

Carbon Accounting Report 2021

AutoStore AS

This report provides an overview of AutoStore's greenhouse gas (GHG) emissions, which is an integrated part of the organisation's climate strategy. Carbon accounting is a fundamental tool in identifying tangible measures to reduce GHG emissions. The annual carbon accounting report enables the organisation to benchmark performance indicators and evaluate progress over time.

This report comprises the following organisational units: Norway (Nedre Vats, Oslo, Husøy, Raglamyr and Stavanger), Poland factory, US (HQ, Denver and Warehouse), the United Kingdom, Germany, France, South Korea, Austria, Japan, Singapore, Canada, Italy, Sweden, Lithuania, Thailand, Australia, Ireland, Malaysia and Spain.

The input data is based on consumption data from internal and external sources, which are converted into tonnes CO₂-equivalents (tCO₂e). The carbon footprint analysis is based on the international standard; *A Corporate Accounting and Reporting Standard*, developed by the Greenhouse Gas Protocol Initiative (GHG Protocol). The GHG Protocol is the most widely used and recognised international standard for measuring greenhouse gas emissions and is the basis for the ISO standard 14064-1.



Reporting Year Energy and GHG Emissions

Emission source	Description	Consumption	Unit	Energy (MWh)	Emissions tCO ₂ e	% share
Transportation total				79.2	17.8	-
Diesel (NO)		2,434.0	liters	25.3	5.1	-
Petrol (E5)		3,400.0	liters	32.4	7.6	-
Diesel (B7)		2,026.0	liters	21.5	5.1	-
Scope 1 total				79.2	17.8	-
Electricity total				1,466.8	593.6	0.6 %
Electricity Nordic mix		575,747.1	kWh	575.7	17.8	-
Electricity USA		68,677.6	kWh	68.7	26.4	-
Electricity Poland		822,382.0	kWh	822.4	549.4	0.6 %
District heating location total				441.7	125.2	0.1 %
District heating Poland mix		441,694.0	kWh	441.7	125.2	0.1 %
Scope 2 total				1,908.5	718.8	0.7 %
Purchased goods and services total				-	98,461.9	98.9 %
Aluminium, recycled		8,173,230.0	kg	-	3,727.8	3.7 %
Steel, stainless		318,435.0	kg	-	1,337.4	1.3 %
Brass		13,768.0	kg	-	76.4	0.1 %
Plastic avg. (virgin)	Rubber	2,897.0	kg	-	9.0	-
Plastic avg. (virgin)		28,685,400.0	kg	-	89,392.3	89.7 %
Copper, recycled		4,200.0	kg	-	0.1	-
PCB		23,895.0	kg	-	936.7	0.9 %
Other material inputs		77,571.5	kgCO ₂ e	-	77.6	0.1 %
Cable, unspecified		16,565.0	kg	-	95.0	0.1 %
Batteries Li-ion		362,190.0	kg	-	2,284.7	2.3 %
Wood material, virgin		1,678,600.0	kg	-	524.7	0.5 %
Waste total				-	9.7	-
Paper waste, recycled		21,610.0	kg	-	0.5	-
Plastic waste, incinerated		3,720.0	kg	-	8.8	-
Glass waste, recycled		1,320.0	kg	-	-	-
Industrial waste, recycled	Wood	15,390.0	kg	-	0.3	-
Industrial waste, recycled	Insulation materials	160.0	kg	-	-	-
Plastic waste, recycled		1,780.0	kg	-	-	-
Metal waste, recycled	Aluminium	2,243.0	kg	-	-	-
Business travel total				-	396.8	0.4 %
Air travel, domestic, incl. RF		1,307,250.0	pkm	-	321.5	0.3 %
Air travel, continental, incl. RF		145,220.0	pkm	-	22.3	-
Air travel, intercontinental, incl. RF		228,843.0	pkm	-	44.2	-
Car, petrol (avg.)		96.0	liters	-	0.2	-
Car, diesel (avg.)		95.0	liters	-	0.3	-
Hotel nights, world		187.0	nights	-	8.4	-
Scope 3 total				-	98,868.4	99.3 %
Total				1,987.7	99,604.9	-
KJ				7,155,778,464.0		

