TCFD Disclosure

revision 2, April 2022

Howmet Aerospace Inc.

At Howmet Aerospace, we continually reassess and revamp our environmental, social and governance (ESG) programs, including those related to climate change.

In 2020, we prepared an initial disclosure following the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and the Sustainability Accounting Board Standard (SASB) for aerospace and defense. We have approached the implementation of these reporting frameworks as a long-term journey, and the steps we carried out in our recent reporting laid the foundation for future work.

This 2022 updated disclosure incorporates two new elements – the outcomes of our energy efficiency and greenhouse gas (GHG) target-setting process and information recommended in two new TCFD guidance documents. These are the updated Guidance on Implementing the TCFD Recommendations and the TCFD Guidance on Metrics, Targets and Transition Plans, both of which were published in 2021.

This report addresses the 11 TCFD-recommended disclosures within the four categories of governance, strategy, risk management, and metrics and targets.

GOVERNANCE: Describe the organization´s governance around climate-related risks and opportunities

Governance: Disclosure a) Describe the board's oversight of climate-related risks and opportunities.

As per our Corporate Governance Guidelines, the full Howmet Aerospace Board of Directors (Board) "oversees and provides guidance to management on the Company's environmental, social and governance (ESG) programs, initiatives and objectives, including but not limited to corporate social responsibility, environmental sustainability, health and safety, and diversity and inclusion. The Board considers and discusses with management (a) current and emerging ESG trends and risks and their impact on the Company and its stakeholders, (b) major global political, legislative and regulatory developments or other public policy issues that may affect the business operations, performance or public image of the Company or are otherwise pertinent to the Company and its stakeholders, and (c) how the Company's policies and practices can address such trends, risks or issues."

Annually, the full Board reviews the outputs of our enterprise risk management (ERM) process, overseeing our management, monitoring and mitigation of enterprise risks. Climate change is built into our ERM process.

CDP recognized our climate governance in 2021 with a score of A in the climate governance section.

Governance: b) Describe management´s role in assessing and managing climate-related risks and opportunities.

Our Executive Leadership Team (ELT) has responsibility for climate-related issues. These responsibilities include guiding our sustainability and climate change assessments, setting objectives, and defining and monitoring resilience strategies and mitigation plans. The ELT also sets ESG disclosure strategies, which incorporate leading standards from SASB, TCFD and the Global Reporting Initiative (GRI).

Our Executive Vice President of Human Resources and our Director of Environment, Health and Safety (EHS) & Sustainability prepare information on climate-related topics for the ELT meetings.

Our technology and commercial leadership at the segment level identify and assess climate-related market and technology opportunities. Our Chief Commercial Officer reports on these opportunities to the ELT.

Our Sustainability Working Committee carries out our day-to-day activities toward the achievement of sustainability and climate change management goals. This committee reports to the Director of EHS & Sustainability, who reports to the Executive Vice President of Human Resources. The committee comprises our Director of EHS & Sustainability, Sustainability & Chemical Compliance Manager, Director of Corporate Environmental & Remediation, Senior Environmental Specialist and ESG Analyst

The Sustainability Working Committee acts as a knowledge hub, supports data gathering, conducts assessments, such as climate change scenario analysis and impact studies, and drives the deployment of the sustainability agenda. The committee further facilitates sustainability initiatives and coordinates internal stakeholder engagement.

STRATEGY: Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material

Strategy: a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.

Our climate-related risks are summarized in Table 1, while our climate-related opportunities are found in Table 2.

Assessment periods related to climate risk are considered short term when less than one year, medium term when one to five years, and long term when more than five years and up to 15 years. Where data was available, we expanded the assessment beyond 15 years.

We have identified risks and opportunities that could have a material financial impact on the organization through our climate change scenario analysis, our ERM system and expert analysis from our commercial teams.

Table 1: Climate-Related Risks Identified by Howmet Aerospace Inc.

