

**Module: Introduction****Page: Introduction****CC0.1 Introduction**

Please give a general description and introduction to your organization.

Praxair, Inc. (Praxair or the company) was founded in 1907 and became an independent publicly traded company in 1992. Praxair was the first company in the United States to produce oxygen from air using a cryogenic process and continues to be a technological innovator in the industrial gases industry.

Praxair is a leading industrial gas company in North and South America and one of the largest worldwide. Praxair's primary products in its industrial gases business are atmospheric gases (oxygen, nitrogen, argon, rare gases) and process gases (carbon dioxide, helium, hydrogen, electronic gases, specialty gases, acetylene). The company also designs, engineers, and builds equipment that produces industrial gases primarily for internal use. The company's surface technologies segment, operated through Praxair Surface Technologies, Inc., supplies wear-resistant and high-temperature corrosion-resistant metallic and ceramic coatings and powders. Praxair's sales were \$10,534 million, \$10,776 million, and \$12,273 million for 2016, 2015, and 2014, respectively.

Praxair serves a diverse group of industries including healthcare, petroleum refining, manufacturing, food, beverage carbonation, fiber-optics, steel making, aerospace, chemicals and water treatment. In 2016, 94% of sales were generated in four geographic segments (North America, Europe, South America and Asia) primarily from the sale of industrial gases, with the balance generated from the surface technologies segment. Praxair provides a competitive advantage to its customers by continuously developing new products and applications, which allow them to improve their productivity, energy efficiency and environmental performance.

**CC0.2 Reporting Year**

Please state the start and end date of the year for which you are reporting data.

The current reporting year is the latest/most recent 12-month period for which data is reported. Enter the dates of this year first.

We request data for more than one reporting period for some emission accounting questions. Please provide data for the three years prior to the current reporting year if you have not provided this information before, or if this is the first time you have answered a CDP information request. (This does not apply if you have been offered and selected the option of answering the shorter questionnaire). If you are going to provide additional years of data, please give the dates of those reporting periods here.

Work backwards from the most recent reporting year.

Please enter dates in following format: day(DD)/month(MM)/year(YYYY) (i.e. 31/01/2001).

**Enter Periods that will be disclosed**

Fri 01 Jan 2016 - Sat 31 Dec 2016

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**CC0.4 Currency selection**

Please select the currency in which you would like to submit your response. All financial information contained in the response should be in this currency.

USD(\$)

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**CC0.6 Modules**

As part of the request for information on behalf of investors, companies in the electric utility sector, companies in the automobile and auto component manufacturing sector, companies in the oil and gas sector, companies in the information and communications technology sector (ICT) and companies in the food, beverage and tobacco sector (FBT) should complete supplementary questions in addition to the core questionnaire.

If you are in these sector groupings, the corresponding sector modules will not appear among the options of question CC0.6 but will automatically appear in the ORS navigation bar when you save this page. If you want to query your classification, please email [respond@cdp.net](mailto:respond@cdp.net).

If you have not been presented with a sector module that you consider would be appropriate for your company to answer, please select the module below in CC0.6.

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**Further Information**

## Module: Management

### Page: CC1. Governance

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#### CC1.1

**Where is the highest level of direct responsibility for climate change within your organization?**

Board or individual/sub-set of the Board or other committee appointed by the Board

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#### CC1.1a

**Please identify the position of the individual or name of the committee with this responsibility**

The name of the Board Committee is the Technology, Safety and Sustainability (TSS) Committee; this committee "assists the Board in its oversight of: (a) technology and research & development, including the use of technology in products applications; (b) safety, particularly the use of technology in enhancing safety performance; (c) sustainability and environmental matters; and (d) certain enterprise risks. In furtherance of these duties, the Technology, Safety & Sustainability Committee, among other duties,

- (1) reviews and evaluates Praxair's use of technology and its technology capabilities and Praxair's strategies, objectives and effectiveness of research and development efforts;
- (2) monitors and reviews Praxair's personnel, process and distribution safety goals and performance and the use of technology to enhance safety performance;
- (3) reviews Praxair's policies, programs and practices related to sustainability and the environment; and
- (4) provides oversight and guidance on certain enterprise risks that are not otherwise reviewed by the full Board of Directors or its other committees including (a) natural disasters, and (b) plant control systems security."

Specifically on Sustainability and Environmental Matters, the Committee "review[s] the Corporation's policies, programs and practices related to sustainability and the environment; and assess[es] current and emerging risks and issues related to sustainability and the environment." (TSS Committee Charter)

This includes risks and activity related to climate change, as well as emerging issues in the sustainability area. The Committee reports to the full Board of Directors on all of these issues. The Chairperson of the Committee is Dr. Nance K. Dicciani.

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#### CC1.2

**Do you provide incentives for the management of climate change issues, including the attainment of targets?**

Yes

**CC1.2a Please provide further details on the incentives provided for the management of climate change issues**

Who is entitled to benefit from these incentives?	The type of incentives	Incentivized performance indicator	Comment
Chief Executive Officer (CEO)	Monetary reward	Emissions reduction project Emissions reduction target Energy reduction project Energy reduction target Efficiency project Efficiency target Other: Increasing sustainability portfolio to >50% of revenue by 2020	<p>The Board believes culture must be driven from the top by example. As such, the Compensation Committee confirmed the importance of setting non-financial objectives to reinforce leadership's focus on maintaining an enduring culture that supports both short- and long-term sustainable results. The Compensation Committee identified the non-financial elements that were considered most important to long-term sustainable success and established annual non-financial goals with respect to those elements.</p> <p>Non-financial goals included continuously reducing the environmental impact of operations, meeting sustainable development performance targets, and helping our customers enhance their environmental performance.</p> <p>The Compensation Committee determined that the Company's performance with respect to the non-financial goals was favorable and awarded a positive 21% adjustment for the Named Executive Officers (limited by the applicable cap). The Compensation Committee noted the following as examples of actions that successfully supported the Company's strategic objectives in determining 2016 variable compensation payouts: -- earning a place on the Dow Jones Sustainability World Index for the 14th consecutive year -- recognized as the only industrial gases company that made the "A-List" for the materials sector on CDP and the 9th consecutive year on CDP's Leadership Index. (see March 2017 Proxy Statement, pages 42-43)</p>
Corporate executive team	Monetary reward	Emissions reduction project Emissions reduction target Energy reduction project Energy reduction target Efficiency project Efficiency target Other: Increasing sustainability portfolio to >50% of revenue by 2020	<p>The Board believes culture must be driven from the top by example. As such, the Compensation Committee confirmed the importance of setting non-financial objectives to reinforce leadership's focus on maintaining an enduring culture that supports both short- and long-term sustainable results. The Compensation Committee identified the non-financial elements that were considered most important to long-term sustainable success and established annual non-financial goals with respect to those elements.</p> <p>Non-financial goals included continuously reducing the environmental impact of operations, meeting sustainable development performance targets, and helping our customers enhance their environmental performance.</p> <p>The Compensation Committee determined that the Company's performance with respect to the non-financial goals was favorable and awarded a positive 21% adjustment for the Named Executive Officers (limited by the applicable cap). The Compensation Committee noted the following as examples of actions that successfully supported the Company's strategic objectives in determining 2016 variable compensation payouts: -- earning a place on the Dow Jones Sustainability World Index for the 14th consecutive year -- recognized as the only industrial gases company that made the "A-List" for the materials sector on CDP and the 9th consecutive year on CDP's Leadership Index. (see March 2017 Proxy Statement, pages 42-43)</p>

Who is entitled to benefit from these incentives?	The type of incentives	Incentivized performance indicator	Comment
Management group	Monetary reward	Emissions reduction target Energy reduction target Efficiency target Other: Increasing sustainability portfolio to >50% of revenue by 2020	
All employees	Monetary reward	Emissions reduction target Energy reduction target Efficiency target Other: Increasing sustainability portfolio to >50% of revenue by 2020	

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**Further Information**

**Attachments**

[https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/ClimateChange2017/CC1.Governance/Praxair\\_2017 Proxy Statement.pdf](https://www.cdp.net/sites/2017/27/15027/Climate%20Change%202017/Shared%20Documents/Attachments/ClimateChange2017/CC1.Governance/Praxair_2017%20Proxy%20Statement.pdf)

**Page: CC2. Strategy**

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**CC2.1**

**Please select the option that best describes your risk management procedures with regard to climate change risks and opportunities**

Integrated into multi-disciplinary company wide risk management processes

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**CC2.1a**

**Please provide further details on your risk management procedures with regard to climate change risks and opportunities**

Frequency of monitoring	To whom are results reported?	Geographical areas considered	How far into the future are risks considered?	Comment
Annually	Board or individual/sub-set of the Board or committee appointed by the Board	North America, South America, Europe, Asia	> 6 years	At least annually, the full Board discusses the key enterprise risks identified by management, management accountability for managing or mitigating each risk, the steps being taken to manage each risk, and which Board Committees will oversee each risk area on an ongoing basis. Each Committee's calendar of recurring meeting agenda topics addresses risk areas pertinent to the Committee's subject-matter responsibilities. These areas include a regular review of the Company's sustainability program and current and emerging risks and issues related to sustainability and the environment (Technology, Safety & Sustainability Committee). Other risk areas are regularly reviewed by the full Board, including safety and environmental risk (covered at each Board meeting). In addition, risk assessments and energy cost forecasts are performed for capital investments in productive capacity; results are reported to the Board annually.

**CC2.1b**

**Please describe how your risk and opportunity identification processes are applied at both company and asset level**

COMPANY LEVEL RISK/OPPORTUNITY ASSESSMENT: Responses are collected in an annual survey to business management and functional leads worldwide, including sustainable development. Respondents identify risks in their area against an incidence/ severity index. The results are subjected to a range of analyses to establish priority concerns. Risks and opportunities are evaluated based on their potential financial implications up to the highest consequence, i.e., loss of life, as well as the probability of occurrence.

Risks are reviewed by the full Board of Directors annually. As part of that review, the Board decides which Board Committees will oversee each risk area on an ongoing basis. Each Committee then addresses its risk areas during its recurring meetings.

ASSET LEVEL RISK/OPPORTUNITY ASSESSMENT: The company level risk assessment takes into account information from the field. In addition, risks to physical assets are monitored with periodic and at least annual evaluations from external risk assessors. These risk assessments evaluate each facility worldwide over a certain size, its vulnerability to risks from severe weather, and the potential monetary risk. The data is analyzed to help determine the scope and limit of Praxair's catastrophic insurance coverage. Risk maps are also developed to identify areas prone to severe weather events, where Praxair also has assets. Finally, Praxair performs long-term assessments of energy supply reliability, costs and volatility, which are material to capital investment projects.

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**CC2.1c****How do you prioritize the risks and opportunities identified?**

Praxair evaluates internal and external stakeholder views at the corporate level. Praxair's business strategy reflects continuous engagement with our customers, employees, shareholders, suppliers and the communities in which we operate.