Reporting Year Market-Based GHG Emissions

Category	Unit	2021
Electricity Total (Scope 2) with Market-based calculations	tCO ₂ e	822.8
Scope 2 Total with Market-based electricity calculations	tCO ₂ e	948.0
Scope 1+2+3 Total with Market-based electricity calculations	tCO ₂ e	99,834.1

Climate accounting AutoStore AS 2022

AutoStore has for the first time conducted a full scope 3 screening and reporting in accordance with the Green House Gas (GHG) Protocol. The accounting for 2022 will be the base year going forward in the company's climate accounting.

In 2022 AutoStore emitted directly and indirectly a total of 189 284.7 tonnes of carbon dioxide equivalent (tCO₂e) in scope 1, 2 and 3:

Scope 1: 6 757.8 tCO₂e (3.6%)

Scope 2: 1 361.2 tCO₂e (0.7%)

Scope 3: 181 165.7 tCO₂e (95.7%)

Purchased goods and services: 170 992 tCO₂e

Changes from 2021

This year with a full scope 3 screening and reporting process, all of AutoStore's units are included in the relevant scopes and categories. Some data was reported in 2021*, however, the reporting did not include all units or follow the GHG Protocols scope 3 criteria. Therefore, the data from 2021 cannot be directly compared with 2022 data.

Estimations

CEMA_{sys} has estimated emissions for some categories and units due to a lack of available information and/or the relative size of the categories. For some categories, CEMA_{sys} has estimated emissions for specific units. For instance, electricity use (per employee) was estimated for offices with less than 15 employees. Together, we have set a threshold for categories and units to be estimated, which will be consistent in the years to follow.

Scope 1

In 2022 AutoStore had company cars in Norway, Poland, the United Kingdom, Germany, Austria and South Korea. The relevant fuel type is reported in liters for all vehicles, and the total emissions are 89.4 tCO₂e. The warehouse in the United States reported propane use, which amounted to 6 668.4 tCO₂e.

Scope 2

Electricity: Electricity is accountable for 0.4% of total emissions in 2022, with 841.2 tCO₂e. In total, 0.5 tCO₂e is from the company's owned and leased vehicles. Electricity use per employee was estimated for offices with less than 15 employees.

District heating: AutoStore indirectly emitted 421.9 tCO₂e from district heating in 2022. The district heating is accountable for 0.2% of the total GHG emissions for the reporting year.

Heat fuel accounted for 98.1 tCO₂e in 2022, 0.1% of the total GHG emissions.

Scope 3

AutoStore's scope 3 emissions mainly stem from category 1 Purchased goods and services. The factory in Poland purchases all materials for AutoStore's products, and does therefore hold the majority of AutoStore's emissions.

Business travel: In the reporting year business travels accounted for 2 222.4 tCO₂e, which is 1.2% of the total GHG emissions. Data was collected from travel agencies and AutoStore's database. Business travel emissions are estimated for countries with less than 15 employees.

Waste: Waste generated from AutoStore's operations is accountable for 37 tCO₂e, which is less than 0.1% of total emissions. The factory in Poland and the office in Nedre Vats generated the most waste. CEMAsys conducted estimations on the countries with less than 15 employees.

Upstream transportation and distribution: In the reporting year upstream transportation was responsible for 4 336 tCO₂e (2.3% of total).

Employee commuting: CEMAsys estimated employee commuting to be 414.3 tCO₂e in 2022, 0.2% of total GHG emissions.

Processing of sold products: Emissions from the processing of sold products was estimated for 2022 and is responsible for 13.7 tCO₂e, less than 0.1% of total emissions.

Use of sold products: Use of sold products was estimated for 2022 and accounted for 1 013 tCO₂e, 0.5% of total emissions. The estimations are based on the average daily power consumption of AutoStore's products.

