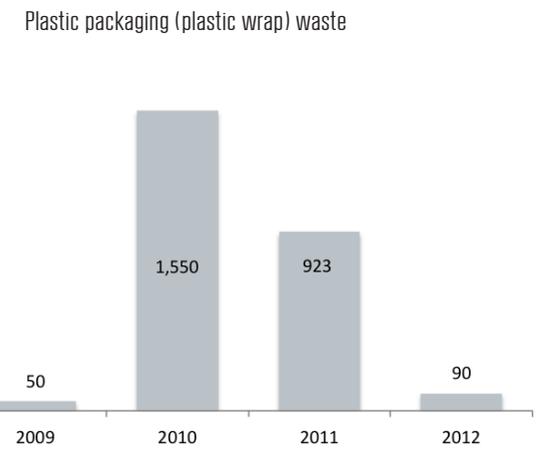
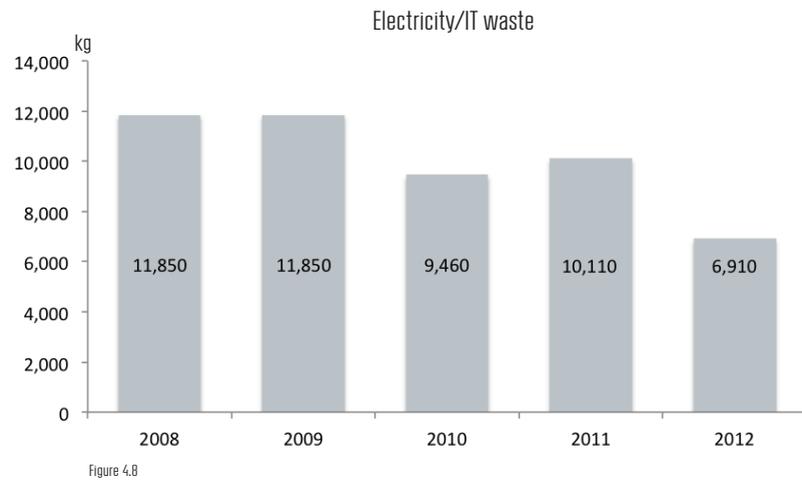


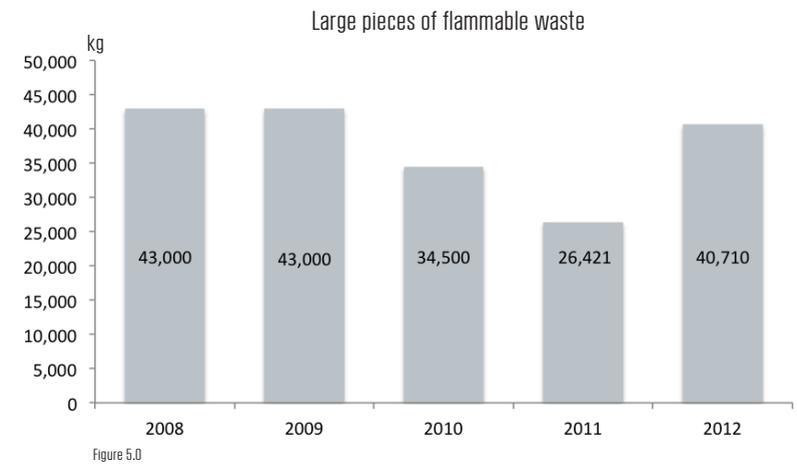
Figure 4.6



It has not been possible to get data on Food/Bio waste in 2010 and 2011.



The plastic packaging (plastic wrap) waste has decreased tremendously since 2010, and the validity of the data is questioned.