During Praxair's risk assessment process, Praxair business management and functional leads respond to an annual risk survey to identify risks in their area against an incidence/ severity index. The results are subjected to a range of analyses and combined with the results of external stakeholder engagement to establish priority concerns. Those risks considered most significant are identified and reported at least annually to executive management and to the Board, and then to shareholders in Praxair's Annual Report, see ITEM 1A RISK.

The list of risks in Praxair's 2016 10k identified climate change risk in the areas of rising energy prices; emerging environmental and GHG regulation; and risks of catastrophic events such as extreme weather.

Because climate change risks were identified by the corporate risk assessment process, they are automatically considered top priorities in the annual sustainable development materiality assessment (SDMA). As part of the SDMA process, Praxair reviews all the issues potentially applicable to the company and ranks the materiality of these issues. During this process, Praxair consolidates findings from key sustainability research organizations plus information from other stakeholders.

For the most recent SDMA, a group of Praxair managers from each of our major countries and corporate functions were asked to rank the top dozen elements for 2016-2020. Six sustainable development priority factors were ultimately identified, which are mapped to Praxair's core values, strategy and growth drivers. "Energy and Climate Change" is one of these six priority factors. In 2016-7 we also gathered views from an MBA class in sustainable business at Columbia University and re-confirmed the priority factors.

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**CC2.2****Is climate change integrated into your business strategy?**

Yes

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**CC2.2a****Please describe the process of how climate change is integrated into your business strategy and any outcomes of this process**

**i. Influence:** Energy & climate change-related initiatives, goals and targets are integrated into Praxair's overall business strategy. The overall business strategy is influenced by the energy & climate change risks and opportunities identified during Praxair's annual risk assessment process, as well as performance against energy & climate change goals and targets. Our corporate GHG targets are the main components of our business strategy influenced by climate change concerns.

Praxair has a Sustainable Development Management System (SDMS) in place to drive the internal process for collecting SD performance data, which includes energy and GHG data. Performance data is reviewed monthly by the businesses and senior management and quarterly by the executive leadership team, which defines and executes our overall SD strategy. Energy & GHG emissions performance, risks and opportunities are considered in the development of Praxair's SD targets.

The vice president of Sustainable Development also reports SD performance information at least twice per year to the CEO and the Executive Leadership SD Steering Committee, and annually to the Board of Directors Committee on Technology, Safety and Sustainability.

**ii. Example:** Our Annual Report identifies cost of energy in the Item 1A Risk Factors because energy is a large cost item for Praxair. Energy influences our corporate strategy, which led us to set an energy savings target to save 8 million MWH of electricity (cumulative), 2009-2020. At the end of 2016, we have saved 4.2 million MWH of electricity.

**iii. Aspects:** Praxair's sustainable development strategy has been influenced by regulatory changes in the U.S. and around the world, which require GHG reporting and/or cap and trade; the identified regulatory, physical and reputational risks including cost and availability of energy; and the opportunities to Praxair's business from applications that enable CO2 emissions to be avoided.

**iv. Short-Term Strategy:** Climate change concerns have influenced Praxair's short-term (1 to 6 years) business strategy, most importantly by serving as the driver for the development of corporate GHG targets. The achievement of these targets is part of the management variable compensation goals.

Our focus on achieving these targets aligns directly with cost savings initiatives. Praxair has developed environmental KPIs to understand environmental and GHG costs in operations. Our productivity organization saves over 5% off our gross cost stack each year. In 2010 we started to report the environmental savings from productivity projects. By 2016, we realized \$100 million gross savings from GHG and energy projects, totalling 393,000 MT CO2e saved. Tracking environmental productivity allows us to see the relationship between different activities, such as reducing energy and reducing water and/or waste.

**v. Long-Term Strategy:** Defined as more than 6 years in the future; we see long-term business opportunity from innovation that takes advantage of opportunities presented by climate change mitigation. With Praxair's business model, much of the environmental benefit we provide customers is energy efficiency. Praxair has created measurement systems in operations and in R&D that allow us to explore the GHG costs and benefits of any operational improvement or innovation project. We have a target that more than 50% revenue should come from our sustainability portfolio, 2016-2020, i.e., from products that bring sustainability benefit. In 2016, our sustainability portfolio was 54% of revenue, or \$5.7 billion.

Climate change concerns have also influenced our long-term risk mitigation practices. To mitigate against the potential increase in the price of energy, and as part of operational eco-efficiency, Praxair continues to invest aggressively in energy efficiency. We have a long-term target: From 2009–2020, achieve cumulative savings in excess of \$500 million, 8 million MWH and 5 million MT CO2e. Through 2016, cumulative savings were more than \$325 million, 4.2 million MWH and 2.6 million MT CO2e avoided, on track for meeting this goal. We also perform energy cost forecasts and risk assessments for capital projects to manage risks associated with the long-term reliability of energy supplies.

**vi. Strategic Advantage:** The focus on energy efficiency and GHG emissions reductions reduces Praxair's risk from higher energy costs, and is a significant contributor to our operational and financial results and Praxair's industry-leading operating margin and return on capital.

**COMPETITIVE ADVANTAGE:** GHG goals are a clear sign of leadership in our sector – evidenced by recognition received from CDP and others. Energy efficiency directly drives business results by providing Praxair's customers with a lower cost solution to industrial gas production than they typically can generate/supply on their own, which allows us to win more customers, among other benefits.

Praxair invested in the calculation of the carbon productivity of our major products and applications (e.g., oxygen in the steel industry), and the validation and communication of this information to our customers and other stakeholders. We invested in research on climate change mitigation technologies that include industrial energy efficiency, 2nd generation biofuels and applications for solar cells. This information is very valuable to our customers and other stakeholders and differentiates us in our sector.

Employee environmental engagement is a key part of our employee engagement strategy. Employees at all levels work to help Praxair achieve the company-wide GHG targets. Praxair is using environmental data and analytics to connect with employee values and the company mission, and to drive results in productivity and eco-

efficiency, improve decision making and gain competitive advantage. Employee environmental engagement is helping save money, energy and GHG emissions, reduce other resource consumption, improve safety and operational discipline, and is driving environmental innovation.

**vii. Business Decisions:** Praxair has a 20% stake in Uno-X Hydrogen, which operates hydrogen fueling stations in Norway. Norway is considering a ban on gas and diesel vehicles by 2025. Praxair's extensive hydrogen production and distribution capabilities will play an important role in establishing a supply network for a future hydrogen car fleet in Norway. In 2016, Praxair signed a strategic alliance with Uno-X to install 20 hydrogen fueling stations across Norway by 2020. The investment in the joint venture was a significant business decision influenced by regulatory risks and the emerging market for hydrogen for fuel cell applications.

**CC2.2c Does your company use an internal price on carbon?**

No, and we currently don't anticipate doing so in the next 2 years

**CC2.3**

**Do you engage in activities that could either directly or indirectly influence public policy on climate change through any of the following? (tick all that apply)**

Direct engagement with policy makers  
Trade associations

**CC2.3a**

**On what issues have you been engaging directly with policy makers?**

Focus of legislation	Corporate Position	Details of engagement	Proposed legislative solution
Regulation of methane emissions	Support	Praxair met with the U.S. Congress and state and local officials to discuss the benefits of leak detection programs for natural gas pipelines.	Praxair provided comment to legislative staff and in response to agency proposed rules regarding the benefits of leak detection technologies in addressing safety and emissions.
Clean energy generation	Support	Praxair met with the U.S. Congress and state and local officials, including in California, to discuss clean energy generation for fuel cell technologies.	Praxair seeks to promote public policies that encourage the use of hydrogen fuel cells as zero-emission sources of energy
Energy efficiency	Support	Praxair met with the U.S. Congress and state and local officials to discuss energy efficiency.	Continued federal and state funding for fossil fuel energy efficiency technology development.

**CC2.3b**

**Are you on the Board of any trade associations or provide funding beyond membership?**

No

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**CC2.3f**

**What processes do you have in place to ensure that all of your direct and indirect activities that influence policy are consistent with your overall climate change strategy?**

Praxair maintains a detailed oversight process to ensure our activities are conducted in a legal, ethical and transparent manner. This includes oversight by the Chief Compliance Officer and an annual program review by the Board of Directors. Praxair's Government Relations department provides regular reporting on such activities to the Chief Compliance Officer and reports to the General Counsel.

In addition, all Praxair employees participate in annual training regarding issues related to doing business with the government, complying with anti-trust and competition laws, and the FCPA.

Finally, there is coordination with the VP & Chief Sustainability Officer and General Counsel to ensure consistency of public policy advocacy with Praxair's sustainability strategy, including our energy and GHG strategy. The VP & Chief Sustainability Officer works closely with Government Relations and participates in cross-functional groups to review advocacy positions that have an environmental or climate change impact. In turn, Government Relations has a seat on the Sustainable Development Council, which meets quarterly.

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**Further Information**

**Page: CC3. Targets and Initiatives**

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**CC3.1**

**Did you have an emissions reduction or renewable energy consumption or production target that was active (ongoing or reached completion) in the reporting year?**

Absolute target  
Intensity target  
Renewable energy consumption and/or production target

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**CC3.1a**

Please provide details of your absolute target

ID	Scope	% of emissions in scope	% reduction from base year	Base year	Base year emissions covered by target (metric tonnes CO2e)	Target year	Is this a science-based target?	Comment
Abs1	Other: Scope 1+2+3	100%	100%	2016	48336000	2016	No, and we do not anticipate setting one in the next 2 years	Praxair has an annual target to enable two times the amount of our own Scope 1+2+3 GHG emissions to be avoided by customers or their end users from certain signature products. In 2016, our emissions were 24,168,000 MT, meaning our target was to enable at least 48,336,000 MT to be avoided. (24,168,000 MT CO2e * 2 = 48,336,000 MT CO2e). We calculated the carbon productivity of 5 signature products in 5 markets, including Hydrogen sold to make ultra-low sulfur fuel (used in vehicles with diesel particulate filters), Oxygen sold to optimize combustion in steelmaking, Krypton sold to insulate windows, Argon for welding, and specialty coatings to make thermal barriers for industrial gas turbine and jet engine efficiency. These markets contributed 12% of sales in 2016. As we explain in Question 14.1, Praxair does not calculate customer GHG emissions. So we express this target as 100% reduction of twice our 2016 emissions (Scope 1+2+3). % emissions in scope is 100, since the target is measured against our total Scope 1+2+3 footprint. See CC14.1 for information on Praxair's Scope 3 emissions. We only include emissions categories we consider relevant in our calculation.

CC3.1b

Please provide details of your intensity target

ID	Scope	% of emissions in scope	% reduction from base year	Metric	Base year	Normalized base year emissions covered by target	Target year	Is this a science-based target?	Comment
Int1	Scope 1	87%	2%	Metric tonnes CO2e per metric tonne of product	2015	100	2020	No, and we do not anticipate setting one in the next 2 years	For 2016-2020, Praxair has a target to improve the Scope 1 GHG intensity of our hydrogen plants by 2%. We report performance against this target in terms of % improvement off a baseline of 100.
Int2	Scope 1	3%	7.5%	Metric tonnes CO2e per metric tonne of product	2015	100	2020	No, and we do not anticipate setting one in the next 2 years	For 2016-2020, Praxair has a target to improve GHG efficiency from Scope 1 trucking by 7.5%. This target combines weighted results for bulk and packaged gas trucking performance. We report performance against this target in terms of % improvement off a baseline of 100.