End-of-life treatment of sold products: Emissions from the future end-of-life treatment of sold products in 2022 are estimated to be 1 191.8 tCO₂e. The calculations are based on units sold and the material composition of AutoStore's products.

Fuel-and-energy-related activities: fuel-and-energy-related activities are accountable for 937.3 tCO₂e in 2022.

Purchased goods and services total: The purchase of goods and services in 2022 is accountable for 90.3% of the total GHG emissions, with 170 992 tCO₂e emitted from the products' production and transportation. AutoStore's factory in Poland is accountable for most purchased goods as it requires input material to produce the company's products and handles most purchases from third-party producers. 78.1% of emissions from purchased goods and services come from virgin plastic that makes out all the bins present in AutoStore's grids.

Production materials were included in the 2021 carbon accounting, making it possible to see changes from 2021 to 2022. In line with AutoStore's growth, their emissions grew accordingly. The two most vital materials and changes are plastic and aluminium. In 2022 AutoStore bought 65.3% more virgin plastic (excluding rubber) than the year before and purchased 129.3% more aluminium in 2022.

For Poland, CEMAsys has estimated the purchase of office furniture. The calculations are based on Norway's purchases in 2022 and calculated based on the number of employees.

Capital goods: In 2022 AutoStore purchased one vehicle in Poland, resulting in emissions of 7.9 tCO₂e.

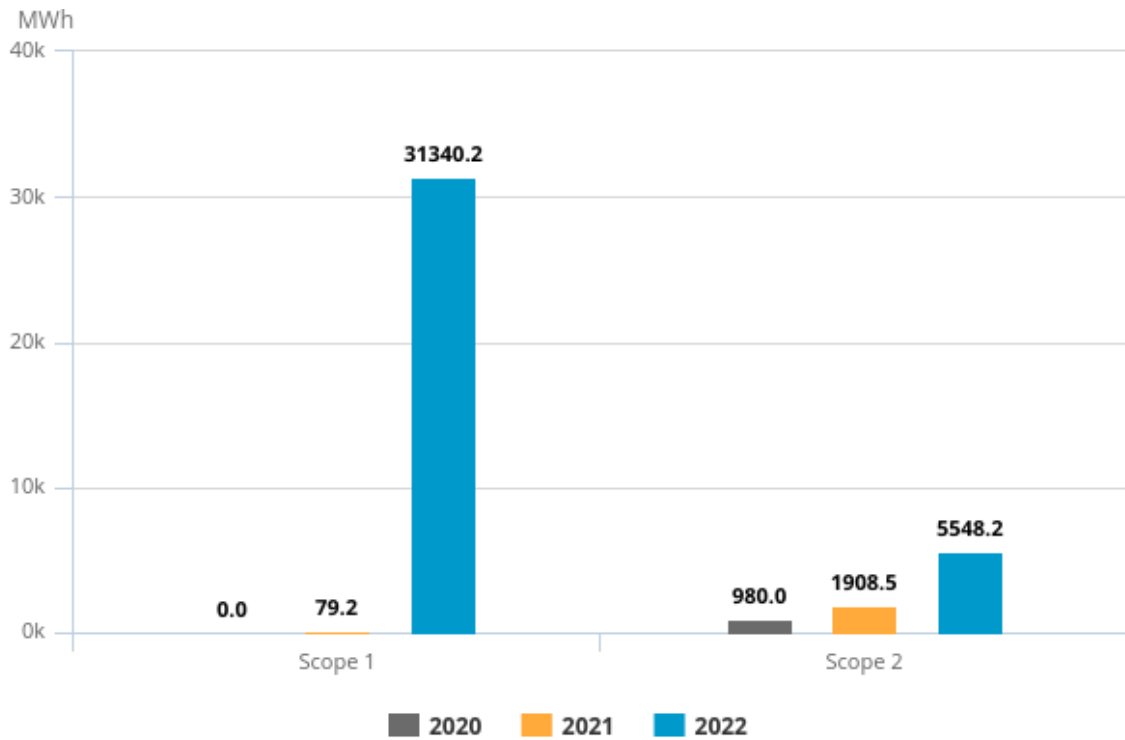
Downstream leased assets: AutoStore rents out grid systems, contributing to 0.1 tCO₂e tCO₂e emissions from the systems' electricity consumption in 2022.

