Machine learning for climate:

Too few large companies report on climate in accordance with international standards

* An analysis from KPMG and FSR – Danish Auditors, September 2020

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Machine learning for climate: Too few large companies report on climate in accordance with international standards

Only few of the largest Danish companies report their CO_2 emissions. Among those who report, even fewer explicitly state that they use the Greenhouse Gas Protocol, which is the internationally recognized reporting standard for calculating companies' greenhouse gas emissions. This makes it difficult for investors to compare companies' climate behavior and weakens the foundation on which policy makers develop climate measures.

Since 2009, it has been a legal requirement that large Danish companies must report their climate impact or explain why they do not. However, the legislation does not specifically require the reporting to include quantitative figures for CO_2, nor does it state which methods the companies should use.

Nearly 90 percent (88 percent) of the companies subject to the law have opted out of either reporting carbon emissions entirely or using the all-dominating international standard in the field, the Greenhouse Gas Protocol. These are the main findings in an analysis conducted by KPMG and FSR – Danish Auditors using artificial intelligence and machine learning.

Only 12 percent of companies report their own climate impact in accordance with the Greenhouse Gas Protocol's division of CO_2 emissions into Scope 1 and Scope 2. The two scopes cover the companies' carbon emissions from their own operations and production, and from consumption of electricity and heat purchased from external utilities companies.

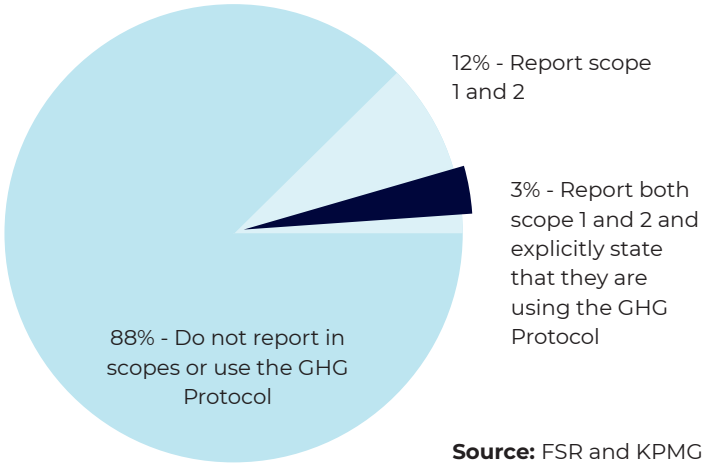
Of these 12 percent, a quarter (corresponding to 3 percent of the total number of companies) explicitly state that they use the principles of the Greenhouse Gas Protocol to calculate their greenhouse gas emissions.

Fact box: The GHG Protocol

The GHG Protocol was developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) and is the most widely used standard for companies reporting their greenhouse gas emissions. To avoid double-counting of emissions by both vendor and purchaser, the GHG Protocol's Corporate Standard divides companies' greenhouse gas emissions into three scopes, where:

- Scope 1 is direct emissions from sources that the company owns or controls
- Scope 2 is indirect emissions from the production of externally purchased energy
- Scope 3 is all indirect emissions (in addition to scope 2) in the company's value chain, including both upstream and downstream

Source: The GHG Protocol



Source: FSR and KPMG

Figure 1: Companies that report in scopes and explicitly state that they use the GHG Protocol. It is possible that the companies that only report in scope 1 and 2 emissions also use the principles of the GHG Protocol, but without explicitly referencing them.

Climate action *requires* **data**

This means that companies' climate data currently do not serve as clear benchmarks for politicians, regulators, authorities, investors, and the companies themselves, when important decisions have to be made.

In order to transition to a low-emission economy and effectively address the climate challenge, Denmark needs a better and more uniform basis for making the right climate decisions.

2020 has been characterized as the year of climate action. The EU has committed to climate neutrality by 2050. Here in Denmark, a broad majority in Parliament has agreed on a national climate law with an ambitious reduction target of 70 percent by 2030 compared to 1990 levels. The government is currently working with the rest of Parliament and various industries on a host of climate plans for Denmark.

One of the ways to a better climate is to invest in climate solutions and redirect capital flows towards low-emission, resilient and resource-efficient activities. Here in Denmark, we have yet to see the crucial elements of these new initiatives to support more climate-friendly behavior. However, it is a given that regardless of the proposals, the climate reporting from the Danish companies to the outside world can serve as a building block. The first step towards changed behavior is to have a clear overview of one's own climate footprint.

