

Greenhouse Gas (GHG) Protocol Disclosure Report

Dow Disclosures – GHG Protocol Disclosure Report

Reporting Policy and Scope for Greenhouse Gas Emissions

Scope 1, 2, and 3 GHG emissions are collected and accounted for in accordance with the WRI/WBCSD GHG Protocol: A Corporate Accounting and Reporting Standard (Revised Edition). Management of Dow asserts that the ESG disclosures referenced or included in the GHG Protocol Disclosure Report for the year ended December 31, 2022, are presented in accordance with GHG Protocol: A Corporate Accounting and Reporting Standard (Revised Edition), published by the World Resources Institute/World Business Council for Sustainable Development.

The GHG emissions covered by this inventory are based on the calendar year January 1, 2022, to December 31, 2022. Dow reports GHG emissions under the operational control approach criteria described in this standard. In cases where asset ownership is shared, a company has operational control over an asset if they have the full authority to introduce and implement its operating policies at the facility. For operations where Dow is a 50-50 partner or less and does not have full authority to implement its policies, emissions are excluded from this inventory. The company reports GHG emissions at approximately 100 sites globally, with approximately 25 of those sites accounting for over 95% of its total GHG emissions.

Current Global Emissions in CO₂e

The following accounting includes four of the seven GHG emissions covered by the UNFCCC/Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and hydrofluorocarbons (HFCs). Dow does not have emissions of perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), or nitrogen trifluoride (NF₃). GHG emissions are reported in millions of metric tons of carbon dioxide equivalents (CO₂e).

(millions of metric tons CO ₂ e)	2022	2021	2020 (base year) ¹	Amount Change 2022/2020	% Change 2022/2020
Scope 1	27.29	28.39 ²	28.79 ²	-1.5	-5.21%
Scope 1 Emissions from Power Sold to Third Party/Grid	5.45	5.84 ²	5.74 ²	-0.29	-5.05%
Scope 2 (Market)	4.19	5.8 ³	6.22 ³	-2.03	-32.64%
Scope 2 (Location)	3.45	3.94	3.95	-0.5	-12.66%
Gross Scope 1 & 2 (Market)	31.48	34.19 ^{2,3}	35.01 ^{2,3}	-3.53	-10.08%
Scope 3	80.55	82.08 ⁴	85.90 ⁴	-5.35	-6.23%

¹ Base year applicable for Scope 1 and 2 only. Dow is working to identify an appropriate base year for Scope 3 emissions.

² Updates to the 2020 and 2021 Scope 1 GHG emissions were completed to account for corrections in calculation methodologies and identified data errors.

³ Historical revisions have been made to reflect the GHG Protocol's hierarchy of using utility/supplier or residual mix factors when available.

⁴ Restated based on significant advancements in Dow's Scope 3 accounting techniques and data management. See [GRI 305-3 Other \(Scope 3\)](#) for more information.

Other GHG Emissions

(millions of metric tons CO ₂ e)	2022	2021	2020 (base year)	Amount Change 2022/2020	% Change 2022/2020
Biomass CO₂	0.46	0.54	0.45	0.01	2.22%
“Other” GHG Emissions¹	0.03	0.06	0.09	-0.06	-66.67%

¹ Other GHG emissions include bromomethane, carbon monoxide, carbon tetrachloride, dimethyl ether and methylene bromide.



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Calculation Methodologies

When calculating Scope 1 GHG emissions, source data is collected within multiple systems following internal processes. Calculation methodologies vary based on a hierarchical approach. Permit-specific or regulatory required emissions factors are prioritized and, where these do not exist, other published emissions factors and calculation methodologies are used. Some sources for these factors include [Intergovernmental Panel on Climate Control \(IPCC\)](#) Guidelines for National Greenhouse Gas Inventories; [U.S. Resources \(U.S. EPA State Inventory and Projection Tools\)](#); [U.S. Emission Factor Resources](#); or [AP-42](#); and German Environmental Authority (12/2016).

For tracking against its targets to reduce GHG emissions, Dow utilizes the market-based methodology for Scope 2 accounting. Emissions are calculated by multiplying the amount of company-purchased steam and electricity consumed by supplier or utility-specific emissions factors or factors denoted through energy attribute certificates, when available. For U.S. sites, where supplier or utility factors are not available, Green-e® Residual Mix factors are used, as these are readily available. In all other cases, Dow utilizes location-based emissions factors. The impacted portion of electricity purchases is insignificant to overall Scope 2 emissions. Dow also reports Scope 2 emissions using the location-based method in which quantities of company-purchased steam and electricity are multiplied by the appropriate emissions factors for that geographic area, rather than supplier-specific factors. For U.S.-based locations, Dow used the location based emissions factors from the EPA EGrid (2020) and for non-U.S. locations Dow used the International Energy Agency (IEA) (2020, released in 2022).

