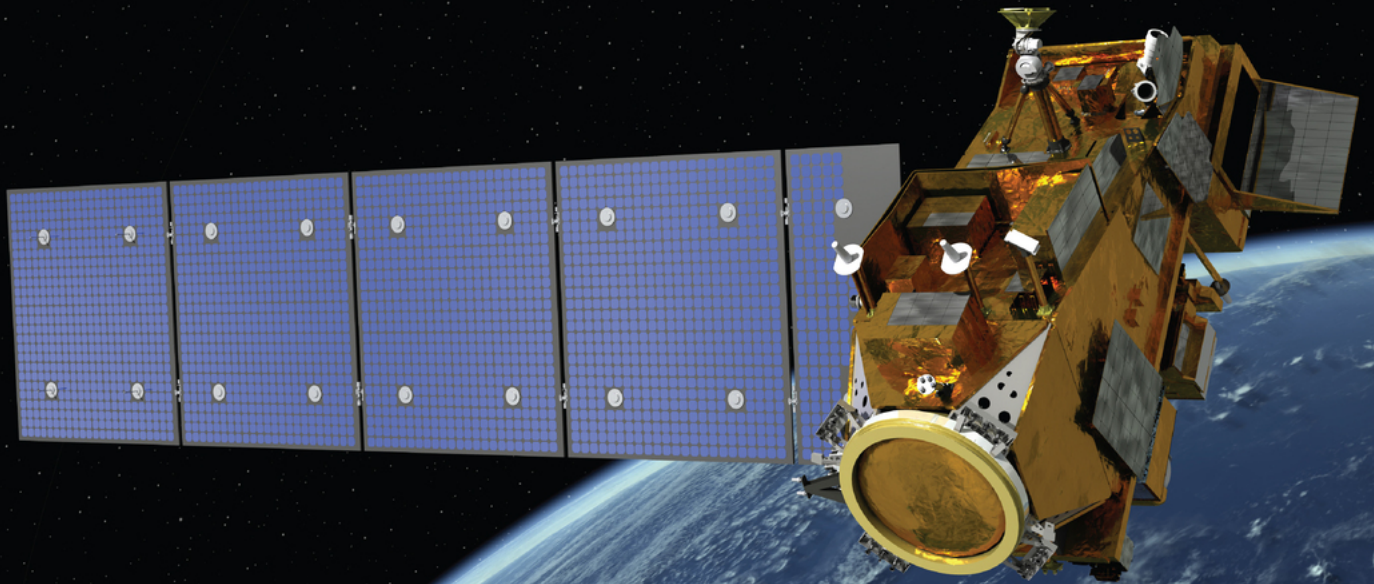


2023 TCFD Report

Following the recommendations of the task force
on climate-related financial disclosures



**NORTHROP
GRUMMAN**



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A Message from Our Chief Sustainability Officer

Ecosystem is an ever-evolving concept in the technology world. What used to define pieces of interconnected hardware now reflects so much more. Now the term includes the people who inspire technology itself, the supply chain impacts, as well as the ethics underpinning every decision along the way. All in addition to the natural world of which we are a part.

Over the past year, we have taken action towards achieving our next-generation climate-related goals as showcased throughout this Task Force on Climate-related Financial Disclosures (TCFD) report, which illustrates our strong commitments throughout our own ecosystems. From footprint reduction to supplier engagement to building a blueprint to a more sustainable future, all of these and more have been part of our company's growth this year. Our second consecutive TCFD report builds on our decades-long sustainability work and provides a transparent look into how we identify, quantify and manage climate-related risks and opportunities inside and outside our company walls.

Northrop Grumman's mission is to create a safer world for all while advancing human discovery. Harmonizing technology with the natural world is a bold and inspiring part of that mission; one we have eagerly embraced. We are driven by our ecosystems, the communities we work and serve in, and each other, which is why our entire team stands in service of a better, more sustainable future.

MIKE WITT

Chief Sustainability Officer
Northrop Grumman
March 16, 2023





About This Report

Northrop Grumman Corporation (herein referred to as “Northrop Grumman,” the “company,” “we,” “us,” or “our”), as a leading global aerospace and defense (A&D) technology company, recognizes the role we play in environmental stewardship, as well as the impact climate-related risks and opportunities may have on businesses, including our own and our suppliers. Northrop Grumman established an environmental sustainability program in 2008 to reduce the company’s environmental footprint by improving operational efficiency and integrating environmental sustainability practices across our operations. Our Environmental Sustainability Program supports a vision for a more sustainable future by expanding environmental sustainability awareness throughout our organization, supporting our corporate values and meeting the expectations of our diverse set of stakeholders. We are proud to produce this TCFD report, which is an update to the report we issued in Spring 2022.

This report reflects our commitment to transparency in climate-related disclosures. The report is structured in line with each of the four TCFD pillars – Governance, Risk Management, Strategy and Metrics and Targets – and describes ways in which Northrop Grumman integrates consideration of climate-related issues into its business practices.





DISCLOSURE STATEMENT

This TCFD report contains statements that constitute “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act of 1995. Words such as “will,” “expect,” “anticipate,” “intend,” “may,” “could,” “should,” “plan,” “project,” “forecast,” “believe,” “estimate,” “guidance,” “outlook,” “trends,” “goals” and similar expressions generally identify these forward-looking statements. Forward-looking statements include, among other things, statements relating to Northrop Grumman’s climate- and sustainability-related strategies, initiatives, commitments, plans, targets and goals. Forward-looking statements are based upon assumptions, expectations, plans and projections that we believe to be reasonable when made, but which may change over time. These statements are not guarantees of future performance and inherently involve a wide range of risks and uncertainties that are difficult to predict. Specific risks that could cause actual results to differ materially from those expressed or implied in these forward-looking statements include, but are not limited to, those identified and discussed more fully in the section entitled “Risk Factors” in the Form 10-K for the year ended December 31, 2022 and, from time to time in our other filings with the Securities and Exchange Commission (SEC). These risks and uncertainties are amplified by the global macroeconomic, health, security and political environments, including inflationary pressures, labor and supply chain challenges and the COVID-19 pandemic, which have caused and will continue to cause significant challenges, instability and uncertainty. You are urged to consider the limitations on, and risks associated with, forward-looking statements and not unduly rely on the accuracy of forward-looking statements. These forward-looking statements speak only as of the date of this report. We undertake no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by applicable law.

The information in this report is based in part on information from third-party sources that Northrop Grumman believes to be reliable, but which has not been independently verified by Northrop Grumman. Data, statistics and metrics included in this report are non-audited, non-assured estimates, continue to evolve and may be based on assumptions believed to be reasonable at the time of preparation, but may be subject to revision. This report also contains statements based on hypothetical scenarios and assumptions. These statements should not necessarily be considered as being indicative of current or actual risk or forecasts of expected risk.

The inclusion of information contained in this report should not be construed as a characterization regarding the materiality or financial impact of that information.





Progress Since Last Report

In 2022, we issued our first TCFD Report. Since then, we have made progress in each of the four TCFD pillars. Highlights include:

TCFD Pillar	Progress Highlights
 <p>GOVERNANCE</p>	<p>In February 2022, the Compensation Committee of the Board of Directors approved changes to the non-financial metrics in the Annual Incentive Plan design. The company revised the metric from a negative-only modifier by embedding it in our core metrics to reflect our continued focus on ESG and to bring greater alignment for employees, shareholders and other stakeholders. The non-financial metrics accounted for 10 percent of the overall 2022 annual incentive plan goals and the environmental non-financial metric was defined by reduction in absolute greenhouse gas (GHG) emissions in our operations.</p> <p>In July 2022, the Board committee charters were updated to further specify climate-related responsibilities, among other responsibilities. See the Board Oversight section for further discussion of climate-related oversight responsibilities.</p>
 <p>RISK MANAGEMENT</p>	<p>In 2022, we announced a goal to specifically target supply chain sustainability risk, including climate, and developed a cross functional team to develop and execute a strategy to achieve the goal. See the Supply Chain Risk Management section for further discussion.</p>
 <p>STRATEGY</p>	<p>In 2022, we developed our next generation water goals based on a water stress risk assessment performed in 2021. For each site in our operational control, we used World Resources Institute’s (WRI) Aqueduct Water Risk Atlas to determine if the site is currently located in a water-stressed area and/or if the site’s region is projected to be in a water-stressed area in 2030. For purposes of this risk analysis, we considered areas designated as having “high” and “extremely high” water stress per the Aqueduct Water Risk Atlas to be water-stressed locations. Based on this risk assessment, a majority of our sites are located in areas that may be water-stressed areas by 2030. As discussed in further detail in the Metrics and Targets section, we developed a water replenishment goal to specifically target our operations in current and future water-stressed sites.</p> <p>In 2022, we further enhanced our Net Zero operations¹ transition plan. Our strategy includes multiple facets - (1) sourcing renewable electricity, (2) identifying and implementing energy efficiency solutions across our sites and (3) engraining resource conservation and efficiency into operations decisions. Northrop Grumman is also pursuing other emissions reduction solutions including electrification, alternative fuels and energy monitoring. We expect that in order to reach Net Zero operations, approximately 10 percent of the overall emissions reduction from the 2019 baseline year will likely be addressed through carbon removals as the emissions will be from hard-to-abate sources.</p>
 <p>METRICS AND TARGETS</p>	<p>In 2022, after we announced our next generation sustainability goals, we established an interim target for our Net Zero operations goal of a 50 percent GHG emissions reduction by 2030 from a 2019 baseline year. See the Metrics and Targets section for further discussion.</p> <p>In 2023, we announced our next generation water and waste goals. See the Metrics and Targets section for further discussion.</p>

¹: “Net Zero operations” is defined as our goal to reach Net Zero GHG emissions in our operations (i.e., our Scope 1 and 2 GHG emissions) by 2035. Our baseline year for tracking interim progress on the goal is 2019.