Risk	Category	Financial Impact	Significant Before Mitigation Measures?	Term	Strategic Response	Practical Management Measures	Metrics Used by Howmet to Track Progress
1. Introduction of carbon price	Transitional – policy changes and market	a) Increased compliance costs linked to cost for CO_2 emissions from our manufacturing plants. Considering the US$100 cost per ton of CO_2 emitted in 2030 in the IEA Sustainable Development Scenario[1], unmitigated cost in 2030 for current Scope 1 emissions would be US$37 million[2]. If similar cost were to apply to Scope 2 emissions, unmitigated cost in 2030 at current emission level would be US$40[3] million. b) Potential price increases in energy and raw materials (metals)	Yes	Medium to long term	Focus on energy efficiency to reduce direct emissions linked to natural gas use and to reduce consumption of electricity, thus reducing financial exposure Work with suppliers to encourage them to adapt to a carbon - constrained world and mitigate potential impacts of climate change in their activities, including potential cost increases linked to carbon costs	During 2021, we identified 103 energy-efficiency projects to be implemented by 2024, with a total cost of US$28.3 million. These projects are expected to reduce our combined Scope 1 and 2 location-based emissions by as much as 21.5 percent by 2024 versus the 2019 baseline. We survey key suppliers yearly regarding their climate change activities. We plan to strengthen our Scope 3 calculations with the end goal of obtaining external third-party verification. We plan to work on a Scope 3 emission-reduction goal for our suppliers.	CO_2 Scope 1, 2 and 3 emissions Energy consumption Energy intensity per revenue + energy intensity per purchased metal CAPEX dedicated to improving energy intensity/year Percentage of suppliers with a "leading or active" score in our yearly supplier sustainability surveys

[1] Sustainable Development Scenario published by the International Energy Agency in 2019

[2] Example cost estimate of US$37 million obtained by multiplying our Scope 1 emissions in 2021 (0.37 million metric tons of CO_2 equivalent) by US$100 per ton of CO_2eq.

[3] Example cost estimate of US$40 million obtained by multiplying our Scope 2 emissions in 2021 (0.40 million metric tons of CO_2eq) by US$100 per ton of CO_2eq.

2. Costs to transition to low-emission technology	Transitional – technology	Capital investments in low-emission technology. R&D cost of adapting process technologies	Yes	Medium to long term	Creation of a Transition Technology Working Group	The Transition Technology Working Group will identify low-emission transition technologies that are applicable to our businesses and economically feasible post 2025.	CAPEX dedicated to introducing low-emission technology in our operations/year
3. Floods and wind damage linked to increased frequency and severity of weather events (storms, hurricanes)	Physical risks – acute	Increased capital expenditures to repair/prevent damage; loss of income due to temporary operation stops; and insurance costs	While we estimate our risk level as low, there are a limited number of locations along the U.S. Atlantic and Gulf Coasts and in Japan and China that potentially could be impacted by a hurricane, cyclone or typhoon. Severe weather impacts have been low.	Short term	Identify potential locations at risk and mitigate impacts by capital or management actions (loss prevention investments) insurance coverage and emergency planning	We have an ongoing program in which third-party risk engineers audit our sites for loss prevention, including flood and wind damage. The audits identify preventive and mitigation actions for individual sites, and our segment leadership tracks the implementation of these actions. Our insurance program mitigates risks caused by flood and wind damage. We plan to review our physical climate scenario analysis when new tools become available.	Risk score provided by our insurance company for each site CAPEX dedicated to loss prevention due to flood and wind damage/year
4. Sea level rise	Physical risks – chronic	No potential impact identified given the location of our manufacturing sites. While there might be potential supply chain impacts, our initial focus is on the	No	Long term	Identify site-specific potential impacts to determine actions needed	As part of scenario analysis, our Sustainability Working Committee has carried out a preliminary site-by-site analysis of flood risks linked to sea level rise using available information, such as the NOAA sea level rise	Score assigned in internal evaluation

		impacts in our own operations				risk tool. No significant issues have been identified.	
5. Increased temperatures and a linked decrease in water availability	Physical risks – chronic	Increased costs linked to increased cooling activity; increased water cost or lost income due to temporary operation stop	Increased temperature is not considered material for our operations. Water availability could limit production in very extreme cases.	Medium to long term	Reduce water consumption	During 2021, we identified site-based water reduction projects to be implemented by 2024, delivering an improvement in water intensity versus the 2019 baseline.	Total water withdrawal water intensity by revenue CAPEX and expenses dedicated to water use reduction

Table 2: Climate Related Opportunities Identified by Howmet Aerospace Inc.