GHG emissions calculations for Scope 3 are collected and accounted for according to Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard as the foundation, referencing the WBCSD's Guidance for Accounting and Reporting Corporate GHG Emissions in the Chemical Sector Value Chain and Global Logistics Emissions Council (GLEC) Framework when needed. Dow relies on internal records as a basis for Scope 3 activity data, such as purchasing and sales data. To convert activity data to carbon emissions, Dow embedded supplier carbon intensity data wherever possible, which was validated using the GHG Protocol, WBCSD Pathfinder Framework and TfS Product Carbon Footprint Guidelines. Dow modeled emissions factors for a subset of raw materials and logistics activities based on knowledge of supply chain conditions, using Ecoinvent emissions factors to represent average conditions. In all other cases, Dow employed industry average emissions factors from Ecoinvent v3.9, Carbon Minds, economic input-output life cycle assessment (EIO-LCA), CDP and the GLEC to estimate Scope 3 emissions. One category, 3.15, contains entirely primary data reported by nonconsolidated affiliates.

Base Year

Dow measures its progress for Scope 1 and Scope 2 emissions toward its current reduction target by its baseline year, 2020. Dow is actively working to identify a Scope 3 base year. If changes occur in the configuration of Dow assets or if significant emissions changes are found that make a material impact to its global footprint, the baseline year will be recalculated to include the new configuration. Dow's internally recognized threshold for significant changes is 0.5% of the previous year's global total. These changes include, but are not limited to, transfer of ownership, improvement of calculation methodologies or the accuracy of emissions factors, and discovery of significant errors, single or collectively.

Dow continues to improve its calculation methodologies for GHG emission accounting globally as part of an effort to align with the GHG protocol standard. Scope 1 and Scope 2 changes, which in aggregate were higher than our 0.5% threshold, resulted in baseline year changes. Specifically, Scope 1 revisions have been made to reflect identified data corrections and methodology improvements at low emitting facilities aligning with the GHG protocol standard. Scope 2 improvements have been made to reflect the GHG Protocol's hierarchy of using utility/supplier-specific emissions factors or residual mix factors when available. All changes are immaterial to the Intersections report as a whole.

Targets

By 2030, Dow will reduce its net annual carbon emissions by 5 million metric tons. This represents a 15% reduction from Dow's 2020 baseline and a 30% reduction from the 2005 baseline. By 2050, Dow intends to be carbon neutral (Scopes 1+2+3 plus product benefits).

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Global Warming Potential (GWP)

To compare the global warming impacts of different greenhouse gases, a universal unit of measurement is needed. GWP factors were developed to measure the amount of energy the emissions of one ton of gas will absorb relative to one ton of carbon dioxide. For Scope 1 emissions, in accordance with the GHG Protocol, Dow uses the most recent IPCC assessment report (AR6) 100-year GWP values for all data, including the baseline, to maintain consistency across time. For Scope 2 emissions, Dow requests, but does not verify, the factors used when data is received from its suppliers. Dow will continue to improve its understanding of the factors used by its suppliers to represent the information as accurately as possible in the future.

Scope 1 Emissions by GHG

GHG Emissions (MT)	2022 Scope 1 (MT)	2022 Scope 1 Total (MT CO ₂ e)	2021 Scope 1 Total (MT CO ₂ e)	2020 Scope 1 Total (Base Year/MT CO ₂ e)
Carbon Dioxide	26,540,000	26,540,000	27,590,000	28,015,000
Methane ¹	18,000	530,000	580,000	520,000
Nitrous Oxide	580	158,000	159,000	145,000
HFCs	50	62,000	60,000	74,000

¹ Assumes all methane emissions are "fossil" and uses associated emissions factors provided in the IPCC AR6 report. Conservative method as non-fossil methane emissions have a lower GWP factor.

Dow does not have emissions of PFCs, SF₆ or NF₃.

Scope 2 Emissions by GHG

Speciated emissions data is not available for Scope 2 accounting as suppliers provide the data to Dow in carbon dioxide equivalents. To include a complete and comparable emissions disclosure relevant to users of this information, Dow will continue to work with suppliers to improve the information provided so that speciated emissions data can be reported for both market-based and location-based Scope 2 accounting in future reports.

Scope 3 GHG Emissions by Activity

Scope 3 GHG emissions data is reported for 13 of the 15 categories. 60% of Dow's emissions fall into upstream categories, primarily related to the carbon footprint of raw materials, fuels and transportation services purchased by Dow. Downstream emissions from the use and end-of-life of Dow's sold products are also a driver of Dow's Scope 3 emissions, largely caused by products being combusted in the use phase or incinerated at end of life. Dow's principal non-consolidated affiliates also contributed to Dow's Scope 3 emissions.