Governance





Governance

We are committed to maintaining high standards of corporate governance consistent with our Values and in service to our shareholders, employees, customers and other stakeholders. Our Principles of Corporate Governance and Standards of Business Conduct, among other documents, serve as key pillars of our strong corporate governance practices, which reflect and reinforce our commitment to our core values and robust governance practices.

Our ESG governance model consists of robust Board oversight, complemented by management and executive leadership responsibility for the day-to-day management and operation of our sustainability program, including specific climate-related focus areas.

BOARD OVERSIGHT

Our Board provides leadership and oversight with respect to ESG practices and our enterprise risk management activities, including those related to climate, among other duties. Each of our independent Board committees assists in this role, providing its expertise. The full Board has ultimate responsibility for the oversight of risk, and receives updates from each of the committees as well as periodic reports from senior management, including the Chief Sustainability Officer (CSO), addressing specific issues and risks, including those related to climate.

Each standing committee of the Board has specific oversight responsibilities for climate-related matters. Specific climate-related roles and responsibilities, include the following:

1. The Policy Committee oversees the company's environmental programs, including climate change, Net Zero operations, water and waste reduction, and other initiatives and matters. The Policy committee reviews with the CSO at least annually the status of such programs and reviews. The committee also provides oversight and recommendations regarding the company's ESG report (formerly known as the Sustainability Report) and the TCFD report. In 2022, the committee reviewed the 2021 Sustainability Report and 2022 TCFD Report. This included review of the company's commitment to achieving Net Zero GHG emissions in our operations by 2035.

2. The Audit and Risk Committee assists the Board in its overall financial and enterprise risk management responsibility, including a review of the company's risks related to environmental (including climate change) matters. The committee also provides oversight of internal controls over publicly reported data in the ESG and TCFD reports and provides oversight of audit and assurance processes for ESG reporting. In 2022, the Audit and Risk Committee reviewed the company's risk factors in the 2021 Annual Report, which included: "Risks associated with climate change and other environmental impacts, and increased focus and evolving views of our customers, shareholders and other stakeholders on climate change issues, could negatively affect our business and operations."

3. The Compensation Committee approves the annual and long-term performance goals for our compensation program, including financial and non-financial metrics for our compensation program, among other responsibilities. The non-financial metrics include certain environmental and diversity, equity and inclusion goals. In February 2022, the Compensation Committee approved changes to the non-financial metrics in the Annual Incentive Plan design. The company revised the metric from a negative-only modifier by embedding it in our core metrics to reflect our continued focus on ESG and to bring greater alignment for employees, shareholders and other stakeholders. The non-financial metrics account for 10% of the overall 2022 annual incentive plan score and include a specific environmental metric - reduction in absolute GHG emissions.

4. The Governance Committee assists the Board in ensuring a comprehensive and effective framework for Board oversight, including of ESG matters. The committee also looks broadly at governance-related risks, including the role of each committee with respect to oversight of ESG and corporate culture, among other responsibilities.

For more information regarding our Board, including those members that have ESG experience, and Board committees, please see our [2023 Proxy Statement](#).



MANAGEMENT'S ROLE

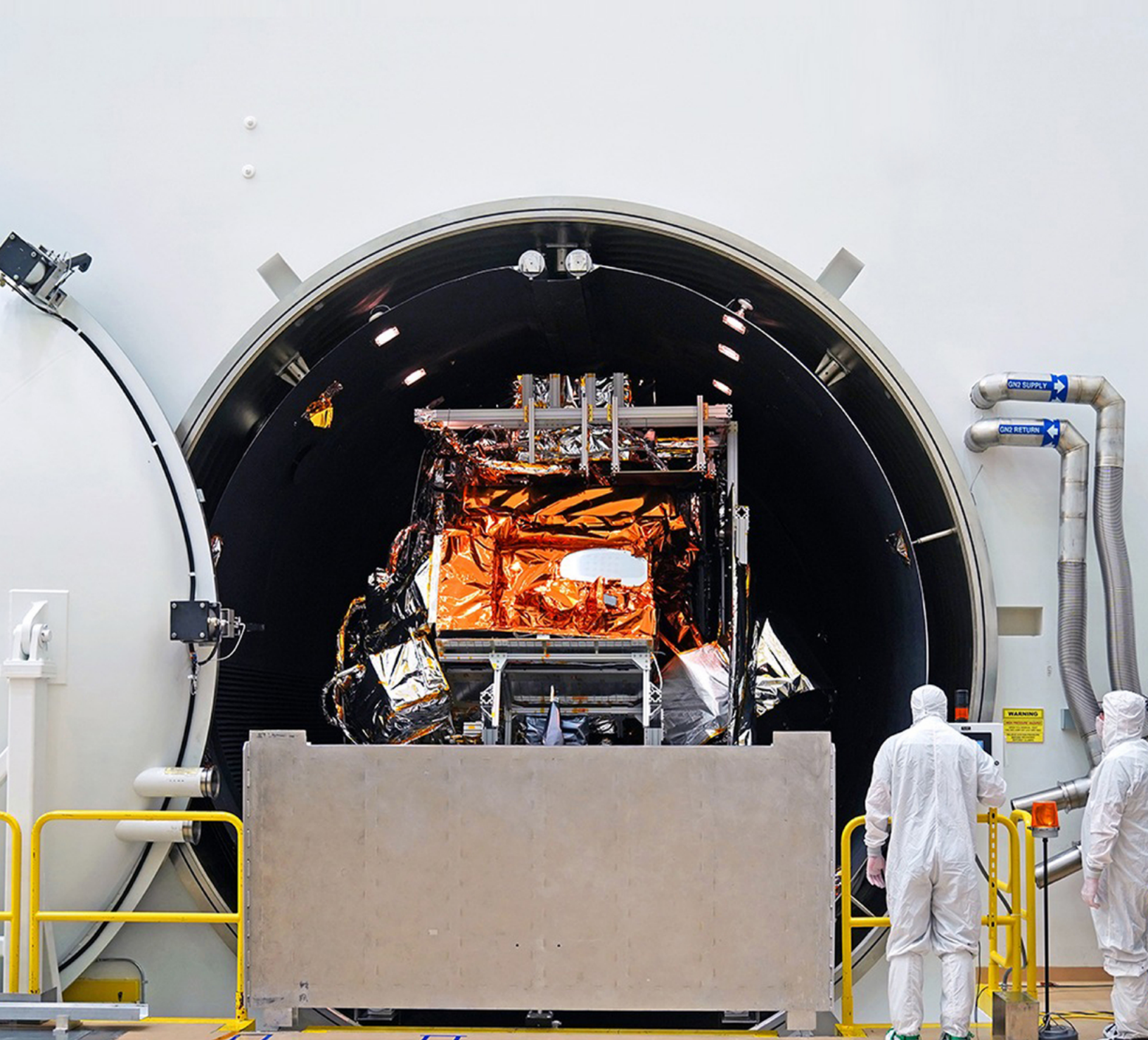
The CSO, who reports to the Chair, Chief Executive Officer and President (CEO), leads a team focused on a variety of sustainability initiatives such as designing and implementing enterprise-wide business practices for carbon reduction, resource efficiency and material management, including the development, management, tracking and reporting of climate-related targets and goals. See the [Metrics and Targets](#) section for further discussion. The CSO is responsible for helping to reduce the company's environmental impact and advance sustainability throughout the business. The CSO is also responsible for the monitoring of climate-related issues and risks and, as a member of the Enterprise Risk Management Committee ("ERMC"), brings forward those issues and risks for discussion as part of its overall risk management function.

Management is directly involved in sustainability risk assessment and monitoring, including risks related to climate change and natural disasters that may affect operations, through, among other things, the ERMC. The ERMC is comprised of the CEO, all members of the Executive Leadership Team (i.e., the sector presidents, the Chief Human Resources Officer, the Vice President of Global Operations, General Counsel, Chief Strategy and Development Officer, Chief Financial Officer, Chief Global Business Officer and Chief Communications Officer) as well as leaders across key functional areas, including the Chief Accounting Officer, Chief Compliance Officer, Chief Technology Officer, CSO, Corporate Secretary, Vice President of Global Supply Chain, Vice President of Internal Audit and Treasurer. Additional information about the ERMC is described in the [Risk Management](#) section.





Risk Management





Risk Management

Northrop Grumman proactively identifies, assesses and manages risks across all aspects of our business. The ERMC evaluates risks and mitigation strategies across the company, including new, emerging or evolving risks. Other groups within the company, such as business continuity and operational resiliency, and supply chain management, have specialized practices in place for additional risk identification, assessment and management.