CC3.1c

Please also indicate what change in absolute emissions this intensity target reflects

ID	Direction of change anticipated in absolute Scope 1+2 emissions at target completion?	% change anticipated in absolute Scope 1+2 emissions	Direction of change anticipated in absolute Scope 3 emissions at target completion?	% change anticipated in absolute Scope 3 emissions	Comment
Int1	Increase	7			We expect overall Scope 1 and 2 GHG emissions to increase between now and 2020, mainly due to new Hydrogen plants coming on line (some of these plants were built in 2015 but did not have a full year of production until 2016). We project that because of our strong focus on efficiency, emissions will plateau in about 2018.
Int2	No change	0			We expect the amount of product to be delivered to increase over time, proportional to our increase in products produced. At the same time, we are making great strides at delivering these products more efficiently. These factors are expected to offset each other, resulting in no significant change in Scope 1 emissions from trucking through 2020.

**CC3.1d Please provide details of your renewable energy consumption and/or production target**

ID	Energy types covered by target	Base year	Base year energy for energy type covered (MWh)	% renewable energy in base year	Target year	% renewable energy in target year	Comment
RE1	Electricity consumption	2016	500000	2%	2016	2%	<p>Praxair's renewable energy target is to source more than 500,000 MWh of renewable electricity annually, 2016-2020. We count renewable electricity sourced through power purchase agreements that guarantee hydro, wind and solar energy. (Note, we do not include in this target the renewable energy that Praxair consumes from electricity delivered from power grids. In 2016, we estimated about 31% of our total electricity purchases from the grid were from renewable sources.)</p> <p>500,000 MWh of renewable electricity is approximately 2% of Praxair's total electricity consumption in 2016.</p>

**CC3.1e**

**For all of your targets, please provide details on the progress made in the reporting year**

ID	% complete (time)	% complete (emissions or renewable energy)	Comment
Abs1	100%	100%	<p>Praxair exceeded the target to enable two times the amount of our own Scope 1+2+3 emissions to be avoided by customers or their end users. In 2016, we calculated GHG emissions avoided from Hydrogen sold to make ultra-low sulfur fuel (used in vehicles with diesel particulate filters), Oxygen sold to optimize combustion in steelmaking, Krypton sold to insulate windows, Argon for welding and specialty coatings to make thermal barriers for industrial gas turbine and jet engine efficiency. These avoided emissions totalled 68 million metric tons CO2e, which exceeds our target of 48,336,000 MT by 19,664,000 MT. See 3.2a for more information on how we calculate emissions avoided.</p>
Int1	20%	0%	<p>When we established our 2020 target for Praxair's hydrogen plants, we expected emissions intensity to deteriorate in 2016 and 2017, then improve 2018 through 2020. As part of our efforts to achieve this target, Praxair is investing in more by-product hydrogen, which is less GHG-intensive than other sources of hydrogen. These sources, coupled with Praxair's energy efficiency efforts, will improve the GHG intensity of Praxair's hydrogen plants.</p> <p>Praxair projected a 3.5% deterioration in GHG intensity at our hydrogen plants in 2016. Thanks to our strong focus on efficiency, GHG intensity deteriorated by only 2.7%.</p>

ID	% complete (time)	% complete (emissions or renewable energy)	Comment
Int2	20%	44%	Praxair is on track to achieving our trucking GHG intensity target. Our combined bulk and packaged gas trucking achieved a 3.3% improvement in efficiency in 2016 compared to 2015, which is 44% of the way toward our goal of 7.5%. Bulk trucking accounted for 76% of the miles driven by Praxair drivers in 2016. Bulk trucking improved their GHG intensity by 2.9%, and packaged gas by 4.7%. These results are weighted based on miles driven to blend performance into a single target.
RE1	100%	100%	Praxair sourced 521,000 MWh renewable energy, including hydropower in New York state, Mexico and Brazil, and wind power in India. This amount exceeds our target of 500,000 MWh. This renewable electricity represents about 2% of all Praxair electricity use.

**CC3.2 Do you classify any of your existing goods and/or services as low carbon products or do they enable a third party to avoid GHG emissions?**

Yes

**CC3.2a Please provide details of your products and/or services that you classify as low carbon products or that enable a third party to avoid GHG emissions**

Level of aggregation	Description of product/ Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
Group of products	<p>Praxair has a target to demonstrate and validate customer carbon productivity for selected products. Praxair's carbon productivity has been calculated for five signature Praxair products in five markets:</p> <ol style="list-style-type: none"> <li>1) Hydrogen (H2) sold to make ultra-low sulfur diesel fuel (ULSD). When used in trucks fitted with diesel particulate filters, it eliminates black carbon. Environmental agencies, including a joint 2011 UNEP and World Meteorological Association report: "Integrated Assessment of Black Carbon and Tropospheric Ozone," see the elimination of black carbon as being the crucial short-term strategy to reduce the rate of global warming.</li> <li>2) Krypton sold to insulate thermal windows.</li> <li>3) Oxygen (O2) sold to optimize combustion in steel making.</li> <li>4) Argon for welding.</li> <li>5) Specialty coatings to make thermal barriers for industrial gas turbine and jet engine efficiency. These applications allow Praxair customers and their end users to avoid Scope 1 and Scope 2 energy-related GHG emissions.</li> </ol>	Avoided emissions	<p>Other: We provide a full description of our methodologies, including emission factors, assumptions and global warming potentials, at <a href="http://www.praxair.com/our-company/sustainable-development/white-papers">http://www.praxair.com/our-company/sustainable-development/white-papers</a>.</p> <p>Example: Hydrogen - H2, a key growth platform for Praxair – is made from natural gas (CH4) and steam. The reaction of CH4 with water (H2O) produces H2 and emits CO2. In addition to enabling the reduction of sulfur from tailpipe emissions, when ultra-low sulfur diesel (ULSD) fuel is used in combination with a diesel particulate filter, 90% or more of black carbon (BC) emissions are eliminated. BC has a global warming potential of 2200. This is based on an analysis by L. Bruce Hill for the Clean Air Task Force, which also provided us with emission factors to convert diesel fuel consumption into total CO2e emissions with and without diesel particulate filters (for example, an emission factor of 1.2 grams/gallon to represent the BC emissions from a class 8 truck operating without a diesel particulate filter). The final claim for benefits from H2 production factored in that 33% of Praxair H2 production is used to make ULSD and that 58% of trucks in the USA are fitted with diesel particulate filters. White papers are published on Praxair's website for all the claims made for GHG benefits enabled by our applications.</p>	12%		<p>These five applications enabled customers and their end users to avoid 68 million metric tons of their Scope 1+2 CO2e in 2016. This includes 10 million MT avoided by the use of oxygen in steel making, 41.9 million MT avoided by the use of hydrogen in ultra-low sulfur diesel, 14.6 million MT avoided from the use of specialty coatings to make thermal barriers for industrial gas turbine and jet engine efficiency, and 1.5 million MT avoided from Krypton in windows and Argon in welding.</p>

**CC3.3**

Did you have emissions reduction initiatives that were active within the reporting year (this can include those in the planning and/or implementation phases)

Yes

**CC3.3a**

Please identify the total number of projects at each stage of development, and for those in the implementation stages, the estimated CO2e savings

Stage of development	Number of projects	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	0	0
To be implemented*	83	11,500
Implementation commenced*	480	143,800
Implemented*	1,996	393,000
Not to be implemented	0	0

**CC3.3b**

For those initiatives implemented in the reporting year, please provide details in the table below

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/ Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the initiative	Comment
Energy efficiency: Processes	773 voluntary projects from 24 different countries providing permanent improvements to energy requirements for turbines, compressors, fans, and other primary process equipment, improvement to heat transfer efficiency and control equipment for process efficiency and reliability optimization.	306,000	Scope 1 Scope 2 (location-based)	Voluntary	60,222,000	58,000,000	1-3 years	Ongoing	Also resulted in over 22.4 million U.S. gallons of water reductions/savings and consolidation of processes.

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the initiative	Comment
Transportation: fleet	778 voluntary projects from 24 countries worldwide provided permanent reduction in diesel and gasoline use from fuel efficiency or route efficiency programs, on-site tank size optimization, trailer size optimization and truck modifications such as fairings & skirts for fuel efficiency.	43,000	Scope 1	Voluntary	34,000,000	10,000,000	1-3 years	Ongoing	Foreign exchange rates reduced the impact of savings when translated into U.S. dollars.
Process emissions reductions	73 projects around the globe that reduced product CO2 and ODS's emissions through reducing transfers, process efficiency, system integrity and refrigerant replacements.	20,000	Scope 1	Voluntary	1,281,000	1,500,000	1-3 years	Ongoing	
Energy efficiency: Building services	43 voluntary projects providing permanent reduction in power consumption for lighting retrofits, HVAC controls and building power improvements.	900	Scope 2 (location-based)	Voluntary	268,000	1,000,000	1-3 years	Ongoing	
Behavioral change	76 projects innovatively revising business and office processes to reduce non-product utilities, transportation fuel consumption, to secure alternative raw material sources for lower internal process energy consumption, lower power use for equipment maintenance, and similar items.	7,000	Scope 2 (location-based)	Voluntary	1,946,000	750,000	1-3 years	Ongoing	
Behavioral change	80 projects from 10 different countries to convert customers from cylinders to 'microbulk' tanks or microbulk to on-site fixed tanks that reduces number of delivery trips; conversions of tank size for filling and truck delivery efficiency.	600	Scope 1	Voluntary	1,009,000	3,500,000	4-10 years	Ongoing	Specific to customer changes that helped improve a Praxair environmental KPI.

**CC3.3c**

**What methods do you use to drive investment in emissions reduction activities?**

Method	Comment
Dedicated budget for energy efficiency	As energy is a significant portion of Praxair's cost stack, Praxair pursues energy efficiency rigorously and in several areas. Praxair's sustainable productivity organization measures the environmental savings in our productivity work. In 2016, energy and GHG efficiency projects resulted in savings of almost \$100 million and 393,000 MT CO2e avoided. These projects contributed to a reduction in electricity use of 624,000 MWh as well as reductions in natural gas and fuel use. Each business unit has a significant capital budget for energy efficiency projects, which in 2016 was around \$100 million.

**Further Information**

In our response to question CC3.3b, we provide information on the primary energy/GHG efficiency projects, which account for about 96% of our CO2 savings for 2016.