Changes in emissions are due to changes in the types and amounts of purchased and sold products as well as improvements in underlying activity data, emissions factors and Scope 3 models. Where indicated below, these improvements necessitated a recalculation of 2020 and 2021 emissions. These changes have served to improve the accuracy of Dow's emissions estimates, with 3.12 End-of-Life of Sold Products remaining the category most challenging to estimate. Additional downstream emissions from transportation (3.9) and processing of sold products (3.10) are likely also material; however, emissions are largely unknown due to the complexity of Dow's downstream value chain and the lack of data and estimation approaches. Dow intends to calculate and report these categories in the future as new data sources and methodologies become available.



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Category ¹	2022	2021	2020	Amt Change 2022/2020	% Change 2022/2020
Category 1: Purchased Goods & Services	40.65	41.65	45.17	-4.52	89.99%
Category 2: Capital Goods	0.29	0.23	0.24	0.05	20.83%
Category 3: Fuel- & Energy-Related Activities	4.42	5.22	4.75	-0.33	-6.95%
Category 4: Upstream Transportation & Distribution	2.63	2.68	2.59	0.04	1.54%
Category 5: Waste Generated in Operations	0.41	0.38	0.41	0	0.00%
Category 6: Business Travel	0.02	0.0045	0.0071	0.013	181.69%
Category 7: Employee Commuting	0.06	0.051	0.046	0.014	30.43%
Category 8: Upstream Leased Assets	0.008	0.014	0.017	-0.009	-52.94%
Category 9: Downstream Transportation & Distribution ²					
Category 10: Processing of Sold Products ²					
Category 11: Use of Sold Products	10.43	10.00	9.52	0.91	9.56%
Category 12: End-Of-Life Treatment of Sold Products	17.46	18.15	19.12	-1.66	-8.68%
Category 13: Downstream Leased Assets ³	0	0	0	0	0.00%
Category 14: Franchises ³	0	0	0	0	0.00%
Category 15: Investments	4.17	3.70	4.03	0.14	3.47%
Total	80.55	82.08⁴	85.90⁴	-5.35	-6.23%

¹ Historical numbers restated based on significant advancements in Dow's Scope 3 accounting techniques and data management. See [GRI 305-3 Other indirect \(Scope 3\)](#) for more information.

² Dow is currently developing a methodology to report this category in the future.

³ Dow does not currently have any downstream leased assets or franchises therefore these categories are not relevant for Scope 3 accounting.

⁴ Restated based on significant advancements in Dow's Scope 3 accounting techniques and data management. See [GRI 305-3 Other indirect \(Scope 3\)](#) for more information.

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Category	Status	Method	Activity Data	Emissions Factor Source(s) for Average Data	Emissions Factor Source(s) for Supplier Data	Description of Any Excluded Activities	% GHGs Covered by Supplier Data	Data Quality Rating
3.1	Relevant, calculated	Hybrid	Dow internal invoice records for all goods and services purchased in 2022	Raw materials: Ecoinvent 3.9, Carbon Minds Packaging & Services: EIO LCA spend-based factors, CDP supplier-reported revenue intensity factors	Supplier data via CDP or directly to Dow	Excluded are benefit payments, customs services, tax authority and non-invoiced spend.	1.0%	Good
3.2	Relevant, calculated	Hybrid	Dow internal invoice records for all goods and services purchased in 2022	Raw materials: Ecoinvent 3.9 Services: EIO LCA adjusted for inflation; CDP supplier-reported revenue intensity factors	Supplier data via CDP or directly to Dow		<1%	Good
3.3	Relevant, calculated	Hybrid	Dow internal records for fuel and energy purchased for Dow's operations in 2022	Ecoinvent 3.9, World Bank T&D losses	n/a	Fuel purchased for use in Dow's on-site vehicles is not included here; these are relatively minor emissions.	0	Good
3.4	Relevant, calculated	Hybrid	All transportation services purchased in 2022 according to Dow shipment and invoice records	GLEC Framework	Supplier data via CDP, Sea Cargo Charter, or directly to Dow	Site logistics emissions, reverse logistics such as returns (0.1% of total Dow shipped weight), transport of feedstock purchases outside of Europe.	57%	Very good
3.5	Relevant, calculated	Hybrid	Dow's internal records on the weight and type of waste generated in Dow's operations	Ecoinvent 3.9	n/a		0%	Good
3.6	Relevant, calculated	Average data	Travel agency records; AAA Foundation	Ecoinvent 3.9	Defra greenhouse gas reporting: conversion factors 2021	Travel booked outside Dow's travel agency.	83%	Good
3.7	Relevant, calculated	Average data	Dow employee records, AAA Foundation	Ecoinvent 3.9	n/a	Only personal car travel is included; employee commutes by other means are not included.	n/a	Fair

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3.8	Relevant, calculated	Hybrid	Dow records on leased assets and building energy use	Ecoinvent 3.9	n/a	Leased assets not managed by Corporate Facilities	0%	Good
3.9	Relevant, not calculated							
3.10	Relevant, not calculated							
3.11	Relevant, calculated	Direct use phase emissions	Weight, type and sold-to industry of sold products with use phase emissions	Dow chemists	n/a	n/a	n/a	Good
3.12	Relevant, calculated	Average data	Weight, type and sold-to industry and region for all Dow sold products that are not included in 3.11; OECD Fate of Plastic Waste	Ecoinvent 3.9	n/a		n/a	Fair
3.13	Not relevant, not calculated							
3.14	Not relevant, not calculated							
3.15	Relevant, calculated	Investment-specific approach	Scope 1 and 2 of the nonconsolidated affiliates; Dow's 10-K ~	n/a	n/a	Joint ventures not listed on Dow's 10-K ~	100%	Very good

GHG Protocol Assurance Statement



INDEPENDENT ACCOUNTANT'S REVIEW REPORT

**Management of
Dow Inc. and The Dow Chemical Company
Midland, MI**

We have reviewed management of Dow Inc.'s and its consolidated subsidiaries, including The Dow Chemical Company (collectively, "Dow" or the "Company") assertion that the GHG Protocol Disclosure Report (the "GHG Disclosures") referenced or included within the accompanying Dow 2022 Intersections Report (the "2022 Intersections Report") as of and for the year ended December 31, 2022, is presented in accordance with the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition), published by the World Resources Institute/World Business Council for Sustainable Development (the "GHG Protocol"). The Company's management is responsible for its assertion. Our responsibility is to express a conclusion on the GHG Protocol Disclosure Report referenced or included within the accompanying Dow 2022 Intersections Report based on our review.

Our review was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants (AICPA). Those standards require that we plan and perform the review to obtain limited assurance about whether any material modifications should be made to the GHG Disclosures in order for it to be presented in accordance with GHG Protocol. The procedures performed in a review vary in nature and timing from and are substantially less in extent than, an examination, the objective of which is to obtain reasonable assurance about whether the GHG Disclosures are presented in accordance with GHG Protocol, in all material respects, in order to express an opinion. Accordingly, we do not express such an opinion. Because of the limited nature of the engagement, the level of assurance obtained in a review is substantially lower than the assurance that would have been obtained had an examination been performed. We believe that the review evidence obtained is sufficient and appropriate to provide a reasonable basis for our conclusion.

We are required to be independent and to meet our other ethical responsibilities in accordance with the Code of Professional Conduct issued by the AICPA. We applied the *Statements on Quality Control Standards* established by the AICPA and, accordingly, maintain a comprehensive system of quality control.

The procedures we performed were based on our professional judgment. In performing our review, we conducted inquiries and performed analytical procedures. For a selection of amounts, we performed tests of mathematical accuracy of computations, compared the amounts to underlying records, or observed the data collection process in regard to the accuracy of the data in the GHG disclosures.

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The preparation of the GHG disclosures in the GHG Protocol Disclosure Report included within the 2022 Intersections Report requires management to interpret the criteria, make determinations as to the relevancy of information to be included, and make estimates and assumptions that affect the reported information. Measurement of Scope 1, 2 and 3 GHG emissions includes estimates and assumptions that are subject to substantial inherent measurement uncertainty resulting, for example, from the accuracy and precision of greenhouse gas emission conversion factors. Obtaining sufficient, appropriate review evidence to support our conclusion does not reduce the inherent uncertainty in the amounts and GHG disclosures. The selection by management of different but acceptable measurement methods, input data, or assumptions may have resulted in materially different amounts or GHG disclosures being reported.

Information outside of the GHG Protocol Disclosure Report, including linked information, was not subject to our review, including the TCFD Disclosure Report, SASB Disclosures Report, WEF Disclosure Report, and Non-GAAP Financial Measures and, accordingly, we do not express a conclusion or any form of assurance on such information. Any information relating to forward looking statements, targets, goals and progress against goals, was not subject to our review and, accordingly, we do not express a conclusion or any form of assurance on such information. Further, any information relating periods prior to the year ended December 31, 2021, or any information relating to scope 3 prior to the year ended December 31, 2022, was not subject to our review; and accordingly, we do not express a conclusion or any form of assurance on such information.

Based on our review, we are not aware of any material modifications that should be made to the GHG Protocol Disclosure Report in order for it be presented in accordance with the GHG Protocol.

Deloitte & Touche LLP

Midland, Michigan

June 19, 2023





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