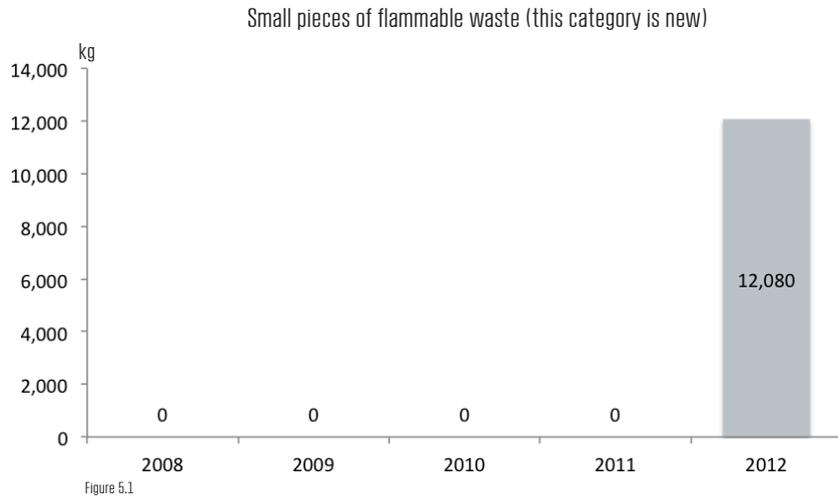


Figure 5.1

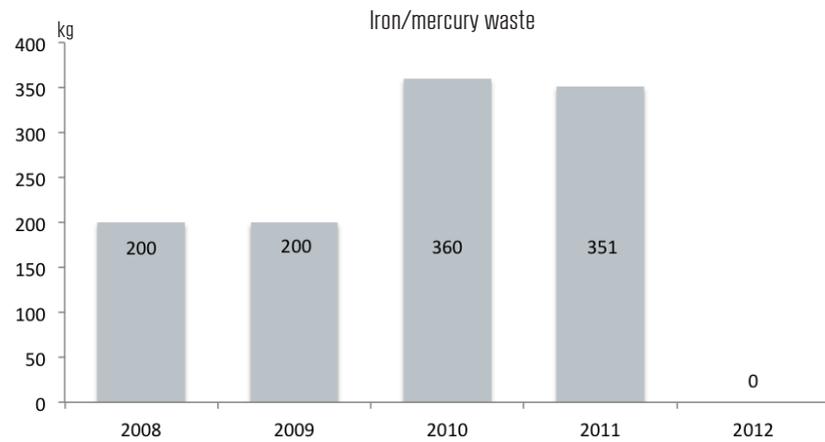


Figure 5.2

This category no longer exists. It has not been possible to get information on how this waste data is ac-

counted for now, but it is plausible that it is either in the construction waste or the safety destruction waste category.