**Page: CC4. Communication**

**CC4.1**

**Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s)**

Publication	Status	Page/Section reference	Attach the document	Comment
In mainstream reports (including an integrated report) but have not used the CDSB Framework	Complete	Item 1A Risks pages 7-8; Environmental Matters/Climate Change pages 23-25	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016 Praxair Annual Report.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016 Praxair Annual Report.pdf</a>	Praxair's 2016 Annual Report discusses climate change risks as they relate to the cost of energy, catastrophic events and environmental and greenhouse gas regulations as well as how these risks are managed.
In other regulatory filings	Complete	Board Role in Risk Oversight (page 9); Determining Strategic Non-financial Goals (page 42); Strategic Non-financial Business Results (page 43)	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair_2017 Proxy Statement.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair_2017 Proxy Statement.pdf</a>	Praxair's Notice of March 2017 Annual Meeting and Shareholder Proxy discusses the Board's role in risk oversight, the non-financial goals of the company, including those related to meeting the company's sustainable development targets and reducing the environmental impacts of operations (both of which address climate change), and how achieving the company's non-financial goals affects variable compensation.

Publication	Status	Page/Section reference	Attach the document	Comment
In voluntary communications	Complete	pages 4-7, 8, 13, 18, 22, 24-25, 26, 35, 38-39	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair 2016 Sustainable Value Report.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair 2016 Sustainable Value Report.pdf</a>	Praxair uses the IIRC Integrated Reporting Framework and GRI's Sustainability Reporting Guidelines as guides to develop the Sustainable Value Report (SVR). The 2016 SVR will be available on our website in early July 2017 at: <a href="http://www.praxair.com/our-company/sustainable-development/reporting-center">http://www.praxair.com/our-company/sustainable-development/reporting-center</a>
In voluntary communications	Underway - previous year attached	2015 GRI Annex page 7, Environmental Aspect: Energy (EN3-7); Aspect: Emissions, Effluents & Emissions (EN16-19); Aspect: Products & Services (EN27); Aspect: Transport (EN30)	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair 2015 SVR_GRI Annex.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC4.1/Praxair 2015 SVR_GRI Annex.pdf</a>	Praxair uses GRI's G4 Sustainability Reporting Guidelines to structure public reporting of performance in key areas, including energy and GHG emissions performance. Our 2016 GRI report will be available on our website in early July 2017 at: <a href="http://www.praxair.com/our-company/sustainable-development/reporting-center">http://www.praxair.com/our-company/sustainable-development/reporting-center</a>

#### Further Information

### Module: Risks and Opportunities

#### Page: CC5. Climate Change Risks

##### CC5.1

**Have you identified any inherent climate change risks that have the potential to generate a substantive change in your business operations, revenue or expenditure? Tick all that apply**

- Risks driven by changes in regulation
- Risks driven by changes in physical climate parameters
- Risks driven by changes in other climate-related developments

**CC5.1a Please describe your inherent risks that are driven by changes in regulation**

**Risk Driver:** Uncertainty surrounding new regulation

**Description:** Praxair operates in jurisdictions that have, or are developing, laws and/or regulations to reduce or mitigate the perceived adverse effects of greenhouse gas (“GHG”) emissions and faces a highly uncertain regulatory environment in this area. For example, the U.S. Environmental Protection Agency (“EPA”) has promulgated rules requiring reporting of GHG emissions, and Praxair and many of its suppliers and customers are subject to these rules. EPA has also promulgated regulations to restrict GHG emissions, including final rules regulating GHG emissions from light-duty vehicles and certain large manufacturing facilities, many of which are Praxair suppliers or customers. More recently, EPA promulgated carbon dioxide regulations for both new and existing power plants, which will require controls on GHG emissions from certain suppliers of power to Praxair’s operations. In addition to these developments in the United States, GHGs are regulated in the European Union under the Emissions Trading System, which has wide implications for our customers and may impact certain operations of Praxair in Europe. There are also requirements for mandatory reporting in Quebec, Canada, which apply to certain Praxair operations and will be used in developing cap-and-trade regulations on GHG emissions. These regulations, as well as similar regulations that have been proposed in Ontario, Canada, are expected to impact certain Praxair facilities in Canada. Climate change and energy efficiency laws and policies are also being widely introduced in jurisdictions throughout Latin America, Mexico and parts of Asia. China has announced plans to launch a national carbon emissions trading system, though it does not appear the regulations will have a direct impact on GHG emissions from Praxair facilities.

Among other impacts, such regulations are expected to raise the costs of energy, which is a significant cost for Praxair. Legislation that limits GHG emissions may impact growth by increasing operating costs and/or decreasing demand.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Increased operational cost	Up to 1 year	Direct	More likely than not	Medium	<p>Among other impacts, cap and trade schemes are expected to raise the cost of energy, which is a significant cost for Praxair. Also, legislation that limits GHG emissions may impact growth in this area by increasing operating costs and/or decreasing demand.</p> <p>For example, if energy prices rise 10%, energy costs to Praxair would rise proportionally and could exceed \$100 million.</p>	<p>To manage risks from current and potential GHG emission regulation, Praxair actively monitors regulatory developments, increases relevant resources and training as needed; consults with vendors, insurance providers and industry experts; incorporates GHG provisions in commercial agreements; conducts regular sensitivity analyses of the impacts of potential energy and raw material cost increases; presents to the Office of the Chairman and Board on various cost scenarios under different potential GHG tax regimes; and explores renewable energy options. Praxair’s commercial contracts also routinely provide rights to recover increased electricity, natural gas and other costs that are incurred by the company.</p> <p>Additionally, Praxair sets corporate energy and GHG targets to manage the risks of an uncertain regulatory environment. These targets drive us to continuously seek opportunities to reduce energy use and GHG emissions. For example: we have a target to save 8 million MWH of electricity and avoid 5 million MT CO<sub>2e</sub>, 2009-2020. At the end of 2016, we saved 4.2 million MWH of electricity and avoided 2.6 million MT CO<sub>2e</sub>.</p> <p>All of our risk management methods, including our targets, limit the likelihood and magnitude of increased cost from new regulation and reduce the risks to Praxair over the target period (5 years).</p>	<p>Praxair believes it will continue to mitigate potential costs through the pass through clauses of its product supply contracts. For the most part, the management of these potential risks has zero additional financial impact and are managed within Praxair’s current human and capital resources and budgets. In addition, Praxair invested in internal consulting to improve its Sustainable Development Management System and reporting. The cost of this was less than \$100,000.</p>

**CC5.1b Please describe your inherent risks that are driven by changes in physical climate parameters**

**Risk Driver:** Change in precipitation extremes and droughts

**Description:** The occurrence of catastrophic events or natural disasters such as extreme weather, including hurricanes and floods, could disrupt or delay Praxair's ability to produce and distribute its products to customers and could potentially expose the company to third-party liability claims. In addition, such events could impact the company's customers and suppliers resulting in temporary or long-term outages and/or the limitation of supply of energy or other raw materials used in normal business operations.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Reduction/ disruption in production capacity	>6 years	Direct	About as likely as not	Medium-high	<p>The most important risk is to human safety. On the financial side, the replacement cost of a single large Praxair facility could be more than \$200 million. On a long-term average annual basis, the Praxair, Inc. portfolio could sustain potentially over \$3 million in hurricane losses.</p>	<p>To manage these risks, Praxair evaluates direct and indirect business risks through business impact analysis, then establishes appropriate priorities and policies; invests in facilities with suitably resilient design and technology; consults with vendors, insurance providers and industry experts; and conducts regular reviews of the business risks with management.</p> <p>Finally, Praxair works with its insurance provider to evaluate the risk from all perils including natural hazards such as extreme weather, windstorm and flooding. The insurer uses rigorous standards based on their own scientific research and proven solutions to identify and quantify exposures to Praxair assets. Based on their recommendations, Praxair may make investments in infrastructure that adapts to or mitigates risks from anticipated climate change.</p> <p>For example: Based on information from our insurance provider and past investments in resilient design, our newest plants are built to withstand winds of 118 mph and critical equipment is raised to specific flood level standards.</p> <p>Our risk management methods limit the potential likelihood and magnitude of a disruption in production capacity due to extreme weather events. When constructing a new site, evaluations provided by our insurance provider can reduce risk in as little as one year.</p>	<p>Praxair annually spends in excess of \$20,000 above normal business costs to study its natural catastrophe risk. The service provides, among other items, detailed evaluations by geography of emerging hurricane and flooding vulnerability and likelihood of incidence of extreme weather.</p>

**CC5.1c Please describe your inherent risks that are driven by changes in other climate-related developments**

**Risk Driver:** Reputation

**Description:** Praxair uses energy and seeks to continually improve its energy efficiency; and its applications often bring energy efficiency, as well as environmental and GHG improvements, to customer processes. Some of our customers are seeking to reduce GHG emissions in their supply chain and ask Praxair to provide information, e.g. through the CDP Supply Chain program, and/or to help meet their targets. If Praxair does not or cannot meet these expectations the company could lose business from that customer.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Reduced demand for goods/ services	3 to 6 years	Direct	Unlikely	Low	The estimated financial implication could be over \$1 million in annual sales.	<p>Praxair manages reputational risks by communicating with customers and the public to demonstrate that its applications create a net GHG benefit. For example, Praxair invested in research to calculate and validate its Carbon Footprint. Praxair's carbon productivity was calculated for 5 signature Praxair products: Hydrogen used to make ultra-low sulfur diesel fuel (used in vehicles with diesel particulate filters); Oxygen used to optimize combustion in steelmaking; Krypton to insulate thermal windows; Argon sold for welding; and specialty coatings to make thermal barriers for industrial gas turbine and jet engine efficiency. In 2016, these markets contributed 12% of sales. Praxair applications enabled customers and their end users to avoid 68 million metric tons of CO<sub>2</sub>e – an amount that exceeded all Praxair GHG emissions by 43.8 million metric tons. We promote this research in public communications to help tell our story and manage the reputational risk from our GHG emissions profile (see <a href="http://www.praxair.com/our-company/sustainable-development/white-papers">www.praxair.com/our-company/sustainable-development/white-papers</a> and our Sustainable Value Report and Annex, which we publish annually).</p> <p>By being transparent about the GHG impacts of our operations and the GHG benefits of our applications, Praxair limits both the likelihood and magnitude of reduced demand for our products and services due to damage to our reputation. We communicate with our stakeholders regularly, which reduces our risk on an ongoing basis.</p>	Praxair conducted the research in-house with subject-matter experts. We paid external providers for validation audits. This amount was less than \$50,000.

**Risk Driver:** Uncertainty in market signals

**Description:** Cost and Availability of Raw Materials and Energy – Increases in the cost of energy and raw materials and/or disruption in the supply of these materials could result in lost sales or reduced profitability. Energy is the single largest cost item in the production and distribution of industrial gases. Most of Praxair’s energy requirements are in the form of electricity, natural gas and diesel fuel for distribution. Praxair attempts to minimize the financial impact of variability in these costs through the management of customer contracts and reducing demand through operational productivity and energy efficiency. Large customer contracts typically have escalation and pass-through clauses to recover energy and feedstock costs. Such attempts may not successfully mitigate cost variability which could negatively impact its financial condition or results of operations. The supply of energy has not been a significant issue in the geographic areas where Praxair conducts business. However, regional energy conditions are unpredictable and may pose future risk.