"It is absolutely crucial that companies, investors and politicians have reliable CO_2 data as a basis for the important decisions to be made in the coming years. We can only do this if the Danish companies improve their reporting as soon as possible."

Henrik Mulvad
CEO and Senior Partner, KPMG Denmark

Most *report on climate* **in separate statements on social responsibility**

Companies required to report on social responsibility, cf. section 99 a of the Danish Financial Statements Act, have the option of placing their reporting elsewhere than in the annual accounts themselves, for example:

— in an external CSR report
— by referring to the parent's reporting on the subject

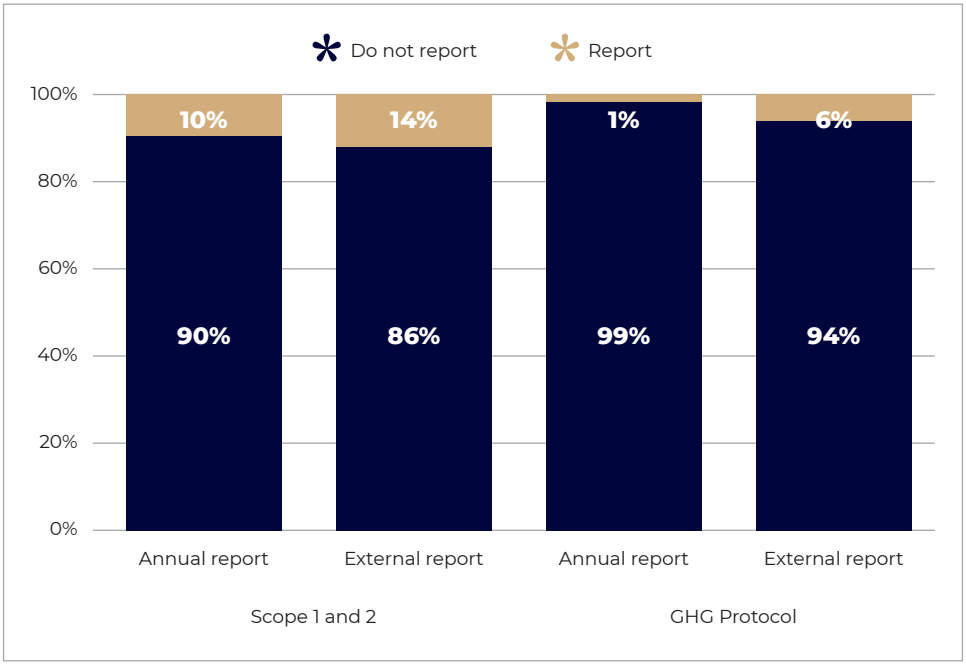
The analysis shows that in 2019, 43 percent of companies chose to place their corporate social responsibility account outside the financial statements, and found a slightly greater tendency among these companies to report CO_2 emissions in scopes and in accordance with the Greenhouse Gas Protocol than among the companies that report on social responsibility directly in the annual accounts.

This may be due, among other things, to the fact that the companies that devote resources to preparing stand-alone CSR reports have a greater focus on social responsibility, and that the international parent companies to which Danish subsidiaries have the opportunity to refer have greater knowledge of good practices in the field.

The review shows that 10 percent of the companies that report directly in the annual accounts report scope 1 and 2 emissions, while the proportion is 14 percent among the companies that refer to an external report.

The difference is even greater when it comes to companies' propensity to disclose whether they follow the principles of the Greenhouse Gas Protocol. Here, only 1 percent of the companies that report CO_2 emissions directly in the annual accounts state that they follow the principles, while it is 6 percent for the companies that refer to an external statement.

Figure 3: Placement of companies' reporting on social responsibility



Source: FSR and KPMG

Technology and transportation companies are among *leading reporters*

More than half of the over 2,000 companies belong to the Financial Services and Holding Companies, Retail and Sales and Manufacturing industries, and therefore these industries also have the numerically largest share of companies that report scope 1 and 2 emissions and refer to the principles of the Greenhouse Gas Protocol.

If we instead look at the propensity to report within each industry, the companies in Information Technology and Communication (21 percent) and the Transport sector (18 percent) are most likely to report scope 1 and 2 emissions, while companies in Electricity generation, gas and heat (11 percent) and Hospitality (14 percent) refer to the GHG Protocol to a greater extent. Companies in Rental and leasing (7 percent) and Health and Associations (7 percent) are among the least likely to report their carbon emissions in scope 1 and 2.