ENTERPRISE RISK MANAGEMENT COUNCIL

The ERMC seeks to ensure that the company has identified and understands the more significant risks facing our business and that we have effective mitigation measures in place to address each of them. These risks are described in the company's Annual Report on Form 10-K. Included within these risks are natural disasters, environmental, health and safety, compliance with laws, hazardous and high-risk operations, and climate-related risks, such as increased wildfire risks, rising mean temperature and sea levels, and long-term changes in precipitation patterns, like increased drought, desertification and/or poor water quality.

The ERMC includes the CEO, all members of the Executive Leadership Team and others as noted above. The ERMC meets at least twice a year and the supporting working group and steering committee meet at least four times a year. At the ERMC meetings, members review each of the significant risks to the business, current trends related to those risks and the status and effectiveness of mitigation measures. For example, the ERMC reviews how climate change may continue to impact facilities, operations, employees and communities in certain regions potentially exposed to climate change-related natural disasters. Similarly, the ERMC evaluates how climate change-related disruptions could impact the availability and cost of materials needed for manufacturing, and how new or more stringent regulations adopted in response to climate change could require substantial capital investment and enhanced reporting. Importantly, the ERMC also identifies, discusses and considers new potential or emerging risks that could become significant to the company, including emerging climate-related risks, and integrates climate-related risks into the overall risk management process at Northrop Grumman.

Members of the ERMC discuss the status of each risk, whether the risk is increasing or decreasing and areas of concern. The company has developed risk mitigation efforts for each of our significant risks, which members of the ERMC manage. The ERMC members work with management on risk mitigation and provide updates at least annually to the Board.



BUSINESS CONTINUITY AND OPERATIONAL RESILIENCY

Our Business Resiliency team operates through centralized control and oversight. The Business Resiliency team conducts physical security surveys to evaluate risks and opportunities and their potential impacts to the company, personnel and/or operations. Business impact analyses are performed annually, originating at the site level and rolling up to the sector level, and the impact is determined on a scale of low, medium or high.

The team facilitates these business impact analyses in coordination with the sectors to assess the potential risk and identify the recovery prioritization of sites and business processes, as well as gaps in recoverability. The analysis assesses the effect on the company by determining the financial, reputational and known legal impact if recovery of the process is not achieved. Using a tiered ranking system, we evaluate risks to help determine prioritization based on probability, business impact (including a focus on top-tier suppliers), recovery time and if the exposure will be addressed at the site, sector or company level. When possible, we establish contingency plans in case our personnel or buildings are unavailable due to risks, such as natural disasters exacerbated by the effects of climate change. Certain risks and issues are elevated to sector and company leadership where mitigation options are developed and funded.





SUPPLY CHAIN RISK MANAGEMENT

Northrop Grumman's Global Supply Chain ("GSC") team utilizes a formal process to identify, assess and mitigate risks that have the potential to disrupt our supply chains. Risks are assessed broadly across 20 characteristics categorized as financial, operational or business. The team uses a data-driven approach to evaluate both the likelihood and impact of each risk. Risk assessments that exceed predefined prioritization levels trigger the development and execution of enterprise-level risk mitigation strategies. Each risk is regularly monitored to determine changes in assessment levels. This enterprise approach incorporates insights from a diverse set of stakeholders and data from many different sources, further enabling collaboration across our sectors to ensure that risks are identified and managed at the appropriate level. Risk management strategies are then applied at the program levels leveraging risk registers that are informed by guidance and data gathered across the enterprise.

Natural disasters, which continue to be exacerbated by climate change, are one of the characteristics integrated into our GSC risk management approach. Our GSC risk management strategy is informed by the natural and environmental disaster risk exposure of our supply chains. Such disasters could affect supplier performance on our contracts and ultimately impact our operations. When a natural disaster-related event is realized, we assess the probability of supply chain disruption, as well as the severity of potential impact to our business operations and programs. Detailed mitigation plans are established at the local or enterprise level in collaboration with our internal stakeholders and suppliers, as appropriate.

In 2022, to specifically target supply chain sustainability risk, we announced a goal to "Update the company's 'Standards of Business Conduct for Suppliers and Other Trading Partners' to incorporate industry-leading sustainability practices by 2023." In response to developing and executing this goal, we established a Global Supply Chain Sustainability Working Group. This team reports to the Supply Chain Leadership Council and is composed of members of supply chain at the sector and corporate levels as well as Investor Relations, Corporate Environmental Sustainability, Mission Assurance, Supplier Diversity, Transportation, the Law Department and Organizational Development. Team members are responsible for the development of the GSC Sustainability Strategy with focus on integrating and advancing ESG considerations. This effort includes utilizing industry best practices to incorporate climate-related considerations into our supply chain processes and engagements with suppliers and other external stakeholders. As of 2022, Northrop Grumman is a member of the International Aerospace Environmental Group (IAEG)'s Work Group 11, which is focused on Aerospace Industry ESG Engagement, including engagement across the supply base.





Strategy





CLIMATE-RELATED RISKS AND OPPORTUNITIES AND THEIR IMPACT ON THE ORGANIZATION

Northrop Grumman recognizes that climate-related risks and opportunities have the potential to impact our business in the short, medium and long term. For the purpose of our climate-related risk and opportunity assessment, we define “short term” as zero to five years, “medium term” as five to 15 years and “long term” as greater than 15 years. We selected these time horizons as these climate-related risks can manifest themselves across our risk categories at different points in time. The following climate-related risks and opportunities that Northrop Grumman may face throughout these time periods are described below, including our management team’s approach to addressing them.

Time Horizon	Climate Risks	Climate Opportunities
Short-term <i>0-5 years</i>	<ul style="list-style-type: none"> ■ Market and reputation transition risk ■ Acute physical risk 	<ul style="list-style-type: none"> ■ Resource efficiency ■ Energy source and resilience ■ Products/services and market
Medium-term <i>5-15 years</i>	<ul style="list-style-type: none"> ■ Policy and legal transition risk ■ Market and reputation transition risk 	<ul style="list-style-type: none"> ■ Products/services and market
Long-term <i>Greater than 15 years</i>	<ul style="list-style-type: none"> ■ Technology transition risk ■ Market and reputation transition risk ■ Chronic physical risk 	

We use the word “material” throughout this report, consistent with Global Reporting Initiative terminology, which states that material issues include those that “reflect the organization’s significant economic, environmental and social impacts; or substantively influence the assessments and decisions of stakeholders.” We do not use the term as defined by, or in the context of, SEC laws, including those related to SEC reporting and disclosure obligations (or any other securities laws) or as the term is used in the context of financial statements and financial reporting.

OPPORTUNITIES

TIME HORIZON: SHORT	OPPORTUNITY AREA: RESOURCE EFFICIENCY
Impact on Business	Resource efficiency creates an opportunity for reduced operating costs at a company’s sites.
Examples	<p>Building Efficiency</p> <p>Driven by Northrop Grumman’s Environmental Sustainability Program and climate goals, we annually invest in our infrastructure through energy efficiency and GHG emission reduction projects, reducing the cost of our operations and minimizing our environmental footprint worldwide.</p> <p>We have 17 “green” buildings in our portfolio, certified to Energy Star and LEED standards, and totaling approximately 2.2 million square feet of floor space. Investments in projects such as these drove performance toward our previous GHG emission reduction goal and reduced operating costs.</p> <p>Transportation Efficiency</p> <p>Northrop Grumman has been a registered U.S. Environmental Protection Agency (EPA) SmartWay Transport Partner since 2008, enabling us to increase our visibility into our freight transportation activities and optimize our transportation modes. Additionally, we have transitioned a significant portion of international shipments from air to surface. These initiatives have increased shipment efficiency, decreased fuel use and reduced Scope 3 GHG emissions.</p>

**TIME HORIZON: SHORT****OPPORTUNITY AREA: RESOURCE EFFICIENCY****Examples (continued)****Transportation Efficiency (continued)**

We have also started to shift our fleet from gas to electric vehicles (EVs) where practicable, and have grown our EV workplace charging program significantly. This better enables employees to have electric cars, therefore lowering our Scope 3 emissions and improving employee satisfaction.

Enabling and engaging our employees to participate in carbon reduction activities is a central part of our environmental sustainability mission. Our EV Workplace Charging Program helps address our employees' demand for onsite charging stations as the use of EVs continues to rise. In 2022, 720 new drivers enrolled in this program, representing a 34% increase in enrollment since 2021. At the end of 2022, we had approximately 2,900 drivers in the program. Three new sites began providing EV charging for employees in 2022, and a total of 14 new charging connections were added across the enterprise to accommodate employee demand for this service.

Reduced Water Usage

Each year, we invest in our infrastructure by implementing water use reduction projects, which decreases the cost of our operations and shrinks our environmental footprint across all of our global operations. For example, the 11 projects completed in 2022 are estimated to conserve 15 million gallons annually.

In 2021, we converted a complete chiller system with 14 hydraulic units into a single pass cooling system at our site in Radford, Virginia, conserving 18 million gallons of water and saving \$140,000 in operational costs annually.

Additionally, our Advanced Technology Laboratories (ATL) site near Baltimore, Maryland completed the implementation of a wastewater recycling solution that significantly reduced water consumption. At ATL, researchers develop some of the most technologically-advanced microelectronics in the world, a process that is not only water intensive, but also requires ultra-pure, deionized water.

The project team designed a sophisticated and highly focused water filtration system to ensure wastewater could meet the quality standards. After two years of reviewing technology, facilitating bench-scale testing designs and piloting the solution, the system was commissioned and brought online in April 2020.