For carbon dioxide, carbon monoxide, helium, hydrogen, specialty gases and surface technologies, raw materials are largely purchased from outside sources. Where feasible, Praxair sources several of these gases, including carbon dioxide, hydrogen and calcium carbide, as chemical or industrial byproducts. In addition, Praxair has contracts or commitments for, or readily available sources of, most of these raw materials; however, their long-term availability and prices are subject to market conditions. A disruption in supply of such raw materials could impact the company’s ability to meet contractual supply commitments.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimatd financial implications	Management method	Cost of management
Increased operational cost	1 to 3 years	Indirect (Supply chain)	About as likely as not	Medium	<p>Energy availability and price is unpredictable and may pose unforeseen future risks. For example, if energy prices rise 10%, energy costs to Praxair would rise proportionally and could exceed \$100 million.</p> <p>In addition, if raw materials became unavailable and Praxair was unable to meet its contractual obligations to customers, the company could potentially incur a loss up to the limits of its contractual liability.</p>	<p>Praxair performs long-term assessments of energy supply cost and reliability when making capital investment decisions to help manage the risk of energy supply and cost volatility, which are material to the internal rate of return and net present value of capital investment projects. Praxair also includes escalation and pass-through clauses in customer contracts to recover energy and feedstock costs.</p> <p>Praxair pursues a range of actions to secure multiple sources of raw materials. For example, in Texas, Praxair uses a 2.5 billion standard cubic foot high-purity hydrogen storage cavern. This, together with sourcing by-product hydrogen, provides Praxair and our customers with confidence that we can provide a reliable service over our long-term contracts.</p> <p>Finally, Praxair pursues energy efficiency, invests in renewable energy and has energy and GHG targets to minimize risks related to energy cost and availability. For example, we have a target to improve the GHG efficiency of trucking 7.5% by 2020. We are on track for meeting the target. In 2016, we expanded the use of telematics in our European fleet, which saves fuel and reduces GHG emissions.</p> <p>Praxair’s management methods reduce the likelihood that disruptions in the supply of energy will have a major impact on operational cost. These investments also reduce the potential magnitude of such disruptions. We make investments in energy efficiency and renewable energy annually, which reduces potential risk on an ongoing basis.</p>	<p>Praxair believes it will continue to mitigate potential costs through the pass through clauses of its product supply contracts. For the most part, the management of these potential risks has zero additional financial impact and are managed within Praxair’s current human and capital resources and budgets. In addition, Praxair invested in internal consulting to improve its Sustainable Development Management System and reporting. The cost of this was less than \$100,000.</p>

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**Further Information**

**Page: CC6. Climate Change Opportunities**

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**CC6.1**

**Have you identified any inherent climate change opportunities that have the potential to generate a substantive change in your business operations, revenue or expenditure? Tick all that apply**

- Opportunities driven by changes in regulation
  - Opportunities driven by changes in physical climate parameters
  - Opportunities driven by changes in other climate-related developments
-

**CC6.1a Please describe your inherent opportunities that are driven by changes in regulation**

**Opportunity Driver:** General environmental regulations, including planning

**Description:** Governmental regulation of GHG and other emissions; renewable fuel standards in the EU and U.S.; the need for infrastructure build out in mature and developing economies (especially with the levels of growth being experienced in global mega-cities) - all these provide Praxair with market opportunities in applications like water technologies, carbon capture and sequestration (CCS) and industrial gases.

The renewable energy market is a growth area for Praxair. Praxair supports the photovoltaics market, a key player in the growth of renewable energy. We offer a complete portfolio of solar-grade atmospheric, specialty and dopant gases, delivery systems and sputtering targets, to help customers meet today's economic and environmental demands and position them to exceed these demands in the future. For example, Praxair manufactures Argon, a critical gas used in solar wafer production. Praxair also supplies Silane, a key raw material for the thin film deposition of amorphous and polysilicon films in the solar industry.

Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Increased demand for existing products/ services	1 to 3 years	Indirect (Client)	More likely than not	Medium	<p>Our sustainable growth portfolio – applications that help customers improve their sustainability performance – was 54% of Praxair's 2016 revenue, or \$5.7 billion.</p> <p>Our sustainable growth portfolio is made up of numerous applications serving numerous markets. For example, the global water and wastewater network market is expected to grow at a compound annual growth rate of 9.6% through 2020. Industry experts expect that the demand for water treatment products in China alone will grow 10.3 percent annually to \$7.5 billion in 2015. Wastewater is an \$80 million end market for Praxair and is growing at &gt;10% per year, 2012 – 2016. This represented a market opportunity of about \$10 million in 2016. 2nd generation biofuels use industrial and specialty gases at many points in their supply chain and provided a potential ~\$100 million gases market in 2016. If applications meet the sustainable growth portfolio target, this has a direct impact on Praxair's profitability and growth.</p>	<p>Praxair's research and development is directed toward developing new and improved methods for the production and distribution of industrial gases and the development of new markets and applications for these gases. The R&amp;D group has set a target for 2016-2020 that Praxair's sustainability portfolio should exceed 50% of revenue. In 2016, Praxair's sustainability portfolio was 54% of revenue, or \$5.7 billion.</p> <p>For example, Praxair signed a strategic alliance with Uno-X in 2016 to install 20 hydrogen fueling stations across Norway by 2020. Norway is considering a ban on gas and diesel cars by 2025. Many in Norway believe hydrogen fuel cell electric vehicles (FCEVs) will be the primary mode of automotive transportation in the future. Praxair has a 20% stake in the Uno-X Hydrogen joint venture, and Praxair's extensive hydrogen production and distribution capabilities will play an important role in establishing a supply network for a future hydrogen car fleet in Norway.</p> <p>By setting targets for our sustainable growth portfolio, Praxair is able to increase the likelihood and magnitude of new environmental regulations leading to increased demand for our products and applications. We expect these opportunities to materialize within the next 3 years.</p>	<p>There was no additional cost for actions taken, outside of regular budgeted staff and business costs in this area, including for R&amp;D. A portion of the total R&amp;D expenditure in 2016 (\$92 million) went to develop the applications and processes described in this section. An external auditor was paid to validate claims for CO2e avoided from Praxair oxygen and hydrogen applications, and this was less than \$50,000 in fees.</p>

**CC6.1b Please describe your inherent opportunities that are driven by changes in physical climate parameters**

**Opportunity Driver:** Change in precipitation extremes and droughts

**Description:** Changes in precipitation extremes are leading to water shortages, especially in mega-cities where there are population pressures. This in turn leads to stricter regulation of water quality, as we are seeing in emerging economies such as China. This presents market opportunity for Praxair, as we develop and deliver customized systems to help industrial plants and municipalities meet their wastewater management goals. We work directly with our customers to provide beginning-to-end treatment methods, from needs assessment and treatment strategy to equipment design, installation and industrial supply. We offer a wide range of applications that treat and reuse process water, all while maximizing treatment capacity, reducing VOC emissions, improving safety and reducing costs.

Also, as the global demand for potable water continues to rise and fresh water supplies are quickly depleting, we are advancing industrial technology to make this life-sustaining resource accessible to a growing population. Last year alone, we helped bring clean drinking water to more than 145 million people around the world.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Increased demand for existing products/ services	1 to 3 years	Indirect (Client)	More likely than not	Medium	<p>The potential financial implications can be calculated from the size of the market and the size of Praxair's opportunity. The global water and wastewater network market is expected to grow at a compound annual growth rate of 9.6% from 2014 to 2020. Wastewater is an \$80 million end market for Praxair and is growing at &gt;10% per year, 2012 – 2016. This represented a market opportunity of about \$10 million in 2016.</p>	<p>Praxair's water technology offerings are supported by a business development group, which is actively investing in innovation and business development. Praxair has identified the need for massive water infrastructure development. For example: Praxair has signed a long-term gas supply contract with Gao Bei Dian Water Recycling Plant of Beijing Drainage Group Co., Ltd. Praxair will build, own and operate a vacuum pressure swing adsorption unit to supply gaseous oxygen to the plant for its wastewater treatment and recycling processes. The plant treats wastewater from municipal drainage and uses the recycled product as cooling water for local power plants as well as for landscaping needs throughout the city. The plant helps to mitigate water shortages and supports the city's sustainable development efforts. To maintain this innovation stream, Praxair R&amp;D developed a target that Praxair's sustainability portfolio should exceed 50% of sales, 2016-2020. In 2016, our sustainability portfolio was 54% of revenue or \$5.7 billion.</p> <p>By setting a target for our sustainability portfolio, Praxair is able to increase the likelihood and magnitude of our opportunity to increase demand for products and applications that help companies manage changes in precipitation extremes. We expect these opportunities to materialize within the next 3 years.</p>	<p>There was zero additional cost for actions taken, outside of regular budgeted staff and business costs in this area, including for R&amp;D. A portion of the total R&amp;D expenditure in 2016 (\$92 million) went to develop the applications and processes described in this section.</p>

**CC6.1c Please describe your inherent opportunities that are driven by changes in other climate-related developments**

**Opportunity Driver:** Changing consumer behavior

**Description:** As more and more companies and individuals acknowledge climate change and its impacts, they will demand new products and services to mitigate the effects of climate change, or plan for adaptation. These play out in different ways in different geographies, but they include the need for infrastructure build outs for water systems; technology to provide more resource efficiency; and energy security and reliability. These provide market opportunity for Praxair, as we provide gases into all these markets, e.g., nitrogen to make lighter composites to make aircraft more fuel efficient; alloys to make wind turbines more durable; CO2 to make water more potable and to clean wastewater systems. These gases are some of the gases sold into Praxair's end-markets in electronics (8% revenue), aerospace (3%) and "other" (10%), and that provide growth opportunities as markets continue to grow for climate-related technologies. Many of these applications are part of Praxair's new strategic focus on faster growing resilient end-markets, which include food, beverage, healthcare, specialty gases, environmental and aerospace. Overall, these end-markets have expanded to 27% of our sales, with several countries, like Brazil and Canada, already close to our 33% target.

Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
New products/ business services	Up to 1 year	Indirect (Client)	More likely than not	Medium	<p>Solar energy: Praxair sales are forecasted to grow from \$60 million at ~ 5% per year. 2nd generation biofuels use industrial and specialty gases at many points in their supply chain and provided a potential ~\$100 million gases market in 2016.</p> <p>Resilient markets are projected to grow to 33% of revenue by 2020, from 27% currently. In 2016 revenue terms, this increase is equivalent to \$600 million.</p>	<p>Praxair is actively investing in innovation and business development in order to meet customer demand for products with a lower carbon footprint. For example, to maintain an environmental innovation stream, Praxair has a target that our sustainability portfolio - applications that bring customers sustainability benefits - should exceed 50% of revenue, 2016-2020. In 2016, Praxair's sustainability portfolio was 54% of revenue, or \$5.7 billion. This focus on environmental innovation is yielding positive market results. Praxair's Global Market Development organization raises awareness of applications within our sustainability portfolio across a broad range of markets and regions. For example, in photovoltaics, Praxair is developing and promoting the use of its products throughout the PV supply chain.</p> <p>We also raise awareness by providing information about products in our sustainability portfolio on our website. For example, we show how Praxair CO2 can be used in industrial applications where the carbon is chemically "fixed" and not emitted to the atmosphere; see <a href="http://Praxair.com/our-company/sustainable-development/climate-change">Praxair.com/our-company/sustainable-development/climate-change</a>.</p> <p>By working towards the sustainability portfolio target, Praxair is able to increase the likelihood and magnitude of our opportunity to meet consumers' demands for climate friendly products and applications. We expect these opportunities to materialize regularly, as we are constantly looking for ways to increase our sustainable growth portfolio.</p>	<p>There was no additional cost for actions taken, outside of regular budgeted staff and business costs in this area, including for R&amp;D. A portion of the total R&amp;D expenditure in 2016 (\$92 million) went to develop the applications and processes described in this section.</p>

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**Further Information**

**Module: GHG Emissions Accounting, Energy and Fuel Use, and Trading**

**Page: CC7. Emissions Methodology**

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**CC7.1**

**Please provide your base year and base year emissions (Scopes 1 and 2)**

<b>Scope</b>	<b>Base year</b>	<b>Base year emissions (metric tonnes CO2e)</b>
Scope 1	Thu 01 Jan 2015 - Thu 31 Dec 2015	8,199,000
Scope 2 (location-based)	Thu 01 Jan 2015 - Thu 31 Dec 2015	12,640,000
Scope 2 (market-based)	Thu 01 Jan 2015 - Thu 31 Dec 2015	12,530,000

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**CC7.2**

**Please give the name of the standard, protocol or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions**

<b>Please select the published methodologies that you use</b>
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)
US EPA Mandatory Greenhouse Gas Reporting Rule
Other

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**CC7.2a**

**If you have selected "Other" in CC7.2 please provide details of the standard, protocol or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions**

The California ARB Regulation for the Reporting of Greenhouse Gas Emissions

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**CC7.3 Please give the source for the global warming potentials you have used**

Gas	Reference
CO2	IPCC Fourth Assessment Report (AR4 - 100 year)
CH4	IPCC Fourth Assessment Report (AR4 - 100 year)
N2O	IPCC Fourth Assessment Report (AR4 - 100 year)
SF6	IPCC Fourth Assessment Report (AR4 - 100 year)
HFCs	IPCC Fourth Assessment Report (AR4 - 100 year)

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**CC7.4**

**Please give the emissions factors you have applied and their origin; alternatively, please attach an Excel spreadsheet with this data at the bottom of this page**

Fuel/Material/Energy	Emission Factor	Unit	Reference
Diesel/Gas oil	22.4	lb CO2e per gallon	US EPA AP 42
Natural gas	120	lb CO2e per 1000 ft3	US EPA AP 42
Distillate fuel oil No 2	223	lb CO2 per gallon	US EPA AP 42
Naphtha	8.50	Other: kg CO2 per gallon	US EPA AP 42

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**Further Information**

Praxair uses 2015 as the base year for its Hydrogen and Trucking GHG intensity targets, which are described in Section CC3 Targets and Initiatives.

**Page: CC8. Emissions Data - (1 Jan 2016 - 31 Dec 2016)**

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**CC8.1**

**Please select the boundary you are using for your Scope 1 and 2 greenhouse gas inventory**

Financial control

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**CC8.2**

Please provide your gross global Scope 1 emissions figures in metric tonnes CO2e

8,348,000

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**CC8.3**

Please describe your approach to reporting Scope 2 emissions

Scope 2, location-based	Scope 2, market-based	Comment
We are reporting a Scope 2, location-based figure	We are reporting a Scope 2, market-based figure	Praxair bases our external reporting of Scope 2 emissions on the location-based method. For the purposes of responding to CDP, we report Scope 2 using the market-based approach by calculating the amount of CO2e that we could deduct for the facilities operating under power purchase agreements for renewable energy. We deducted 173,000 metric tons CO2e from our Scope 2 location-based total to arrive at the market-based value.

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**CC8.3a**

Please provide your gross global Scope 2 emissions figures in metric tonnes CO2e

Scope 2, location-based	Scope 2, market-based (if applicable)	Comment
12,881,000	12,708,000	We report Scope 2 using the market-based approach by calculating the amount of CO2e that we could deduct for the facilities operating under power purchase agreements for renewable energy. We deducted 173,000 metric tons CO2e from our Scope 2 location-based total to arrive at the market-based value.

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**CC8.4**

Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure?

Yes

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CC8.4a

Please provide details of the sources of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure

Source	Relevance of Scope 1 emissions from this source	Relevance of location-based Scope 2 emissions from this source	Relevance of market-based Scope 2 emissions from this source (if applicable)	Explain why the source is excluded
Electricity use at very small sites	No emissions excluded	Emissions are not relevant	Emissions are not relevant	Praxair has several very small office sites, many with 1-2 people. We estimated the emissions from these sites and, as they represent less than 1% of our Scope 2 emissions, consider them to be de minimis.

CC8.5

Please estimate the level of uncertainty of the total gross global Scope 1 and 2 emissions figures that you have supplied and specify the sources of uncertainty in your data gathering, handling and calculations

Scope	Uncertainty range	Main sources of uncertainty	Please expand on the uncertainty in your data
Scope 1	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	Our Sustainable Development Management System was implemented in 2011 and requires monthly sign-off from all businesses of their results versus corporate GHG targets and a quarterly review by the Office of the Chairman. This creates a level of internal oversight and management over our GHG emissions data. Most of Praxair Scope 1 emissions are from hydrogen production, much of which is made from natural gas (CH4). GHG emissions from hydrogen production are based on assumptions that all carbon in the natural gas is converted into CO2 and is emitted unless there are additional carbon-based products such as CO, methanol or formaldehyde; or if the hydrogen is by-product sourced. There are some measurement constraints in regards to all the data needed to do this material balance such as variability in carbon content in the natural gas, meter reading availability of the different raw materials as well as the type of products produced. In addition, natural gas data at our Packaged Gas and PST sites is collected only once every three years. This represents less than 2.5% of our total emissions, and does not warrant the level of effort for collecting this data annually.
Scope 2 (location-based)	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	Our Sustainable Development Management System was implemented in 2011 and requires monthly sign-off from all businesses of their results vs. corporate GHG targets and a quarterly review by the Office of the Chairman. This creates a level of internal oversight and management over our GHG emissions data. Standard Plants represent about 8% of Praxair's Scope 2 emissions. Praxair does not pay for or meter the electricity at these sites, as these plants are on customer sites and the customer pays the electricity. These emissions are estimated once every three years because actual activity data is not available. Praxair uses assumptions based on similar plants that we own and operate. In addition, we have a small number of owned corporate offices that account for less than 1% of our Scope 2 emissions. This data is collected once every five years from the larger offices, and estimated based on square footage for the smaller of these offices. Because of the small contribution to our emissions total, this category does not warrant the level of effort to collect and calculate emissions annually.

Scope	Uncertainty range	Main sources of uncertainty	Please expand on the uncertainty in your data
Scope 2 (market-based)	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	The uncertainty range and sources of uncertainty related to calculating Scope 2 emissions using the market-based approach are the same as the location-based approach described above.

**CC8.6**

**Please indicate the verification/assurance status that applies to your reported Scope 1 emissions**

Third party verification or assurance process in place

**CC8.6a**

**Please provide further details of the verification/assurance undertaken for your Scope 1 emissions, and attach the relevant statements**

Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/section reference	Relevant standard	Proportion of reported Scope 1 emissions verified (%)
Annual process	Complete	Limited assurance	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC8.6a/FINAL Audit Letter June 2017.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC8.6a/FINAL Audit Letter June 2017.pdf</a>	Page 1 - audit cycle, scope of audit, reporting year, type of assurance, assurance standard used, findings, proportion of reported emissions verified; page 2 - audited KPI values	ISO14064-3	100

**CC8.7**

**Please indicate the verification/assurance status that applies to at least one of your reported Scope 2 emissions figures**

Third party verification or assurance process in place

**CC8.7a**

Please provide further details of the verification/assurance undertaken for your location-based and/or market-based Scope 2 emissions, and attach the relevant statements

Location-based or market-based figure?	Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 2 emissions verified (%)
Location-based	Annual process	Complete	Limited assurance	<a href="https://www.cdp.net/sites/2017/27/15027/Climate%20Change%202017/Shared%20Documents/Attachments/CC8.7a/FINAL%20Audit%20Letter%20June%202017.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC8.7a/FINAL Audit Letter June 2017.pdf</a>	Page 1 - audit cycle, scope of audit, reporting year, type of assurance, assurance standard used, findings, proportion of reported emissions verified; page 2 - audited KPI values	ISO14064-3	100

**CC8.8**

Please identify if any data points have been verified as part of the third party verification work undertaken, other than the verification of emissions figures reported in CC8.6, CC8.7 and CC14.2

Additional data points verified	Comment
Year on year change in emissions (Scope 2)	Praxair's Scope 2 emissions account for 61% of emissions (not including Scope 3). Electricity accounts for a significant portion of Praxair's operational spend, and we invest heavily in energy efficiency, especially at our ASUs, which comprise 82% of our Scope 2 emissions. We had the year on year change in Scope 2 emissions verified; these emissions increased by 2%.

**CC8.9**

Are carbon dioxide emissions from biologically sequestered carbon relevant to your organization?

No

**Further Information**

**CC9.1 Do you have Scope 1 emissions sources in more than one country?**

Yes

**CC9.1a**

**Please break down your total gross global Scope 1 emissions by country/region**

Country/Region	Scope 1 metric tonnes CO2e
North America	7,564,000
South America	54,000
Europe	54,000
Asia, Australasia, Middle East and Africa	676,000

**CC9.2**

**Please indicate which other Scope 1 emissions breakdowns you are able to provide (tick all that apply)**

- By business division
- By GHG type

**CC9.2a**

**Please break down your total gross global Scope 1 emissions by business division**

Business division	Scope 1 emissions (metric tonnes CO2e)
ASUs	411,000
Hydrogen Plants	7,260,000
CO2 Plants	312,000
Packaged Gas	86,000
Electronics + Surface Technologies	23,000
Helium Plants	0
Trucking	252,000
Corporate Offices	4,000

**CC9.2c**

Please break down your total gross global Scope 1 emissions by GHG type

GHG type	Scope 1 emissions (metric tonnes CO2e)
CO2	8,305,000
N2O	13,000
SF6	1,000
HFCs	28,000
CH4	1,000

**Further Information**

Page: **CC10. Scope 2 Emissions Breakdown - (1 Jan 2016 - 31 Dec 2016)**

**CC10.1**

Do you have Scope 2 emissions sources in more than one country?