Opportunities	Category	Financial Impact	Term	Strategic Response	Metrics Used by Howmet to Track Progress
Commitment of the aviation industry to reduce emissions, which is driving the need for more fuel-efficient engines and lighter aircraft	Products	Increased revenue from increased product content on the next-generation aerospace engines and lighter aircraft	Short, medium and long term	Development of innovative lightweight and fuel-efficient aviation components	Revenue by product stream
Incentives in commercial road transportation to increase fuel efficiency per ton of payload	Products	Increased revenue from increased aluminum wheel content on truck tractors, trailers, buses and other commercial transportation	Short and medium term	Increased manufacturing and commercialization efforts: Aluminum wheels represent less than 20 percent of the global heavy truck market. Product innovation focus that will increase freight efficiency by reducing the weight of	Increased aluminum wheel content on truck tractors, trailers, buses and other commercial transportation

				aluminum wheels. Our lightest wheel is 47 percent lighter than steel wheels, allowing increased fuel efficiency per ton of payload.	
Manufacture of fasteners used in renewable energy, including windmills and solar panels	Products	Increased revenue through increased market penetration of these product lines	Short and medium term	Product innovations that support lower operations and maintenance (O&M) and therefore reduced costs for renewables	Revenue by product stream
Increased resource efficiency	Energy and water efficiency	Reduced operating costs from reduced natural gas, electricity and water costs	Short and medium term	Operational changes to improve energy and water efficiency (non-capital) Capital investments in energy and water efficiency that will reduce operating expenditures	Savings in natural gas, electricity and water per year CAPEX invested in efficiency projects/year
Green financing	Access to capital	Beneficial rates for accessing capital through sustainability-linked bonds	Medium and long term	Review of potential available options	NA

Strategy: b) Describe the impact of climate-related risks and opportunities in the organization´s business, strategy and financial planning.

Our climate strategy is based on three levers – product sustainability, energy management and supply chain management. While the text below provides an overview of each of the levers, a summary of the impacts of climate-related risks and opportunities in our strategy can be seen in Tables 1 and 2 in columns "Strategic Response" and "Practical Management Measures." Financial impacts of the climate-related risks and opportunities identified are also listed in Tables 1 and 2 of this document, addressing revenues, operating costs, CAPEX and access to capital.

Product Sustainability
Through our products, we support our customers' efforts to reduce their GHG footprint and position themselves for market success in an increasingly carbon-constrained environment.

Products that our customers manufacture from our advanced materials and technologies use less energy and emit fewer GHGs than those produced from heavier materials or legacy technologies. As a result, GHG emissions avoided by using our products are substantial relative to the emissions generated in the manufacturing of these materials. This represents a key commercial opportunity. Further details can be found in the "Products" section of the Howmet ESG Report.

Energy Management, Associated Scope 1 and 2 Emissions, and Transition to a Low-Carbon Economy
The second strategic lever is to improve the resilience of our operations to a carbon-constrained environment by reducing our direct and indirect emissions through improvements in energy efficiency – thus addressing the risk of increased carbon costs linked to carbon pricing.

We seek to align our direct and indirect emissions with the goals of the Paris Agreement. This means that our target framework, pace of emission contraction and ultimate goal of net zero will be based on science and proven technologies.

Our objective is to develop a credible and realistic transition plan that we have divided into near-, medium- and long-term phases focusing on 2024, 2030 and 2050, respectively. Our first efforts target our own operations – this covers Scope 1 and 2 emissions, which we have externally verified.

In 2021, we made substantial progress by setting a near-term goal that seeks to align with the 1.5˚ C pathway. We identified more than 100 energy-saving projects that represent a future investment of US$28.3 million. These projects are forecasted to significantly reduce our energy intensity and reduce the GHG footprint of our operations by 21.5 percent by 2024 from our 2019 baseline.

Year	Near-Term Goal	Plan	Cost
2019-2024	21. 5 percent combined Scope 1 and 2 GHG emission contraction by 2024 versus a 2019 baseline, covering all of our Scope 1 and 2 location-based emissions	103 energy efficiency projects	US$28.3 million

In the medium term (2025 to 2030), we believe that a further reduction of carbon emissions is achievable but represents a more significant challenge. This is because we will be dependent on technological developments that we can apply in our facilities and improvement in the energy infrastructure in the communities where we operate.

A newly created Transition Technology Workgroup that consists of our segment leads on energy and technology will initiate our reduction initiative for the medium term. The workgroup will identify strategies that will lead to opportunities to both reduce our GHG emissions per unit produced and replace fuels with renewable alternatives where technically and economically feasible. As the cost of carbon is expected to rise, we will include this aspect in the evaluations of new projects and capital expenditures to ensure our investments are sustainable.

After analyzing technological opportunities, feasibility and costs, we will build a 2025 to 2030 plan to achieve a medium-term climate goal that seeks continued alignment with the Paris Agreement.

In the long term (by 2050 at the latest), our operations need to transform toward carbon neutral and transition from a dependency on natural gas and a carbon-rich electricity grid to achieve the targets set in the Paris Agreement. We believe that clean energy, including hydrogen fuel, has potential, but its use in our industry is in the early stages with significant technological acceleration and maturation needed.

