Greenhouse Gas Calculation Methodology

Water Calculation Methodology

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SCOPE	GHG Calculation Methodology Description
Scope 1	Howmet uses a calculation approach to quantify GHG emissions as direct measurement is not practical for our organization. Natural gas accounts for ~95% of Howmet's scope 1 emissions. Natural gas activity data is collected from natural gas invoices maintained in an external database used for energy and procurement spend reporting. Scope 1 data other than natural gas is collected from Howmet locations using an electronic database. Locations generally use purchase records, and or service records for such activity data.
Scope 2	Howmet uses a calculation approach to quantify scope 2 GHG emissions. Electricity activity data is collected from invoices and data maintained in an external database used for energy and procurement spend reporting. Howmet then uses emission factors that have been published by national regulatory agencies or recognized international organizations for use in calculating scope 2 GHG emissions. For location based calculations, Howmet's uses for example factors published by EPA eGRID and UK DEFRA. For market based calculations, Howmet uses values published by Green-e, and AIB.
SCOPE 3 CATEGORY	**GHG Calculation Methodology Description**
1: Purchased Goods & Services	NON METAL PURCHASES: Howmet uses a spend-based approach with environmentally extended input-output ("EEIO") based emission factors to quantify GHG emissions from non-metal purchased goods and services. To obtain activity data for purchased goods and services, other than purchased metals, Howmet relies on the records contained in its purchasing systems for reporting year. Howmet uses the emission factors for purchased goods and services that are referenced in the Scope 3 Emission Evaluator tool ("Evaluator") that is provided by The Greenhouse Gas Protocol and Quantis for use by companies to evaluate their Scope 3 emissions, the tool used data from the World Input-Output Database (WIOD). The emission factors included in the Evaluator are based on 2009 data. The reporting year spend data is adjusted to 2009 equivalent spend using consumer price index data. METAL PURCHASES: Howmet uses an average-data method approach (i.e., weight of purchased metals) along with supplier-specific or published weight-based emission factors to quantify emissions from purchased metals. Metal procurement representatives from each of the Howmet business units provide information on the weights of metal purchases for each location for the reporting year. Howmet believes that a mass-based approach for quantifying GHG emissions from purchased metals provides higher quality results for quantifying emissions because metals like aluminum and titanium are commodities that can be subject to large fluctuations in price which can artificially inflate or deflate the associated emissions.
2: Capital Goods	We use purchasing data to perform spend based GHG calculations for Capital goods. Emission factors for spend based calculations are obtained from the International Aerospace Environmental Group, or other published sources such as the GHG Protocol cross sector tool. Howmet distinguishes purchased goods included in Category 1 from capital goods included in Category 2 consistent with Howmet's financial accounting procedures for treating expenditures as expense or capital. Howmet's approach is consistent with The GHG Protocol Standard's expectation that companies should follow their own financial accounting procedures to determine whether to account for a purchased product as a capital good or a purchased good and service. Howmet's approach prevents the double counting of emissions between Category 1 and Category 2. Howmet's accounting practices capitalize the asset when it is placed in service. Howmet accounts for the emissions from purchased capital goods in the year that the good is placed in service. For example, a piece of equipment may be purchased in one year but the actual installation and placing in operation may not occur until the following year.
3: Fuel- and Energy-Related Activities	We calculate fuel and energy related activity emissions using utility data found on invoices and location reported metrics. For transportation and distribution losses, grid- or country specific T&D loss emission factors that have been published from various credible sources including but not limited to government agencies and other factors as allowed by the GHG Protocol. For cradle to gate electricity, country specific emission factors are used if provided; otherwise values are based on the grid generation mixture and upstream factor for each generation type. Other fuels cradle to gate emissions are calculated using country specific emission factors, or if none are published a value from a country in the same region.
4: Upstream Transportation	Emission Year 2022 was the first year category 4 was calculated using a weight distance method. This year was used as a baseline from which to calculate emission year 2023. For emission year 2023, reported values for emission year 2022 were increased by the same % as the % increase in third party revenue. This was done due to the complexity of the underlying dataset. In emission year 2022, Howmet used a weight-distance method to quantify emissions from upstream transportation during the baseline year. Records of shipment were used to identify distance traveled, mode of transport for upstream transportation and distribution. Data values were then entered into the "GHG Emissions from Transport or Mobile Sources" tool found on the GHG Protocol website. Howmet is actively working to improve the methods of calculation for this category for future years reporting.
5: Waste from Operations	We calculate GHG's from waste generated in operations using waste metrics reported by our locations, and emission factors published by the EPA emission factor hub and DEFRA.
6: Business Travel	We use a corporate travel tool for booking business travel. Data obtained from the travel tool including mode of transport and distance traveled were coupled with EPA and DEFRA emission factors for GHG calculations.
7: Employee Commuting	We made estimates of each employee's anticipated commute distance and pattern; coupled with EPA and DEFRA emission factors, GHG's are calculated.
8: Upstream Leased Assets	Howmet uses an average-data method to quantify emissions from upstream leased assets. This involves knowing the type of space leased, the area of the space leased and applying an average emission factor per square footage of area leased. For a given property use (manufacturing, warehouse, office), the energy intensities (electricity and/or natural gas per unit area) for that use is multiplied by the carbon intensities of the energies consumed (mt CO_2e per unit of energy). This results in a use-specific carbon intensity factor which is then multiplied by the leasehold area to obtain the GHG emissions from the use of the leased property for the reporting year. The sum of the emissions from properties is the total emission from upstream leased properties.
9: Downstream Transportation	Seventy percent of the metal we purchase is aluminum, we currently use a quantitative aluminum product life cycle assessment to estimate downstream transport shipment GHG emission rates (CO_2e/Metal Mass Shipped). Purchased metal mass is obtained from Howmet Procurement. We assume and 80% utilization rate. This is an engineering judgement based on our knowledge and expertise of our processes.
12: End-of-Life Treatment of Sold Products	Howmet's products sold are intermediate products. The emissions are accounted from disposing the intermediate products at the end of its life, not the final products. Howmet's sold products are almost made exclusively of metals, and thus the end-of-life treatment of these metals is expected to be primarily recycling (we assume a 20% recycling rate), some amount will end up being disposed. Howmet used cradle to gate results for aluminum recycling found in the Aluminum Association Report "Environmental Footprint of Semi-Fabricated Al Products in North America". Category 12 utilized the mass of metal shipped found in the category 9 calculations. The mass of metal shipped, is then multiplied by the Howmet assumed recycling rate of 20% to determine the mass of metal recycled. The mass of metal recycled is then multiplied by the kg CO_2e/kg metal recycled LCA factor to determine the total GHG's from end of life treatment of sold products.

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	Water Calculation Methodology
Water withdrawal measurement methodology description	Across Howmet operations, over 99.5% of the water we withdrawal is from municipal water utilities. Our water withdrawal measurements are therefore based on utility invoices in almost all cases. In certain situations, at smaller sites, where our operations share a building or campus with other companies or operations, or a landlord is responsible for water payment, we either measure and record our intake from the third-party with our own meters or estimate our usage portion based on a detailed site water balance that accounts for flow rates at specific equipment in our operations. We have a groundwater well supply at one location, the measurement of which is based on a meter. Any legacy groundwater remediation projects we operate are not included in our water withdrawal measurement, as this water is not used in our manufacturing processes. Most of the water we withdraw is not consumed. Our facilities use water primarily for cooling, plating and rinsing processes, as well as potable and sanitary uses. Generally, water is treated and returned to the local water system.