Yes

**CC10.1a**

Please break down your total gross global Scope 2 emissions and energy consumption by country/region

Country/Region	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low carbon electricity, heat, steam or cooling accounted in market- based approach (MWh)
North America	6,256,000	6,131,000	11,438,000	423,000
South America	437,000	434,000	3,131,000	46,000
Europe	1,293,000	1,293,000	3,167,000	0
Asia, Australasia, Middle East and Africa	4,895,000	4,850,000	6,573,000	52,000

**CC10.2** Please indicate which other Scope 2 emissions breakdowns you are able to provide (tick all that apply)

By business division

**CC10.2a** Please break down your total gross global Scope 2 emissions by business division

Business division	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)
ASUs	10,592,000	10,455,000
Hydrogen Plants	859,000	823,000
CO2 Plants	204,000	204,000
Packaged Gas	120,000	120,000
Electronics + Surface Technologies	41,000	41,000
Helium Plants	31,000	31,000
Standard Plants	1,028,000	1,028,000
Trucking	0	0
Corporate Offices	6,000	6,000

**Further Information**

**Page: CC11. Energy**

**CC11.1** What percentage of your total operational spend in the reporting year was on energy?

More than 25% but less than or equal to 30%

**CC11.2**

Please state how much heat, steam, and cooling in MWh your organization has purchased and consumed during the reporting year

Energy type	MWh
Heat	0
Steam	1,147,000
Cooling	0

**CC11.3**

Please state how much fuel in MWh your organization has consumed (for energy purposes) during the reporting year

3,096,000

**CC11.3a**

Please complete the table by breaking down the total "Fuel" figure entered above by fuel type

Fuels	MWh
Natural gas	2,709,000
Distillate fuel oil No 2	11,000
Diesel/Gas oil	344,000
Naphtha	31,000

**CC11.4**

Please provide details of the electricity, heat, steam or cooling amounts that were accounted at a low carbon emission factor in the market-based Scope 2 figure reported in CC8.3a

Basis for applying a low carbon emission factor	MWh consumed associated with low carbon electricity, heat, steam or cooling	Emissions factor (in units of metric tonnes CO2e per MWh)	Comment
Contract with suppliers or utilities, with a supplier-specific emission rate, not backed by electricity attribute certificates	521,000	0	Low carbon energy is associated with various renewable energy sources, including solar, wind and hydro. All of these have an emission factor of zero. Praxair accounts for 521,000 MWh of renewable energy purchased through contracts with utility suppliers. This represents about 2% of Praxair's total worldwide electricity consumption. Additionally, Praxair assumes that worldwide, approximately 31% of the electricity we purchased off the grid was from renewable sources in 2016. However, we do not account for renewable electricity that is part of the grid mix in the low carbon energy data provided here.

**CC11.5 Please report how much electricity you produce in MWh, and how much electricity you consume in MWh**

Total electricity consumed (MWh)	Consumed electricity that is purchased (MWh)	Total electricity produced (MWh)	Total renewable electricity produced (MWh)	Consumed renewable electricity that is produced by company (MWh)	Comment
23,162,000	23,162,000	0	0	0	In 2016, Praxair used renewable electricity but did not produce it.

**Further Information**

**Page: CC12. Emissions Performance**

**CC12.1 How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to the previous year?**

Increased

**CC12.1a**

**Please identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined) and for each of them specify how your emissions compare to the previous year**

Reason	Emissions value (percentage)	Direction of change	Please explain and include calculation
Emissions reduction activities	2	Decrease	Emissions decreased 2% due to energy efficiency and other GHG emissions reduction activities. This percent was derived by dividing 393,000 MT CO <sub>2</sub> e saved (as reported in question 3.3a) by Praxair's 2015 Scope 1+2 total of 20,839,000 MT CO <sub>2</sub> e * 100 to arrive at 2%. We do not count new purchases of renewable energy here, because we are using the location-based method for Scope 2 accounting.
Divestment			
Acquisitions			
Mergers			

Reason	Emissions value (percentage)	Direction of change	Please explain and include calculation
Change in output	3	Increase	Praxair's total production increased from 2015 to 2016 by 1%. Additionally, there were several large hydrogen plants in India and South America that started up in 2015 and were at full production in 2016. These plants account for 4% of the emissions increase. Due to customer requirements, one of these plants mostly runs on naphtha, which is more GHG emissions-intensive than other sources of hydrogen. The ratio of MT product to MT emissions for this new plant is 1:11, as opposed to the Praxair-wide average for hydrogen plants of 1:5.  Combined, these factors account for a 3% increase in GHG emissions, 2015 to 2016.
Change in methodology			
Change in boundary	1	Increase	Starting in 2016, Praxair is including in our GHG inventory a handful of hydrogen plants that are on customer sites, but owned and operated by Praxair. These are similar to our "Standard Plant" ASUs, which we have been including in our inventory for some time. These sites account for approximately 250,000 MT CO2e, which is approximately a 1% increase in our total Scope 1+2 emissions from 2015.
Change in physical operating conditions			
Unidentified			
Other			

**CC12.1b**

**Is your emissions performance calculations in CC12.1 and CC12.1a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?**

Location-based

**CC12.2 Please describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tonnes CO2e per unit currency total revenue**

Intensity figure	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator: Unit total revenue	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
0.002015	metric tonnes CO2e	10,534,000,000	Location-based	4	Increase	As explained in our response to 12.1a, emissions increased by 2% in 2016 compared to 2015. In addition, revenue in 2016 was 2% below sales in 2015 (Praxair 2016 Annual Report, page 21). These factors combined resulted in a 4% increase in MT CO2e per dollar of revenue.

**CC12.3**

**Please provide any additional intensity (normalized) metrics that are appropriate to your business operations**

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator	Metric denominator: Unit total	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
0.001697	metric tonnes CO2e	Other: Total revenue excluding currency fluctuation	12,512,000,000	Location-based	1	Increase	The increase is in line with the overall increase in production of 1%. Total Scopes 1 and 2 emissions increased by 2%, and sales decreased 2%, primarily due to negative currency translation impacts of 3%. These factors combined resulted in a 1% increase in MT CO2e per dollar of revenue excluding currency fluctuation.

**Further Information**

**Page: CC13. Emissions Trading**

**CC13.1**

**Do you participate in any emissions trading schemes?**

Yes

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**CC13.1a**

Please complete the following table for each of the emission trading schemes in which you participate

Scheme name	Period for which data is supplied	Allowances allocated	Allowances purchased	Verified emissions in metric tonnes CO2e	Details of ownership
California's Greenhouse Gas Cap and Trade Program	Fri 01 Jan 2016 - Sat 31 Dec 2016	47,629	0	70,956	Facilities we own and operate
Other: Quebec Cap and Trade Program	Fri 01 Jan 2016 - Sat 31 Dec 2016	37,547	0	33,769	Facilities we own and operate

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**CC13.1b**

**What is your strategy for complying with the schemes in which you participate or anticipate participating?**

Praxair stays current with developments in global regulations. While Praxair is not covered under the EU Emissions Trading Scheme (ETS), we do have facilities that are part of California's Greenhouse Gas Cap and Trade program, Quebec's Cap and Trade program, and the UK's Climate Change Agreement (the UK program is part of their carbon tax program; it is not a trading scheme). These are all regulated programs; Praxair does not trade allowances in voluntary speculative trading schemes. An entirely robust estimation of the future demands of these trading schemes is not possible. However, Praxair is prepared to participate in these schemes by having an adequate and flexible GHG strategy. This takes into account a range of emissions reduction measures, e.g. use of abatement technology, increase in energy efficiency, as well as the use of project-based carbon credits and, in the eventual case of ETS, a purchase strategy for EUAs. Praxair's customer contracts pass through increases in the cost of energy, and would also pass through allowance purchases.

If Praxair comes under additional regulated emissions trading regimes such as ETS, we will participate.

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**CC13.2**

**Has your organization originated any project-based carbon credits or purchased any within the reporting period?**

Yes

CC13.2a

Please provide details on the project-based carbon credits originated or purchased by your organization in the reporting period

Credit origination or credit purchase	Project type	Project identification	Verified to which standard	Number of credits (metric tonnes CO2e)	Number of credits (metric tonnes CO2e): Risk adjusted volume	Credits canceled	Purpose, e.g. compliance
Credit purchase	Forests	The Rio Bravo Climate Action Project, a 15,550-acre area of tropical forest located in northwest Belize, registered by the Nature Conservancy. This is Praxair's fifth year with this project and fifth purchase of the same number of credits.	VCS (Verified Carbon Standard)	667	667	Yes	Voluntary Offsetting
Credit purchase	Forests	To meet part of our compliance obligation under the California Cap & Trade Program, we purchased 5,500 MT of CO2 offset credits from The Nature Conservancy that were generated by the Clinch Valley, Virginia, Conservation Forestry Program. This is a unique partnership between the Conservancy and private landowners aimed at sustaining the productivity and biological health of "working forests."	CAR (The Climate Action Reserve)	5500	5500	Yes	Compliance

Further Information

Quebec's Cap and Trade Program requires Praxair to obtain emissions credits for CO2 that leaves as product. Therefore, the emissions reported above in 13.1a are higher than the emissions Praxair uses to calculate its GHG inventory, since Praxair does not count product CO2 in its GHG emissions inventory.

CC14.1

Please account for your organization’s Scope 3 emissions, disclosing and explaining any exclusions

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Purchased goods and services	Not relevant, explanation provided				Praxair's largest purchased good is energy, such as electricity to operate our facilities and natural gas to make hydrogen. Details on our energy purchases and emissions are provided in sections CC7-CC11 of this report. Other goods and services purchased by Praxair include logistics and transportation services, office infrastructure requirements and administrative benefits and services. In the rows below, we detail our largest upstream emissions from the purchase of capital goods and upstream energy-related emissions. In 2012 and 2013, we estimated emissions from our consumption of paper using the U.S. EPA's WARM methodology. These emissions, along with emissions from the remaining upstream goods and services, are less than 0.1% of our Scope 3 footprint and are considered to be not relevant when compared to our energy-related activities.
Capital goods	Relevant, calculated	483,000	The principal material Praxair procures for capital projects is steel. Based on our annual spend, we used our Steelfirst subscription to calculate the price of carbon steel per country. The weight of steel was then calculated as price per ton divided into spend. Related GHG emissions were calculated by multiplying the weight of the carbon steel using a GHG emission factor derived from the U.S. EPA (0.87 MT CO2e/ per MT carbon steel).	100.00%	