Our research and development (R&D) teams will play an essential role in developing, selecting and implementing the technologies of tomorrow that will support our GHG ambitions. We will need to manage dependencies on R&D results, affordable clean energy and supporting infrastructure as part of our plan to achieve the climate goals. We expect to detail and communicate our long-term plan as we progress through our analysis.

Supply Chain Management
The third strategic lever is related to suppliers. We request that our suppliers drive GHG reductions into their processes and practices, helping us build a more resilient supply base and leverage supplier experience to achieve our climate-related goals.

Since our most significant emissions are related to the purchases of primary metals, it is important that we use suppliers that are focused on energy efficiency, renewable energy and advanced technologies to minimize their GHG impact and, in turn, our Scope 3 emissions. Indirectly, this approach also addresses the potential cost increases linked to regulatory actions (carbon pricing) in the raw materials supply chain.

We plan to strengthen our Scope 3 emission calculations, have them externally verified and set related supply chain GHG goals.

Strategy: c) Describe the resilience of the organization´s strategy, taking into consideration different climate-related scenarios, including a 2º C or lower scenario.

To further understand the impact that climate change could have on our business, we performed a high-level climate change scenario analysis in 2020 for both physical risks and risks related to policies linked to the transition to a low-carbon economy.

For physical risks, we considered a worst-case scenario with no policy mitigation actions and a middle-of-the-road scenario to screen worst-case impacts. For risks related to the transition to a low-carbon economy, such as changing policies, we used the International Energy Agency Sustainable Development (SDS) Scenario.

The scenario is constructed to limit global temperature increase by 1.8˚ C with a 66 percent probability without reliance on global net negative CO_2 emissions. This is equivalent to limiting the temperature rise to 1.65° C with a 50 percent probability.

Carbon Pricing and Transitional Risk

In the Sustainable Development Scenario, society acts rapidly to limit GHG emissions. Policies, such as a forecasted carbon price of US$100 per ton of emissions by 2030, are implemented to discourage GHG emissions. We have assumed that there will be no significant physical impacts to our business by 2030 in this scenario. Thus, only the impacts of regulatory changes are assessed, focusing on carbon pricing.

The main impacts identified in this transition scenario are associated with projected carbon pricing schemes in key countries, driving increases in both manufacturing costs due to natural gas-related CO_2 emissions and the cost of energy and raw materials.

Our analysis considered various market growth scenarios and mitigation strategies to understand the financial impact associated with our direct carbon emissions. One of the key mitigation strategies is centered around energy-efficiency objectives in the near term that include operational improvements, equipment upgrades and process design changes.

Energy efficiencies are a critical lever to reduce GHG emissions for our operating locations. This is why we developed the first steps of the transition plan outlined in Strategy disclosure b) in this document, in the section "Energy Management, Associated Scope 1 and 2 Emissions, and Transition to a Low-Carbon Economy."

Physical Risk

In the physical impact scenarios, CO_2 emissions continue to rise, increasing CO_2 concentration and thus the global temperature to around 4˚ C in 2100. In this assessment, we did not include impacts from regulatory restrictions but focused on physical impacts.

We used the following scenarios from the Intergovernmental Panel on Climate Change (IPCC):

- Representative concentration pathway (RCP) 8.5, which is a worst-case scenario with a worldwide average global temperature increase of 4˚ C in 2100; and
- RCP 4.5, which is a scenario with an average global temperature increase of 2˚ C.

The initial approach was to focus on the direct impact of physical risks in our operations. Potential supply chain impacts will be considered in the future for additional assessment.

The main physical impacts identified in the 4° C worst-case scenario analysis are:

- Acute physical risks: Increased frequency and severity of extreme weather events, such as storms and floods; and
- Chronic physical risks: Potential for sea-level rise to affect facilities, but no significant exposure was indicated.

A general conclusion from the physical scenario analysis was that no dramatic change in physical risks at our locations is expected between 2020 to 2050. Beyond 2050, risk increases locally in the 4° C average temperature increase scenario. We plan to review the assessment when more standardized tools to evaluate physical impacts become available.

While the focus of both the physical and transition scenario analyses was limited to in-house operations, outcomes validate our strategic direction.

RISK MANAGEMENT: Disclose how the organization identifies, assesses, and manages climate-related risks.

Risk Management: a) Describe the organization´s processes for identifying and assessing climate-related risks.

Climate-related transition risks are identified by our Sustainability Working Committee. Current climate-related physical risks are identified as part of our external risk audits, which is a process carried out by our insurance company. The Sustainability Working Committee reviewed climate risks linked to potential chronic effects of climate change in the future.

We integrate the identification, assessment and management of climate-related risks into our company-wide ERM process. Each identified risk is assigned a subject matter expert (SME) that revisits and evaluates the risk twice a year as per a set of criteria. Considering potential impact and likelihood, we consider risks as base risk, watch tier risk or key enterprise risk. Potential new risks are identified via bi-annual leadership discussions.

Risk Management: b) Describe the organization´s process for managing climate-related risks.

We address all identified risks. We address base risk and watch tier level risks at the segment/business unit level, while key company risks have management plans that are periodically reviewed by the company-wide Risk Management Team. This team comprises members from our legal, financial, EHS, sustainability, human resources, operations and commercial teams.

The Risk Management Team contacts the SMEs biannually to revisit current risk status, discuss potential rating changes and explore additional risks that might have been identified. Risk owners develop and own risk management plans and are responsible for their implementation. The Risk Management Team reviews the status of the management plans and progress against them. The Executive Team is briefed on the risks periodically, and the Board is briefed on the risks at least annually.

Risk Management: c) Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organization´s overall risk management.

The previous two risk management related disclosures – a) and b) – address in detail how climate-related risks are identified, assessed and managed as part of our ERM process.

METRICS & TARGETS: Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.

Metrics & Targets:

a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.

b) Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.

c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

The metrics we are using to assess climate-related risks and opportunities are listed in Tables 1 and 2 in this document, under the column "Metrics Used by Howmet to Track Progress."

While we are not disclosing all metrics internally used to assess climate risks and opportunities, Table 3 below lists the metrics we are disclosing and the related objectives. These are grouped as per the seven categories of cross-industry climate-related metrics identified in the TCFD 2021 guidance document on "Metrics, Targets and Transition Plans."

Further information on our GHG and water objectives and on how we are performing against them can be found in the Howmet ESG Report.

Table 3: Climate-Related Metrics and Targets as per the seven categories for Cross-Industry Metrics in the 2021 TCFD guidance on "Metrics, Targets and Transition Plans"

Cross-Industry Metric Category	Metrics/Information Disclosed	Targets	Location of the Information
GHG Emissions	• Absolute Scope 1, 2 and 3 emissions • GHG intensity (Scope 1 and 2) by revenue • Total energy use • Energy intensity by revenue • Energy intensity per segment/business unit • Energy Intensity per metric ton of metal procured	• Short-term goal: Combined Scope 1 and 2 GHG emission reduction by 21. 5 percent by 2024 versus a 2019 baseline, covering 100 percent of Scope 1 and 2 location-based emissions. • Short-term goal: Strengthen our Scope 3 emission calculations, have them externally verified and set related supply chain GHG emissions goals • Medium term: Establish a Transition Technology Workgroup to deliver a 2025 to 2030 plan to build a medium-term climate goal that seeks to align with the Paris Agreement.	Howmet ESG Report and disclosure b) on Strategy in this report

Cross-Industry Metric Category	Metrics/Information Disclosed	Targets	Location of the Information
Transition Risks	Currently, a limited percentage of our Scope 1 emissions are covered by emission trading schemes or direct GHG-related taxes	Not applicable.	CDP disclosure
	Percentage of suppliers with sustainability programs considered as active or leading	Continue working with our supply base to increase supplier resilience.	Howmet ESG Report
Physical Risks	As per our climate scenario analysis, no dramatic change in physical risks at our locations is expected between 2020 to 2050. Beyond 2050, risk increases locally in the 4° C average temperature increase scenario.	Revisit our physical risk scenario analysis when new tools become available.	Table 1 and disclosure c) on Strategy in this report
	Water withdrawal, consumption, use and discharge. Percent of water withdrawn from water-stressed areas	Improve our revenue-based water intensity by 2024 from a 2019 baseline.	Howmet ESG Report
Climate-Related opportunities	Revenue by segment and description of opportunities		Annual Report and Table 2 in this report
Capital Deployment	CAPEX for energy-efficiency and water-efficiency projects	Deploy CAPEX needed to achieve energy- and water-intensity reduction goals.	Table 1 in this report
Internal Carbon Prices	NA	We are considering establishing an internal carbon price associated with capital expenditures.	CDP disclosure
Remuneration	Our Compensation Committee can assign 20 percent of the weight of our incentive compensation target to achieving strategic goals. In 2021, ESG performance was among one of the factors considered.	See the 2022 Proxy Statement for all factors considered.	2022 Proxy Statement