The ATL project received the Industrial Environmental Association's 2020 Environmental Excellence Award. With the system fully operational, ATL has a roughly 50% water reuse rate, meaning half of each gallon used is treated and put back into the water system. This system will save approximately 33 million gallons of potable water annually.

These projects help us with our water conservation goals and reduce operational costs. We will continue to identify and implement similar projects to leverage this opportunity.

**TIME HORIZON: SHORT****OPPORTUNITY AREA: ENERGY SOURCE AND RESILIENCE****Impact on Business**

New and renewable energy sources create significant opportunities for a company to reduce operational costs, increase cost competitiveness, reduce exposure to fossil-fuels and transition toward lower-emissions sources.

Examples**Renewable Energy Sources**

We completed the installation of our newest solar power-generating system at our Rolling Meadows, Illinois site in 2021. This array is the largest onsite solar energy installation at a Northrop Grumman facility to date and joins the company's other solar power initiatives in Florida, California and Virginia. The new system generates 1.1 megawatts of alternating current solar electricity and will reduce an estimated 870 metric tonnes of carbon dioxide emissions each year – enough to power nearly 100 homes for a year.

We are proud to add this project to the company's growing renewable energy portfolio, which now includes four fully-installed, company-owned, onsite solar arrays and the acquisition of Renewable Energy Certificates (RECs) prior to certain Virtual Power Purchase Agreements coming online. In 2022, our onsite renewable energy sources generated 660 megawatt hours (MWh) of electricity and our total renewable energy consumption was 156,840 MWh. We continue to work on new renewable energy opportunities across our sites.

Alternative Fuel

Although we do not produce it, aviation fuel is important to our business and advancements in its formulation offer significant opportunities to reduce emissions. We are committed to exploring the use of sustainable aviation fuel alternatives in our products as they become available and welcome the ability to participate in additional emission reduction programs.

Energy Conservation

Energy conservation is a central tenet to reducing our GHG emissions and we are committed to driving energy conservation throughout our operations. Internally, our Energy Management Committee brings together site representatives from across the company to share best practices and learn about new technologies that could drive further efficiencies. Externally, our partnership with the U.S. EPA ENERGY STAR program has supported the implementation of efficiency measures at our sites and reinforces our commitment to energy conservation.

**TIME HORIZON:
SHORT TO MEDIUM****OPPORTUNITY AREA:
PRODUCTS/SERVICES AND MARKET****Impact on Business**

Climate-related issues may increase demand for lower-emissions technologies and for capabilities that support environmental and weather research. A shift in investor attitudes toward industries with lower-perceived impact on climate change and that are able to demonstrate climate transition preparedness has the potential to positively impact a company.

Examples**Substitution of Existing Products and Services with Lower Emissions Options**

The U.S. government's use of buying power to reward climate innovation in new products or services could result in opportunities for Northrop Grumman to continue to develop new products and technology with lower emissions, climate resiliency or technological advances that assist with the transition to a low-carbon economy.

Climate Adaptation Solutions

Changing conditions impacting the frequency of extreme weather, the movement of glaciers and soil moisture conditions require increased monitoring and measurement. From observations to decision support, Northrop Grumman develops and operates systems and services to deliver environmental intelligence through science, sensors and enterprise services.

In 2022, we expanded engagement with our Technology for Conservation (T4C) program and launched two new projects. One new project is HOP Queue, which utilizes a hyperspectral imager and an onboard artificial intelligence processor to more quickly and efficiently determine coastal water and forest health from low Earth orbit. Phase 1 of the project is currently underway. During this phase, airborne data is being collected using the new HOP Queue method and is being compared to "truth data" from smart buoys on the Chesapeake bay as well as satellite images and prior data acquired from partners like the National Aeronautics and Space Administration (NASA) to establish a baseline.

The second new T4C project is Project Glacier Watch, which establishes an innovative system to better measure glacial melt below the surface of the ocean, a major cause of sea level rise. The project utilizes sensors mounted on smart buoys to collect conductivity, temperature and depth information data. This allows the T4C team and our partners at the NASA Jet Propulsion Lab and Hyperkelp to measure the sub-glacial meltwater plume from fixed depths. The buoys will take daily measurements in several places along the underwater column, creating a more frequent and efficient data collection method.

Other examples include:

- The Global Hawk air vehicle that is being used by NASA earth science missions as sustainment services for the Air Force Weather program;
- The ICESat-2 satellite that measures the changing height of Earth's glaciers, ice sheets and sea ice; and
- The AstroMesh-Lite® reflector being developed for NASA's Jet Propulsion Laboratory Soil Moisture Active Passive spacecraft.



**TIME HORIZON:
SHORT TO MEDIUM**

**OPPORTUNITY AREA:
PRODUCTS/SERVICES AND MARKET**

Examples (continued)

Landsat 9

Landsat 9 is a joint mission formulated, implemented and operated by NASA and the United States Geological Survey. The mission continues the Landsat program’s critical role in monitoring, understanding and managing the land resources needed to sustain human life. Landsat data constitutes the longest continuous record of the Earth’s surface as seen from space, a unique and valuable resource for applications including agriculture, land use mapping, forestry, carbon cycling and sequestration, and water resource management. Landsat is the only U.S. satellite system designed and operated to repeatedly observe the global land surface to show both natural and human-induced change at a scale that enables users to see detailed human-scale processes, such as urbanization, but not individual houses.

Research and Development Innovation

Northrop Grumman has provided a significant investment in a partnership with the California Institute of Technology (Caltech) for the development of the Space Solar Power Initiative. This program brings together our top engineers with researchers from Caltech to develop scientific and technological innovations to enable a space-based solar power system capable of generating electric power at cost parity with grid-connected fossil fuel power plants. In 2015, Northrop Grumman provided \$17.5 million to support this project and continues to collaborate with the Caltech team to develop solutions, build prototypes and obtain experimental and numerical validation concepts that could allow for the development and eventual implementation of new deep space solar technology.

**TRANSITION RISKS**

TIME HORIZON: MEDIUM	RISK TYPE: POLICY AND LEGAL
Description	Companies may face new climate change-related policy and legal requirements, such as carbon taxes or cap-and-trade programs, in the states and/or countries in which they primarily operate.
Impact on Business	<p>Carbon Tax</p> <p>The financial impact of a carbon tax could be significant, based on Northrop Grumman’s historical Scope 1 and 2 emission levels and the International Energy Agency’s (IEA’s) estimated carbon price of \$140/tCO₂ by 2040. A deeper analysis of carbon taxes can be found in the Resilience of Strategy section.</p> <p>Requirements for and Regulation of Existing Products and Services</p> <p>Although existing products and services are less likely to be impacted by climate-related requirements, such as emission limits, our facilities and operations may be indirectly exposed to such requirements. Increased regulatory requirements have the potential to result in additional costs based on GHG emissions. This may result in a meaningful impact to our business.</p>
Management Approach	<p>Emissions Reductions Goals</p> <p>In 2022 we announced our next generation environmental sustainability goals. These include Net Zero GHG emissions in operations by 2035 and sourcing 50 percent of total electricity from renewable sources by 2030. By proactively and voluntarily reducing our GHG emissions, we are minimizing exposure to future carbon taxes from the federal government, states and/or countries where we do business, while also making a meaningful contribution to the fight against climate change. Please see the Climate-Related Targets section of this report for more on our emissions reductions goals.</p> <p>Environmental Health and Safety (EHS)</p> <p>The EHS team heads the company’s efforts to conduct our operations in an environmentally responsible manner and in accordance with applicable legal requirements and best practices, including with respect to GHG emissions.</p> <p>Regulation and Regulation Tracking</p> <p>Management functions – such as the Law Department, Business Management, Internal Audit and Global Supply Chain – proactively track emerging requirements to allow us to assess and implement changes to our business operations and minimize climate-related costs associated with new governmental programs.</p>



TIME HORIZON: LONG	RISK TYPE: TECHNOLOGY
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Description	Technological improvements that support the transition to a low-carbon economy have the potential to have a meaningful impact on companies generally. For example, companies with lower-emission products or services may have a competitive advantage over those whose products create higher GHG emissions. Further, costs to reduce emissions, purchase renewable energy or implement carbon capture technologies at facilities could be significant.
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Impact on Business	<p>Substitution of Existing Products and Services with Lower Emissions Options</p> <p>Changes in our customers’ requirements, priorities and ways of doing business have an impact on our business, operations and financial success. These changes create opportunities and risks. If, for example, our customers develop requirements and adopt procurement policies that encourage social and environmental objectives, including products and technology with lower emissions, climate resiliency or technological advances that assist with the transition to a low-carbon economy, and we are unable to meet those evolving demands, our competitiveness may be impacted. However, we may have opportunities to be more successful in selling our products, winning new business and growing our revenues if we are able to meet customer expectations about social and environmental objectives.</p>
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Costs to Transition to Lower Emissions Technology

Considering the pace of sustainability-focused technological advancements across the globe and the emissions and/or climate impacts associated with the defense industrial base, both for Northrop Grumman and our suppliers, it is reasonably likely that the industry will experience changes in technology over the next 20 to 30 years. As we expect many of these costs will be considered allowable and allocable costs to our U.S. government contracts, it is expected that they will be recoverable through our cost plus contracts but not our fixed price contracts in the short term. However, there is potential for the costs to impact overall affordability in the short term and that some of these costs could be managed through efficiencies gained in the future.