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Fuel-and-energy-related activities (not included in Scope 1 or 2)	Relevant, calculated	2,166,000	The methodology used is based on the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Category 3. For electricity, we prorated the fuel mix ratios in those 7 countries where we use more than 1 billion KW. These 7 countries represent more than 87% of our total electricity usage. We extrapolated this mix to the remaining 13% of our electricity usage. We then assumed a T&D loss rate of 7%, based on information from the U.S. Department of Energy. We then added in emissions from upstream natural gas.	100.00%	
Upstream transportation and distribution	Not relevant, explanation provided				In 2013, two transportation projects were evaluated: one very large project in Russia and one medium-sized project in the U.S. For each project, distance traveled was recorded for road, rail and sea. Emissions factors per mode of transportation were used from CEFIC/ ECTA March 2011 Guidelines for Measuring and Managing CO2 Emissions from Freight Transport Operations, and GHG emissions were determined per project. The average GHG emissions per project were multiplied by the number of oversized and heavy capital equipment transportation projects. This was multiplied by 1.2 to determine GHG emissions from 100 percent of capital equipment purchased. The number likely overstates the emissions as 20 percent is from far smaller capital equipment transportation projects. These emissions represented less than 1.5% of our Scope 3 footprint in both 2013 and 2014. Therefore, we did not calculate these emissions for 2015 and deem them not relevant.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Waste generated in operations	Relevant, calculated	14,000	The methodology used is based on the Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Using the average data method according to this standard, Praxair uses waste volumes provided by waste vendors and multiplies the waste treated by third parties for each waste treatment method by the associated emission factors. The amount of waste treated by third parties is recorded in our EKPI database according to the waste treatment methods (landfill, recycled, other). To calculate the CO2e emissions resulting from waste treated in landfills, Praxair multiplies the total amount of waste in this category by an emissions factor provided by the EPA, which is associated with the municipal waste mix in the United States. The IPCC suggests that any CO2e emissions associated with recycling should not be included in Scope 3 inventories. Therefore, Praxair uses an emissions factor of 0 for recycled waste treated by third parties. The small amount of waste which is not landfilled or recycled is calculated equally as if it were landfilled.	100.00%	Emissions from waste generated in operations is relevant to Praxair. We have a Zero Waste program that encourages all sites to reduce waste and eliminate sending waste to landfill. Participation in this program is growing and through this program, we track waste data and the GHG benefits from reducing waste.
Business travel	Not relevant, explanation provided				Praxair estimated emissions from business travel in 2012 and 2013. These emissions were about 9,000 metric tons CO2e, representing 0.3% of our Scope 3 footprint. Since our level of business travel has not changed significantly compared to 2013, we did not recalculate these emissions. We do not consider these emissions to be relevant to our Scope 3 footprint.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Employee commuting	Not relevant, explanation provided				Praxair calculated GHG emissions from employee commuting for 2012 through 2014. In each year, emissions totaled less than 2% of total Scope 3 emissions. As emissions from employee commuting are not relevant to our Scope 3 footprint, we did not calculate these emissions for 2016.
Upstream leased assets	Not relevant, explanation provided				Praxair estimated emissions from leased office space in 2012 and 2013. These emissions were about 15,000 metric tons CO2e in 2013, representing 0.5% of our measured Scope 3 footprint. Since the square footage of leased office space has not changed significantly compared to 2013, we did not recalculate these emissions. We do not consider these emissions to be relevant to our Scope 3 footprint.
Downstream transportation and distribution	Relevant, calculated	276,000	Praxair products are delivered by pipeline, through on-site product production, and by truck. A small portion is delivered by train and ship. Product delivered by Praxair trucks is reported as Scope 1. About half of Praxair's truck miles each year are driven by contractors. Contractor miles driven are collected in each country and business or region and tracked as part of Praxair's safety program. Praxair's Scope 3 emissions resulting from delivery of products by third-party carriers were derived by assuming contractor fuel efficiency is equivalent to the prior year Praxair driving fuel efficiency. This miles per gallon value was then multiplied by total miles driven and converted to GHGs using an EPA emission factor for diesel fuel.	100.00%	

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Processing of sold products	Not relevant, explanation provided				<p>Guidance for this category is based on the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, section 6.4. Praxair is at the beginning of many value chains (for carbonated beverage companies, refineries, electronics, aerospace, automotive, healthcare, steel making, etc.). Praxair provides many intermediate products with many downstream applications, each of which has a very different GHG profile. The effort involved in determining Scope 3 emissions from processing of our products is not reasonable, and for this reason, we are unable to reasonably estimate the downstream emissions associated with the various end uses of our products. For these reasons, we do not report emissions in the following categories: processing of sold products, use of sold products, and end of life treatment of sold products.</p> <p>Emissions from our CO2 sales to the food industry may be traceable. This market segment is a subset of our food and beverage end market, which is 9% of our annual revenue. Actual CO2 volumes are business confidential. However, customers have requested this information as part of CDP's Supply Chain program and we have provided it to them.</p>

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Use of sold products	Not relevant, explanation provided				<p>Guidance for this category is based on the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, section 6.4. Praxair is at the beginning of many value chains (for carbonated beverage companies, refineries, electronics, aerospace, automotive, healthcare, steel making, etc.). Praxair provides many intermediate products with many downstream applications, each of which has a very different GHG profile. The effort involved in determining Scope 3 emissions from use of our products is not reasonable, and for this reason, we are unable to reasonably estimate the downstream emissions associated with the various end uses of our products. For these reasons, we do not report emissions in the following categories: processing of sold products, use of sold products, and end of life treatment of sold products.</p> <p>As noted in CC3.2a, the use of a number of our products/applications helps customers reduce their GHG emissions, i.e., the use of our products does not generate emissions but helps others reduce theirs.</p> <p>Emissions from our CO2 sales to the food industry may be traceable. This market segment is a subset of our food and beverage end market, which is 9% of our annual revenue. Actual CO2 volumes are business confidential. However, customers have requested this information as part of CDP's Supply Chain program and we have provided it to them.</p>

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
End of life treatment of sold products	Not relevant, explanation provided				<p>Guidance for this category is based on the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, section 6.4. 47% of Praxair's raw materials are non-greenhouse gas atmospheric gases, extracted directly from the air and ultimately returned to the atmosphere with no GHG impact. In addition, Praxair is at the beginning of many value chains (for carbonated beverage companies, refineries, electronics, aerospace, automotive, healthcare, steel making, etc.). Praxair provides many intermediate products with many downstream applications, each of which has a very different GHG profile. The effort involved in determining Scope 3 emissions from end-of-life treatment of our products is not reasonable, and for this reason, we are unable to reasonably estimate the downstream emissions associated with the various end uses of our products. For these reasons, we do not report emissions in the following categories: processing of sold products, use of sold products, and end of life treatment of sold products.</p> <p>Emissions from our CO2 sales to the food industry may be traceable. This market segment is a subset of our food and beverage end market, which is 9% of our annual revenue. Actual CO2 volumes are business confidential. However, customers have requested this information as part of CDP's Supply Chain program and we have provided it to them.</p>
Downstream leased assets	Not relevant, explanation provided				Praxair does not have any downstream leased assets.
Franchises	Not relevant, explanation provided				Praxair does not have any franchises.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Investments	Not relevant, explanation provided				An estimate of Praxair's share of GHG emissions from joint ventures where we own less than 50% was made for 2012 and 2013 based on assuming the same output per \$ revenue in our JV's as in our own business. In 2014 and 2015, we owned only a small share in a joint venture, and our share of revenue in JV's is only a fraction of our total revenue. We estimated emissions from JV's to be less than 1% of our Scope 3 footprint and, therefore, consider them not relevant.
Other (upstream)					
Other (downstream)					

**CC14.2**

**Please indicate the verification/assurance status that applies to your reported Scope 3 emissions**

Third party verification or assurance process in place

**CC14.2a**

**Please provide further details of the verification/assurance undertaken, and attach the relevant statements**

Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 3 emissions verified (%)
Annual process	Complete	Limited assurance	<a href="https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC14.2a/FINAL Audit Letter June 2017.pdf">https://www.cdp.net/sites/2017/27/15027/Climate Change 2017/Shared Documents/Attachments/CC14.2a/FINAL Audit Letter June 2017.pdf</a>	Page 1 - audit cycle, scope of audit, reporting year, type of assurance, assurance standard used, findings, proportion of reported emissions verified; page 2 - audited KPI values	ISO14064-3	9

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**CC14.3**

**Are you able to compare your Scope 3 emissions for the reporting year with those for the previous year for any sources?**

Yes

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**CC14.3a**

**Please identify the reasons for any change in your Scope 3 emissions and for each of them specify how your emissions compare to the previous year**

Sources of Scope 3 emissions	Reason for change	Emissions value (percentage)	Direction of change	Comment
Capital goods	Change in output	4	Decrease	The reduction in Scope 3 emissions from capital goods is due to fewer plants built in 2016 compared to 2015.
Fuel- and energy-related activities (not included in Scopes 1 or 2)	Change in output	0.3	Decrease	Praxair started using customer-provided naphtha as a feedstock at one large new hydrogen plant. Combined with a 1% increase in electricity use, this mostly offset a 3% decrease in natural gas use.
Waste generated in operations	Emissions reduction activities	18	Decrease	Praxair's total waste increased, 2015 to 2016, by 4,000 MT. However, we decreased landfill waste by more than 5,000 MT, or 28%. Due to the way emissions are calculated in this category (waste that is recycled is assigned zero emissions), emissions resulting from waste disposal decreased 18% since the previous year. Reduction in waste to landfill is the focus of Praxair's Zero Waste to Landfill program, which is an employee engagement program that encourages recycling and finding alternatives to landfill disposal.
Downstream transportation and distribution	Change in output	9	Increase	The amount of product delivered increased 1% in 2016 compared to 2015. In addition, more miles were driven by contractors than Praxair drivers. Over the same time period, GHG emissions from Praxair drivers decreased by 3%.

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**CC14.4**

**Do you engage with any of the elements of your value chain on GHG emissions and climate change strategies? (Tick all that apply)**

Yes, our suppliers

**CC14.4b**

To give a sense of scale of this engagement, please give the number of suppliers with whom you are engaging and the proportion of your total spend that they represent

Type of engagement	Number of suppliers	% of total spend (direct and indirect)	Impact of engagement
Active engagement	80	43%	<p>An example of the impact of our engagement with energy providers in 2016: At Praxair's Fife, Washington ASU facility. An idea for ASU energy efficiency started in Praxair's Technology Center in Buffalo, NY, and then moved to the engineering and R&amp;D teams. The team added a higher capacity side core heat exchanger to the plant's liquefier and this is now saving nearly 5.4 million kilowatt hours a year – enough to power 500 homes across the area. Tacoma Power rewarded these efforts by giving Praxair a \$1.2 million rebate, one of the largest in the utility's history.</p> <p>The impact of our engagement with contract carriers: Contract drivers account for 52% of the total miles driven to distribute Praxair products around the world. On-board computers (OBCs) installed on most Praxair bulk gas delivery trucks have helped Praxair drivers significantly improve vehicle safety, save fuel and limit carbon dioxide emissions. To help contract carriers achieve these same results, Praxair instituted a pilot program in Germany, where distribution is conducted exclusively by contract carriers. Due to the success of the pilot, the use of telematics is now being extended to Scandinavia, with plans to roll out to the rest of Europe during 2017.</p>

**Further Information**

Praxair considers purchased goods and services, upstream transportation and distribution, business travel, employee commuting, upstream leased assets, and investments as "not relevant" Scope 3 categories. Combined, these sources account for approximately 4.8% of Scope 3 emissions. Praxair's de minimis threshold is 5%.

**Module: Sign Off**

**Page: CC15. Sign Off**

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**CC15.1**

**Please provide the following information for the person that has signed off (approved) your CDP climate change response**

<b>Name</b>	<b>Job title</b>	<b>Corresponding job category</b>
Anne K. Roby	Senior Vice President, Office of the Chairman	Chief Operating Officer (COO)

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**Further Information**

**CDP**