*In 2021 AutoStore reported 116 307 130 kg plastic avg (virgin), corresponding to 362 447.9 tCO₂e. However, this number was incorrect, and the true value of plastic was 28 685 400 tCO₂e. CEMAsys has changed the data for 2021, and the correct data is represented in the '% change from the previous year' column in this report.

Annual GHG Emissions

Category	Description	2019	2020	2021	% change from previous year
Transportation total		-	-	17.8	-
Diesel (NO)		-	-	5.1	100.0 %
Petrol (E5)		-	-	7.6	100.0 %
Diesel (B7)		-	-	5.1	100.0 %
Scope 1 total		-	-	17.8	100.0 %
Electricity total		-	2,344.4	593.6	295.0 %
Electricity Nordic mix		-	1,670.0	17.8	9,256.7 %
Electricity USA		-	29.7	26.4	-11.3 %
Electricity Poland		-	644.7	549.4	-14.8 %
District heating location total		-	-	125.2	-
District heating Poland mix		-	-	125.2	100.0 %
Scope 2 total		-	2,344.4	718.8	226.2 %
Purchased goods and services total		-	63,457.9	98,461.9	55.2 %
Plastic avg. (virgin)		-	58,960.4	89,392.3	51.6 %
Plastic avg. (virgin)	Rubber	-	-	9.0	100.0 %
Aluminium, recycled		-	1,756.0	3,727.8	112.3 %
Batteries Li-ion		-	1,930.2	2,284.7	18.4 %
Steel, stainless		-	810.6	1,337.4	65.0 %
Copper, recycled		-	0.6	0.1	-76.7 %
Brass		-	-	76.4	100.0 %
PCB		-	-	936.7	100.0 %
Other material inputs		-	-	77.6	100.0 %
Cable, unspecified		-	-	95.0	100.0 %
Wood material, virgin		-	-	524.7	100.0 %
Waste total		-	-	9.7	-
Paper waste, recycled		-	-	0.5	100.0 %
Plastic waste, incinerated		-	-	8.8	100.0 %
Glass waste, recycled		-	-	-	100.0 %
Industrial waste, recycled	Wood	-	-	0.3	100.0 %
Industrial waste, recycled	Insulation materials	-	-	-	100.0 %
Plastic waste, recycled		-	-	-	100.0 %
Metal waste, recycled	Aluminium	-	-	-	100.0 %
Business travel total		-	-	396.8	-
Air travel, domestic, incl. RF		-	-	321.5	100.0 %
Air travel, continental, incl. RF		-	-	22.3	100.0 %
Air travel, intercontinental, incl. RF		-	-	44.2	100.0 %
Car, petrol (avg.)		-	-	0.2	100.0 %
Car, diesel (avg.)		-	-	0.3	100.0 %
Hotel nights, world		-	-	8.4	100.0 %
Scope 3 total		-	63,457.9	98,868.4	55.8 %
Total		-	65,802.3	99,604.9	-33.9 %
Percentage change		-	-	51.4 %	

Annual energy consumption (MWh) Scope 1 & 2



Annual Market-Based GHG Emissions

Category	Unit	2019	2020	2021
Electricity Total (Scope 2) with Market-based calculations	tCO ₂ e	-	769.4	822.8
Scope 2 Total with Market-based electricity calculations	tCO ₂ e	-	769.4	948.0
Scope 1+2+3 Total with Market-based electricity calculations	tCO ₂ e	-	1,734,227.3	99,834.1
Percentage change		-	-	-94.2 %

Methodology and sources

The Greenhouse Gas Protocol initiative (GHG Protocol) was developed by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). This analysis is done according to *A Corporate Accounting and Reporting Standard Revised edition*, currently one of four GHG Protocol accounting standards on calculating and reporting GHG emissions. The reporting considers the following greenhouse gases, all converted into CO₂-equivalents: CO₂, CH₄ (methane), N₂O (laughing gas), SF₆, HFCs, PFCs and NF₃.