Management Approach	<p>Product Development</p> <p>Our products and services are designed to meet contractual requirements of our customers, primarily the U.S. government. Company-sponsored research and development investment strategy includes significant investment to support future technologies and mission solutions primarily related to government programs. One example of a low-carbon future technology is the development of a space-based solar power system. Please see the Opportunities section of the report to learn more.</p>
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**TIME HORIZON:
SHORT TO LONG**

**RISK TYPE:
MARKET AND REPUTATION**

Description

Investors, advisory services, government regulators, lenders, insurers and other market participants have focused increasingly on the environmental or “sustainability” practices of companies. There is the potential for increased market and reputational risk tied to changing customer and stakeholder expectations and standards, which continue to evolve, related to an organization’s ESG practices, disclosures and performance, including expectations about transitioning to a low-carbon economy. For example, the perception that a company is not a responsible environmental steward or any failure to effectively respond to new or evolving legal and regulatory requirements or other sustainability concerns could adversely affect a company’s business, reputation or financial position. This also could create opportunities, as noted above.

Impact on Business

Changing Customer Behavior

Many of the arenas in which we operate are characterized by rapidly changing technologies and are highly competitive. If customer acquisition strategies, including those of the U.S. government, are modified to include climate change-related requirements, and we meet those evolving demands, we may see competitive advantages and enhanced future successes. If, conversely, current or future competitors outperform us in response to such demands or on our current and planned transition efforts to innovative climate-related products or services, we could lose future business to our competitors, which could affect our ability to maintain market share and affect our financial position, results of operations and/or cash flows.

Increased Cost of Raw Materials

The long-term nature of Northrop Grumman’s contracts would mean that an unanticipated, significant and extended period of rising raw material and component prices (either because of inherent value appreciation or supplier logistics pass-through costs) would impact profitability until contract expirations allow for repricing or other suppliers can be identified to avoid becoming less affordable on future contracts. Raw materials can also include the cost of electricity, natural gas and jet fuel. As the world transitions away from fossil fuels in an attempt to lessen GHG emissions, there could be considerable additional costs placed on gas and oil for a variety of uses, including electricity, freight and transportation. Northrop Grumman relies on electricity and fuel usage in the manufacturing of our products, and sudden or significant increases in prices outside of cost escalation assumptions could impact the profitability of our fixed-price U.S. government contracts, as well as the affordability of our cost-type contracts.



TIME HORIZON: SHORT TO LONG	RISK TYPE: MARKET AND REPUTATION
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**Impact on Business
(continued)**

Increased Stakeholder Interest

Shareholders, financial institutions, insurers and others have increasingly looked to a company's ESG practices, disclosures and performance, which include climate-related matters and metrics, before making investment or other financial decisions. Regulators have been increasing requirements and enforcement activities. We believe our practices, disclosures and performance are strong and growing. However, if they do not continue to meet investor, lender, regulator or other stakeholder expectations and standards, which continue to evolve, our access to capital may be negatively impacted, including in both the equity and debt markets, and we may be adversely affected.

Management Approach

Commitment to Climate Adaptation

Northrop Grumman is committed to the proactive management of our environmental impacts and risks. We show this commitment by setting climate-related targets, promoting strong leadership in environmental sustainability and climate change, and responding to voluntary disclosure frameworks, such as TCFD. We believe this continued commitment gives us a competitive advantage in the marketplace.

Long-Term Contracts

When practicable, Northrop Grumman negotiates long-term price agreements with suppliers to protect against the risk of price escalations over time. This strategy has also been used to mitigate risks attributed to inflation and to capitalize on the availability of supplier capacity during market disruptions.

PHYSICAL RISKS

TIME HORIZON: SHORT	RISK TYPE: ACUTE
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Description

Acute physical risks refer to those that are event-driven, including the increased severity of extreme weather events such as hurricanes, wildfires or floods. These events can have direct (physical damage) and indirect (business and supply chain disruption) impacts on a company's operations. As a result of the increased risk and expected recovery cost after catastrophic climate events, there is a risk of insurance coverage becoming less available or a larger financial burden.

Impact on Business

Increased Severity of Extreme Weather Events

The increase in frequency and/or severity of extreme weather events may have a significant impact on many parts of our business, including: our manufacturing, warehousing, research and development, administration and other use facilities that have been and may in the future be exposed to extreme weather events; distribution facilities, logistics and transportation, supply chain and even demand for product, as stated within the Risk Factors section of our Annual Report. We have significant operations, including centers of excellence, located in regions that have been and may in the future be exposed to hurricanes and other damaging storms, changing water levels, wildfires and other natural disasters. Our subcontractors and suppliers similarly are subject to natural disasters that could affect their ability to deliver or perform under a contract, including possible disruptions to their workforce or the critical industrial infrastructure needed for normal business operations.

**TIME HORIZON: SHORT****RISK TYPE: ACUTE****Impact on Business
(continued)****Insurance Coverage Loss**

As property and casualty insurers look to remain profitable in the face of an increase in frequency and severity of extreme weather events, certain insurance coverages, like commercial property, may undergo significant price increases and re-underwriting. This could result in higher deductibles, lower policy limits and restrictions in coverage for certain geographies. If we experience a significant disruption to our business because of a natural disaster and insurance or other risk transfer mechanisms are unavailable or insufficient to recover all costs, it could have an adverse effect on our financial position, results of operations and/or cash flows.

Management Approach**Business Resiliency Program**

The program is designed to enable the company to respond effectively to unanticipated events like natural disasters with an emphasis on the protection of people, information and assets, as well as continuity of mission. The Business Resiliency Team leverages annual risk assessments to evaluate risks and opportunities and their potential impacts to the company, personnel and/or operations.

Our business continuity and operational resiliency response in Louisiana is one such example.

Northrop Grumman's Aircraft Maintenance and Fabrication Center in Lake Charles was directly impacted by Hurricane Laura in late August 2020. The region was hit by the hurricane which, with high winds, delivered devastating loss of life and property damage to the community. Residents were just recovering from this first hurricane when Hurricane Delta hit in early October 2020, bringing another round of torrential rains across the region. Both hurricanes caused widespread power outages and flooding, which created extensive debris fields.

Crisis management teams engaged early, with Northrop Grumman's recovery and response preparation efforts guided by well-documented crisis management and business continuity plans and established protocols. Once all personnel had been accounted for, teams were deployed to assist with employee needs including supplies, insurance coordination, repairs, temporary housing and more, with a focus on timely and targeted outreach and communications. Partial business resumption after Hurricane Delta occurred after only nine days, and full resumption occurred after 20 days, demonstrating improved resiliency. In 2021, Northrop Grumman received Disaster Recovery Institute International's "Award for Excellence" in the category of Response and Recovery of the Year based on our crisis management response to these hurricanes.

More information about our Business Resiliency Program can be found in the [Risk Management](#) section of this report.



TIME HORIZON: LONG	RISK TYPE: CHRONIC
Description	Chronic physical risks refer to longer-term shifts in climate patterns. This may manifest as extreme variability in weather patterns and sea level rise, causing disruptions to a company’s global supply chain and impacting operational continuity and the demand for and use of the company’s products.
Impact on Business	<p>Changes in Precipitation Patterns and Extreme Variability in Weather Patterns</p> <p>Extreme weather can disrupt all transportation mediums across the supply chain, particularly on coastal ports most impacted by tropical storms and hurricanes. We work with many small suppliers who may not be able to afford climate adaptation efforts. These factors could result in an elevated potential for adverse downstream impacts on our operations because of the disruption of our supply chain.</p> <p>Rising Sea Levels</p> <p>Northrop Grumman has facilities in the coastal states of the continental U.S. that are susceptible to disruption from sea level rise. Furthermore, the global supply chain may be exposed to similar risks as well, stemming from significant damage to coastal ports, which could also affect material flow.</p>
Management Approach	<p>Supply Chain Risk Management</p> <p>Natural disasters, which continue to be exacerbated by climate change, are one of the characteristics integrated into our GSC risk management approach. Our GSC risk management strategy is informed by the natural and environmental disaster risk exposure of our supply chains. Such disasters could affect supplier performance on our contracts and ultimately impact our operations. When a natural disaster-related event is realized, we assess the probability of supply chain disruption, as well as the severity of potential impact to our business operations and programs. Detailed mitigation plans are established at the local or enterprise level in collaboration with our internal stakeholders and suppliers, as appropriate. Please see the Supply Chain Risk Management section of this report for more information on our supply chain risk management process.</p> <p>Site Selection</p> <p>Northrop Grumman’s ERM includes chronic physical risks as part of its risk assessment and management programs. We leverage insurance modeling systems to determine the maximum windstorm exposure as well as proximity to coasts when designing new buildings, and use this as a basis for annual insurance coverage. We also review the infrastructure supporting critical sites and assess and rank priority risk level based on function and facility two times a year to determine the best way to support the highest-priority facilities.</p>



RESILIENCE OF STRATEGY

In 2022, Northrop Grumman conducted a climate scenario analysis on certain physical and transition risks to gain a deeper understanding of our resilience in different climate scenarios. The climate scenarios chosen are based on standardized third-party scenarios, which are widely used when performing climate scenario analyses to enhance comparability of climate resilience across companies. The modeling processes and results of these analyses are discussed below. We did not update these analyses in 2023 as there has not been a significant change in our underlying assumptions, including the location of our major operations, and have included the 2022 results again in this report for reference. We did not include drought in our previous physical risk analysis; however, see the [Progress Since Last Report](#) section for discussion of the water stress risk assessment used during 2022 as we developed our next generation water goals.