Table 1: Distribution of the different sectors' climate reporting

Industry	Share of all companies	Scope 1 and 2		The GHG Protocol	
		Report	Do not report	Report	Do not report
Financial services and holding companies	26%	10%	90%	1%	99%
Retail and sales	19%	13%	87%	4%	96%
Manufacturing	16%	13%	87%	3%	97%
Headquarters and consulting services	9%	11%	89%	3%	97%
Transportation and storage	5%	18%	82%	4%	96%
Rental and leasing	4%	7%	93%	1%	99%
Information and communication	4%	21%	79%	7%	93%
Real estate	3%	9%	91%	1%	99%
Construction	3%	12%	88%	1%	99%
Electricity, gas and heating	3%	15%	85%	11%	89%
Health and associations	1%	7%	93%	0%	100%
Extraction	1%	13%	87%	7%	93%
Hospitality	1%	14%	86%	14%	86%
Water, sewage and recycling	1%	8%	92%	8%	92%
Agriculture and forestry	1%	9%	91%	9%	91%

Source: FSR and KPMG

Conclusion:
Robust climate data is crucial to combat climate change

If Denmark and the Danish companies are to make a serious contribution to combating the global climate crisis, it can only be done on the basis of a robust and comparable overview of current carbon emissions. This climate information is essential for investors, policy makers, employees and consumers to make decisions to reduce their footprint and help combat climate change.

It is important that such an overview is comparable and verified. Here, auditors can play a crucial role in helping companies use the right methods and verifying their data.

As the trusted representatives of the general public auditors can increase the credibility of climate reporting to allow both corporate stakeholders and the companies themselves to make decisions based on reliable data.

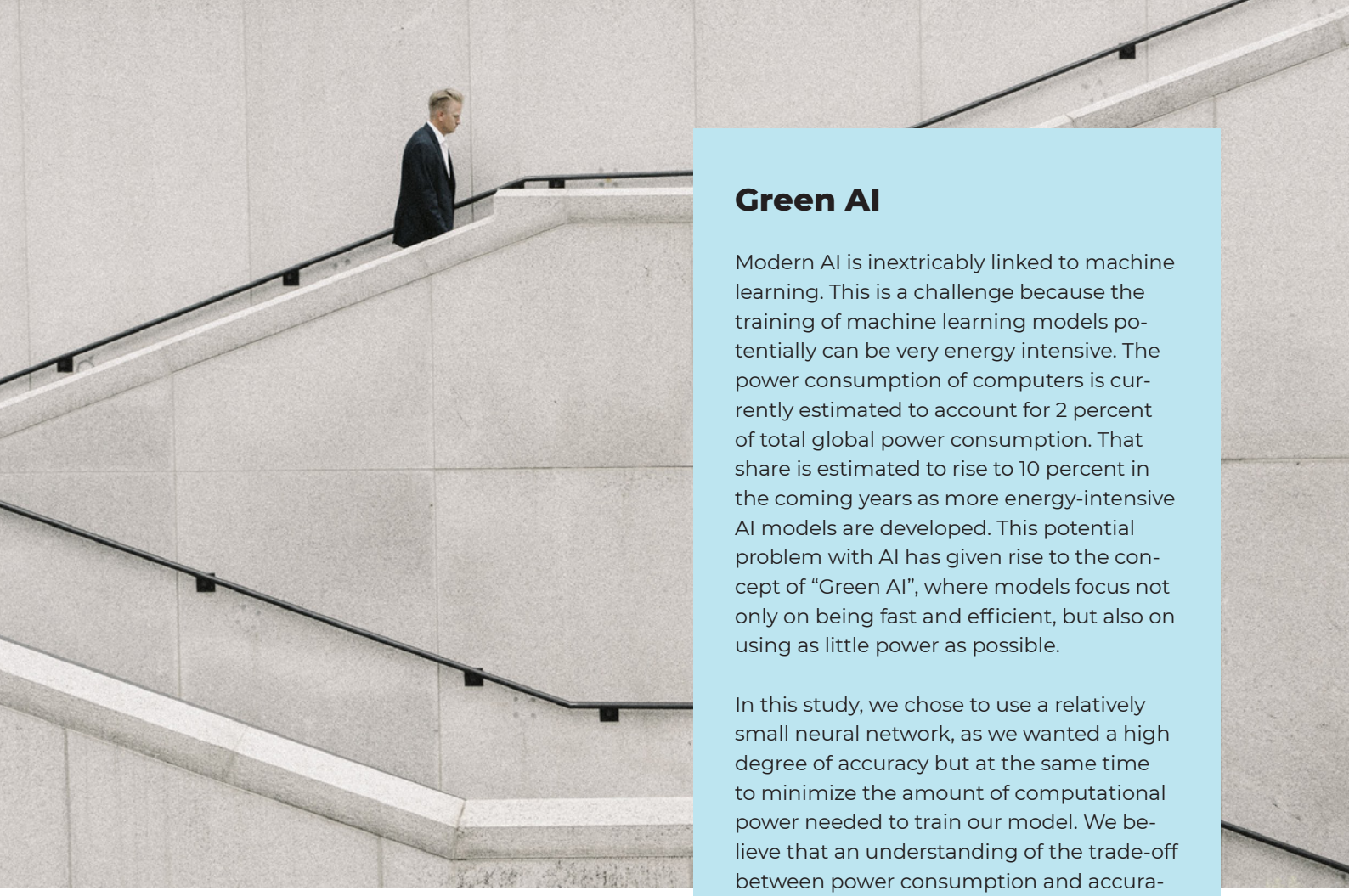
"As a profession, the auditing industry has an ideal and robust framework to support the green transition at the company-level through validation of climate reporting. The industry has a strong regulatory framework, professional guidelines, international standards and effective quality assurance systems to ensure that independence remains intact and the level of competence is top-notch to be able to support the quality and utility value of climate reporting."