For corporate reporting, two distinct approaches can be used to consolidate GHG emissions: the equity share approach and the control approach. The most common consolidation approach is the control approach, which can be defined in either financial or operational terms.

The carbon inventory is divided into three main scopes of direct and indirect emissions.

Scope 1 includes all direct emission sources. This includes all use of fossil fuels for stationary combustion or transportation, in owned and, depending on the consolidation approach selected, leased, or rented assets. It also includes any process emissions, from e.g. chemical processes, industrial gases, direct methane emissions etc.

Scope 2 includes indirect emissions related to purchased energy; electricity and heating/cooling where the organisation has operational control. The electricity emission factors used in Cemasys are based on national gross electricity production mixes from the International Energy Agency's statistics (IEA Stat). Emission factors per fuel type are based on assumptions in the IEA methodological framework. Factors for district heating/cooling are either based on actual (local) production mixes, or average IEA statistics.

In January 2015, the GHG Protocol published new guidelines for calculating emissions from electricity consumption. Primarily two methods are used to "allocate" the GHG emissions created by electricity generation to the end consumers of a given grid. These are the location-based and the market-based methods. The location-based method reflects the average emission intensity of the grids on which energy consumption occurs, while the market-based method reflects emissions from electricity that companies have purposefully chosen (or not chosen).

Organisations who report on their GHG emissions will now have to disclose both the location-based emissions from the production of electricity, and the market-based emissions related to the potential purchase of Guarantees of Origin (GoOs) and Renewable Energy Certificates (RECs).

The purpose of this amendment in the reporting methodology is on the one hand to show the impact of energy efficiency measures, and on the other hand to display how the acquisition of GoOs or RECs affect the GHG emissions. Using both methods in the emission reporting highlights the effect of all measures regarding electricity consumption.

The location-based method: The location-based method is based on statistical emissions information and electricity output aggregated and averaged within a defined geographic boundary and during a defined time period. Within this boundary, the different energy producers utilize a mix of energy resources, where the use of fossil fuels (coal, oil, and gas) result in direct GHG-emissions. These emissions are reflected in the location-based emission factor.

The market-based method: The choice of emission factors when using this method is determined by whether the business acquires GoOs/RECs or not. When selling GoOs or RECs, the supplier certifies that the electricity is produced exclusively by renewable sources, which has an emission factor of 0 grams CO₂e per kWh. However, for electricity without the GoO or REC, the emission factor is based on the remaining electricity production after all GoOs and RECs for renewable energy are sold. This is called a residual mix, which is normally substantially higher than the location-based factor. As an example, the market-based Norwegian residual mix factor is approximately 7 times higher than the location-based Nordic mix factor. The reason for this high factor is due to Norway's large export of GoOs/RECs to foreign consumers. In a

market perspective, this implies that Norwegian hydropower is largely substituted with an electricity mix including fossil fuels.

Scope 3 includes indirect emissions resulting from value chain activities. The scope 3 emissions are a result of the company's upstream and downstream activities, which are not controlled by the company, i.e. they are indirect. Examples are business travel, goods transportation, waste handling, consumption of products etc.

In general, the carbon accounting should include information that users, both internal and external to the company, need for their decision making. An important aspect of relevance is the selection of an appropriate inventory boundary which reflects the substance and economic reality of the company's business relationships.

Sources:

[Department for Business, Energy & Industrial Strategy](#) (2022). Government emission conversion factors for greenhouse gas company reporting (DEFRA)

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WBCSD/WRI (2015). GHG protocol Scope 2 guidance: An amendment to the GHG protocol corporate standard. World Business Council on Sustainable Development (WBCSD), Geneva, Switzerland /World Resource Institute (WRI), Washington DC, USA, 117 pp.

The reference list above is incomplete but contains the essential references used in CEMAsys. In addition, several local/national sources may be relevant, depending on which emission factors are used.