TRANSITION RISK

For our 2022 transition risk assessment, we focused on the potential for increased pricing of GHG emissions because of the implementation of a carbon price. The analysis contemplates the impact of direct carbon taxes on our Scope 1 emissions, as well as the increased price of electricity (Scope 2), driven by pass-through costs from utility providers as a result of direct carbon pricing on their emissions.

SCENARIO SELECTION

To understand the potential impacts of carbon pricing, we chose two scenarios for our analysis based upon the IEA Stated Policies Scenario (STEPS, 2.6°C) and Sustainable Development Scenario (SDS, 1.5-to-2°C), across a time horizon spanning from a base year of 2021 to 2050. For the purpose of modeling the impact of carbon pricing, STEPS considers only currently-enacted carbon policy (which aligns with a 2.6°C increase in temperature by 2100 relative to pre-industrial levels), whereas SDS represents IEA's view on the policy necessary for an orderly transition to a low-carbon economy in support of global temperature increases well below 2°C.

STEPS is based on policies in place as of mid-2021. It includes long-term energy and climate targets only to the extent that they are backed up by specific governmental or regulatory policies. Under STEPS, the share of renewable energy is gradually increasing, and accounts for over 40% of electricity generation by 2040. SDS assumes a near-term surge in clean energy policies and investments to achieve sustainable energy objectives in line with the Paris Agreement, including universal access to modern energy and air quality goals. Renewables are even more prevalent than in STEPS, with all advanced economies reaching net zero emissions by 2050.² Although some assumptions made by the IEA may seem aggressive relative to current trends, they are modeled as presented for standardization purposes and best practices to allow us to understand the impact to our business under a 1.5-to-2°C warming scenario. We believe these two scenarios provide a useful comparison between existing policy (STEPS) and what would be necessary to avoid the worst physical impacts of climate change (SDS).

²: Assumption taken from the EIA's 2021 World Energy Outlook.



METHODOLOGY OVERVIEW

Using information from scientific studies performed by the IEA and other available energy and policy projections, we determined and modeled the characteristics associated with IEA’s STEPS and SDS climate change scenarios from present day through 2050. We also considered two potential emissions paths to quantify the potential carbon cost associated with each under the defined time horizons and climate scenarios. The first of these represents a scenario that does not reflect consideration of Northrop Grumman’s Net Zero operations commitment and so includes no expected GHG reductions. Although we do not expect this scenario to occur, we modeled this to reflect the potential risk to our operations in the absence of a net zero commitment. The second scenario reflects the potential impact of achieving our commitment to Net Zero operations by 2035.

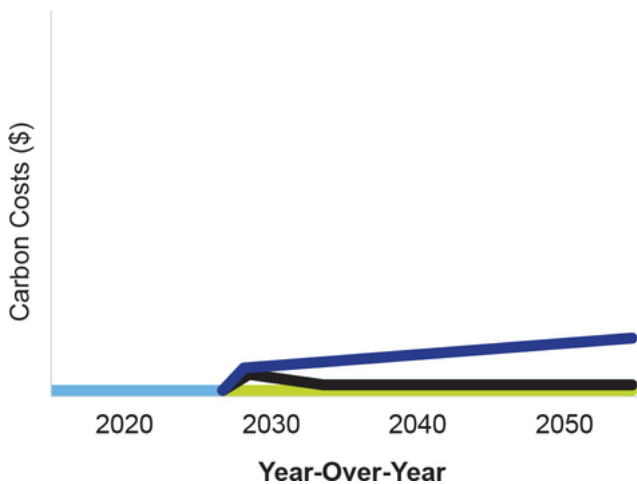
Our model applied a simplified approach to emissions reductions. We will continue to refine this analysis in the future. We did not explicitly model, for example, the emergence of the cost of a transition to renewable energy generation sources that may arise in the future.

In addition to different climate scenarios and GHG strategies, we separately projected carbon prices for the operating regions in which Northrop Grumman observes significant GHG emissions (U.S., U.K. and E.U. countries with and without a net zero target, and Australia) under each climate change scenario. We calculated the direct Scope 1 carbon price impact based upon these projections in conjunction with Scope 1 emissions projections by site under both future GHG strategies and relevant time horizons. Indirect Scope 2 carbon price impacts were modeled through the increase in electricity costs to our business (assumed to be passed through from electric utilities). We separately projected electricity prices for the operational regions listed above under each climate change scenario. The indirect Scope 2 carbon price impact was calculated based on these projections, in conjunction with energy consumption projections by site, under both future GHG strategies.

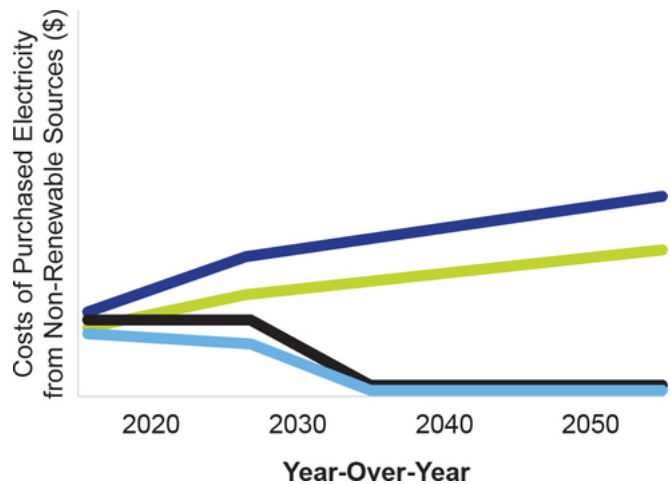
RESULTS

The potential carbon price impact to Northrop Grumman varies considerably across climate change scenarios, as the lower warming scenario (SDS) requires a more stringent policy implementation. In this scenario, the impacts to operating expenses are projected to be substantially higher than the STEPS scenario by 2050 on both Scope 1 and 2 emissions. The graphs below are shown in the same scale and represent the potential magnitude of the impact of each scenario under each GHG strategy through 2050 for Scope 1 and Scope 2 emissions.

Scope 1 Modeled Carbon Cost



Scope 2 Modeled Costs of Purchased Electricity from Non-Renewable Sources



Emissions Strategy & Scenario

- No Strategy Change - SDS
- Net Zero - SDS
- No Strategy Change - STEPS
- Net Zero - STEPS



As shown in the graphs, our projections of the potential direct impact of carbon pricing on Scope 1 emissions under STEPS is very low. This is not surprising, as the majority of our operations are in the U.S. where no broad carbon price is currently in effect. Under SDS, the increase in 2030 is driven by the scenario's assumption of carbon pricing being implemented in the U.S. at that time, which is then assumed to increase year-over-year from 2030 through 2050. In either scenario, the estimated direct impact of carbon pricing on our Scope 1 emissions, as produced by our model, is negligible due to our low Scope 1 emission levels. The primary source of potential cost from the implementation of carbon pricing is from purchased electricity costs (Scope 2 emissions) as utility companies pass the carbon price on their emissions through the cost of electricity. However, our risk of carbon pricing can be decreased by achieving our commitment to Net Zero operations.

Furthermore, under both the STEPS and SDS scenarios, the impact of carbon pricing does not appear significant relative to prior year revenue in either emissions strategy. For these reasons, we believe we are currently resilient in a carbon policy environment that is aligned to 1.5-to-2°C. We will continue to revisit this analysis in the future as carbon policy in our significant operating areas evolves. Additionally, we will continue to enhance our scenario analysis to contemplate additional forms of transition risks and to generate and share a more complete picture of our transition risk exposure.

PHYSICAL RISK

As a leading global A&D company, we rely on the continued operations of our facilities and the safety of our employees. Our physical risk assessment focuses on the potential changes to the risk of flood, tornados, tropical cyclones and wildfires at all of our site locations, including manufacturing facilities, offices and warehouses.

SCENARIO SELECTION

Similar to our scenario analysis selections in transition risk modeling, we use established third-party scenarios from the Intergovernmental Panel on Climate Change (IPCC) to model our potential risk exposure. Representative Concentration Pathways (RCP) 2.6 and RCP 8.5 are two generally-accepted scenarios used for the purposes of discussing physical risk scenario testing, and we believe that they provide a useful contrast of best- and worst-case physical risk exposure. RCP 2.6 is characterized by substantial net negative GHG emissions by the year 2100. It assumes carbon transition policies are put in place and is largely aligned with the well-below 2°C warming scenario described in the Paris Agreement. Alternatively, RCP 8.5 is characterized by very high emissions throughout the 21st century. Though considered relatively unlikely, this scenario would result in approximately 4.3°C of warming³ as minimal additional effort is made to constrain GHG emissions. This is generally considered a “worst-case” climate change scenario.