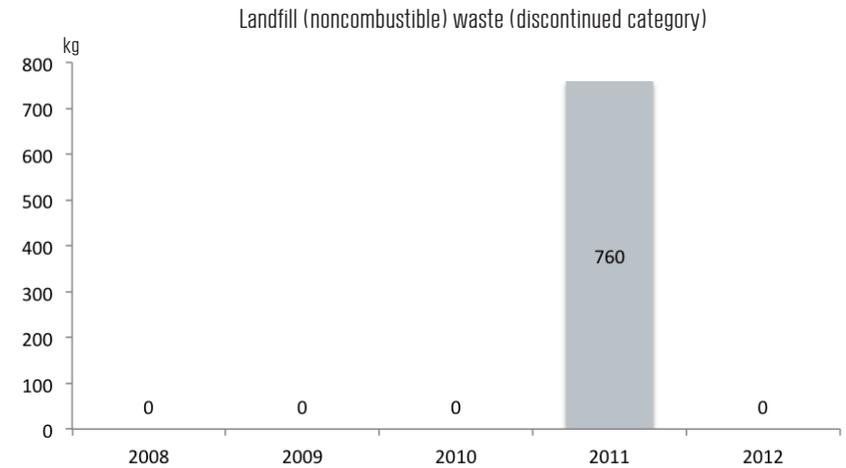


Figure 5.3

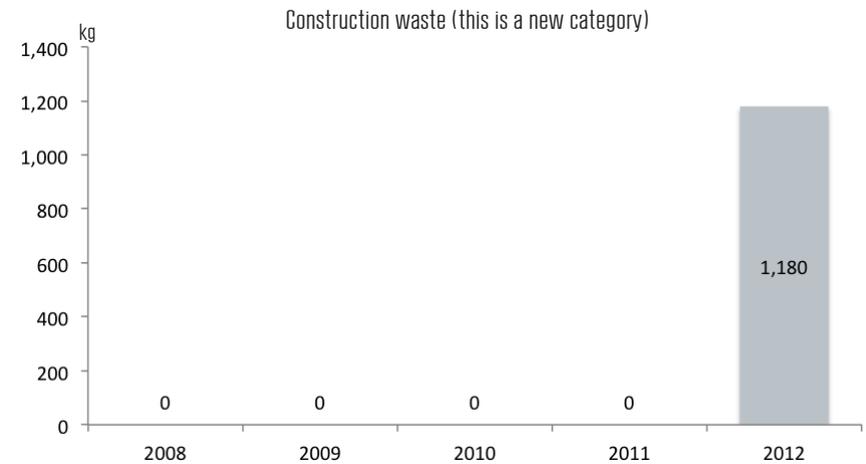


Figure 5.4



POSSIBLE INITIATIVES FOR CBS

It is crucial for CBS to have a waste sorting system, which is present at all CBS facilities to make waste sorting work.

The current system is simply not functioning well enough, due to it being present at too few locations and a lack of understanding of the waste categories. To make it work, CBS has to increase the number of places where waste sorting is possible.

It has internally from CBS been proposed to use 450.000 DKK to make a well functioning sorting system. There were unfortunately not money for this in the 2013 budget. This should be one of the highest priorities in the future, when focusing on environmental initiatives.

As soon as a good waste sorting system is in place, understanding the categories becomes the main focus area. For them to work it is important that both students and staff know how to use them correctly and understand the importance of sorting.

To get students and staff to sort their waste better three focus areas to work with have been identified: Identity and attitude, behavior and habits and last but not least information and knowledge. To work

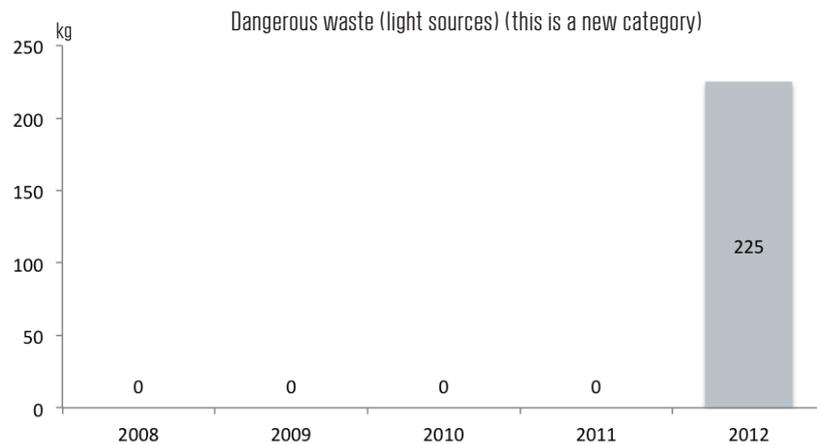


Figure 5.5

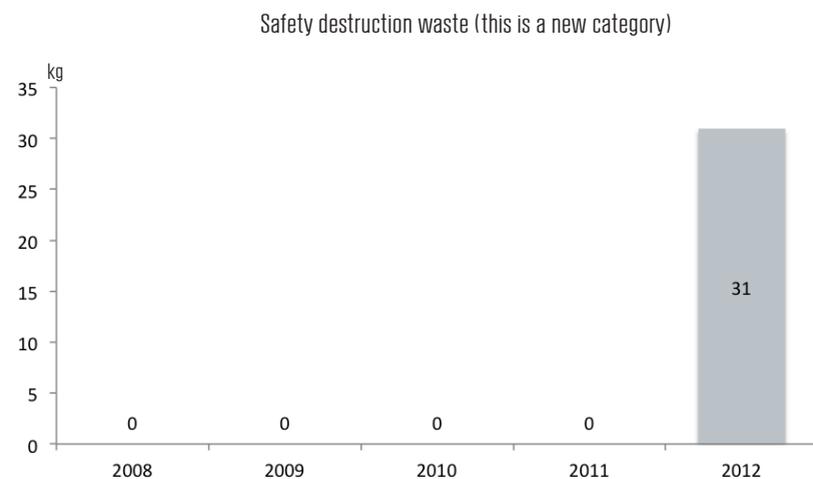


Figure 5.6

towards a more sustainable attitude concerning waste sorting, we suggest using ideas from narrative theory and appreciative inquiry. Through interviews, we found that a lot of students currently do not think that waste sorting matters. We, therefore, want to bring in narratives/stories about how sorting matters. This can be done by linking it up with how much paper currently is being recycled and what it means in number of trees saved, money saved and other things students and staff can relate to. It can, thereby, create an understanding of the impact that sorting has. Focusing on the fact that CBS is among the top business universities in the world, can also be used in stories about how CBS can be among the top sustainable leaders in the world. By highlighting the collaboration that CBS Goes Green currently has with Harvard in USA and UBC in Canada, concerning sustainability, the identity aspect can be reached.

But an attitude is not enough to get students and staff to sort their waste. Cognitive dissonance explains how there often is a mismatch between attitude and behavior. This is often seen with sustainable attitude and behavior. Research shows that when other people observe one's behavior it is more likely that behavior follows the attitude. So by making the bins more accessible and creating more visibility on how

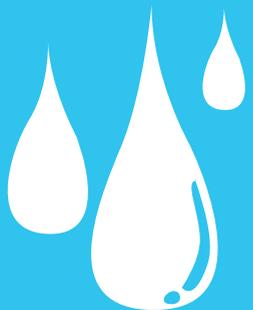
students and staff should sort their waste, a stronger link between attitude and behavior can be established. This is something there has been great success with in Higher Education Institutions in England, as we learned during the 2012 EAUC conference in York, England.

Finally it is essential that students and staff know how to sort their waste, which very few know. We have found out, that with limited resources it would be most effective to focus on students starting this September. It is easier to affect the new student compared to the older students. This is why we suggest a bigger focus on the intro period where a close collaboration with the student intro guides, can be used as role models. If all new students acquire the necessary knowledge when they start, the knowledge gap would be minimized significantly in the future. But there should also be a focus on the older students, which mainly could be reached through articles in the CBS Observer together with a better display of signs.

WATER

Difficulties mastered are opportunities won

- Winston Churchill



WATER CONSUMPTION

As portrayed in the water consumption sum up section, CBS' consumption of water since 2008 is as follows

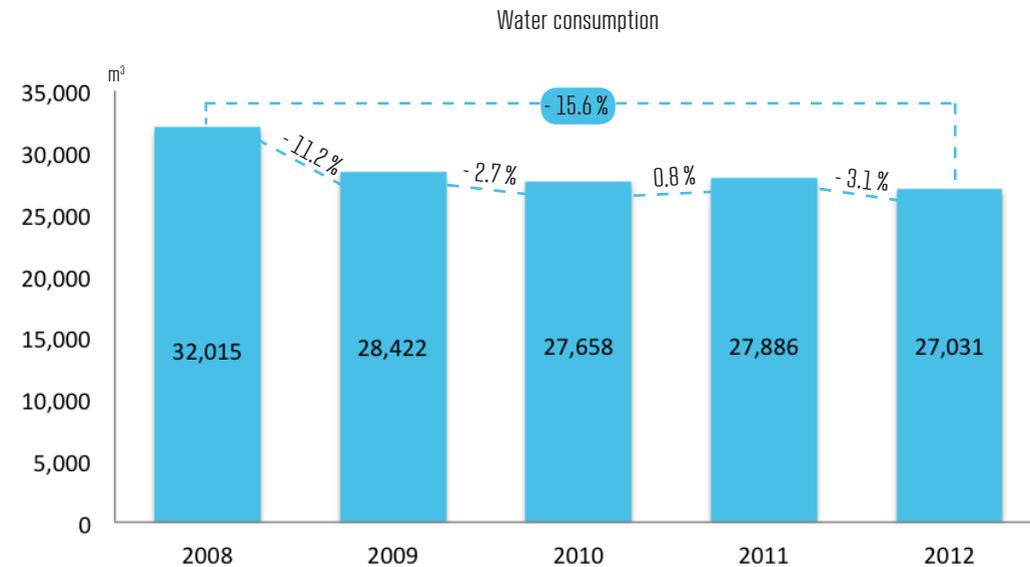


Figure 5.7

WHAT IS INCLUDED

Water consumption from the following buildings, which CBS has full control over, includes the main contributors. The number from each building is the consumption from 2012:

- Solbjerg Plads 3 (14,346 m³)
- Dalgas Have 15 (4,650 m³)

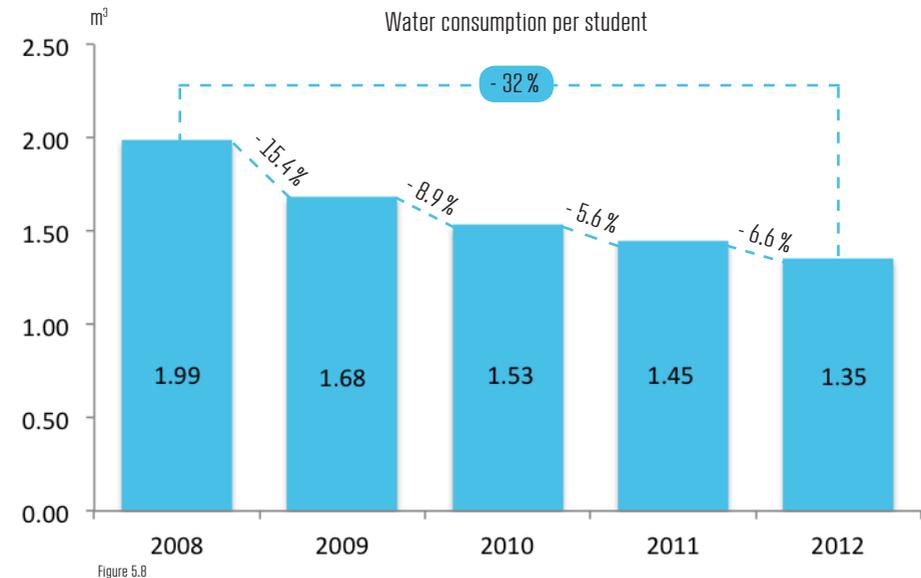
- Porcelænshaven 16-26 (4,229 m³)
- Kilen (2,245 m³)
- Porcelænshaven 22 (520 m³)
- Howitzvej 60 (485 m³)
- Howitzvej 11-13 (281 m³)
- Steen Blichersvej 22 (172 m³)
- Grundtvigsvej 25 B (48 m³)
- Grundtvigsvej 37 (36 m³)
- Porcelænshaven 7 (18 m³)

Water consumption from the following buildings is not included:

- Rooms used for teaching at Copenhagen Zoo
- Rooms used for teaching at Falkoner Cinema
- Amager Strandvej 108B (exam location)

The Zoo and the cinema are the new leased buildings for lectures. These buildings are, however, only being leased some hours on weekdays and CBS does not have full control over them. It is not possible to get a number of their consumption.

Amager Strandvej 108B, which is the new exam building, only has one water meter. The building is shared with other users, and the water consumption



is gathered by one single meter as one number. It is, therefore, not possible to get a number of the consumption.

THE DEVELOPMENT

Despite a 22% increase in students the water consumption has decreased with 15.6% from 2008-2012. This is mainly because of investments made by CBS, analyzing which toilets and sinks were leaking and then repairing them. Additionally, improved behavior of students and staff has had a positive impact. This is an area that CBS has had great success with. It is also an area that has a clear economic benefit as

one m³ water costs 35.68 DKK, which means a total saving of 177,829 DKK in 2012 in relation to 2008.



POSSIBLE INITIATIVES FOR CBS

Increased focus on the water consumption by the canteen and the cleaning activities.

Continue the effort of repairing and replacing leaking sinks and toilets.

A campaign to further improve the behavior of students and staff to minimize water consumption and to report any dysfunctional water facilities.

OVERALL

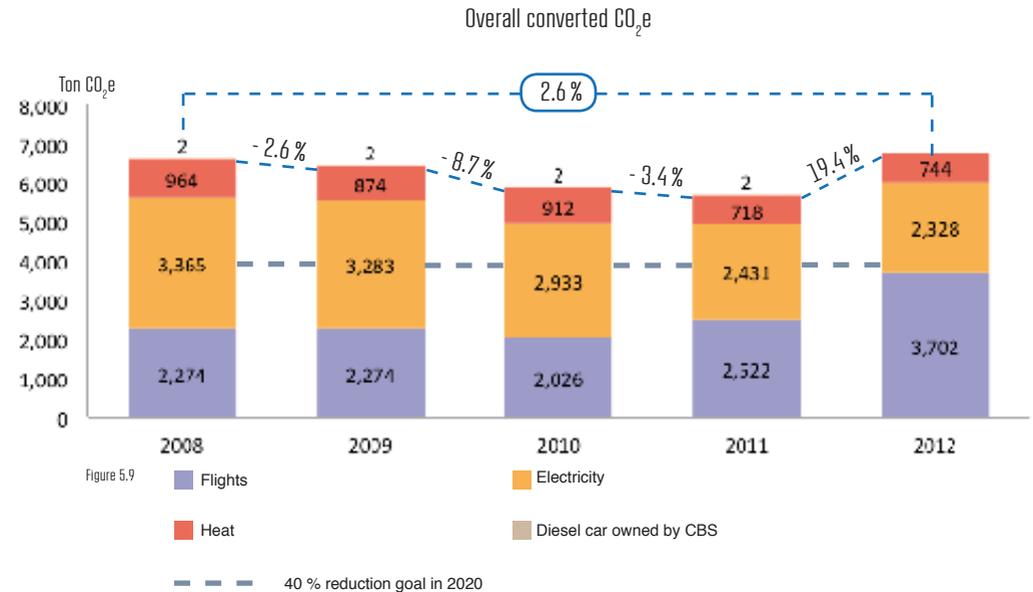
Divide each difficulty into as many parts as is feasible and necessary to resolve it.

-Rene Descartes



OVERALL CONVERTED CO₂e

As portrayed in the overall CO₂e sum up section, CBS' actual CO₂e emissions since 2008 look as follows:



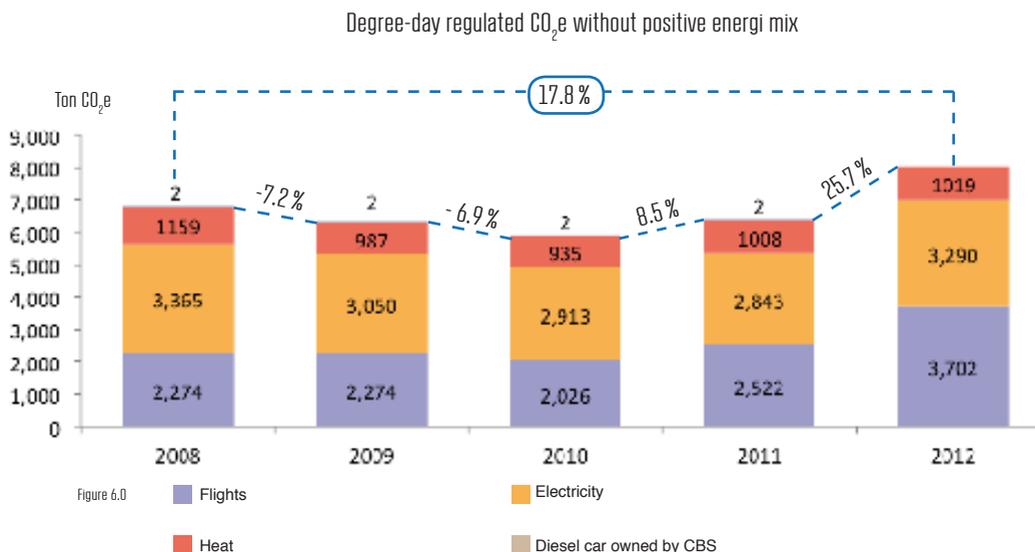
This shows that there has been a 2.6% increase in actual CO₂e emissions from 2008 to 2012.