Charlotte Jepsen,
CEO, FSR – Danish Auditors

About the statutory requirement § 99 a

Pursuant to section 99 a of the Danish Financial Statements Act, the large Danish companies must publish a statement on corporate social responsibility as part of the management's report in the annual report. Among other things, information must be provided on their environmental policies, including the efforts to reduce the climate impact of the company's activities. If the company does not have corporate social responsibility policies, it must be stated in the management's report, including the reason, also known as the "comply or explain" principle. Thus, the current legislation does not specifically state how companies must report their climate footprint.

The statutory requirement for corporate social responsibility disclosures pertains to companies in accounting class D and large C. D-companies are state-owned or listed companies, while large C-companies are characterized by exceeding at least two of the following three size limits in two consecutive financial years: A net turnover of DKK 313 million, a balance sheet total of DKK 156 million, and an average of 250 full-time employees.



Green AI

Modern AI is inextricably linked to machine learning. This is a challenge because the training of machine learning models potentially can be very energy intensive. The power consumption of computers is currently estimated to account for 2 percent of total global power consumption. That share is estimated to rise to 10 percent in the coming years as more energy-intensive AI models are developed. This potential problem with AI has given rise to the concept of "Green AI", where models focus not only on being fast and efficient, but also on using as little power as possible.

In this study, we chose to use a relatively small neural network, as we wanted a high degree of accuracy but at the same time to minimize the amount of computational power needed to train our model. We believe that an understanding of the trade-off between power consumption and accuracy should be a natural part of all future AI projects.

Facts about *the analysis*

Using artificial intelligence and machine learning, KPMG and FSR – Danish auditors have reviewed over 2,000 Danish companies' annual accounts to identify their disclosures on their efforts to reduce their climate impact.

Method
The study used OCR (Optical Character Recognition) and a neural network, which is a machine learning algorithm, to „read" over 2,000 financial statements to identify the quality of companies' CO_2 reporting. Based on information about corporate reporting in 2018, the algorithm learned to find words and phrases that indicate how companies report on their CO_2 emissions, whether they use the principles of the Greenhouse Gas Protocol, and whether they report in scopes. The analysis took into account that some companies report their CO_2 emissions in terms other than scopes, such as direct and indirect emissions. Neural networks need notated datasets, in this case the reports for 2018, which were classified using other methods. The algorithm used that input to search for differences in the notated data to find patterns for further classification of the unnotated reports for 2019. The accuracy of the classification method was measured to be 80 percent. Subsequently, manual notating was used to increase the accuracy to up to between 93 percent and 96 percent.

Machine learning and artificial intelligence
Machine learning is a sub-category of artificial intelligence (AI) based on computer algorithms that use data to update how they perform their primary function. In this report, we used data to improve classification. This allows computers to learn from their experiences, just as humans do. Modern society has created an abundance of data that requires new methods of processing. Here, machine learning is the obvious choice. Machine learning is used in many different industries and more broadly in society. Areas of application range from recommendations in online marketing to cancer screening and prediction of heart attacks.

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