METHODOLOGY OVERVIEW

Our physical risk assessment starts with assigning objective, peril-based risk scores to each of Northrop Grumman's site locations. These scores align with risk levels ranging from Very Low to Extreme. A baseline (present day) score is given to each location for each peril type we analyzed, and this score is then projected into future time horizons. Projections are calculated by analyzing historically-observed weather data, current risk scores and weather projections under various climate change scenarios. The table on the next page details present day and projection scoring methodology for each modeled peril.

³: Assumption taken from the IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.



Peril	Current (Historical) Scoring Methodology	Projection Scoring Methodology
Flood	Severity: flood depth (feet) Frequency: flood return period (years)	Projections calculated based on adjusted return period variables
Tornado	Severity: average wind speed translates to severity category Frequency: average number of occurrences of the corresponding severity category in 40 years, within 25 miles of the location	Projection based on the weighted average of the % changes of two variables: 1. Maximum one-day precipitation level 2. Maximum wind speed
Tropical Cyclone	Severity: average wind speed translates to severity category Frequency: average number of occurrences of the corresponding severity category in 40 years, within 100 miles of the location	Projection based on the weighted average of the % changes of three variables: 1. Maximum one-day precipitation level 2. Maximum wind speed 3. Average temperature
Wildfire	Severity: area burned (acres) Frequency: average number of times where the corresponding number of acres burned in 35 years, within 10 miles of the location	Projection based on the weighted average of the % changes of three variables: 1. Consecutive dry days 2. Average temperature 3. Average wind speed

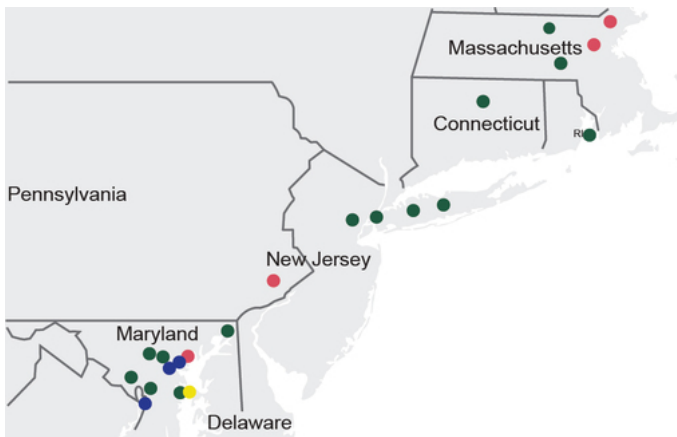
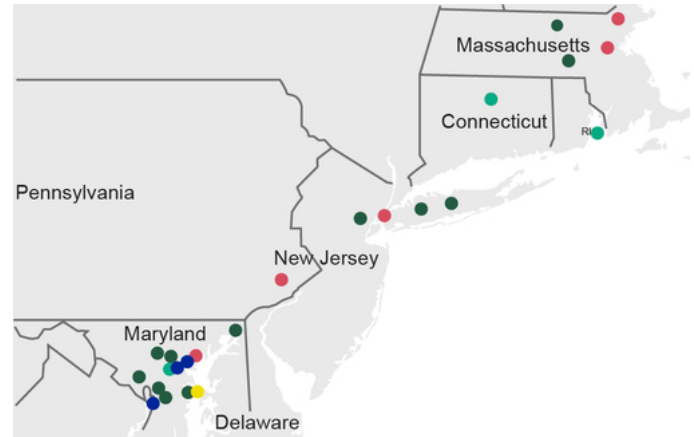
Upon modeling the baseline and projected risk scores, we analyzed the results at site and regional levels to determine potential climate risk exposure and identified the locations and perils contributing the most risk which continue to inform future mitigation strategies to protect us from these risks in the future.

RESULTS

Overall, Northrop Grumman's business is diversified geographically in both high and low warming scenarios, and no single peril presents a heavily concentrated risk across all locations. As expected, physical risk is estimated to be more impactful under RCP 8.5 conditions because of higher global GHG emissions. However, we still observe changes to physical risk levels under RCP 2.6 conditions. We split our analysis by peril, highlighting the regions that face the biggest risk or experience the biggest increase in projected risk in each area.

FLOOD

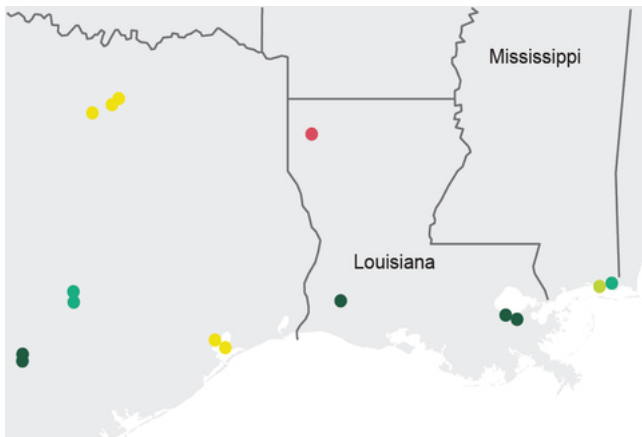
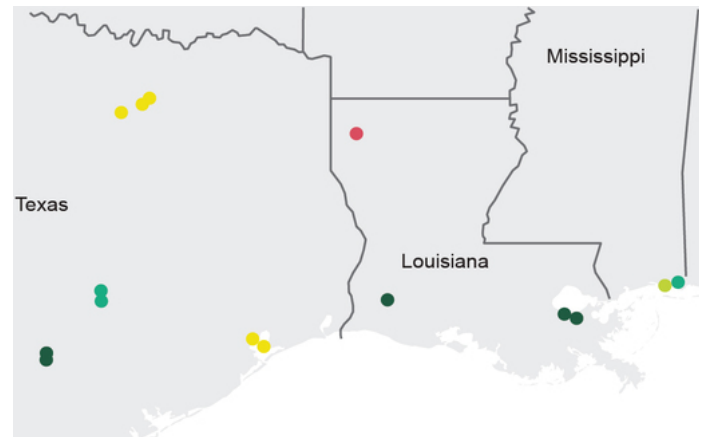
Flood is the most spatially uniform peril, with a majority of regions exhibiting moderate risk and showing little-to-no change in risk levels in future climate scenarios. Select locations along the east coast show increased flood risk levels, whereas in contrast, future scenarios suggest decreased risk in some arid western regions. However, on average, decreases in flood risk for the western region outpace the modest increases in flood risk in the northeast in 2050 under RCP 8.5.

Baseline Flood Risk (Northeast)**RCP 8.5 in 2050 Flood Risk (Northeast)**

■ Extreme ■ Very High ■ High ■ Significant ■ Moderate ■ Low ■ Very Low

TORNADOES

Tornadoes exhibit the greatest risk in the center of the U.S., with very little change tied to either warming scenario in any region. On average, changes in risk score in either direction under future climate scenarios are small, suggesting that tornado risk is likely to be similar to present day in the future.

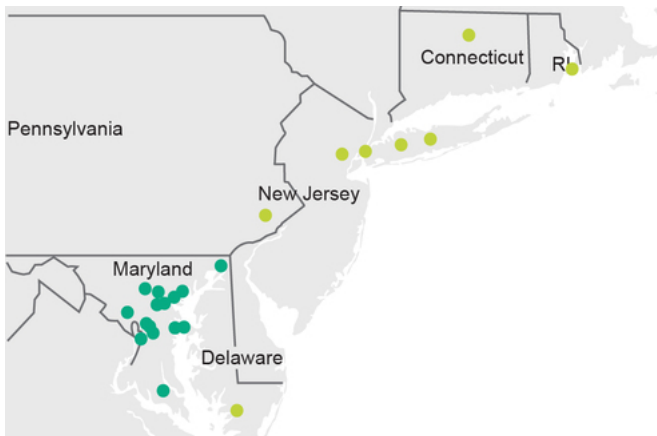
Baseline Tornado Risk (South)**RCP 8.5 in 2050 Tornado Risk (South)**

■ Extreme ■ Very High ■ High ■ Significant ■ Moderate ■ Low ■ Very Low

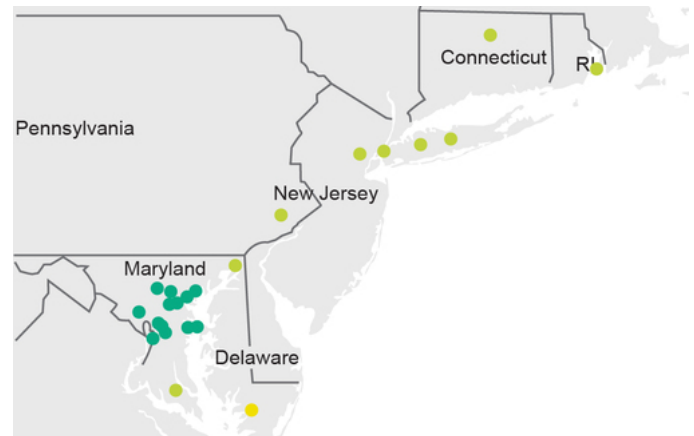
TROPICAL CYCLONES

Our physical risk modeling under both scenarios suggests that tropical cyclones represent the greatest risk in the south and southeast regions of the U.S., with the largest individual risks occurring in Florida. However, the largest risk increase occurs in the northeast, associated with the expected northward shift in land-falling hurricanes as the climate warms. Although the northeast reflects the largest overall increase in tropical cyclone exposure, the increases in risk scores are modest across the climate scenarios and time horizons modeled.