These are the actual emissions from CBS, however, to get a picture of the effects of CBS' actions it is interesting to look at other factors.

One way to do this is to include degree-day regulation in the heat consumption and to keep both CO₂e

factors constant to that of the baseline year, 2008. This way the influence of the weather and the positive effects of a cleaner energy mix are excluded and only CBS' actions effect the CO₂e emissions.

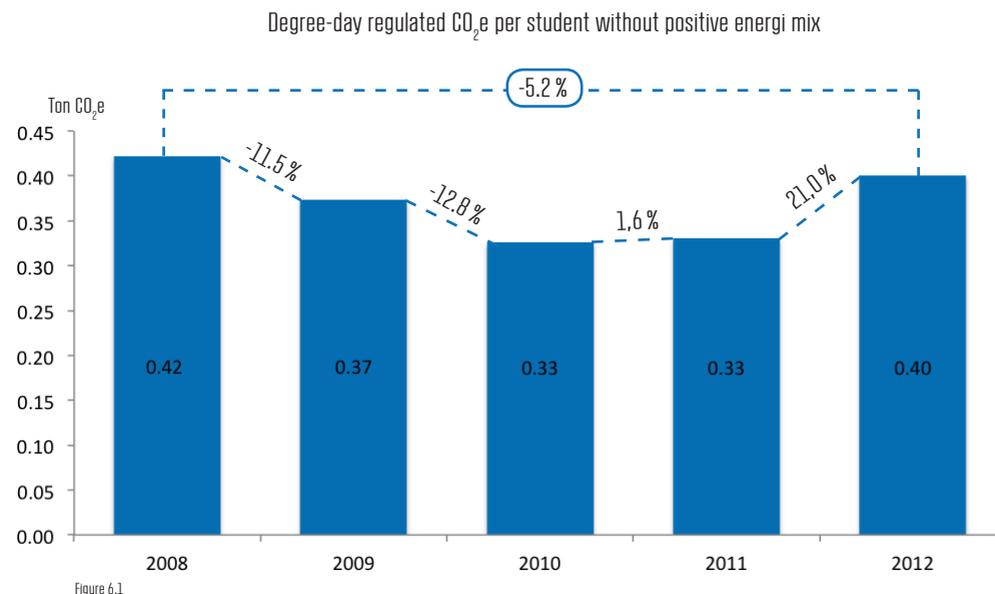
A graph created this way looks as follows:



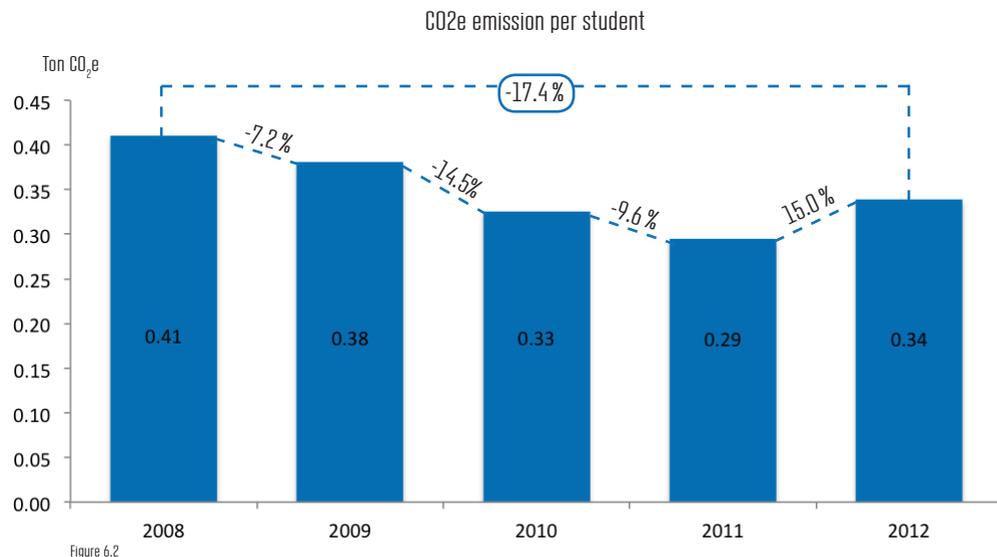
This shows that there has been a 17.8% increase in regulated CO₂e emissions from 2008 to 2012. It is important to note that these are not actual emissions but emissions regulated to make CBS' actions more clear.

A 17.8% increase seems high and paints a negative

picture of CBS' efforts. However, it is important to take the growth in number of students into account. The regulated CO₂e emissions per student look as follows:



This shows a decrease of 5.2% from 2008 to 2012. Looking at the actual CO₂e emissions per student the development is even more positive, with a 17.4% decrease from 2008 to 2012:



However, caution should also be taken when interpreting these graphs, as the current marginal CO₂e emissions per student is very low.

So with all these different graphs, which is the most important?

As mentioned earlier, it all comes down to what the question asked is. Figure 5.9 portrays the actual emissions by CBS. Figure 6.0 are not actual emissions, but are regulated to give a transparent picture of what the effects of CBS' actions have been. Figure 6.1 then takes these regulated emissions and divides them with the number of students in the respective years. Figure 6.2 takes the actual emissions and di-

vides them with the number of students in the respective years.

When we, in this report, refer to the 40% reduction goal in 2020, with a baseline year in 2008, it is always in regards to the total actual CO₂e emissions (figure 5.9). This seems as the most accurate way to do it, as these are the actual emissions caused by CBS.

It is, however, still important to look at the other calculations and graphs, as these show a transparent picture of the situation, just with different perspectives.

Non-CO₂e converted categories

The non-CO₂e categories are also very important for CBS' environmental footprint even though we have not been able to convert them to CO₂e.

CBS have improved a lot with regards to water consumption, which shows that a strong effort and focus on an area really can make a difference, financially and environmentally. If this category had been converted to CO₂e it would have contributed positively to reaching the 2020 goal. This will hopefully be accomplished in the future.

Waste is another very important category that significantly affects CBS' environmental footprint. This is, however, a category that is extremely difficult to convert to CO₂e. Hopefully this is something that can be accomplished in the future to give more clarity on which areas to focus on.

Furthermore, it would be optimal that all the rest of the scope 3 activities that have not been accounted for in this report, upstream and downstream, will be included in the future.

It is, however, important to consider the marginal benefit from measuring the different activities, compared to the cost of calculating them, as some of the resources might be better used on actual environmental projects. However, some measurements are necessary to get an adequate understanding of the situation.

FUTURE PERSPECTIVE

To change something it is important to know what one is dealing with. This report should provide CBS with the foundation to continue its efforts on reducing their footprint and reaching the 2020 goal of a 40% reduction in overall CO₂e emissions. It is now possible to see what some of the main categories contribute with, and from that information prioritize which projects should receive the highest focus. This is, however, just the beginning and as it is also stated in the report there are some uncertainties and some areas that could have been investigated further. Hopefully this will be accomplished in the future to bring further clarity to how CBS can move forward and be a sustainable leader that walks the talk. CBS will get a perfect possibility to prove just this, when they build the proposed new big building. The future of this project looks promising, as there currently is a dialogue about prioritizing sustainability. It is our belief that CBS can reach the 2020 goal with the right focus and efforts.