Baseline Tropical Cyclone Risk (Northeast)



RCP 8.5 in 2050 Tropical Cyclone Risk (Northeast)



■ Extreme ■ Very High ■ High ■ Significant ■ Moderate ■ Low ■ Very Low

WILDFIRES

Wildfires are projected to be the greatest risk in many regions, particularly in the west. A number of sites in Southern California are classified as Very High under current conditions and Extreme in both future warming scenarios. This can be attributed primarily to projected decreased precipitation in the region. In addition, the northern Rockies and Plains and the Ohio Valley will also observe potential significant increases in wildfire risk level, higher even than the western region sites on a percentage change in risk score basis. However, the western region shows a larger absolute increase, given the higher level of risk in the baseline scenario.

Baseline Wildfire Risk (West)



RCP 8.5 in 2050 Wildfire Risk (West)



■ Extreme ■ Very High ■ High ■ Significant ■ Moderate ■ Low ■ Very Low

Our business is geographically diversified across the U.S., with no single peril heavily concentrated across all locations. The majority of our locations both now and in the future are classified as Very Low risk levels. Risk levels generally increase in future time periods under both climate scenarios we modeled; however, changes are generally small, and our diversification across the U.S. is a positive contributing factor toward resiliency. We also separately analyzed sites we deem to be critical to our operations, and found that – for sites where current risk levels are High, Very High or Extreme – the changes in projected future risk did not substantially increase under either climate scenario. Because of the already-elevated risk levels at these critical sites, mitigation strategies, such as our business resiliency programs and physical hardening efforts, are already in place and continually reassessed. For these reasons, we believe that we are well positioned to respond to physical climate change risks. As with transition risk, we will continue to update our physical risk scenario analysis as appropriate, and continue our efforts to maximize resiliency and our response to natural disasters as they occur.





Metrics and Targets



CLIMATE-RELATED METRICS

Northrop Grumman recognizes the importance of tracking climate-related metrics year-over-year to understand our progress and areas needing improvement. Below are relevant environmental metrics tied to climate-related risks and opportunities over a three-year period. Note: GHG emissions are shown in the [Scope 1, 2 and 3 Emissions](#) section of this report.

Topic	2020	2021	2022
Climate-Related Opportunities			
Sites with ISO 14001 certification	23	22	21
Reuse (tons)	730	420	240
Recycling (tons)	18,690	20,660	20,260
Composting (tons)	860	1,370	1,220
Onsite renewable electricity generation (MWh)	690	690	660
Carbon removals (tonnes CO ₂ e)	11,000	0	0
Reduction of greenhouse gas emissions (from 2019 base year) (%)	-4.7%	-5.5%	-10.6%
Climate-Related Risks			
Significant fines and penalties (shown in years paid) (\$)	—	—	—
Tons of toxic release inventory	420	670	N/A
Hazardous waste generation (tons)	3,530	3,400	3,560
Hazardous waste (number of reportable spills)	—	—	1
Water withdrawal (potable)—total (gallons)	1,261,608,000	1,374,568,000	1,459,828,000
Energy			
Energy consumption (GJ)	9,929,370	10,227,860	10,384,010
Renewable energy consumption (GJ)	77,570	85,330	564,630
Electricity consumption (MWh)	1,514,350	1,546,500	1,567,600
Renewable electricity consumption (MWh)	21,550	23,700	156,840
Percentage of electricity that is renewable (%)	1%	2%	10%

In 2022, we shifted our environmental data reporting year from calendar year (January-December) to the government fiscal year (October-September). This shift accommodates our earlier report publication date and enables our data to include actual results for all months where data is available, improving our data quality and eliminating duplicative reporting efforts. The 2019-2021 environmental data for GHG, energy, water and solid waste has been re-stated to reflect our adjusted reporting year.

CLIMATE-RELATED METRICS IN EXECUTIVE COMPENSATION

To enhance accountability for ESG performance, our corporate non-financial performance metrics influence Northrop Grumman's annual incentive compensation. As noted in our Proxy Statement, under our Annual Incentive Plan, we use a mix of financial and non-financial metrics to measure our performance for the purpose of determining award payout annually. Environmental sustainability is one of five non-financial metrics that are measured. The 2022 environmental metric was defined by reduction in absolute GHG emissions in our operations. Compensation is ultimately determined by our Board, through the Compensation Committee, as discussed in the [Governance](#) section.



GHG EMISSIONS

SCOPE 1 AND 2 EMISSIONS

Scope 1 and 2 emissions for the past three years are presented in the table below. All emissions are listed in metric tonnes CO₂e. Emissions are calculated based on guidance from the GHG protocol. Limited assurance over Scope 1 and Scope 2 emissions figures is provided by a third party to evaluate the accuracy and reliability of our methods and data and to promote accountability, as shown in our [LRQA Independent Assurance Statement](#).

Emissions Metrics	2020	2021	2022
Direct (Scope 1)	268,700	265,650	282,240
Indirect (Scope 2) (market-based)	493,680	479,100	423,000
Carbon removals	11,000	0	0
Total operational GHG emissions (market-based includes carbon removals)	751,380	744,750	705,240
Greenhouse gas emission intensity (Scope 1 and Scope 2 – Market-based) (tonnes CO ₂ e/USD sales)	0.00002042	0.00002088	0.00001927

In 2022, we shifted our environmental data reporting year from calendar year (January-December) to the government fiscal year (October-September). This shift accommodates our earlier report publication date and enables our data to include actual results for all months where data is available, improving our data quality and eliminating duplicative reporting efforts. The 2019-2021 environmental data for GHG, energy, water and solid waste has been re-stated to reflect our adjusted reporting year.

SCOPE 3 EMISSIONS

We disclose the Scope 3 emissions for categories that are relevant to us and calculated within our annual CDP response. We have assessed all fifteen Scope 3 categories and have determined the following as relevant to our company. See our [CDP response](#) for further details.

Relevant and Calculated	Relevant, Not Yet Calculated	Not Relevant
Category 3: Fuel-and-energy-related activities	Category 1: Purchased goods and services	Category 8: Upstream leased assets
Category 4: Upstream transportation and distribution	Category 2: Capital goods	Category 9: Downstream transportation and Distribution
Category 5: Waste generated in operations	Category 11: Use of sold products	Category 10: Processing of sold products
Category 6: Business travel		Category 12: End of life treatment of sold products
Category 7: Employee commuting		Category 14: Franchises
Category 13: Downstream leased assets (not relevant, calculated)		Category 15: Investments

CLIMATE-RELATED TARGETS

In April 2022, Northrop Grumman announced a set of six new environmental sustainability goals. Expanding on sustainability initiatives the company first put in place in 2010, these next-generation goals will help guide the company's environmental sustainability initiatives, including those related to climate, going forward. These goals underscore our commitment to an environmentally-sustainable future.

The company's next generation environmental sustainability goals are across three mission areas.



MISSION 1: Footprint

Address the fundamental needs driving environmental sustainability by minimizing the footprint of our operations. Footprint goals include:

- Net zero greenhouse gas emissions in our operations by 2035. Later in 2022, we also set a target of a 50 percent GHG emissions reduction by 2030 from a 2019 baseline year.
- Source 50 percent of total electricity from renewable sources by 2030.
- Strengthen leadership in operational footprint reduction through setting and achieving pioneering targets in environmental stewardship by 2025, including potable water use and solid waste to landfill. In 2022, we continued to refine this goal and, in 2023, we announced specific water and waste goals that will be tracked and managed going forward through 2030:
 - **Water**
 - *Reduce* 10 percent of absolute water withdrawals from a 2019 baseline year,
 - *Reuse* 10 percent of water withdrawals, and
 - *Replenish* 10 percent of water withdrawals, focusing in water-stressed regions - all by 2030.
 - **Solid Waste**
 - 10 percent reduction in waste sent to landfill (WTL) by 2030 from a 2019 baseline year.



MISSION 2: Handprint

Enhance sustainability within the aerospace & defense industry by supporting customer needs and supply chain objectives. Handprint goals include:

- In collaboration with key customers, work to develop a pioneering product stewardship program focused on material efficiency, product design and life cycle assessment.
- Update the company's "Standards of Business Conduct for Suppliers and Other Trading Partners" to incorporate industry-leading sustainability practices by 2023.



MISSION 3: Blueprint

Affirm our leadership in sustainability by collaboration to protect ecosystems and define environmental opportunities in our communities. Our Blueprint goal is to:

- Expand T4C initiatives in proximity to Northrop Grumman's U.S. locations by 2030, in collaboration with external partners.

See the [2022 ESG Report](#) for additional detail on our next generation sustainability goals, including progress in the current year.

Our commitment to environmental sustainability and climate change is a priority for Northrop Grumman. In addition to establishing our next generation sustainability goals in 2022 and 2023, we link environmental sustainability performance to executive compensation (as described in the [Climate-Related Metrics](#) section), commit philanthropic giving to environmental sustainability operations and initiatives and have a thriving, environmentally-focused employee resource group, greenNG. Decarbonizing our future is a global challenge, and a critical step in mitigating the impacts of climate change on our planet and our communities. As a leader in A&D, we support climate science and the need for society as a whole to limit global temperature rise to 1.5°C and drive global GHG emissions to net zero by 2050.

For more information on our ESG Reporting see our website:

