

# Alphabet, Inc. - Climate Change 2019

## C0. Introduction

---

### C0.1

---

#### **(C0.1) Give a general description and introduction to your organization.**

As our founders Larry and Sergey wrote in the original founders' letter, "Google is not a conventional company. We do not intend to become one." That unconventional spirit has been a driving force throughout our history -- inspiring us to do things like rethink the mobile device ecosystem with Android and map the world with Google Maps. As part of that, our founders also explained that you could expect us to make "smaller bets in areas that might seem very speculative or even strange when compared to our current businesses." From the start, the company has always strived to do more, and to do important and meaningful things with the resources we have.

Alphabet is a collection of businesses -- the largest of which is Google. It also includes businesses that are generally pretty far afield of our main internet products in areas such as self-driving cars, life sciences, internet access and TV services. We report all non-Google businesses collectively as Other Bets. Our Alphabet structure is about helping each of our businesses prosper through strong leaders and independence.

We have always been a company committed to building products that have the potential to improve the lives of millions of people. Our product innovations have made our services widely used, and our brand one of the most recognized in the world. Google's core products and platforms such as Android, Chrome, Gmail, Google Drive, Google Maps, Google Play, Search, and YouTube each have over one billion monthly active users. But most important, we believe we are just beginning to scratch the surface. Our vision is to remain a place of incredible creativity and innovation that uses our technical expertise to tackle big problems. As the majority of Alphabet's big bets continue to reside within Google, an important benefit of the shift to Alphabet has been the tremendous focus that we're able to have on Google's many extraordinary opportunities.

We generate revenues primarily by delivering both performance advertising and brand advertising. Beyond our advertising business, we also generate revenues in other areas. For instance, we generate revenue when users purchase digital content like apps, movies and music through Google Play or when they purchase our Made by Google hardware devices. Businesses also pay for the use of our cloud services like Google Cloud Platform and G Suite.

Google's mission to organize the world's information and make it universally accessible and useful has always been our North Star, and our products have come a long way since the company was founded two decades ago.

Google was incorporated in California in September 1998 and re-incorporated in the State of Delaware in August 2003. In 2015, we implemented a holding company reorganization, and as a result, Alphabet Inc. (Alphabet) became the successor issuer to Google.

Our Class A common stock has been listed on the Nasdaq Global Select Market under the symbol "GOOG" since August 19, 2004 and under the symbol "GOOGL" since April 3, 2014. Our Class C capital stock has been listed on the Nasdaq Global Select Market under the symbol "GOOG" since April 3, 2014.

Our headquarters are located in Mountain View, California. We also own and lease office and building space in the surrounding areas near our headquarters, which in the aggregate (including our headquarters) represent approximately 11.2 million square feet of office/building space and approximately fifty-nine acres of developable land to accommodate anticipated future growth. In addition, we

own and lease office/building space and research and development sites around the world, primarily in North America, Europe, South America, and Asia. We own and operate data centers in North America, Europe, South America, and Asia.

As of December 31, 2018, we had more than \$136 billion in total revenues and 98,771 full-time employees.

As used herein, "Alphabet," "the company," "we," "us," "our," and similar terms include Alphabet Inc. and its subsidiaries, unless the context indicates otherwise.

Alphabet's responses to this Questionnaire contain projections, future estimates, plans, expectations, and other forward-looking statements that are subject to risks and uncertainties. Readers are cautioned not to place undue reliance on these forward-looking statements. Forward-looking statements are not guarantees of future performance and actual results may differ materially from those reflected in the forward-looking statements for a number of reasons, including, but not limited to, risks discussed in Alphabet's Annual Report on Form 10-K and other documents it files with the Securities and Exchange Commission. Alphabet undertakes no obligation to correct, revise or update any information included in this Questionnaire.

## C0.2

---

**(C0.2) State the start and end date of the year for which you are reporting data.**

	Start date	End date	Indicate if you are providing emissions data for past reporting years	Select the number of past reporting years you will be providing emissions data for
Row 1	January 1 2018	December 31 2018	No	<Not Applicable>

## C0.3

---

**(C0.3) Select the countries/regions for which you will be supplying data.**

Argentina  
Australia  
Austria  
Belgium  
Brazil  
Canada  
Chile  
China  
China, Hong Kong Special Administrative Region  
Colombia  
Croatia  
Czechia  
Democratic People's Republic of Korea  
Denmark  
Finland  
France  
Germany  
Ghana  
Greece  
Hungary  
India  
Indonesia  
Ireland  
Israel  
Italy  
Japan  
Kenya  
Lithuania  
Malaysia  
Mexico  
Netherlands  
New Zealand  
Nigeria  
Norway  
Peru  
Philippines  
Poland  
Portugal  
Romania  
Russian Federation  
Singapore  
Slovakia  
South Africa  
Spain  
Sweden  
Switzerland  
Taiwan, Greater China  
Thailand  
Turkey  
Ukraine  
United Arab Emirates  
United Kingdom of Great Britain and Northern Ireland  
United States of America

---

**C0.4**

**(C0.4) Select the currency used for all financial information disclosed throughout your response.**

USD

## C0.5

---

**(C0.5) Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note that this option should align with your consolidation approach to your Scope 1 and Scope 2 greenhouse gas inventory.**

Operational control

## C1. Governance

---

### C1.1

---

**(C1.1) Is there board-level oversight of climate-related issues within your organization?**

Yes

#### C1.1a

---

**(C1.1a) Identify the position(s) (do not include any names) of the individual(s) on the board with responsibility for climate-related issues.**

Position of individual(s)	Please explain
Chief Financial Officer (CFO)	Our CFO is responsible for overseeing climate-related issues, including signing our CDP report, as she has visibility across all company operations. Our CFO meets with Alphabet's board of directors regularly and brings up climate-related issues on an as-needed basis. Primary responsibility for managing climate-related issues is delegated to Google's Sustainability Officer (GSO), who reports up to our CFO. We also have an internal Sustainability Board focused on scaling sustainability impact through strategic alignment. It includes senior executives from across the company with diverse skills, from teams including operations, products, ethics and compliance, investor relations, treasury, marketing, legal, PR/Comms, and policy. This group is chaired by a Finance VP and meets on a quarterly basis to discuss, review and approve climate-related initiatives, and to provide recommendations and guidance. Our GSO leads engagement with the Sustainability Board and reports to them quarterly.

#### C1.1b

---

**(C1.1b) Provide further details on the board's oversight of climate-related issues.**

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – some meetings	Reviewing and guiding risk management policies Monitoring and overseeing progress against goals and targets for addressing climate-related issues	Climate-related issues may be added to the agenda for meetings of Alphabet's board of directors on an as-needed basis. Google's Sustainability Officer provides an annual update, which includes climate-related issues, to the audit committee of Alphabet's board of directors. Climate-related issues are integrated into our risk management process and goals/targets. We also have a non-independent internal Sustainability Board focused on scaling sustainability impact through strategic alignment. It includes senior executives from operations (i.e. Cloud; Development, Real Estate and Security), products (i.e. Hardware and Google Earth), ethics and compliance, investor relations, treasury, marketing, legal, communications/PR, and policy. This group is chaired by a Vice President, Finance, and meets on a quarterly basis to discuss, review and approve climate-related initiatives, and to provide recommendations and guidance. Our GSO leads engagement with the Sustainability Board and reports to them quarterly. Climate-related issues are a scheduled agenda item for all meetings of our Sustainability Board, which meets on a quarterly basis. Through the Sustainability Board, climate-related risks are integrated into our organizational strategy, plans of action, management policies, performance objectives; and how we monitor progress against targets and goals.

## C1.2

**(C1.2) Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.**

Name of the position(s) and/or committee(s)	Responsibility	Frequency of reporting to the board on climate-related issues
Chief Sustainability Officer (CSO)	Both assessing and managing climate-related risks and opportunities	Quarterly

## C1.2a

**(C1.2a) Describe where in the organizational structure this/these position(s) and/or committees lie, what their associated responsibilities are, and how climate-related issues are monitored (do not include the names of individuals).**

The highest level of direct responsibility for climate change rests with the Senior Vice President and Chief Financial Officer of Alphabet and Google, who is responsible for overseeing climate-related issues as she has visibility across all of the company's operations. Our CFO is the final sign-off for Alphabet's CDP climate change report, which summarizes our assessment and management of climate-related risks and opportunities.

The Audit Committee of the Board of Directors oversees and monitors the risks and exposures associated with our operational infrastructure, particularly reliability, business continuity, capacity and security, among other matters. Our CFO meets with Alphabet's Audit Committee and Board of Directors regularly and can raise climate-related issues on an as-needed basis. Other people may also be requested to present climate-related information to the board. For example, Google's Sustainability Officer (GSO) provides an annual update to the audit committee on our sustainability and climate change strategy.

We also have an internal Sustainability Board focused on scaling sustainability impact through strategic alignment. It includes senior executives from operations (i.e. Cloud; Development, Real Estate and Security), products (i.e. Hardware and Google Earth), ethics and compliance, investor relations, treasury, marketing, legal, communications/PR, and policy. This group is chaired by a Vice President, Finance, and meets on a quarterly basis to discuss, review and approve climate-related initiatives, and to provide recommendations and guidance. Our GSO leads engagement with the Sustainability Board and reports to them quarterly.

Climate-related issues are a scheduled agenda item for all meetings of our Sustainability Board, which meets on a quarterly basis. Through the Sustainability Board, climate-related risks are integrated into our organizational strategy, plans of action, management policies, performance objectives; and how we monitor progress against targets and goals.

Primary responsibility for managing climate-related issues is delegated to our GSO, who reports up to our CFO and updates her as needed. Our GSO's team leads much of Alphabet's work on assessing and managing climate-related risks and opportunities, including programs such as carbon accounting and reporting, carbon offsets, our 10+ year commitment to carbon neutrality, our climate resilience strategy (including our climate scenario analysis), and engagement with employees on sustainability issues (i.e. our annual Google Green Awards, which includes a category for employees that have reduced Google's energy use and/or carbon footprint).

Our GSO leads cross-functional strategy and collaboration of sustainability teams across the company, including teams such as real estate sustainability, data center sustainability, and consumer hardware sustainability, and the leads for these teams have a dotted line report to her. Our GSO facilitates a monthly meeting of 15+ employees with key sustainability leadership roles across various departments, including designated sustainability representatives from groups such as Google Earth Outreach, policy, and Cloud marketing. She also coordinates development and monitoring of company-wide sustainability objectives and targets. Lastly, our GSO engages with government policy-makers at a local, federal, and international level on sustainability topics as needed to support efforts led by our policy team. For example, she has engaged with the European Commission and various federal agencies about Google's sustainability initiatives, as well as with municipal officials in the San Francisco Bay Area and other cities about climate resilience. For all of the reasons listed above, our GSO is well positioned to assess and manage climate-related issues.

Our GSO also has a dotted line report to Google's Senior Vice President of Technical Infrastructure. Google's Senior VP of Technical Infrastructure is responsible for data center operations, in addition to many other responsibilities. As data center power consumption is responsible for a significant component of Alphabet's carbon footprint and our energy bills, Google's Senior VP of Technical Infrastructure has a strong interest in measuring and offsetting our carbon footprint, as well as in leading Google's work to purchase renewable energy for our operations.

## C1.3

**(C1.3) Do you provide incentives for the management of climate-related issues, including the attainment of targets?**

Yes

**C1.3a**

---

**(C1.3a) Provide further details on the incentives provided for the management of climate-related issues (do not include the names of individuals).**

**Who is entitled to benefit from these incentives?**

Other, please specify (Data center engineer)

**Types of incentives**

Monetary reward

**Activity incentivized**

Efficiency project

**Comment**

Through quarterly individual- and team-level target-setting, regular performance reviews, and bonus programs, performance for many employees is tied to meeting targets related to energy efficiency, reduced energy use, and increased renewable energy procurement.

---

**Who is entitled to benefit from these incentives?**

Energy manager

**Types of incentives**

Monetary reward

**Activity incentivized**

Energy reduction project

**Comment**

Through quarterly individual- and team-level target-setting, regular performance reviews, and bonus programs, performance for many employees is tied to meeting targets related to energy efficiency, reduced energy use, and increased renewable energy procurement.

---

**Who is entitled to benefit from these incentives?**

Facilities manager

**Types of incentives**

Monetary reward

**Activity incentivized**

Efficiency target

**Comment**

Through quarterly individual- and team-level target-setting, regular performance reviews, and bonus programs, performance for many employees is tied to meeting targets related to energy efficiency, reduced energy use, and increased renewable energy procurement.

---

**Who is entitled to benefit from these incentives?**

Environment/Sustainability manager

**Types of incentives**

Monetary reward

**Activity incentivized**

Emissions reduction project

**Comment**

Through quarterly individual- and team-level target-setting, regular performance reviews, and bonus programs, performance for many employees is tied to meeting targets related to energy efficiency, reduced energy use, and increased renewable energy procurement.

---

**Who is entitled to benefit from these incentives?**

Public affairs manager

**Types of incentives**

Monetary reward

**Activity incentivized**

Behavior change related indicator

**Comment**

This encompasses communications/ marketing/ public affairs managers. Through quarterly individual- and team-level target-setting, regular performance reviews, and bonus programs, performance for many employees is tied to meeting targets related to raising internal/external awareness about energy efficiency, reduced energy use, and increased renewable energy procurement.

---

**Who is entitled to benefit from these incentives?**

Corporate executive team

**Types of incentives**

Monetary reward

**Activity incentivized**

Emissions reduction target

**Comment**

For Google's Senior VP of Technical Infrastructure, a member of the Corporate Executive Team, performance bonuses are tied to meeting quarterly targets for improving the sustainability / energy efficiency of our operations.

---

**Who is entitled to benefit from these incentives?**

All employees

**Types of incentives**

Recognition (non-monetary)

**Activity incentivized**

Behavior change related indicator

**Comment**

Google runs an annual employee recognition program to recognize Googler individuals and teams around the world who are driving sustainability across the company and in the communities where we operate. Several VPs and Senior VPs are involved in the final selection process and finalists are celebrated at an internal awards ceremony hosted at our Bay Area headquarters.

---

## C2. Risks and opportunities

---

### C2.1

---

**(C2.1) Describe what your organization considers to be short-, medium- and long-term horizons.**

	From (years)	To (years)	Comment
Short-term	1	8	In 2017, we conducted a Phase 2 assessment of Google's exposure to climate risk, which incorporated near-term climate projections (2020/2025). This represented a 1 to 8 year short-term time horizon.
Medium-term	9	34	In 2016, we conducted a Phase 1 assessment of Google's exposure to climate risk in the mid-term (2050) and long-term (2100). This represented a 9 to 34 year medium-term time horizon.
Long-term	35	84	In 2016, we conducted a Phase 1 assessment of Google's exposure to climate risk in the mid-term (2050) and long-term (2100). This represented a 35 to 84 year long-term time horizon.

### C2.2

---

---

**(C2.2) Select the option that best describes how your organization's processes for identifying, assessing, and managing climate-related issues are integrated into your overall risk management.**

Integrated into multi-disciplinary company-wide risk identification, assessment, and management processes

## C2.2a

**(C2.2a) Select the options that best describe your organization's frequency and time horizon for identifying and assessing climate-related risks.**

	Frequency of monitoring	How far into the future are risks considered?	Comment
Row 1	Six-monthly or more frequently	>6 years	The scope of the process considers regulatory risks due to climate change that could increase energy costs, across all of Alphabet's operations globally. Results are reported to an individual appointed by the Board (the Chief Financial Officer for Alphabet and Google).

## C2.2b

**(C2.2b) Provide further details on your organization's process(es) for identifying and assessing climate-related risks.**

On behalf of Alphabet and Google's CFO and Google's Senior VP of Technical Infrastructure, Google's Sustainability Officer (GSO) collaborates with risk management, operations, and finance teams to ensure risks and opportunities are evaluated across the company for climate change mitigation and adaptation. Geographical areas considered in risk and opportunities management include Google's Bay Area headquarters, major global office operations, and 15 global data center sites. Results of risk and opportunity assessments are reported to a cross-functional group of key internal stakeholders and executives.

These risks and opportunities are primarily assessed at a company level by modeling likely future energy cost scenarios under climate change regulation, and applying these scenarios to estimate the cost impact to our overall operations. To mitigate these risks, we look for opportunities to procure wholesale renewable energy via long-term contracts with stable prices, such as through power purchase agreements (PPAs).

Risks and opportunities are also assessed at an asset level using the same models. For example, the risk and opportunity assessments at individual data centers include using a shadow price for carbon to estimate expected future energy costs. For our global office locations, Google assesses risk and opportunity based on specific climate risk factors, detailed below.

The scope of the process considers regulatory risks due to climate change that could increase energy costs, across all of Alphabet's operations globally. Results are reported to the CFO for Alphabet and Google, who can bring up climate-related issues to the Board as needed.

In collaboration with external consultants and other key stakeholders, our GSO led development of a climate resilience strategy in 2017, including a global assessment of the impacts of sea level rise, precipitation, temperature, and water stress on our major real estate operations (defined as our top 23 sites by headcount) and 15 data center sites and a deep dive on the impacts of climate change on our Bay Area headquarters. This included climate scenario analysis.

We determined climate exposure by assessing future changes to sea level rise, precipitation, temperature, and water stress, as a result of climate change. In collaboration with the World Resources Institute, Google completed a water risk analysis of the current

and future water stress at each of its data centers and top headcount offices.

The process for assessing potential size and scope of identified climate risks, and their relative significance, is a focus globally and in particular for real estate development in the Bay Area, where our headquarters is located. For example, Google is engaged in a large scale master plan effort in our Mountain View and Sunnyvale locations. Sea level rise, flooding and urban heat island have emerged as critical climate risks that have a material impact to physical assets and occupants, and have been considered as part of the overall development strategy for Google's expanding footprint. To determine the relative significance of climate-related risks in relation to other risks, we developed a methodology for evaluating risk from a triple bottom line perspective, including environment, financial and social impacts.

In 2015, Google developed a set of Principles of Climate Resilience, which support our definition of climate risk and resilience. To define the Principles, we looked at two frameworks: the San Francisco Estuary Institute's Vision for a Resilient Silicon Valley Landscape and the Rockefeller Foundation's City Resilience Index. We then convened a cross-functional team that represented three different parts of the business and arrived at the following principles, which will guide future decision-making on climate resilience:

- Setting and Context: The unique aspects of geographic location determine opportunities and constraints for addressing resilience.
- Scale: Resilience should be optimized at all scales (building, campus, district, region).
- Robust: Well-conceived, constructed, and managed systems improve climate resilience at different scales.
- Integrated: Linkages between distinct systems and infrastructure optimize outcomes for resilience.
- Redundant: Spare capacity promotes diversity and complexity, and accommodates disruption.
- Diverse and Complex: Richness and variety in the network of systems and infrastructure are critical for Google to thrive.
- People: The people who support, shape, and sustain Google are central to resilience strategy.

Among other considerations, we reference the framework established in SEC guidance to help assess substantive financial impact on our business. We consider quantitative and qualitative factors when determining significance and materiality with respect to financial reporting and matters related to financial reporting.

For more information, see: [https://ssir.org/articles/entry/connecting\\_climate\\_resilience\\_to\\_the\\_bottom\\_line](https://ssir.org/articles/entry/connecting_climate_resilience_to_the_bottom_line)

## C2.2c

### (C2.2c) Which of the following risk types are considered in your organization's climate-related risk assessments?

	<b>Relevance &amp; inclusion</b>	<b>Please explain</b>
Current regulation	Relevant, always included	We are closely monitoring state renewable portfolio standards in the United States. We see these policies as critical to help drive low-carbon power sources in states where we have offices and data centers. Recently, there have been efforts to weaken or roll back these standards in some states. If they are weakened, it will make it more difficult for Google to meet its renewable energy goals. We also filed comments opposing the proposed repeal of the Clean Power Plan (CPP), which we consider an important policy to bring renewable energy onto the grid, particularly in markets where we have a data center presence but have limited access to purchase renewables. A rollback in state renewable portfolio standards or the EPA Clean Power Plan would make it more difficult for Google to meet its renewable energy goals by decreasing access to renewable energy in states where we operate. This would mean we would have to find other alternatives to procure renewable power, which are likely to be more expensive than taking it directly from the grid. The scope of our risk assessment process considers regulatory risks due to climate change that could increase energy costs, across all of Alphabet's operations globally. Our GSO reports these results to our CFO, who can bring up any climate-related issues to the Board as needed.
Emerging regulation	Relevant, always included	We have very few direct emissions of greenhouse gases, therefore we do not expect our operations to be directly impacted by climate policy in the US, nor do we expect to participate in any current or future compliance markets for carbon trading in the US. Google does, however, face the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). To the extent that this price is passed on to us from a regulated entity, the cost of running our operations will increase. However, we already operate some of the most efficient data centers in the world, procure renewable power for our data centers, and generate onsite renewable energy at several of our offices, all of which reduce our exposure to this risk. In addition, we already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. Finally, we are carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations. If a carbon price of e.g. \$14/metric tonne were established through regulation (price of carbon/tonne at AB32 Auction in May 2014), this could increase our costs by ~\$10.5M [= (2018 Scope 1 + market-based Scope 2) * \$14], assuming these costs were passed through to electricity consumers and we were not further able to reduce our carbon footprint. The financial impact would likely be less as we already voluntarily purchase carbon offsets.

	<b>Relevance &amp; inclusion</b>	<b>Please explain</b>
Technology	Relevant, always included	We monitor and consider the ongoing environmental performance of our various technologies. As of Dec. 31, 2018, Google owned and operated 15 large data centers, which host our Cloud-based technology products and services. In 2017, we conducted an assessment of Google's exposure to climate risk, which included our facilities and operations. We assess the climate-related risks of our hardware products through conducting life cycle assessments for each device, which enable us to assess and respond to opportunities to reduce emissions.
Legal	Not relevant, explanation provided	Alphabet is a collection of businesses -- the largest of which is Google. It also includes businesses that are generally pretty far afield of our main internet products in areas such as self-driving cars, life sciences, internet access and TV services. Based on current climate-related litigation, we don't believe that Alphabet's industry—internet services—is one with significant risk.
Market	Relevant, sometimes included	Google's revenue is largely based on advertising. Advertisers advertise to users because they believe the users are in a position to become customers via an economic transaction as a result of the advertisement. Advertisers pay Google for the ability to advertise via our online properties. Fluctuating socio-economic conditions due to climate change could have a negative impact on Google's revenue if they cause users to reduce the rate of economic transactions and thus causes advertisers to demand less online advertising. It is difficult to predict the magnitude of this risk, given the indirect nature of the relationship between climate change and online consumer economic activity. That said, we generated 85% (\$116,318,000,000) of total Google segment revenues from advertising in 2018. If, for example, all online economic activity decreased by 1%, it is hypothetically possible that we could experience a similar reduction in our share of this activity. In collaboration with external consultants and other key stakeholders, Google's Sustainability Officer led development of a climate resilience strategy in 2017, including a global assessment of the impacts of sea level rise, precipitation, temperature, and water stress on our major real estate operations (defined as our top 23 sites by headcount) and 15 data center sites and a deep dive on the impacts of climate change on our Bay Area headquarters.
Reputation	Relevant, sometimes included	Disclosing and properly addressing climate change risks and impacts associated with the IT industry and proliferation of the cloud is becoming more and more important. Not only does a company need to speak to the efforts they're making, they also need to show through their actions that they are making improvements or taking mitigation measures. Not addressing climate change risks and impacts head on could result in a reduced demand for our goods and services because of negative reputation impact. The 2018 Best Global Brands report, produced independently by Interbrand, ranks Google as the second most valuable global brand. Negative reputation could result in a decrease in brand value and in a loss of future brand equity. This risk driver could have a negative impact on our brands. For example, Interbrand's 2018 Best Global Brands report estimates Google's brand value at approximately \$156 billion. Using Interbrand's estimated brand value, a hypothetical reputational risk resulting in a 0.1% decrease in brand value could result in a loss of future brand equity of approximately \$156 million. It is very difficult to predict the magnitude or potential occurrence of this risk, given the indirect nature of the relationship between climate change and online consumer economic activity.
Acute physical	Relevant, sometimes included	In 2017, we conducted an assessment of Google's exposure to climate risk in the near-term (2020-2025), mid-term (2050), and long-term (2100). This included a global assessment of the impact of sea level rise, precipitation (flooding), precipitation (drought), temperature and water stress on our real estate operations. Based on this assessment, we found our biggest risk to be flooding at our Bay Area headquarters.
Chronic physical	Relevant, sometimes included	We must cool our data centers to keep them in operation, and the amount of energy needed to cool them is related to the outside air temperature. If global temperatures increase, this will increase the amount of energy required to cool our data centers and increase the cost of running our operations. Given that climate change is expected to increase average temperatures globally and we have facilities and operations around the world, this is a risk we face at all of our facilities globally. In particular, this may impact our data centers located in warm climates, such as our data center in Singapore. As of Dec. 31, 2018, Google owned and operated 15 large data centers across North America, South America, Europe, and Asia. To learn more about our data centers and their locations, see: <a href="https://www.google.com/about/datacenters/inside/locations/index.html">https://www.google.com/about/datacenters/inside/locations/index.html</a> In general, we expect that our cooling costs will go up proportionately to the increase in cooling-degree-days due to increasing average temperatures. We are not able to predict the exact temperature increase, but if, for example, the number of cooling-degree-days increased by 10%, we would expect a 10% rise in our cooling costs, assuming we were not further able to improve our energy efficiency. This would have a low-medium negative financial impact. In collaboration with external consultants and other key stakeholders, Google's Sustainability Officer led development of a climate resilience strategy in 2017, including a global assessment of the impacts of sea level rise, precipitation, temperature, and water stress on our major real estate operations (defined as our top 23 sites by headcount) and 15 data center sites and a deep dive on the impacts of climate change on our Bay Area headquarters.
Upstream	Relevant, sometimes included	In our supply chain, Google employs a Supplier Code of Conduct and evaluates the risk of doing business with individual suppliers, which includes considerations of climate risk and conducting sustainable supply chain audits. The Supplier Code of Conduct stipulates that our suppliers require their suppliers to follow the same requirements, which flows our requirements up the supply chain.
Downstream	Relevant, always included	Google faces the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). While the regulatory risk to our business is small, we are minimizing our exposure to this risk by working to run the most efficient computer infrastructure in the world. Through efficiency innovations, we have managed to cut energy usage in our data centers so that we're using significantly less energy than the industry average. For example, in 2018, Google's data centers that reached our operational thresholds for reporting achieved an average PUE (power usage effectiveness) of 1.11, compared with the industry average of 1.67. By making our products and services more efficient and matching electricity use with renewable energy, Google is creating an alternative solution for business that will be beneficial should regulation come forth, allowing our customers to hedge against future energy costs. Our risk assessments at individual data centers includes using a shadow price for carbon to estimate expected future energy costs.

## C2.2d

**(C2.2d) Describe your process(es) for managing climate-related risks and opportunities.**

On behalf of Alphabet and Google's Chief Financial Officer and Google's Senior VP of Technical Infrastructure, Google's Sustainability Officer collaborates with risk management and operations teams to ensure risks and opportunities are evaluated across the company for mitigation of and adaptation to climate change. Geographical areas considered in risk and opportunities management include Google's Bay Area headquarters, its major global office operations, and its 15 sites with operating data centers. Results of risk and opportunity assessments are reported to a cross-functional group of key internal stakeholders, including executives in operations and finance.

These risks and opportunities are primarily assessed at a company level by modeling likely future energy cost scenarios under climate change regulation, and applying these scenarios to estimate the cost impact to our overall operations. To mitigate these risks, we look for opportunities to procure wholesale renewable energy via long-term contracts with stable prices, such as the power purchase agreements (PPA) we work hard to procure.

In 2018, Google entered into 8 more long-term renewable energy agreements which, together with our existing long-term contracts, provide 3.75 GW of clean, renewable energy that is new to the grid. This makes Google the largest cumulative corporate purchaser of renewable energy on the planet.

Risks and opportunities are also assessed at an asset level by using the same models applied to both transition risks and physical risks. For example, from a transition risk perspective, the risk and opportunity assessments at individual data centers also includes using a shadow price for carbon to estimate expected future energy costs.

From a physical risk perspective, when we launched Google's Ecology Program in 2014, our goal was ecological resilience. We incorporated cutting-edge science and data from the onset, sponsoring the San Francisco Estuary Institute (SFEI) to create the Landscape Resilience Framework for ecological planning in the region. We also engaged with outside ecologists, landscape architects, planners, and local nongovernmental organizations to ensure that our outdoor environments would enhance the region's existing ecology over time. Together, we focused on the following objectives: expanding wildlife habitat, creating diverse landscapes that can withstand the stresses of climate change, and restoring many of the ecological functions lost with the development of office parks across the Valley.

Beyond this, we're working across the company to integrate sustainability values and culture into day-to-day operations. We've pushed Google data centers to make them some of the most efficient in the world, improving their environmental performance even as demand for our products has dramatically risen. Google's global offices take action to mitigate climate change by leveraging our Sustainable Operations Program. In our supply chain, Google employs a Supplier Code of Conduct and evaluates the risk of doing business with individual suppliers, which includes considerations of climate risk and conducting sustainable supply chain audits.

To prioritize each risk and opportunity identified, we consider three key factors: its potential impact on our financial bottom line, its potential impact to our company's reputation, and progress towards our renewable energy and greenhouse gas emissions reduction targets. We weigh these and other factors on a case by case basis, depending on the risk/opportunity being prioritized.

For example, there are many elements we consider in deciding where and how to pursue renewable energy supply contracts, including the emissions reduction potential of sourcing renewable energy by avoiding electricity with a high carbon intensity and whether renewable energy can be economical in the long term. Regarding energy costs specifically, we evaluate the net present value of entering into a renewable energy supply contract by comparing the business-as-usual scenario to energy costs under the long-term renewable energy scenario. If we find that renewable energy will significantly reduce the carbon intensity of our electricity supply and be more economical, these are very important inputs to identify a project as an opportunity as well as to decide whether or not to enter into a long-term contract. Long-term renewable energy contracts are one of the most important tools we have in mitigating risk and providing opportunity with respect to climate change, because they can reduce emissions while keeping energy costs known and manageable.

## C2.3

---

**(C2.3) Have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?**

Yes

### C2.3a

---

**(C2.3a) Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.**

**Identifier**

Risk 1

**Where in the value chain does the risk driver occur?**

Customer

**Risk type**

Transition risk

**Primary climate-related risk driver**

Policy and legal: Increased pricing of GHG emissions

**Type of financial impact**

Increased operating costs (e.g., higher compliance costs, increased insurance premiums)

**Company- specific description**

We have very few direct emissions of greenhouse gases, therefore we do not expect our operations to be directly impacted by climate policy in the US, nor do we expect to participate in any current or future compliance markets for carbon trading in the US. Running our business requires us to use a lot of electricity to power our data centers, offices, and other infrastructure. In 2018, our total energy consumption was 10,572,485 MWh. Therefore, Google does face the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). To the extent that this price is passed on to us from a regulated entity, the cost of running our operations will increase. However, we already operate some of the most efficient data centers in the world, procure renewable power for our data centers, and generate onsite renewable energy at several of our offices, all of which reduce our exposure to this risk. In addition, we already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. Finally, we are carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations.

**Time horizon**

Short-term

**Likelihood**

Unlikely

**Magnitude of impact**

Low

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

10500000

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

If a carbon price of e.g. \$14/metric tonne were established through regulation (price of carbon/tonne at AB32 Auction in May 2014), this could increase our costs by ~\$10.5 million [= (2018 Scope 1 + market-based Scope 2) \* \$14], assuming these costs were passed through to electricity consumers and we were not further able to reduce our carbon footprint. The financial impact would

likely be less as we already voluntarily purchase carbon offsets. Note that this is a hypothetical example and not our actual internal carbon price.

#### **Management method**

While the regulatory risk to our business is small, we are minimizing our exposure to this risk by working to run the most efficient computer infrastructure in the world. Through efficiency innovations, we have managed to cut energy usage in our data centers so that we're using significantly less energy than the industry average. For example, in 2018, we achieved PUEs (power usage effectiveness ratios) as low as 1.09, compared with the industry average of 1.67. We achieved this through the use of increasingly efficient power supplies, evaporative cooling technology, machine learning and other innovations. An additional risk mitigation activity is our work to procure wholesale renewable energy for our operations via long-term contracts with stable prices. In 2018, we announced 8 more renewable energy commitments to procure 780 additional MW of wind and solar power in Alabama, Georgia, Tennessee, and Finland. Though there is an up-front capital cost associated with our data center efficiency improvements, these projects have financial paybacks because they improve our energy efficiency and thus reduce our operational costs. So from a net point of view, these improvements come at zero net cost, so our cost of management is \$0.

#### **Cost of management**

0

#### **Comment**

---

#### **Identifier**

Risk 2

#### **Where in the value chain does the risk driver occur?**

Direct operations

#### **Risk type**

Transition risk

#### **Primary climate-related risk driver**

Policy and legal: Other

#### **Type of financial impact**

Increased operating costs (e.g., higher compliance costs, increased insurance premiums)

#### **Company- specific description**

Insufficiently addressing climate change risks and impacts could result in reduced demand for our goods and services because of negative reputation impact. The 2018 Best Global Brands report, produced independently by Interbrand, ranks Google as the second most valuable global brand, valued at approximately \$156 billion. Negative reputation could result in a decrease in brand value and in a loss of future brand equity.

#### **Time horizon**

Short-term

#### **Likelihood**

More likely than not

#### **Magnitude of impact**

Medium

#### **Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

#### **Potential financial impact figure (currency)**

0

#### **Potential financial impact figure – minimum (currency)**

<Not Applicable>

#### **Potential financial impact figure – maximum (currency)**

<Not Applicable>

#### **Explanation of financial impact figure**

An elimination of policies that enable corporate end users to purchase clean energy, a rollback in state renewable portfolio standards, or a rollback of the EPA Clean Power Plan would make it more difficult for Google to meet its renewable energy goals by decreasing access to renewable energy in states where we operate. This would mean we would have to find other alternatives to procure renewable power, which are likely to be more expensive than taking it directly from the grid. We are unable to make precise estimates for this risk, so we have put \$0 for potential financial impact.

**Management method**

We have been working directly with federal and state policymakers, NGOs, and others in industry to provide support for these policies. The costs of this engagement are headcount on our public policy team, travel costs for trips to states where renewable portfolio standards are under attack, and dues paid to national trade organizations. We estimate this to be a \$1-2 million/year recurring operating expense.

**Cost of management**

1500000

**Comment****Identifier**

Risk 3

**Where in the value chain does the risk driver occur?**

Direct operations

**Risk type**

Physical risk

**Primary climate-related risk driver**

Chronic: Rising mean temperatures

**Type of financial impact**

Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil fuel plants)

**Company- specific description**

We must cool our data centers to keep them in operation, and the amount of energy needed to cool them is related to the outside air temperature. If global temperatures increase, this will increase the amount of energy required to cool our data centers and increase the cost of running our operations. Given that climate change is expected to increase average temperatures globally and we have facilities and operations around the world, this is a risk we face at all of our facilities globally. In particular, this may impact our data centers located in warm climates, such as our data center in Singapore. As of Dec.31, 2018, Google owned and operated 15 large data centers across North America, South America, Europe, and Asia. To learn more about our data centers and their locations, see: <https://www.google.com/about/datacenters/inside/locations/index.html>

**Time horizon**

Medium-term

**Likelihood**

Very likely

**Magnitude of impact**

Medium-low

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

0

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

In general, we expect that our cooling costs will go up proportionately to the increase in cooling-degree-days due to increasing average temperatures. We are not able to predict the exact temperature increase, but if, for example, the number of cooling-degree-days increased by 10%, we would expect a 10% rise in our cooling costs, assuming we were not further able to improve our energy efficiency. This would have a low-medium negative financial impact. We are unable to make precise estimates for this risk, so we have put \$0 for potential financial impact.

**Management method**

While the risk to our business is low-medium, we are minimizing our exposure to this risk (as well as regulatory risk) by working to run the most efficient computer infrastructure in the world. Through efficiency innovations, we've cut energy usage in our data centers so that we're using significantly less energy than the industry average. For example, in 2018, we achieved PUEs (power usage effectiveness ratios) as low as 1.09, compared with the industry average of 1.67. We achieved this through the use of increasingly efficient power supplies, evaporative cooling technology, machine learning and other innovations. In addition, because

our data centers are located around the world, we minimize the risk that an unusually large increase in a particular region's temperature would force us to increase energy use and emissions in the most vulnerable locations or increase our costs disproportionately compared to the average global temperature increase. Though there is an upfront capital cost associated with our data center efficiency (and specifically cooling efficiency) improvements, these projects have financial paybacks because they improve our energy efficiency, reduce our emissions, and reduce our operational costs.

#### **Cost of management**

0

#### **Comment**

---

#### **Identifier**

Risk 4

#### **Where in the value chain does the risk driver occur?**

Direct operations

#### **Risk type**

Transition risk

#### **Primary climate-related risk driver**

Reputation: Increased stakeholder concern or negative stakeholder feedback

#### **Type of financial impact**

Reduced revenue from decreased demand for goods/services

#### **Company- specific description**

Insufficiently addressing climate change risks and impacts could result in reduced demand for our goods and services because of negative reputation impact. The 2018 Best Global Brands report, produced independently by Interbrand, ranks Google as the second most valuable global brand, valued at approximately \$156 billion. Negative reputation could result in a decrease in brand value and in a loss of future brand equity.

#### **Time horizon**

Medium-term

#### **Likelihood**

About as likely as not

#### **Magnitude of impact**

Medium

#### **Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

#### **Potential financial impact figure (currency)**

156000000

#### **Potential financial impact figure – minimum (currency)**

<Not Applicable>

#### **Potential financial impact figure – maximum (currency)**

<Not Applicable>

#### **Explanation of financial impact figure**

This risk driver could have a negative impact on our brands. For example, the 2018 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately \$156 billion. Using Interbrand's estimated brand value, a hypothetical reputational risk resulting in a 0.1% decrease in brand value could result in a loss of future brand equity of approximately \$156 million. It is very difficult to predict the magnitude or potential occurrence of this risk, given the indirect nature of the relationship between climate change and online consumer economic activity.

#### **Management method**

We continually strive to make our processes more efficient and reduce our impact on the environment, thereby helping our customers reduce their footprint as well by choosing our products and services. For example, every day, people are saving time and money with Google Maps - and getting where they need to be - all while minimizing their impact on the environment. Google also works to accelerate the development of renewable energy, not only by procuring renewable energy for our operations, but also through renewable energy investments. On the data center side, for over 10 years, we've been building and running some of the most efficient data centers in the world. Through white papers and blog posts on sustainability.google we work to establish transparency to help others do the same. For example, in 2014, we published a white paper on machine learning and data center optimization:

<http://static.googleusercontent.com/media/www.google.com/en/us/about/datacenters/efficiency/internal/assets/machine-learning-applicationsfor-datacenter-optimization-finalv2.pdf> In 2018, we entered into 8 more long-term renewable energy agreements which, together with our existing long-term contracts, provide 3.75 GW of clean, renewable energy. The costs associated with properly addressing climate change risks and impacts are the staff time to create and manage the associated projects. These costs are confidential, so we have put \$0 for cost of management.

#### **Cost of management**

0

#### **Comment**

---

#### **Identifier**

Risk 5

#### **Where in the value chain does the risk driver occur?**

Direct operations

#### **Risk type**

Transition risk

#### **Primary climate-related risk driver**

Market: Changing customer behavior

#### **Type of financial impact**

Reduced demand for goods and/or services due to shift in consumer preferences

#### **Company- specific description**

Google's revenue is largely based on advertising. Advertisers advertise to users because they believe the users are in a position to become customers via an economic transaction as a result of the advertisement. Advertisers pay Google for the ability to advertise via our online properties. Fluctuating socio-economic conditions due to climate change could have a negative impact on Google's revenue if it causes users to reduce the rate of economic transactions and thus causes advertisers to demand less online advertising.

#### **Time horizon**

Medium-term

#### **Likelihood**

Unlikely

#### **Magnitude of impact**

Medium

#### **Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

#### **Potential financial impact figure (currency)**

1163180000

#### **Potential financial impact figure – minimum (currency)**

<Not Applicable>

#### **Potential financial impact figure – maximum (currency)**

<Not Applicable>

#### **Explanation of financial impact figure**

Fluctuating socio-economic conditions could have a negative impact on Google's revenue if they cause users to reduce the rate of economic transactions and thus cause advertisers to demand less online advertising. It is difficult to predict the magnitude of this risk, given the indirect nature of the relationship between climate change and online consumer economic activity. That said, we generated 85% (\$116,318,000,000) of total Google segment revenues from advertising in 2018. If, for example, all online economic activity decreased by 1%, it is hypothetically possible that we could experience a similar reduction in our share of this activity (i.e. \$1,163,180,000).

#### **Management method**

Since avoiding or minimizing climate change would reduce this risk, activities to promote & advocate for clean energy help to minimize this risk. We actively engage with policy makers to support local, regional, national, and international policies to reduce dependence on carbon intensive power and support clean energy deployment. For example, Google engaged in a number of activities to advocate for a strong agreement at the United Nations Framework Convention on Climate Change (UNFCCC) twenty-first annual Conference of the Parties (COP21), which took place from November 30th to December 11th, 2015 in Paris. We continued to engage on clean energy policy in 2018. The costs associated with our risk management described here are staff time

to conduct these advocacy activities, industry memberships, grants and research analysis. We estimate this to be a \$1-2 million/year recurring operating expense.

**Cost of management**

1500000

**Comment**

---

**Identifier**

Risk 6

**Where in the value chain does the risk driver occur?**

Direct operations

**Risk type**

Physical risk

**Primary climate-related risk driver**

Acute: Increased severity of extreme weather events such as cyclones and floods

**Type of financial impact**

Increased capital costs (e.g., damage to facilities)

**Company- specific description**

In 2017, we conducted an assessment of Google's exposure to climate risk in the near-term (2020-2025), mid-term (2050), and long-term (2100). Based on RCP 4.5 and 8.5, the San Francisco Bay Area is projected to experience sea level rise between 18.5-26.0 inches by the end of the century. Even though the location of Google's Bay Area headquarters is not projected to experience the highest level of sea level rise when compared to the other Google sites assessed as part of this study, the location of our buildings in Mountain View, Sunnyvale, and Palo Alto and the importance of these sites as Google's global headquarters places those facilities at a particularly high risk when mapped against anticipated sea level rise. Many of Google's buildings in these locations are located in the current 100-year floodplain and, therefore, are at risk to impacts from coastal flooding in the present day. Those risks will only be further exacerbated by sea level rise throughout the century. Coastal flooding caused by rising sea levels could have the following impacts on Google's facilities and operations: 1) Flood impacts to Google's buildings could result in damage to the structure, building equipment, and contents, as well as potential risks to employee safety, 2) Flood impacts to major roadways and other transportation routes may impact the ability of employees to get to work, 3) On a more global scale, sea level rise and coastal flooding could impact Google's global supply chains and business operations.

**Time horizon**

Long-term

**Likelihood**

Likely

**Magnitude of impact**

Medium

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

0

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

We are still analyzing the financial impact of this risk. Among other considerations, we reference the framework established in SEC guidance to help assess substantive financial impact on our business. We consider quantitative and qualitative factors when determining significance and materiality with respect to financial reporting and matters related to financial reporting. We are unable to make precise estimates for this risk, so we have put \$0 for potential financial impact.

**Management method**

We are actively evaluating climate risk over multiple time horizons. While we are still developing a method of managing climate risk across our global footprint, we have developed a process for our Bay Area headquarters. For example, Google is engaged in a large-scale master plan effort for our Mountain View and Sunnyvale locations, which are both in California. Sea level rise and flooding have emerged as critical climate risks that can have a material impact on physical assets, and have been considered as

part of the overall development strategy for Google's expanding footprint in the area. To determine and manage the relative significance of climate-related risks in relation to other risks, we have evaluated risk from a triple bottom line perspective, including environment, financial and social impacts.

**Cost of management**

0

**Comment**

---

## C2.4

---

**(C2.4) Have you identified any climate-related opportunities with the potential to have a substantive financial or strategic impact on your business?**

Yes

### C2.4a

---

**(C2.4a) Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.**

**Identifier**

Opp1

**Where in the value chain does the opportunity occur?**

Customer

**Opportunity type**

Products and services

**Primary climate-related opportunity driver**

Development and/or expansion of low emission goods and services

**Type of financial impact**

Increased revenue through demand for lower emissions products and services

**Company-specific description**

Carbon regulation as an efficiency driver: Any regulation that imposes a price on carbon or regulates carbon emissions may incentivize customers to switch their technology infrastructure to G Suite enterprise solutions and take advantage of Google's cloud, which is highly energy efficient and is carbon neutral. This could create additional demand for Google's existing products and/or services.

**Time horizon**

Short-term

**Likelihood**

About as likely as not

**Magnitude of impact**

Low

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

136000000

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

If new carbon regulations are implemented, Google is in a position to grow its products and services as its data centers use 50%

less energy than a typical data center. For illustrative purposes, if a new energy efficiency regulation resulted in a hypothetical regulatory advantage for Google and yielded an unpredictable 0.1% increase in revenue, it is hypothetically possible that we could experience a similar increase in annual revenue. Based on our FY 2018 revenue of approximately \$136 billion, 0.1% would equate to approximately \$136 million.

### Strategy to realize opportunity

We've worked hard to minimize the environmental impact of our products and services and we continue to find new ways to reduce our impacts even further. Our data centers are some of the most efficient in the world—they use 50% less energy than typical data centers. Providing an active user one month of Google services creates about the same amount of GHG emissions as driving a car one mile. We were the first major Internet company to achieve a multi-site energy management system certification to ISO 50001. We're working to support transition of the world's power to more renewables like wind and solar by buying electricity directly from wind farms near our data centers. In 2018, we entered into 8 more long-term renewable energy agreements which, together with our existing long-term contracts, provide 3.75 GW of clean, renewable energy. We're also working with our utility partners to find solutions that will make more renewable energy available for us and for others. Making our products and services more efficient and matching our electricity use with renewable energy enables our customers to hedge against future energy costs, should regulations come forth. The main costs associated with our sustainability efforts are the headcount of engineers, program managers, and partner managers working on these initiatives, as well as software development costs. These costs are confidential, so we have put \$0 for cost of management.

### Cost to realize opportunity

0

### Comment

---

#### Identifier

Opp2

#### Where in the value chain does the opportunity occur?

Customer

#### Opportunity type

Energy source

#### Primary climate-related opportunity driver

Use of lower-emission sources of energy

#### Type of financial impact

Returns on investment in low-emission technology

#### Company-specific description

Carbon regulation as a renewable energy driver: Future regulatory systems that put a price on carbon could increase the amount of renewable power that states are incentivized or required to procure. Both of these are likely to provide great economic opportunity for efforts to develop and invest in renewable power, as well as to draw more attention to this important issue. Since 2010, Google has made commitments to invest nearly \$2.5 billion in innovative, large-scale renewable energy projects with a total combined capacity of 3.7 GW (separate from the PPAs we use to purchase renewable energy for our own operations). We view this as an opportunity to help deploy renewable energy at larger scale while at the same time making investments that have an attractive risk-adjusted return. We continue to look for opportunities for further investments around the globe.

#### Time horizon

Short-term

#### Likelihood

About as likely as not

#### Magnitude of impact

Medium-high

#### Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

#### Potential financial impact figure (currency)

0

#### Potential financial impact figure – minimum (currency)

<Not Applicable>

#### Potential financial impact figure – maximum (currency)

<Not Applicable>

### **Explanation of financial impact figure**

The International Energy Agency (IEA) estimates that the world will spend \$26 trillion over the next two decades to build the energy infrastructure necessary to meet global demand. Bloomberg New Energy Finance (BNEF) estimates that \$7 trillion will be spent through 2020 for renewable energy. This presents a tremendous business opportunity for the private sector to help pave the path towards a clean energy future while making attractive risk adjusted returns. In pursuing this opportunity, Google has already committed nearly \$2.5 billion of investments in large scale renewable energy projects and residential solar rooftop funds with a total capacity of 3.7GW. For example, in 2014, we signed an agreement to invest \$84M in an 80MW solar power plant in Red Hills, UT. In 2015 alone, Google made commitments to invest over \$700m into renewable energy projects in both the US and overseas. Our returns on investment are confidential, so we have put \$0 for potential financial impact.

### **Strategy to realize opportunity**

Google employs renewable energy investment professionals to source, review, and execute investments in utility-scale renewable energy projects. We also engage external consultants for financial and technical diligence. For each investment, we obtain approval from an internal investment committee as well as from senior executives. We also have an asset management team for ongoing management of these investments. As of the end of 2018, Google has committed to invest nearly \$2.5 billion in large-scale renewable energy projects and residential solar rooftop funds around the world with a combined capacity of 3.7 GW. These targeted investments go beyond our own operational footprint, enabling renewable energy deployment at a larger scale while generating attractive risk-adjusted returns. Other costs include the staff time to source, analyze, and execute the deals. We also have an internal asset management team for ongoing management of these investments. These costs are confidential, so we have put \$0 for cost of management.

### **Cost to realize opportunity**

0

### **Comment**

---

#### **Identifier**

Opp3

#### **Where in the value chain does the opportunity occur?**

Customer

#### **Opportunity type**

Products and services

#### **Primary climate-related opportunity driver**

Development of new products or services through R&D and innovation

#### **Type of financial impact**

Increased revenue through demand for lower emissions products and services

#### **Company-specific description**

Our products help drive carbon mitigation efforts and inform climate science. We see an opportunity to help raise awareness about the physical changes to the Earth's natural resources and climate through Google Earth and other products, resulting in wide social benefits. Google has developed Google Earth Engine ([earthengine.google.com](http://earthengine.google.com)), a planetary scale platform for geospatial data analysis that brings together the world's environmental and Earth observation satellite imagery, and makes it available for analysis online globally. Also, Google created the Earth Outreach program, which gives non profits and organizations the knowledge and resources they need to visualize their causes and share their story with hundreds of millions of users. As a global platform, Earth Engine can help to analyze data and information from around the world. The wider social benefits created by Google Earth may result in increased brand loyalty for Google.

#### **Time horizon**

Short-term

#### **Likelihood**

Virtually certain

#### **Magnitude of impact**

Medium

#### **Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

#### **Potential financial impact figure (currency)**

156000000

#### **Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

To date, Google Earth Engine has primarily been a philanthropic project that has not made money, but this could change as the product evolves. If customers value Google Earth Engine as a tool to examine the physical changes to the Earth's natural resources and climate, this could result in increased customer loyalty or brand value. This opportunity driver could have a positive impact on our brands. For example, the 2018 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately \$156 billion. Using Interbrand's estimated brand value, a hypothetical increase in brand value of 0.1% could result in a gain of future brand equity of approximately \$156 million via brand loyalty created by wider social benefits.

**Strategy to realize opportunity**

Earth Engine was developed to bring together the world's satellite imagery and make it available online with tools for scientists, independent researchers, and nations to mine this massive warehouse of data about Earth's natural resources to detect changes, map trends and quantify differences on the earth's surface. Using this technology platform, we're helping scientists develop applications for detecting deforestation and mapping land use trends, and have started working with individual countries to develop their own applications. For example, the Global Surface Water Explorer was launched at the UN World Data Forum in 2018. Developed by Google in conjunction with the European Commission's Joint Research Centre, it maps the location and temporal distribution of water surfaces at the global scale over the past 3.5 decades and provides statistics on the extent and change of those water surfaces. The dataset, produced from Landsat imagery, will support applications including water resource management, climate modeling, biodiversity conservation and food security (see <https://global-surface-water.appspot.com/>). For more information on other similar engagements, see our response to question 12.3e. The main costs associated with our Earth Engine efforts are headcount, software development, petabytes of data storage and the processing of this data (i.e. running scientific algorithms) in our data centers. These costs are confidential, so we have put \$0 for cost of management.

**Cost to realize opportunity**

0

**Comment****Identifier**

Opp4

**Where in the value chain does the opportunity occur?**

Customer

**Opportunity type**

Products and services

**Primary climate-related opportunity driver**

Development and/or expansion of low emission goods and services

**Type of financial impact**

Increased revenue through demand for lower emissions products and services

**Company-specific description**

Reputation: Disclosing and properly addressing climate change risks and impacts associated with the IT industry and proliferation of the cloud is becoming more and more important. Not only does a company need to speak to the efforts they're making, they also need to show through their actions that they are making improvements or taking mitigation measures. Google's core products such as Search, Android, Maps, Chrome, YouTube, Google Play, and Gmail each have over 1 billion monthly active users. Addressing climate change opportunities head on could result in an increased demand for our goods and services by positively impacting our reputation. We own and lease additional office and building space, research and development labs, and sales and support offices across more than 150 cities primarily in North America, Europe, South America, and Asia, and we own and operate 15 data centers across four continents. We matched 100% of the 2018 electricity consumption of our global operations with renewable energy purchases, which could positively impact our reputation in regions where we operate.

**Time horizon**

Medium-term

**Likelihood**

About as likely as not

**Magnitude of impact**

Medium

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

156000000

**Potential financial impact figure – minimum (currency)**

&lt;Not Applicable&gt;

**Potential financial impact figure – maximum (currency)**

&lt;Not Applicable&gt;

**Explanation of financial impact figure**

This opportunity driver could have a positive impact on our brands. For example, the 2018 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately \$156 billion. Using Interbrand's estimated brand value, a hypothetical increase in brand value of 0.1% could result in a gain of future brand equity of approximately \$156 million. It is very difficult to predict the magnitude or potential occurrence of this opportunity, given the indirect nature of the relationship between climate change and online consumer economic activity.

**Strategy to realize opportunity**

We strive to make our processes more efficient and reduce our impact on the environment, thereby helping our customers reduce their footprints as well by choosing our products and services. For example, people can save time and money with Google Maps—getting where they need to be, while minimizing their impact on the environment—because Google Maps provides over 1 billion km worth of transit results every day. Google Maps has transit information for nearly 10,000 agencies, running through more than 4 million transit stations, in over 100 countries. Google also works to accelerate the development of renewable energy by procuring renewable energy for our operations and through renewable energy investments. We also build and run some of the most efficient data centers in the world. Through white papers and posts on our Sustainability blog we work to establish transparency to help others do the same. For example, in 2014, we published a white paper on machine learning and data center optimization. All these efforts can have positive impacts on our reputation and potentially increase demand for Google's products and services. The costs associated with properly addressing climate change opportunities and impacts are the staff time to create and manage the associated projects. These costs are confidential, so we have put \$0 for cost of management.

**Cost to realize opportunity**

0

**Comment**

---

**Identifier**

Opp5

**Where in the value chain does the opportunity occur?**

Customer

**Opportunity type**

Energy source

**Primary climate-related opportunity driver**

Shift toward decentralized energy generation

**Type of financial impact**

Returns on investment in low-emission technology

**Company-specific description**

Growing demand for energy: With the rising need for energy, we expect renewable energy to play an integral part in the world's energy infrastructure. By being an early investor and deploying smart capital to fund utility-scale projects, we believe we have helped accelerate the deployment of the latest clean energy technologies while providing attractive returns to Google as well as more capital for developers to build additional projects. This is a global opportunity as there are renewable energy opportunities worldwide, across different geographies and technology types. We've not only invested in large scale renewable energy projects, but also in funds that help to deploy solar PV panels on residential homes, where the falling costs of solar PV have made distributed generation much more economic and in some regions already competitive with retail rates. We believe this growth in distributed generation, accelerated by the drop in PV prices, has helped accelerate the deployment of clean energy technologies while providing attractive returns to Google. In 2014, we signed an agreement to invest \$84M in an 80MW solar power plant in Red Hills, UT, which at the time was the largest solar energy generation facility in the state.

**Time horizon**

Short-term

**Likelihood**

Very likely

**Magnitude of impact**

Medium

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

0

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

IEA estimates the world will spend \$26 trillion over the next two decades to build the energy infrastructure necessary to meet global demand. BNEF states that 2015 was the first time that renewable energy (excluding large hydro) made up over half of all the energy capacity additions worldwide and estimates that \$7 trillion will be spent through 2020 for renewable energy. This presents a tremendous business opportunity for the private sector to help build a clean energy future while making attractive risk adjusted returns. In pursuing this opportunity, Google has made commitments to invest nearly \$2.5 billion of investments since 2010 in large scale renewable energy projects and residential solar rooftop funds with a total capacity of 3.7GW. In 2015 alone, Google made commitments to invest over \$700 million into renewable energy projects in both the US and overseas. We will continue to manage our existing investments. Our ROI is confidential, so we have put \$0 for financial impact.

**Strategy to realize opportunity**

Google employs renewable energy investment professionals to source, review, and execute investments in utility-scale renewable energy projects. We also engage external consultants for financial and technical diligence. For each investment, we obtain approval from an internal investment committee as well as from senior executives. We also have an asset management team for ongoing management of these investments. In 2015, Google made a \$300 million investment commitment to a fund with SolarCity. By participating in this program, homeowners help the environment and benefit from a compelling value proposition, typically recognizing savings off their past electricity bills immediately upon connection. As of the end of 2018, Google has committed to invest nearly \$2.5 billion in large-scale renewable energy projects and residential solar rooftop funds around the world with a combined capacity of 3.7 GW. These targeted investments go beyond our own operational footprint, enabling renewable energy deployment at a larger scale while generating attractive risk-adjusted returns. Other costs include the staff time to source, analyze, and execute the deals. These costs are confidential, so we have put \$0 for cost of management.

**Cost to realize opportunity**

0

**Comment****Identifier**

Opp6

**Where in the value chain does the opportunity occur?**

Customer

**Opportunity type**

Products and services

**Primary climate-related opportunity driver**

Development and/or expansion of low emission goods and services

**Type of financial impact**

Increased revenue through demand for lower emissions products and services

**Company-specific description**

As climate change occurs, we expect that energy prices will increase and hence, more consumers will use public and alternative transportation rather than private vehicles. We therefore see an opportunity for increased use of Google Maps Transit, which provides public transit directions and walking and biking routes in Google Maps. As can be seen at [www.google.com/transit](http://www.google.com/transit), Google Maps Transit provides maps & schedules for public transit systems in cities worldwide. Currently, Google Maps serves one billion active monthly users with mapping tools. Google Maps has transit information for nearly 10,000 agencies, running through more than 4 million transit stations, in over 100 countries. It provides over 1 billion km worth of transit results every day. For more information about how Google Maps helps users minimize their impact on the environment, see:  
<http://googleblog.blogspot.com/2014/05/hop-on-boardand-go-almost-anywherewith.html>.

**Time horizon**

Short-term

**Likelihood**

Very likely

**Magnitude of impact**

Medium-low

**Are you able to provide a potential financial impact figure?**

Yes, a single figure estimate

**Potential financial impact figure (currency)**

156000000

**Potential financial impact figure – minimum (currency)**

<Not Applicable>

**Potential financial impact figure – maximum (currency)**

<Not Applicable>

**Explanation of financial impact figure**

Google Transit and biking/walking routes are a feature of Google Maps, a free online tool that helps people as they navigate, explore and get things done in the world. As demand increases for information about alternative transportation options, we expect that there will be more users of Google Maps. This opportunity driver could have a positive impact on our brands. For example, the 2018 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately \$156 billion. Using Interbrand's estimated brand value, a hypothetical increase in brand value of 0.1% could result in a gain of future brand equity of approximately \$156 million via brand loyalty created by access to helpful tools.

**Strategy to realize opportunity**

Transit on Google Maps is a public transportation planning tool that combines the latest agency data with the power of Google Maps, and we are continually improving this tool, with many new features and cities added in 2018. For agencies around the world, Google Maps is a cost-effective solution targeted at transit novices and seasoned travelers alike. We make Google Maps available in 69 different languages and it is compatible with screen readers for the visually impaired. We have made the Transit and Biking Directions on Google Maps feature available on selected mobile devices through Google Maps for mobile, and we have also included public transportation information in Google Earth. Google has a team of employees that manage Google Maps and Google Transit. The main costs associated with our Google Transit efforts and Google Maps features are the team's headcount of engineers, product managers, and partner managers, as well as software development costs. These costs are confidential, so we have put \$0 for cost of management.

**Cost to realize opportunity**

0

**Comment**

---

C2.5

---

**(C2.5) Describe where and how the identified risks and opportunities have impacted your business.**

	<b>Impact</b>	<b>Description</b>
Products and services	Not yet impacted	Any regulation that imposes a price on carbon or regulates carbon emissions may incentivize customers to switch their technology infrastructure to G Suite enterprise solutions and take advantage of Google's cloud, which is highly energy efficient and is carbon neutral. This could create additional demand for Google's existing products and/or services. If new carbon regulations are implemented, Google is in a position to grow its products and services as its data centers use 50% less energy than a typical data center. The potential time horizon for this impact is predicted to be short-term.
Supply chain and/or value chain	Not yet impacted	We have very few direct emissions of greenhouse gases, therefore we do not expect our operations to be directly impacted by climate policy in the US, nor do we expect to participate in any current or future compliance markets for carbon trading in the US. Google does, however, face the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). To the extent that this price is passed on to us from a regulated entity, the cost of running our operations will increase. However, we already operate some of the most efficient data centers in the world, procure renewable power for our data centers, and generate onsite renewable energy at several of our offices, all of which reduce our exposure to this risk. For example, in 2018, the average annual Power Usage Effectiveness (PUE) for our global fleet of data centers was 1.11, compared with the industry average of 1.67. Google is also the world's largest corporate purchaser of renewable energy; since 2010, we've signed 34 agreements totaling 3.75 gigawatts of renewable energy. In addition, we already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. Finally, we are carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations. The potential time horizon for this impact is predicted to be short-term.
Adaptation and mitigation activities	Not yet impacted	Based on RCP 4.5 and 8.5, the San Francisco Bay Area is projected to experience sea level rise between 18.5-26.0 inches by the end of the century. The location of our buildings in Mountain View, Sunnyvale, and Palo Alto and the importance of these sites as Google's global headquarters places those facilities at a particularly high risk when mapped against anticipated sea level rise. Many of Google's buildings in these locations are located in the current 100-year floodplain and, therefore, are at risk to impacts from coastal flooding in the present day. Those risks will only be further exacerbated by sea level rise throughout the century. Coastal flooding caused by rising sea levels could have the following impacts on Google's facilities and operations: 1) Flood impacts to Google's buildings could result in damage to the structure, building equipment, and contents, as well as potential risks to employee safety. 2) Flood impacts to major roadways and other transportation routes may impact the ability of employees to get to work. 3) On a more global scale, sea level rise and coastal flooding could impact Google's global supply chains and business operations. The potential time horizon for this impact is predicted to be long-term.
Investment in R&D	Not yet impacted	Our products help drive carbon mitigation efforts and inform climate science. We see an opportunity to help raise awareness about the physical changes to the Earth's natural resources and climate through Google Earth and other products. Google has developed Google Earth Engine ( <a href="http://EarthEngine.Google.com">EarthEngine.Google.com</a> ), a planetary scale platform for environmental data & analysis that brings together the world's satellite imagery and makes it available online. Also, Google created the Earth Outreach program, which gives non profits and organizations the knowledge and resources they need to visualize their causes and share their story with hundreds of millions of users. As a global platform, Earth Engine can help to analyze data and information from around the world. The wider social benefits created by Google Earth may result in increased brand loyalty for Google, and thus, increased brand value. The potential time horizon for this impact is predicted to be short-term.
Operations	Not yet impacted	We must cool our data centers to keep them in operation, and the amount of energy needed to cool them is related to the outside air temperature. If global temperatures increase, this will increase the amount of energy required to cool our data centers and increase the cost of running our operations. Given that climate change is expected to increase average temperatures globally and we have facilities and operations around the world, this is a risk we face at all of our facilities globally. In particular, this may impact our data centers located in warm climates, such as our data center in Singapore. In general, we expect that our cooling costs will go up proportionately to the increase in cooling-degree-days due to increasing average temperatures. We are not able to predict the exact temperature increase, but if, for example, the number of cooling-degree-days increased by 10%, we would expect a 10% rise in our cooling costs, assuming we were not further able to improve our energy efficiency. This would have a low-medium negative financial impact. The potential time horizon for this impact is predicted to be medium-term.
Other, please specify	Please select	

**C2.6**

---

**(C2.6) Describe where and how the identified risks and opportunities have been factored into your financial planning process.**

	<b>Relevance</b>	<b>Description</b>
Revenues	Not yet impacted	Any regulation that imposes a price on carbon or regulates carbon emissions may incentivize customers to switch their technology infrastructure to G Suite enterprise solutions and take advantage of Google Cloud, which is highly energy efficient and is carbon neutral. This could create additional demand for Google's existing products and/or services, and therefore increase revenues. If new carbon regulations are implemented, Google is in a position to grow its products and services, and therefore its revenues, as its data centers use 50% less energy than a typical data center. The potential time horizon for this impact is predicted to be short-term.
Operating costs	Not yet impacted	Running our business requires us to use a lot of electricity to power our data centers, offices, and other infrastructure. Google owns and operates 15 data centers. In 2018, our total energy consumption was 10,572,485 MWh. We must cool our data centers to keep them in operation, and the amount of energy needed to cool them is related to the outside air temperature. If global temperatures increase, this will increase the amount of energy required to cool our data centers and increase the cost of running our operations. Given that climate change is expected to increase average temperatures globally and we have facilities and operations around the world, this is a risk we face at all of our facilities globally. In particular, this may impact our data centers located in warm climates, such as our data center in Singapore. In general, we expect that our cooling costs will go up proportionately to the increase in cooling-degree-days due to increasing average temperatures. We are not able to predict the exact temperature increase, but if, for example, the number of cooling-degree-days increased by 10%, we would expect a 10% rise in our cooling costs, assuming we were not further able to improve our energy efficiency. This would have a low-medium negative financial impact. The potential time horizon for this impact is predicted to be medium-term.
Capital expenditures / capital allocation	Not yet impacted	Google owns and operates 15 data centers. As Google requires a lot of energy to run our operations, we face the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). We are assessing the potential impacts of carbon taxes and legislation. For example, we filed comments opposing the proposed repeal of the Clean Power Plan (CPP). We already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. We are also carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations. The potential time horizon for this impact is predicted to be short-term.
Acquisitions and divestments	Not yet impacted	Acquisitions, joint ventures, investments and divestitures are important elements of our overall corporate strategy and use of capital. For example, in January 2018, we completed the acquisition of a team of engineers and a non-exclusive license of intellectual property from HTC for \$1.1 billion in cash. Any regulation that imposes a price on carbon or regulates carbon emissions may impact the types of companies we consider acquiring or the segments of the business we consider divesting, depending on how carbon intensive they are, as it may impact their valuation. The potential time horizon for this impact is predicted to be short-term.
Access to capital	Not impacted	As a technology company and due to the nature of our business, we do not believe that climate change will impact our access to capital.
Assets	Not yet impacted	Since 2010, we've committed to invest nearly \$2.5 billion in large-scale renewable energy projects and residential solar rooftop funds with a combined capacity of 3.7 GW. These targeted investments go beyond our own operational footprint, enabling renewable energy deployment at a larger scale while generating attractive risk-adjusted returns. The potential time horizon for this impact is predicted to be medium-term.
Liabilities	Not yet impacted	The availability of our products and services depends on the continuing operation of our information technology and communications systems. Our systems are vulnerable to damage, interference or interruption from natural disasters, the effects of climate change (such as sea level rise, drought, flooding, wildfires, and increased storm severity), or other factors. Our headquarters are located in Mountain View, California. We also own and lease office and building space in the surrounding areas near our headquarters, which in the aggregate (including our headquarters) represent approximately 11.2 million square feet of office/building space and approximately fifty-nine acres of developable land to accommodate anticipated future growth. In 2017, we conducted an assessment of Google's exposure to climate risk in the near-term (2020-2025), mid-term (2050), and long-term (2100). This included a global assessment of the impact of flooding on our real estate operations. Based on RCP 4.5 and 8.5, the San Francisco Bay Area is projected to experience sea level rise between 18.5-26.0 inches by the end of the century. Even though the location of Google's Bay Area headquarters is not projected to experience the highest level of sea level rise when compared to the other Google sites assessed as part of this study, the location of the buildings in Mountain View, Sunnyvale, and Palo Alto and the importance of these sites as Google's global headquarters places those facilities at a particularly high risk when mapped against anticipated sea level rise. Many of Google's buildings in these locations are located in the current 100-year floodplain and, therefore, are at risk to impacts from coastal flooding in the present day. Those risks will only be further exacerbated by sea level rise throughout the century. The potential time horizon for this impact is predicted to be medium-term.
Other	Please select	

### C3. Business Strategy

---

#### C3.1

---

**(C3.1) Are climate-related issues integrated into your business strategy?**

Yes

### C3.1a

---

#### (C3.1a) Does your organization use climate-related scenario analysis to inform your business strategy?

Yes, qualitative and quantitative

### C3.1c

---

#### (C3.1c) Explain how climate-related issues are integrated into your business objectives and strategy.

Since our founding, we've focused on providing the best user experience possible and taken great care to ensure the products and services we provide serve our customers. We value efficiency in everything we do, from creating products and building data centers to managing our supply chain and office space. We continually strive to make our processes more efficient and to reduce our impact on the environment, thereby helping our customers reduce their footprint, too. Our products and services like Google Cloud Platform and G Suite enable millions of businesses to shift to our highly efficient, renewable energy-based computing infrastructure.

i. Because we believe climate change and environmental regulation may result in higher energy prices, our strategy has been influenced in two ways: (1) we purchase renewable electricity for our operations, and (2) we design and operate our facilities to be as energy efficient as possible. Specifically, to mitigate future price rises in electricity costs (including due to environmental regulation), we seek long-term contracts for renewable electricity and work to improve energy efficiency in all our data centers and office spaces.

Our internal reporting process enables us to track progress toward our goals and influence future strategies. Both the Technical Infrastructure and Real Estate teams develop strategies to reach our goals. These are then translated into programs and projects whose results are reported to the SVP of Technical Infrastructure and the VP of Real Estate quarterly. This process is embedded across the company and the feedback mechanism of quarterly reporting helps further influence future strategies.

For example, our Real Estate team runs an internal Sustainable Operations Program, which requires each participating office to comply with a set of annual and ongoing sustainability best practices, in addition to completing at least one data driven project each year to reduce their local environmental impact.

As we become more efficient, customers using our products and services inevitably do too, which also decreases their carbon footprint. For example, by moving its 17,000 employees to Google Apps and Gmail, the US General Services Administration reduced server energy consumption by nearly 90%. (see: <https://static.googleusercontent.com/media/www.google.com/en//green/pdf/google-apps.pdf>)

ii. Physical and regulatory risks also influence our strategy. Specifically, the potential increase in electricity prices due to the physical impacts of climate change and any resulting regulations have increased our push to source long-term contracts for renewable electricity to avoid exposure to electricity price volatility and/or increases. Additionally, regulatory opportunity also influenced our strategy; by adopting long-term contracts for renewable electricity now, we stay ahead of potential future regulations.

As we've noticed new opportunities resulting from climate change, we've also adopted several new product lines. For example, in 2015 we launched Project Sunroof, an online tool that helps users estimate potential solar energy production and cost savings if they were to install rooftop solar. In 2018, this tool expanded coverage beyond the United States into Germany, France and the UK—in partnership with leading utilities—and has to date mapped over 107 million rooftops across 21,500 cities.

iii. Energy risk management remains the most important component of our short-term strategy influenced by climate change. This includes our desire to maximize energy efficiency in order to increase the utilization of each kWh we purchase. For example, compared with five years ago, our data centers now deliver around seven times as much computing power with the same amount of electrical power. We focus on reducing the energy we use by designing and building energy- and resource-efficient data centers and office buildings, as well as supporting energy efficient operations.

iv. In 2007, we announced our goal to become carbon neutral, which we achieved that year, and we've maintained carbon neutrality for twelve consecutive years. In 2012, we set a long-term goal to purchase enough renewable energy to match all the electricity we

consume globally on an annual basis. In 2017 and again in 2018, we achieved it: Google's total purchase of energy from sources like wind and solar exceeded the amount of electricity used by our operations around the world, including offices and data centers.

Our long-term goals to build a cleaner energy future will result in our products and services, and therefore ultimately our users, reducing their environmental footprint. The most important component of this strategy is our commitment to seek out long-term contracts for the purchase of renewable electricity. To meet that goal, we continue to pursue such contracts, which, over the long term, will reduce our carbon footprint and help protect us from the aforementioned risks. Another part of our long-term strategy is to encourage the development and deployment of more renewable energy through policy advocacy.

v. Google data centers use 50% less energy than a typical data center and we are the largest corporate purchaser of renewable energy in the world. We believe this helps us achieve strategic advantage over our competitors by ensuring stable electricity prices over the long term, lowering our operational costs, and helping protect us from the aforementioned sourcing and potential regulatory risks. Companies and users that choose our products and services can be confident that we're helping them minimize their environmental impact—even as their needs and services scale.

vi. In 2018, the most substantial business decisions we made that were influenced by climate change include signing new renewable energy deals, regulatory work, and ongoing data center efficiency efforts, as follows:

- We entered into 8 more long-term renewable energy agreements which, together with our existing long-term contracts, provide 3.75 GW of clean, renewable energy. For example, on August 9, 2018, we announced that we'd signed contracts through a program with Georgia Power to purchase the output of 78.8 MW of solar energy from two solar farms in Georgia, in partnership with other Georgia Power customers Walmart, Target, and Johnson & Johnson.
- We engaged directly with policymakers to call for policies that promote renewable energy and/or reduce carbon emissions. For example, in April 2018, Google filed comments in response to the EPA's proposed rulemaking to repeal the Clean Power Plan
- In 2018, we maintained a comprehensive energy management system for our data centers and a corporate, multi-site ISO 50001 certification

The aspect of climate change that influenced these business decisions is the potential physical and regulatory impacts of climate change, as explained in (i).

### C3.1d

---

**(C3.1d) Provide details of your organization's use of climate-related scenario analysis.**

Climate-related scenarios	Details
Other, please specify (RCP4.5 and RCP8.5)	In 2017, we established Google's climate baseline by assessing future changes to the following climate factors as a result of climate change: sea level rise, precipitation, temperature, and water stress. We used WRI's definitions of water stress and high-stress/extremely high-stress areas. Each of these climate factors were assessed against two emissions pathways and across three time horizons. As a means to capture a short-term, mid-term, and long-term understanding of Google's future climate exposure, three time horizons were identified and considered: 2020/2025, 2050, and 2100. These time horizons were chosen as they correlate with Google's intentions to plan for resilience of its data centers and office buildings, while also providing information about immediate actions needed to improve resilience of its business operations. For each of these time horizons, we conducted an analysis of the Paris compliant scenario and the business as usual scenario to understand the range of possible future climate impacts. The emissions scenarios were based on the representative concentration pathways (RCPs) developed by the Intergovernmental Panel on Climate Change as part of its Fifth Assessment Report. The RCPs describe four possible climate futures, based on a wide range of possible changes to GHG emissions as a result of human activity. RCP8.5, the high-emissions pathway, approximates a "business as usual" scenario if there is no significant global action toward GHG emissions reduction and mitigation. The low-emissions scenario, RCP4.5, was chosen because it takes into account significant mitigation efforts and aligns with the Paris climate accord that went into effect in November 2016. Based on this climate baseline data, the research team identified the climate exposure for each of Google's sites included in this assessment and developed high-level recommendations and priorities to help shape Google's next steps toward developing a climate resilience strategy. In collaboration with external consultants and other key stakeholders, our GSO led development of a climate resilience strategy for Google, including a global assessment of the impacts of sea level rise, precipitation, temperature, and water stress on our major real estate operations (our top 23 sites by headcount) and 15 data center sites. The two key results of the scenario analysis are: exposure to increased temperatures is likely to impact many of our global sites and combined effects of sea level rise and flooding could be significant in our San Francisco Bay Area headquarters, both as early as 2050. The results of the scenario analysis has primarily informed our real estate development objectives and strategy in the Bay Area. Climate resilience has become a central theme that has influenced our large-scale district and master planning. In terms of business objectives, the results of the scenario analysis encouraged Google to take a longer term view on how risks will impact real estate strategy beyond the 2050 time horizon. In terms of strategy, Google is exploring specific ways to invest in mitigation measures today that will reduce future risk, such as expanding creek channels and raising finished floor elevation of new buildings. We're also engaging in public/private partnerships to advance climate resilience solutions at the regional scale. For example, we're engaged in a large-scale master plan effort for our Mountain View and Sunnyvale locations, both in California. Sea level rise, flooding and urban heat island have emerged as critical climate risks that can have a material impact on physical assets and occupants, and have been considered as part of the overall development strategy for Google's expanding footprint in the area. To determine the relative significance of climate-related risks in relation to other risks, we developed a methodology for evaluating risk from a triple bottom line perspective, including environment, financial and social impacts.

## C4. Targets and performance

---

### C4.1

---

**(C4.1) Did you have an emissions target that was active in the reporting year?**

Both absolute and intensity targets

#### C4.1a

---

**(C4.1a) Provide details of your absolute emissions target(s) and progress made against those targets.**

**Target reference number**

Abs 1

**Scope**

Scope 1+2 (market-based) +3 (upstream)

**% emissions in Scope**

100

**Targeted % reduction from base year**

100

**Base year**

2018

**Start year**

2018

**Base year emissions covered by target (metric tons CO2e)**

1210661

**Target year**

2018

**Is this a science-based target?**

No, and we do not anticipate setting one in the next 2 years

**% of target achieved**

100

**Target status**

Expired

**Please explain**

Every year, we have a goal of being carbon neutral. As of December 31, 2018, we reached carbon neutrality for 100% of our FY2018 operational emissions, which represent Scope 1 + Scope 2 (market-based) + Scope 3 (business travel, candidate travel, and employee commuting). Abs1 covers Scope 1 + Scope 2 (market-based) + Scope 3 (business travel, candidate travel, and employee commuting). We committed to being carbon neutral in 2007 and we have achieved this goal each year since then. We maintain our commitment to carbon neutrality of our operational footprint first through energy efficiency, second, by signing long-term contracts for renewable energy directly from our utility providers and from green energy facilities in the same grid regions as our data centers, and lastly, by investing in high-quality carbon offset projects. We understand that CDP does not acknowledge carbon offsets as a way to reduce emissions, however, we do recognize offsets as a viable and important approach for mitigating our carbon emissions impact, as well as a critical component of our three-tiered carbon neutrality strategy.

---

**Target reference number**

Abs 2

**Scope**

Scope 1 +2 (market-based)

**% emissions in Scope**

100

**Targeted % reduction from base year**

100

**Base year**

2015

**Start year**

2015

**Base year emissions covered by target (metric tons CO2e)**

1451418

**Target year**

2025

**Is this a science-based target?**

No, and we do not anticipate setting one in the next 2 years

**% of target achieved**

100

**Target status**

Achieved

**Please explain**

Abs2 includes RE2, as well as Scope 1 emissions, and is our interim target for Abs3. On July 27, 2015, Google committed to tripling our purchases of renewables (then 1.1GW) by 2025 (see: <https://www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge>). This was expected to result in installed production capacity of 3.4GW of renewable power and an annual GHG emissions reduction of approximately 2.7 million tCO2 by 2025, of which an increase of 1.8 million tCO2 in our annual GHG emissions reduction (from 0.9 million tCO2/year to 2.7 million tCO2/year) will be achieved by 2025. As of December 31, 2018, we exceeded this target seven years early: since 2010, we've signed 34 agreements totaling 3.75 gigawatts of renewable energy (see target RE2). As of the end of 2018, our annual greenhouse gas emissions reductions from our renewable energy projects were 3.6 million metric tons, which puts us 202% of the way towards this goal from an emissions reduction perspective, and 115% of the way towards this goal from a renewable energy perspective. Our calculations

---

assume that the grid emissions factors in the target year remain the same. Our overall energy usage from base year to target year is expected to increase, so this target is expected to result in an equivalent annual reduction of emissions from base year to target year of 124% by 2025, though we have written 100% as that is the maximum value possible for this field. Our % reduction from base year represents annual emissions reductions in our target year due to additional purchases of renewables (1.8 million tCO<sub>2</sub>), as compared to our annual base year emissions covered by this target (1.5 million tCO<sub>2</sub>). [(1.8 million tCO<sub>2</sub>/1.5 million tCO<sub>2</sub>)\*100 = 124%]. Our market-based Scope 2 emissions represented 91.5% of our combined Scope 1 and market-based Scope 2 emissions in 2018.

---

**Target reference number**

Abs 3

**Scope**

Scope 1 +2 (market-based)

**% emissions in Scope**

100

**Targeted % reduction from base year**

100

**Base year**

2015

**Start year**

2015

**Base year emissions covered by target (metric tons CO<sub>2</sub>e)**

1451418

**Target year**

2040

**Is this a science-based target?**

No, and we do not anticipate setting one in the next 2 years

**% of target achieved**

100

**Target status**

Underway

**Please explain**

Abs3 includes RE1, as well as Scope 1 emissions. In 2012, we set a longterm goal to purchase enough renewable energy to match all the electricity we consume globally on an annual basis. In 2017, and again in 2018, we achieved it: Google's total purchase of energy from sources like wind and solar exceeded the amount of electricity used by our operations around the world, including offices and data centers. While we're still drawing power from the grid, some of which is from fossil fuel resources, we're purchasing enough wind and solar energy to match every MWh of electricity our data center and office operations consume annually. In 2018, our annual GHG reductions from our renewable energy projects were 3.6 million metric tons. This puts us 202% of the way towards this goal from an emissions reduction perspective. Google is the largest cumulative corporate purchaser of renewable energy in the world. Since 2010, we've signed 34 agreements totaling 3.75 gigawatts of renewable energy. Reaching our 100% renewable purchasing goal means that Google buys on an annual basis the same amount of megawatt-hours (MWh) of renewable energy—both the physical energy and its corresponding renewable energy certificates (RECs)—as the amount of MWh of electricity that we consume for our operations around the world. Where possible, we buy this energy directly from our utility providers and from green energy facilities in the same grid regions as our data centers. Since we're using Abs2 as our interim target for Abs3 and it would be difficult to predict our emissions in 2040, we used most of the same data here for Abs3 as we did for Abs2. We know we will increase our annual GHG emissions reduction by at least 1.8 million tCO<sub>2</sub> of emissions (our Abs2 target) sometime before 2040. The actual reduction in tCO<sub>2</sub> will likely be greater as we believe our Scope 2 emissions will grow between our base year and 2040. Matching 100% renewable energy is just the beginning. We're building new data centers and offices, and as demand for Google products grows, so does our electricity load. We need to be constantly adding renewables to our portfolio to keep up. So we'll keep signing contracts to buy more renewable energy. And in those regions where we can't yet buy renewables, we'll keep working on ways to help open the market. As such, while we achieved our target this year, our efforts are ongoing.

---

**C4.1b**

**(C4.1b) Provide details of your emissions intensity target(s) and progress made against those target(s).**

**Target reference number**

Int 1

**Scope**

Scope 1 +2 (market-based)

**% emissions in Scope**

0.47

**Targeted % reduction from base year**

50

**Metric**

Metric tons CO2e per unit FTE employee

**Base year**

2011

**Start year**

2011

**Normalized base year emissions covered by target (metric tons CO2e)**

0.14

**Target year**

2025

**Is this a science-based target?**

No, and we do not anticipate setting one in the next 2 years

**% of target achieved**

100

**Target status**

Achieved

**Please explain**

We have many emission reduction activities, and this is one we chose to highlight here. Google's NYC office has chosen to participate in the NYC Carbon Challenge. We have volunteered to go beyond the 30% greenhouse gas reduction per full-time equivalent employee (FTE) by 2030 and instead work to a 50% reduction in metric tons CO2e per FTE employee by 2025 from 2011 baselines for Scope 1 and 2 emissions. This target applies to our Google-occupied building spaces in NYC. Google is committed to reducing our Scope 1 and 2 emissions per FTE by 50% in our New York City office by 2025. As of Dec.31, 2018, we have achieved a 54% reduction of Scope 1 and 2 emissions per FTE through various energy efficiency and emissions reductions projects, therefore we have exceeded this goal seven years early. This target is related to Scope 1 and 2 emissions, therefore, we don't expect any change in Scope 3 emissions from this target specifically.

**% change anticipated in absolute Scope 1+2 emissions**

0.48

**% change anticipated in absolute Scope 3 emissions**

0

---

## C4.2

---

**(C4.2) Provide details of other key climate-related targets not already reported in question C4.1/a/b.**

**Target**

Renewable electricity consumption

**KPI – Metric numerator**

Total renewable energy purchased annually

**KPI – Metric denominator (intensity targets only)**

Total annual global electricity consumption

---

**Base year**

2015

**Start year**

2015

**Target year**

2040

**KPI in baseline year**

48

**KPI in target year**

100

**% achieved in reporting year**

100

**Target Status**

Achieved

**Please explain**

RE1 is the Scope 2 portion of Ab3. In 2012, we set a long-term goal to purchase enough renewable energy to match all the electricity we consume globally on an annual basis. In 2018, we achieved it for the second year in a row: Google's total purchase of energy from sources like wind and solar exceeded the amount of electricity used by our operations around the world, including offices and data centers. While we're still drawing power from the grid, some of which is from fossil fuel resources, we're purchasing enough wind and solar energy to match every megawatt-hour (MWh) of electricity our data center and office operations consume annually. Google is the largest corporate purchaser of renewable energy in the world. Since 2010, we've signed 34 agreements totaling 3.75 gigawatts of renewable energy. Reaching our 100% renewable purchasing goal means that Google buys on an annual basis the same amount of megawatt-hours (MWh) of renewable energy—both the physical energy and its corresponding renewable energy certificates (RECs)—as the amount of MWh of electricity that we consume for our operations around the world. Where possible, we buy this energy directly from our utility providers and from green energy facilities in the same grid regions as our data centers. Matching 100% renewable energy is just the beginning. We're building new data centers and offices, and as demand for Google products grows, so does our electricity load. We need to be constantly adding renewables to our portfolio to keep up. So we'll keep signing contracts to buy more renewable energy. And in those regions where we can't yet buy renewables, we'll keep working on ways to help open the market. In 2018, we announced a longer-term ambition to power all of our data centers with carbon-free energy on a 24x7 basis (every hour of every day). We also published a paper tracking our progress toward that goal (see <https://storage.googleapis.com/gweb-sustainability.appspot.com/pdf/24x7-carbon-free-energy-data-centers.pdf>). In 2015, Google joined the RE100 initiative—an initiative led by the Climate Group and CDP—as well as the We Mean Business coalition, committing to procure 100% of our electricity from renewable sources (see <https://www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge>).

**Part of emissions target**

Abs3

**Is this target part of an overarching initiative?**

RE100

**Target**

Renewable electricity consumption

**KPI – Metric numerator**

Total renewable energy production capacity installed, minus 1.1GW (installed capacity during base year)

**KPI – Metric denominator (intensity targets only)**

2.3 GW of renewable energy production capacity installed. This represents our target of 3.4 GW minus 1.1GW (installed capacity during base year)

**Base year**

2015

**Start year**

2015

**Target year**

2025

**KPI in baseline year**

1.1

**KPI in target year**

3.4

**% achieved in reporting year**

100

**Target Status**

Achieved

**Please explain**

RE2 is the Scope 2 portion of Abs2 and is our interim target for RE1. On July 27, 2015, as part of the White House American Business Act on Climate Pledge, Google committed to tripling our purchases of renewables (then 1.1GW) by 2025 (see: <https://www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge> and <https://www.theclimatedgroup.org/news/google-joins-re100-target-triple-renewable-energy-purchases-2025>). This is expected to result in installed production capacity of 3.4GW of renewable power by 2025. As of December 31, 2018, we had entered into 34 long-term renewable energy agreements which, together, total 3.75 GW of installed production capacity, putting us 115% of the way towards this goal.

**Part of emissions target**

Abs2

**Is this target part of an overarching initiative?**

RE100

---

## C4.3

---

**(C4.3) Did you have emissions reduction initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.**

Yes

### C4.3a

---

**(C4.3a) Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO2e savings.**

	Number of initiatives	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	0	
To be implemented*	1	0
Implementation commenced*	4	1440
Implemented*	101	1054
Not to be implemented	0	

### C4.3b

---

**(C4.3b) Provide details on the initiatives implemented in the reporting year in the table below.**

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Lighting

**Estimated annual CO2e savings (metric tonnes CO2e)**

258

---

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

18221

**Investment required (unit currency – as specified in C0.4)**

30000

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

16-20 years

**Comment**

Small pilot to upgrade fluorescent fixtures to LEDs with smart controls at our Iowa data center. This represents progress made on this project in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

HVAC

**Estimated annual CO2e savings (metric tonnes CO2e)**

15

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

150000

**Investment required (unit currency – as specified in C0.4)**

0

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

11-15 years

**Comment**

Replace two-stage filtration with single-stage filtration for rooftop HVAC units at our Iowa data center. This represents progress made on this project in 2018. New units already have single-stage filtration so the annual cost savings represented here is actually a cost avoidance for new buildings. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

273

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

1625957

**Investment required (unit currency – as specified in C0.4)**

16500000

**Payback period**

11-15 years

**Estimated lifetime of the initiative**

21-30 years

**Comment**

Ongoing implementation of multi-year energy efficiency projects in our New York office as part of the NYC Carbon Challenge. In 2018, significant progress was made on 5 projects. In 2011, Google committed to the NYC Carbon Challenge. It asked companies to strive for a 30% GHG reduction per FTE by 2030, but we volunteered to go beyond this and committed to a 50% reduction by 2025. As of Dec.31, 2018, we achieved a 54% reduction, exceeding our target seven years early. See Question 4.1b for more details. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

74

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

56862

**Investment required (unit currency – as specified in C0.4)**

0

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

6-10 years

**Comment**

Energy efficiency projects in our San Francisco Bay area offices. In 2018, 17 individual projects were implemented. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

188

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

24003

**Investment required (unit currency – as specified in C0.4)**

15648

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

6-10 years

**Comment**

Pursuit of LEED EB:O&M Gold certification for our office in Hyderabad, India, which includes 6 energy efficiency projects implemented in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

100

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

30350

**Investment required (unit currency – as specified in C0.4)**

13500

**Payback period**

<1 year

**Estimated lifetime of the initiative**

Ongoing

**Comment**

Implementation of 40 fine-tuning initiatives to improve energy management at our office in Kirkland, Washington in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

97

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

---

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

19589

**Investment required (unit currency – as specified in C0.4)**

10600

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

Ongoing

**Comment**

Implementation of 11 fine-tuning initiatives to improve energy management at our office in Dublin, Ireland in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

35

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

5487

**Investment required (unit currency – as specified in C0.4)**

6064

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

Ongoing

**Comment**

Implementation of 7 fine-tuning initiatives to improve energy management at our office in Sydney, Australia in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

**Initiative type**

Energy efficiency: Building services

**Description of initiative**

Other, please specify (Various energy efficiency projects)

**Estimated annual CO2e savings (metric tonnes CO2e)**

15

**Scope**

Scope 2 (market-based)

**Voluntary/Mandatory**

Voluntary

**Annual monetary savings (unit currency – as specified in C0.4)**

---

2014

**Investment required (unit currency – as specified in C0.4)**

14052

**Payback period**

1-3 years

**Estimated lifetime of the initiative**

Ongoing

**Comment**

Implementation of 10 fine-tuning initiatives to improve energy management at our office in Krakow, Poland in 2018. Google has many emissions reduction initiatives and we've chosen only a small subset to detail out here as examples of the activities we've implemented in the reporting year. Amounts for investment required are pre-incentive (they do not incorporate any potential rebates earned). Payback periods are post-incentive (they do incorporate any potential rebates earned).

---

## C4.3c

**(C4.3c) What methods do you use to drive investment in emissions reduction activities?**

Method	Comment
Financial optimization calculations	We conduct payback calculations to decide which emissions reduction activities will best help us meet our carbon neutral goal and deliver the best financial returns to the company.

## C4.5

**(C4.5) 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

## C4.5a

**(C4.5a) 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**

Group of products

**Description of product/Group of products**

G Suite: G Suite (including G Suite for Education and G Suite for Nonprofits) is a set of cloud-based intelligent apps designed with real-time collaboration and machine intelligence to bring people together and help them work smarter. There are 4 million paying businesses that use G Suite. G Suite includes: Gmail, Drive, Docs, Sheets, Slides, Calendar, Hangouts, Keep, Sites and Cloud Search. G Suite for Education is the same set of apps as G Suite, but includes Classroom, and is designed with features that make work easier and bring teachers and students together. There are more than 80 million G Suite for Education users worldwide. G Suite for Nonprofits is equivalent to G Suite Basic but includes Shared Drives. More than 100,000 nonprofits and more than 1.6 million nonprofit users actively use G Suite for Nonprofits every month to collaborate, communicate, and streamline their operations.

**Are these low-carbon product(s) or do they enable avoided emissions?**

Low-carbon product

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year**

**Comment**

A number of Google's products and services directly help users avoid Scope 2 GHG emissions. Emissions are avoided due to our data center energy efficiency efforts as well as our carbon neutrality. This means businesses that use our cloud-based products are greener too. We studied the energy efficiency benefits of our products by looking at the use of Google Apps at large. By switching to Google Apps, companies have reduced office computing costs, energy use, and carbon emissions by 65% to 90%. Since our cloud is carbon neutral, we help further mitigate the carbon impact for businesses that use Google Apps. The experience of one of our large Google Apps clients, the U.S. General Services Administration (GSA), supports these findings. By switching to Google Apps for its approximately 17,000 users, the GSA reduced server energy consumption by nearly 90% and carbon emissions by 85%. This represents an annual emissions reduction of 1,570 tonnes of CO<sub>2</sub>. For more information, see our white paper "Google Apps: Energy Efficiency in the Cloud":

[http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdf/google-apps.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/google-apps.pdf)

---

#### **Level of aggregation**

Product

#### **Description of product/Group of products**

Gmail: Gmail is advanced email with a huge inbox, lightning-fast search, built-in instant messaging, voice calling and video chat. There are 1.5 billion monthly Gmail users.

#### **Are these low-carbon product(s) or do they enable avoided emissions?**

Low-carbon product

#### **Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

#### **% revenue from low carbon product(s) in the reporting year**

#### **Comment**

A number of Google's products and services directly help users avoid Scope 2 GHG emissions. For example, Gmail, Google's cloud-based email service, is more energy efficient than email hosted locally. Because the cloud supports many products at a time, it can more efficiently distribute resources among many users. That means we can do more with less energy—and other businesses can too. In addition, we've engineered our cloud-based services to run on efficient custom-designed servers that live in data centers that we've built to be as efficient as possible. Lawrence Berkeley National Laboratory published research indicating that moving all office workers in the United States to the cloud could reduce the energy used by information technology by up to 87%. To learn more about the energy efficiency potential of cloud-based software, see the paper:

[http://crd.lbl.gov/assets/pubs\\_presos/ACS/cloud\\_efficiency\\_study.pdf](http://crd.lbl.gov/assets/pubs_presos/ACS/cloud_efficiency_study.pdf) Businesses that use Gmail have decreased the environmental impact of their email service by up to 98% compared to those that run email on local servers. Google can provide Gmail service to 80 companies for the same amount of energy that a single company would typically use to run email services locally. Small businesses with fewer than 50 people can save up to 172.8 kWh of energy and 101.6 kg of carbon per user per year by using Gmail, resulting in 1,490,925 tonnes of CO<sub>2</sub> net savings over one year. Further details and methodology can be found in our published white paper "Google's Green Computing: Efficiency at Scale". (See:  
[http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdfs/google-green-computing.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdfs/google-green-computing.pdf))

---

#### **Level of aggregation**

Group of products

#### **Description of product/Group of products**

Google Cloud Platform: Google Cloud Platform enables developers to build, test, and deploy applications on Google's highly-scalable and reliable infrastructure. Key products include: Compute Engine, App Engine, Container Engine, BigQuery, Cloud Storage, Cloud Bigtable, Cloud Networking, and Cloud Machine Learning For more information on Google Cloud Platform, see: <https://cloud.google.com/products/>

#### **Are these low-carbon product(s) or do they enable avoided emissions?**

Low-carbon product

#### **Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

#### **% revenue from low carbon product(s) in the reporting year**

#### **Comment**

A number of Google's products and services directly help users avoid scope 2 GHG emissions. When developers and businesses work in the cloud with Google Cloud Platform, they're using an infrastructure that uses 50% less energy than the average data center, is carbon neutral, and adheres to the highest certified environmental, health and safety standards. In fact, compared with five years ago, we now deliver around seven times as much computing power with the same amount of electrical power. For more information on Google Cloud Products & Services, see: <https://cloud.google.com/products/> See also our response above specific to

Gmail, which is one of our Cloud-based services.

---

**Level of aggregation**

Product

**Description of product/Group of products**

Google Maps: Google Maps assists people as they navigate, explore and get things done in the world.

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 emissions. Several features in Google Maps help people reduce their personal carbon footprint by facilitating use of alternate forms of transportation. With Google Maps you can pinpoint the places and information you need quickly, whether it's how many minutes until the next bus arrives, or how long it will take to walk or bike from work to home. Google Maps provides over 1 billion km worth of transit results every day. Google Maps has transit information for nearly 10,000 agencies, running through more than 4 million transit stations, in over 100 countries. In 2018, Google Maps launched a new feature to enable users to search for information about electric vehicle charging stations around the world. For more information, see our blog post on Google Maps and transit: <http://googleblog.blogspot.com/2014/05/hop-on-boardand-go-almost-anywherewith.html>

---

**Level of aggregation**

Product

**Description of product/Group of products**

Project Sunroof

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 and/or Scope 2 emissions. Project Sunroof is a Google product that helps its users decide whether or not to go solar. If a user enters their address on the Project Sunroof site, Google will use 3D mapping of rooftops and nearby obstructions to estimate potential solar energy production if they were to install a rooftop solar system. Project Sunroof combines this production estimate with detailed, localized information about weather, utility rates, solar costs, and incentives to generate an accurate estimate of the financial benefits of going solar. The product also makes it easy for users to connect with solar installers and take the next step towards going solar. As an example of helping users avoid emissions, Google's Project Sunroof data was used by the City of San José, CA for their city-wide solar assessment to achieve a proposed 1GW target and global partners like E.On have deployed Sunroof to help over 10,000 customers understand their roof's solar potential. By the end of 2018, Project Sunroof has mapped more than 107 million rooftops globally, and we've made this information available on [www.google.com/get/sunroof](http://www.google.com/get/sunroof), [insights.sustainability.google](http://insights.sustainability.google), and on partner sites around the world. For more information, see: <https://www.google.com/get/sunroof>

---

**Level of aggregation**

Product

**Description of product/Group of products**

Project Air View

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 and/or Scope 2 emissions. For the past few years, Google Earth Outreach has worked with the Environmental Defense Fund (EDF) to map thousands of methane leaks from natural gas lines under select U.S. city streets using Street View cars equipped with methane analyzers. In 2018, we announced that we were expanding to the new Street View fleet -- starting with 50 cars in 2019. This is the next step in Project Air View's efforts to make air quality information more accessible and useful -- essentially making the invisible visible. We also launched our first projects in Europe -- first, in Copenhagen, and then in London, where we are part of a coalition with EDF and C40.org to map air pollution in London at a hyperlocal level.

---

**Level of aggregation**

Product

**Description of product/Group of products**

Nest thermostat

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 and/or Scope 2 emissions. Nest thermostats give owners the power to save energy. In fact, as of December 31, 2018, Nest thermostats had saved over 29 billion kWh -- that's enough energy to drive every electric vehicle (EV) ever made around the planet. Independent studies showed that Nest saved people an average of 10% to 12% on heating and 15% on cooling. Based on typical energy costs, we've estimated average savings of \$131 to \$145 a year. That means a Nest thermostat can pay for itself in under two years. Nest thermostats control residential heating and cooling systems, reduce home energy consumption, and help achieve collective savings. They use learning algorithms and smart control of the heating and cooling systems to reduce home energy consumption and the associated Scope 1 and Scope 2 emissions. Most people leave their thermostat at one temperature and forget to change it, while the Nest thermostat learns your schedule, programs itself, and can be controlled from your phone. Nest is also working with energy companies, nonprofits and original equipment manufacturers (OEMs) to bring 1 million energy- and money-saving Nest Thermostats to families in need by 2023 through the Nest Power Project. Saving energy is core to Nest's mission of creating a home that cares for the people inside it and the world around it, and we believe everyone deserves access to energy-saving technology. For more information on how Nest helps users save energy, see: - Nest Power Project: <https://nestpowerproject.withgoogle.com> - Impact: <https://nest.com/downloads/press/documents/nest-corporate-fact-sheet.pdf> - Rush Hour Rewards (helps reduce the load on the electrical grid during times when demand for energy is high): <https://nest.com/support/article/What-is-Rush-Hour-Rewards> - Seasonal Savings: <https://nest.com/support/article/What-is-Seasonal-Savings>

---

**Level of aggregation**

Product

**Description of product/Group of products**

Makani Energy Kites

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 and/or Scope 2 emissions. Makani is an independent company within Alphabet. Makani is developing energy kites that use a wing tethered to a ground station to efficiently harness energy from the wind, generating electricity at utility-scale. As the kite flies autonomously in loops, rotors on the wing spin as the wind moves through them, generating electricity that is sent down the tether to the grid. The Makani energy kite system integrates advances in aerospace engineering, materials science, and autonomous controls to create a lightweight design that is easy to transport and install. The low mass of Makani's system unlocks wind energy resources in areas like deepwater offshore that are not economically viable for existing technologies. Harnessing energy from the wind in new places means more people around the world will have access to clean, affordable wind power. For more information, see <https://makanipower.com/>

---

**Level of aggregation**

Company-wide

**Description of product/Group of products**

Other: Alphabet and Google offer many products and services in addition to those mentioned above, including Search, Chrome, Android, Play, Travel, Translate, Payments, Fiber, Photos, and YouTube. Google's core products and platforms such as Android, Chrome, Gmail, Google Drive, Google Maps, Google Play, Search, and YouTube each have over one billion monthly active users.

**Are these low-carbon product(s) or do they enable avoided emissions?**

Low-carbon product

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Many of Alphabet's and Google's products and services directly help users avoid Scope 2 GHG emissions, since Google data centers use 50% less energy than typical data centers, we are carbon neutral, and we adhere to the highest certified environmental, health and safety standards. Compared with five years ago, we now deliver around seven times as much computing power with the same amount of electrical power.

---

**Level of aggregation**

Product

**Description of product/Group of products**

Environmental Insights Explorer: In 2018, we launched the Environmental Insights Explorer (EIE), a new online tool created in collaboration with the Global Covenant of Mayors for Climate & Energy (GCoM), which is designed to make it easier for cities to access, and act upon, new climate-relevant datasets. By analyzing Google's comprehensive global mapping data together with standard greenhouse gas (GHG) emission factors, EIE estimates city-scale building and transportation carbon emissions data, as well as renewable energy potential, leading to more globally-consistent baselines from which to build policies, guide solutions, and measure progress.

**Are these low-carbon product(s) or do they enable avoided emissions?**

Avoided emissions

**Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions**

Other, please specify (Our own methodology)

**% revenue from low carbon product(s) in the reporting year****Comment**

Avoided emissions represent the third party's Scope 1 and 2 emissions. The Environmental Insights Explorer was launched in 2018 as a public Beta for 5 cities, with the goal to bring this level of information to more cities in the future. As of the end of 2018, more than 9,000 cities have made commitments to comply with the Paris Agreement, which presents a formal plan and timeline to phase out reliance on fossil fuels. But less than 20% have been able to complete, submit or monitor greenhouse gas inventories. The potential of the commitments made by Global Covenant of Mayors cities is equivalent to reducing nearly 1.4 billion tons of CO<sub>2</sub>e emissions per year by 2030. For more information, see [insights.sustainability.google](https://insights.sustainability.google) and <https://www.blog.google/products/earth/more-you-know-turning-environmental-insights-action/>

---

## C5. Emissions methodology

---

### C5.1

---

**(C5.1) Provide your base year and base year emissions (Scopes 1 and 2).**

**Scope 1**

**Base year start**

January 1 2009

**Base year end**

December 31 2009

**Base year emissions (metric tons CO<sub>2</sub>e)**

10919

**Comment**

**Scope 2 (location-based)**

**Base year start**

January 1 2009

**Base year end**

December 31 2009

**Base year emissions (metric tons CO<sub>2</sub>e)**

1147991

**Comment**

**Scope 2 (market-based)**

**Base year start**

January 1 2009

**Base year end**

December 31 2009

**Base year emissions (metric tons CO<sub>2</sub>e)**

1147991

**Comment**

## C5.2

---

**(C5.2) Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions.**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

## C6. Emissions data

---

### C6.1

---

**(C6.1) What were your organization's gross global Scope 1 emissions in metric tons CO2e?**

**Reporting year**

**Gross global Scope 1 emissions (metric tons CO2e)**

63521

**Start date**

January 1 2018

**End date**

December 31 2018

**Comment**

---

## C6.2

**(C6.2) Describe your organization's approach to reporting Scope 2 emissions.**

**Row 1**

**Scope 2, location-based**

We are reporting a Scope 2, location-based figure

**Scope 2, market-based**

We are reporting a Scope 2, market-based figure

**Comment**

---

## C6.3

**(C6.3) What were your organization's gross global Scope 2 emissions in metric tons CO2e?**

**Reporting year**

**Scope 2, location-based**

4344686

**Scope 2, market-based (if applicable)**

684236

**Start date**

January 1 2018

**End date**

December 31 2018

**Comment**

---

## C6.4

**(C6.4) 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

---

## C6.4a

**(C6.4a) 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**

Non-CO<sub>2</sub> sources of emissions are excluded from the chemical boundary

**Relevance of Scope 1 emissions from this source**

Emissions are not relevant

**Relevance of location-based Scope 2 emissions from this source**

Emissions are not relevant

**Relevance of market-based Scope 2 emissions from this source (if applicable)**

Emissions are not relevant

**Explain why this source is excluded**

Other chemicals such as methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) are considered negligible to our operations and were excluded from the chemical boundary.

---

## C6.5

---

**(C6.5) Account for your organization's Scope 3 emissions, disclosing and explaining any exclusions.**

**Purchased goods and services**

**Evaluation status**

Relevant, calculated

**Metric tonnes CO<sub>2</sub>e**

0

**Emissions calculation methodology**

This year we are transitioning to using Life Cycle Assessment (LCA) to estimate full supply chain GHG emissions in this category for Google consumer devices and food consumed in our cafes and microkitchens. For Google consumer devices, GHG emissions were calculated for 99.9% of Google's flagship products sold in 2018. LCA models were developed for each product or similarly grouped products based on tear-down analysis, bill-of-materials, data on some part manufacturing processes and third-party LCA electronics and material databases. The quality of the estimate is likely moderate, given that upstream data from LCA databases might not be fully representative of the purchased technology and geography. In 2018, for the first time, we factored our food program into this category. We conducted the estimate using procurement data from Bay Area cafes and microkitchens as a proxy for our global operations. We used LCA emission factors sourced from publicly available datasets recommended by WRI and we combined them with annual Bay Area procurement volumes. We then extrapolated to our global operations using seated head count as a scaling factor. The quality of the estimate is likely moderate, as supplier-specific LCA figures were not collected and regional differences in procurement were not captured in the assessment. We are not breaking this data out specifically for business reasons. The total is included in the "Other (upstream)" category below.

**Percentage of emissions calculated using data obtained from suppliers or value chain partners**

**Explanation**

## **Capital goods**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

2422000

### **Emissions calculation methodology**

To calculate emissions from capital goods for hardware manufacturing, we collected supplier Scope 1 and 2 GHG emissions data directly from our hardware contract manufacturers and component suppliers through the CDP Supply Chain Program. GHG emissions were estimated by using facility and company level emissions allocated to Alphabet reported by suppliers or calculated based on GHG intensity and spend data, and scaled up with total spend to represent 100% of the spend. For fabless suppliers, company-level allocated emissions for their Scope 1, 2 and manufacturer's data were used when reported. Data gaps were estimated with CDP's industry average intensities and spend. GHG emissions beyond our Tier 1 hardware manufacturing suppliers are included in the "Other (upstream)" category below. Data center construction emissions were estimated by using published construction emissions data and applying it to our construction activity data. Given the lack of high-quality data on embodied emissions of hardware, equipment and buildings, the estimates are of only moderate quality.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

35

### **Explanation**

## **Fuel-and-energy-related activities (not included in Scope 1 or 2)**

### **Evaluation status**

Not relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

0

### **Emissions calculation methodology**

For fuel and energy related Scope 3 emissions, we performed an analysis of our total energy consumed using life cycle inventory (LCI) and Environmentally Extended Input-Output (EEIO) datasets. The quality of this estimate is likely moderate to low, as the upstream fuel and energy activities' LCI and EEIO data might not be fully representative of the specific and current energy generation technologies and geographies where we operate.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

### **Explanation**

We estimated that the emissions associated with fuel-and-energy-related activities not covered in our Scope 1 and 2 are de minimis relative to our overall footprint.

## **Upstream transportation and distribution**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

475000

### **Emissions calculation methodology**

We calculated GHG emissions from transportation and warehousing of our consumer products, data center equipment, and Google Shopping deliveries by third party logistics providers, both inbound and outbound, paid for by Alphabet. Some transportation providers reported customer-allocated GHG emissions that they calculated aligned with the GHG Protocol based on fuel use or weight-distance data and routing associated with a shipment. We used activity data to calculate GHG emissions from the other transportation providers, obtained directly from the providers or from our internal databases tracking weight and origin and destination of each shipment. Electricity and natural gas use in warehousing were estimated using average energy consumption per square foot from the 2012 Commercial Buildings Energy Consumption Survey (CBECS) and then multiplied by the square feet allocated from the warehouse to Alphabet. This excluded any refrigerants, and also likely overestimated natural gas use.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

95

### **Explanation**

## **Waste generated in operations**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

For the emissions associated with waste generated in our operations, we performed an analysis using our annual spend and annual waste generation, and used life cycle inventories and EEIO datasets to estimate the total emissions. Overall, the data quality is estimated to be low, as the LCI and EEIO datasets might not be fully representative of the geographies and technologies used in the counties and municipalities where we operate. Emissions associated with waste from our operations were estimated to be de minimis relative to our overall footprint.

## **Business travel**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

313000

### **Emissions calculation methodology**

We estimated business travel and candidate travel using data that includes the distance of each trip and the seating class for air travel and rail travel. We then applied the relevant emission factor provided in CDP's guidance. We also included data from rental car companies on total fuel consumption from all rental car reservations. Given that our internal data collection for business travel is robust, the quality of the resulting emissions estimate is also likely high, assuming that the quality of the CDP-provided emissions factors is also high.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

### **Explanation**

## **Employee commuting**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

150467

### **Emissions calculation methodology**

We estimated employee commuting using internal data on employees and applying the average one-way commuting distance and average passenger vehicle fuel economy from U.S. government data sources. We excluded trips made by our shuttles, vanpools, and self-powered commuters (walking, biking, etc.) as these commuting emissions were captured in Scope 1 emissions or are 0. We also accounted for commuters using electric vehicles (as EV charging on Google campuses is part of our Scope 2). The quality of this estimate is probably moderate as we used a US-average commute distance given the lack of better data.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

### **Explanation**

## **Upstream leased assets**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

Up until 2016, we included onsite fuel consumption in leased buildings as part of our Scope 3 emissions. In 2017, we moved this category into our Scope 2 emissions as per the requirements of WRI's GHG Protocol Scope 2 Guidance. Our estimation methodology for this category has not changed: we estimated our emissions from onsite fuel consumption by taking the square footage of our leased space and multiplying it by standard office fuel usage and emissions factors from CBECS, a government data source. Assuming that the CBECS emissions factor data is good, the quality of the estimate is likely moderate given that we have a robust internal real estate square footage tracking system.

## **Downstream transportation and distribution**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

0

### **Emissions calculation methodology**

We estimated downstream transportation and distribution for those Alphabet activities that we estimated to be significant compared to our overall footprint. We used internal shipment data and emission estimates provided by transportation vendors. Overall, the quality of this data is estimated to be moderate.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

### **Explanation**

We included outbound transportation (paid by Alphabet) in the "upstream transportation and distribution" category.

## **Processing of sold products**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

We do not sell intermediate goods that require further processing.

## **Use of sold products**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

0

### **Emissions calculation methodology**

The GHG emissions from use of sold products were calculated for 99.9% of Google's flagship products sold in 2018. Use impact was calculated through laboratory power draw measurements and common industry assumptions of use patterns. The quality of the estimate is likely moderate, given that assumptions of use patterns might not be fully representative of actual use patterns. We are not breaking this data out specifically for business reasons. The total is included in the "Other (upstream)" category below.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

#### **Explanation**

In 2017 and 2018, we conducted life-cycle assessment (LCA) studies for our flagship products and produced product-level carbon footprints broken out by life cycle stages (including use phase). These were included in the product environmental reports published in 2018 on the Google Store Sustainability site (<https://store.google.com/us/magazine/sustainability>) and the Google Sustainability site (<https://sustainability.google>). Our teams have operational control over the energy efficiency of our products and this is where we have historically focused our efforts to measure and mitigate our emissions. We've done an initial assessment of emissions from use of sold products and are further developing our model.

## **End of life treatment of sold products**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

0

### **Emissions calculation methodology**

We calculated emissions associated with the end-of-life treatment of sold products through our life cycle assessment process and we will continue to expand this assessment over time. Our initial assessments identify this category to be one that does not have significant life cycle impact. We continue to develop programs to extend the life of our sold products and also to ensure efficient management of end-of-life materials. We are not breaking this data out specifically for business reasons. The total is included in the "Other (upstream)" category below.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

#### **Explanation**

## **Downstream leased assets**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

#### **Explanation**

We do not have any significant activity leasing assets to other organizations.

## **Franchises**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

We do not have franchises.

## **Investments**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

We have selected the "operational control" boundary method. We do not have any additional entities over which we exert operational control that are not already included in our inventory.

## **Other (upstream)**

### **Evaluation status**

Relevant, calculated

### **Metric tonnes CO<sub>2</sub>e**

10919000

### **Emissions calculation methodology**

This is the first year we are reporting estimated upstream emissions beyond our Tier 1 suppliers. The estimate was determined by applying a multiplier based on Alphabet's past carbon footprints using Economic Input-Output LCA; there is a high degree of uncertainty with these estimates. The total shown here represents purchased goods and services, use of sold products, capital goods upstream emissions beyond Tier 1 suppliers, and end-of-life treatment of sold products as described in the respective category notes.

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

### **Explanation**

## **Other (downstream)**

### **Evaluation status**

Not relevant, explanation provided

### **Metric tonnes CO<sub>2</sub>e**

<Not Applicable>

### **Emissions calculation methodology**

<Not Applicable>

### **Percentage of emissions calculated using data obtained from suppliers or value chain partners**

<Not Applicable>

### **Explanation**

We do not have other relevant downstream impacts. In previous years, we used this category for all Scope 3 emissions that were not broken out for business reasons, to protect competitive information. This year, we have aggregated these emissions under the "Other (upstream)" category as the majority of the aggregated emissions occur upstream.

## C6.7

---

(C6.7) Are carbon dioxide emissions from biologically sequestered carbon relevant to your organization?

Yes

## C6.7a

---

(C6.7a) Provide the emissions from biologically sequestered carbon relevant to your organization in metric tons CO2.

**Row 1**

**Emissions from biologically sequestered carbon (metric tons CO2)**

22862

**Comment**

## C6.10

---

(C6.10) Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO2e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

**Intensity figure**

0.00000547

**Metric numerator (Gross global combined Scope 1 and 2 emissions)**

747757

**Metric denominator**

unit total revenue

**Metric denominator: Unit total**

136819000000

**Scope 2 figure used**

Market-based

**% change from previous year**

5.2

**Direction of change**

Increased

**Reason for change**

As a large and complex multi-national company, it's not possible to determine the exact cause of year-over-year changes in emissions or emissions intensity. In 2018, our wind and solar deals, together with the RE that comes from the grid, produced enough renewable energy to match 100% of the electricity consumption of our data centers and offices. In addition, we continue to deliver more and better services and products to more users using less energy and fewer emissions, as well as to operate our data centers and offices more efficiently (see: <https://www.google.com/about/datacenters/efficiency/>). Despite a significant increase in our total procurement of renewable energy in 2018 to match 100% of the electricity consumption of our operations, we have data centers in a few locations (i.e. Singapore) on grids where we are not able to source renewable electricity. Our operations at some of these sites grew last year, resulting in a slight increase in our total market-based Scope 2 emissions. This is the primary reason for this increase in emission intensity.

---

**Intensity figure**

8.4

**Metric numerator (Gross global combined Scope 1 and 2 emissions)**

747757

**Metric denominator**

full time equivalent (FTE) employee

**Metric denominator: Unit total**

89450

**Scope 2 figure used**

Market-based

**% change from previous year**

9.96

**Direction of change**

Increased

**Reason for change**

As a large and complex multi-national company, it's not possible to determine the exact cause of year-over-year changes in emissions or emissions intensity. In 2018, our wind and solar deals, together with the RE that comes from the grid, produced enough renewable energy to match 100% of the electricity consumption of our data centers and offices. In addition, we continue to deliver more and better services and products to more users using less energy and fewer emissions, as well as to operate our data centers and offices more efficiently (see: <https://www.google.com/about/datacenters/efficiency/>). Despite a significant increase in our total procurement of renewable energy in 2018 to match 100% of the electricity consumption of our operations, we have data centers in a few locations (i.e. Singapore) on grids where we are not able to source renewable electricity. Our operations at some of these sites grew last year, resulting in a slight increase in our total market-based Scope 2 emissions. This is the primary reason for this increase in emission intensity. This FTE employee intensity figure was calculated by taking our combined 2018 Scope 1 and market-based Scope 2 emissions divided by our average 2018 headcount.

---

**Intensity figure**

0.049

**Metric numerator (Gross global combined Scope 1 and 2 emissions)****Metric denominator**

Other, please specify (megawatt hour (MWh) consumed)

**Metric denominator: Unit total****Scope 2 figure used**

Market-based

**% change from previous year**

1.97

**Direction of change**

Increased

**Reason for change**

As a large and complex multi-national company, it's not possible to determine the exact cause of year-over-year changes in emissions or emissions intensity. In 2018, our wind and solar deals, together with the RE that comes from the grid, produced enough renewable energy to match 100% of the electricity consumption of our data centers and offices. In addition, we continue to deliver more and better services and products to more users using less energy and fewer emissions, as well as to operate our data centers and offices more efficiently (see: <https://www.google.com/about/datacenters/efficiency/>). Despite a significant increase in our total procurement of renewable energy in 2018 to match 100% of the electricity consumption of our operations, we have data centers in a few locations (i.e. Singapore) on grids where we are not able to source renewable electricity. Our operations at some of these sites grew last year, resulting in a slight increase in our total market-based Scope 2 emissions. This is the primary reason for this increase in emission intensity. This MWh intensity figure was calculated by taking our 2018 market-based Scope 2 emissions of our data centers divided by the 2018 electricity consumption at our data centers. For confidentiality reasons, we are not disclosing the numerator and denominator.

---

## C7. Emissions breakdowns

---

### C7.1

---

---

**(C7.1) Does your organization break down its Scope 1 emissions by greenhouse gas type?**

Yes

### C7.1a

**(C7.1a) Break down your total gross global Scope 1 emissions by greenhouse gas type and provide the source of each used greenhouse warming potential (GWP).**

Greenhouse gas	Scope 1 emissions (metric tons of CO <sub>2</sub> e)	GWP Reference
CO <sub>2</sub>	63521	IPCC Fifth Assessment Report (AR5 – 100 year)

### C7.2

**(C7.2) Break down your total gross global Scope 1 emissions by country/region.**

Country/Region	Scope 1 emissions (metric tons CO <sub>2</sub> e)
United States of America	50360
Other, please specify (Rest of world)	13161

### C7.3

**(C7.3) Indicate which gross global Scope 1 emissions breakdowns you are able to provide.**

Please select

### C7.5

**(C7.5) Break down your total gross global Scope 2 emissions by country/region.**

Country/Region	Scope 2, location-based (metric tons CO <sub>2</sub> e)	Scope 2, market-based (metric tons CO <sub>2</sub> e)	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)
United States of America	3270348	7195	7085620	7082062
Other, please specify (Rest of world)	1074338	677041	3018675	1695784

### C7.6

**(C7.6) Indicate which gross global Scope 2 emissions breakdowns you are able to provide.**

Please select

### C7.9

**(C7.9) How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to those of the previous reporting year?**

Increased

C7.9a

---

**(C7.9a) 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.**

	Change in emissions (metric tons CO2e)	Direction of change	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption		<Not Applicable>		
Other emissions reduction activities	869446	Decreased	151	<p>The impact of emission reduction activities in 2018 is a 151% reduction compared to the emissions we reported last year. In 2018, emissions reduction activities accounted for a large share of our emission reductions, primarily from two activities -- (1) In 2018, our green power purchases (in excess of our 2017 green power purchases) resulted in significant emissions reductions in our total footprint (2) In addition to emission reductions from green power purchases, our emissions also declined due to emission reduction programs and activities at our data centers, such as machine learning, improved hardware utilization, improved optimization of data center operations, and more efficient data center designs. In addition to these two primary emissions reduction activities, we continued to expand our portfolio of LEED-certified office space as well as to implement other efficiency and emission reduction initiatives, such as making operational improvements to office buildings, improving transportation programs, and encouraging our employees to operate IT equipment more efficiently. We continue to look for ways to increase our use of clean energy, including trying new, innovative technologies at our offices. In 2018, our additional renewable power purchases (in excess of our 2017 renewable power purchases) (868,392 tCO2e) and our energy efficiency efforts (1,054 tCO2e) together resulted in an additional reduction of 869,446 tCO2e beyond our 2017 emissions reduction activities. In 2018, our total Scope 1 and market-based Scope 2 emissions were 747,757 tCO2e. Therefore we arrived at this percentage decrease as follows:</p> <p><math>[(868,392+1,054)/747,757]*100 = 151\%</math>. While the savings generated by our energy efficiency initiatives cannot be directly accounted for in this number, we believe that our emissions reduction activities are much larger than we are able to quantify. We have done our best to estimate the contribution from our emissions reduction activities, but the actual numbers could be different due to changes in other factors, such as emissions factors and weather. This estimate should be considered a lower bound as it does not include the many small emission reductions projects we've undertaken that are difficult to quantify.</p>
Divestment		<Not Applicable>		
Acquisitions		<Not Applicable>		
Mergers		<Not Applicable>		
Change in output	171874	Increased	30	<p>As a large and complex multi-national company, there are many factors impacting our emissions and it's not possible to isolate any one particular factor and quantify it exactly. Based upon the comparison of 2017 to 2018 reported data, growth of our business created a 30% increase in our emissions compared to the emissions we reported last year. This change in output was calculated by taking our 2018 Scope 1 and market-based Scope 2 emissions minus the 2017 Scope 1 and market-based Scope 2 emissions, divided by the 2017 Scope 1 and market-based Scope 2 emissions, then multiplied by 100. This percent change would also be a 30% increase if it were calculated using our location-based Scope 2 emissions. Despite a significant increase in our total procurement of renewable energy in 2018 to match 100% of the electricity consumption of our operations, we have data centers in a few locations (i.e. Singapore) on grids where we are not able to source renewable electricity. Our operations at some of these sites grew last year, resulting in a slight increase in our total market-based Scope 2 emissions. This is one contributor to this increase in emissions.</p>
Change in methodology		<Not Applicable>		
Change in boundary		<Not Applicable>		
Change in physical operating conditions		<Not Applicable>		
Unidentified		<Not Applicable>		
Other		<Not Applicable>		

**C7.9b**

---

**(C7.9b) Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?**

Market-based

## C8. Energy

---

### C8.1

---

**(C8.1) What percentage of your total operational spend in the reporting year was on energy?**

More than 0% but less than or equal to 5%

### C8.2

---

**(C8.2) Select which energy-related activities your organization has undertaken.**

	Indicate whether your organization undertakes this energy-related activity
Consumption of fuel (excluding feedstocks)	Yes
Consumption of purchased or acquired electricity	Yes
Consumption of purchased or acquired heat	No
Consumption of purchased or acquired steam	No
Consumption of purchased or acquired cooling	No
Generation of electricity, heat, steam, or cooling	Yes

### C8.2a

---

**(C8.2a) Report your organization's energy consumption totals (excluding feedstocks) in MWh.**

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total MWh
Consumption of fuel (excluding feedstock)	LHV (lower heating value)	83344	384845	468189
Consumption of purchased or acquired electricity	<Not Applicable>	8771969	1322903	10094872
Consumption of purchased or acquired heat	<Not Applicable>	<Not Applicable>	<Not Applicable>	<Not Applicable>
Consumption of purchased or acquired steam	<Not Applicable>	<Not Applicable>	<Not Applicable>	<Not Applicable>
Consumption of purchased or acquired cooling	<Not Applicable>	<Not Applicable>	<Not Applicable>	<Not Applicable>
Consumption of self-generated non-fuel renewable energy	<Not Applicable>	5877	<Not Applicable>	9423
Total energy consumption	<Not Applicable>	8861190	1711294	10572485

### C8.2b

---

**(C8.2b) Select the applications of your organization's consumption of fuel.**

	Indicate whether your organization undertakes this fuel application
Consumption of fuel for the generation of electricity	Yes
Consumption of fuel for the generation of heat	No
Consumption of fuel for the generation of steam	No
Consumption of fuel for the generation of cooling	No
Consumption of fuel for co-generation or tri-generation	Yes

**C8.2c**

**(C8.2c) State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.**

**Fuels (excluding feedstocks)**

Other, please specify (Renewable Diesel)

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

83344

**MWh fuel consumed for self-generation of electricity**

0

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

This was previously reported as Biodiesel, but it has been corrected to reflect our use of Renewable Diesel.

**Fuels (excluding feedstocks)**

Other, please specify (Diesel / Gas Oil)

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

28014

**MWh fuel consumed for self-generation of electricity**

28014

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

---

**Fuels (excluding feedstocks)**

Jet Kerosene

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

24772

**MWh fuel consumed for self-generation of electricity**

0

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

---

**Fuels (excluding feedstocks)**

Landfill Gas

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

0

**MWh fuel consumed for self-generation of electricity**

0

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

In prior years, we consumed some landfill gas (LFG). We ceased generating electricity from LFG in 2017.

---

**Fuels (excluding feedstocks)**

Motor Gasoline

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

70397

**MWh fuel consumed for self-generation of electricity**

0

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

---

**Fuels (excluding feedstocks)**

Natural Gas

**Heating value**

LHV (lower heating value)

**Total fuel MWh consumed by the organization**

261662

**MWh fuel consumed for self-generation of electricity**

0

**MWh fuel consumed for self-generation of heat**

0

**MWh fuel consumed for self-generation of steam**

<Not Applicable>

**MWh fuel consumed for self-generation of cooling**

<Not Applicable>

**MWh fuel consumed for self-cogeneration or self-trigeneration**

0

**Comment**

---

C8.2d

---

**(C8.2d) List the average emission factors of the fuels reported in C8.2c.**

**Jet Kerosene**

**Emission factor**

9.43

**Unit**

kg CO<sub>2</sub> per gallon

**Emission factor source**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

**Comment**

**Landfill Gas**

**Emission factor**

2.48

**Unit**

kg CO<sub>2</sub> per m<sup>3</sup>

**Emission factor source**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

**Comment**

Biogenic emissions.

**Motor Gasoline**

**Emission factor**

8.81

**Unit**

kg CO<sub>2</sub> per gallon

**Emission factor source**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

**Comment**

**Natural Gas**

**Emission factor**

59.2

**Unit**

kg CO<sub>2</sub> per million Btu

**Emission factor source**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

**Comment**

**Other**

**Emission factor**

9.46

**Unit**

kg CO<sub>2</sub> per gallon

**Emission factor source**

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

**Comment**

Biogenic emissions. Emission factor for 100% renewable diesel (i.e. biofuel 100% renewable with no fossil fuels).

**C8.2e**

---

**(C8.2e) Provide details on the electricity, heat, steam, and cooling your organization has generated and consumed in the reporting year.**

	Total Gross generation (MWh)	Generation that is consumed by the organization (MWh)	Gross generation from renewable sources (MWh)	Generation from renewable sources that is consumed by the organization (MWh)
Electricity	9423	9423	5877	5877
Heat				
Steam				
Cooling				

## C8.2f

---

**(C8.2f) Provide details on the electricity, heat, steam and/or cooling amounts that were accounted for at a low-carbon emission factor in the market-based Scope 2 figure reported in C6.3.**

**Basis for applying a low-carbon emission factor**

Power Purchase Agreement (PPA) with energy attribute certificates

**Low-carbon technology type**

Solar PV

Wind

**Region of consumption of low-carbon electricity, heat, steam or cooling**

Other, please specify (Europe, Latin America, North America)

**MWh consumed associated with low-carbon electricity, heat, steam or cooling**

8771969

**Emission factor (in units of metric tons CO2e per MWh)**

0

**Comment**

Direct procurement contract with a grid-connected generator or Power Purchase Agreement (PPA), supported by energy attribute certificates. Because 'MWh consumed associated with low-carbon electricity' specifies 'consumption', this was calculated using WRI's GHG Scope 2 Protocol rather than Alphabet/Google's accounting method for 100% renewable energy. In 2018, we matched 100% of the electricity consumption of our operations with renewable energy purchases for the second consecutive year. The RE purchases come both from PPAs and from the residual renewables already present in the grids we consume electricity from.

---

## C9. Additional metrics

---

### C9.1

---

**(C9.1) Provide any additional climate-related metrics relevant to your business.**

**Description**

Energy usage

**Metric value**

0.11

**Metric numerator**

Noncomputing overhead data center energy use

**Metric denominator (intensity metric only)**

Energy used to power IT equipment

**% change from previous year**

0

**Direction of change**

No change

**Please explain**

Google's data center energy metric is the ratio of noncomputing overhead energy use divided by IT equipment energy use. This ratio was 0.11 in both 2017 and 2018. That's a 0% decrease, indicating roughly constant efficiency year-over-year. This metric is closely related to power usage effectiveness (PUE), which is a standard data center industry ratio. PUE compares total data center energy (IT + noncomputing overhead like cooling and power distribution) to IT energy. A PUE of 2.0 means that for every watt of IT power, an additional watt is consumed to cool and distribute power to the IT equipment. A PUE closer to 1.0 means nearly all the energy is used for computing. We measure and monitor PUE vigilantly and Google's data center staff have access to real-time data. Each quarter, we publish PUE data on our public website. For more information, see:  
<https://www.google.com/about/datacenters/efficiency/internal/> In 2018, the average annual PUE for our global fleet of data centers was 1.11, compared with the industry average of 1.67—meaning that our data centers use about six times less overhead energy.

---

## C10. Verification

---

### C10.1

---

**(C10.1) Indicate the verification/assurance status that applies to your reported emissions.**

	Verification/assurance status
Scope 1	Third-party verification or assurance process in place
Scope 2 (location-based or market-based)	Third-party verification or assurance process in place
Scope 3	Third-party verification or assurance process in place

---

### C10.1a

---

**(C10.1a) Provide further details of the verification/assurance undertaken for your Scope 1 and/or Scope 2 emissions and attach the relevant statements.**

**Scope**

Scope 1

**Verification or assurance cycle in place**

Annual process

**Status in the current reporting year**

Complete

**Type of verification or assurance**

Limited assurance

**Attach the statement**

google\_fy2018\_ghg-inventory-verification-letter (CDP).pdf

**Page/ section reference**

Pages 1 to 3

**Relevant standard**

ISO14064-3

**Proportion of reported emissions verified (%)**

100

---

**Scope**

Scope 2 location-based

**Verification or assurance cycle in place**

Annual process

**Status in the current reporting year**

Complete

**Type of verification or assurance**

Limited assurance

**Attach the statement**

google\_fy2018\_ghg-inventory-verification-letter (CDP).pdf

**Page/ section reference**

Pages 1 to 3

**Relevant standard**

ISO14064-3

**Proportion of reported emissions verified (%)**

100

---

**Scope**

Scope 2 market-based

**Verification or assurance cycle in place**

Annual process

**Status in the current reporting year**

Complete

**Type of verification or assurance**

Limited assurance

**Attach the statement**

google\_fy2018\_ghg-inventory-verification-letter (CDP).pdf

**Page/ section reference**

Pages 1 to 3

**Relevant standard**

ISO14064-3

**Proportion of reported emissions verified (%)**

100

---

C10.1b

---

**(C10.1b) Provide further details of the verification/assurance undertaken for your Scope 3 emissions and attach the relevant statements.**

**Scope**

Scope 3- at least one applicable category

**Verification or assurance cycle in place**

Annual process

**Status in the current reporting year**

Complete

**Attach the statement**

google\_fy2018\_ghg-inventory-verification-letter (CDP).pdf

**Page/section reference**

Pages 1 to 3

**Relevant standard**

ISO14064-3

---

## C10.2

---

**(C10.2) Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?**

Yes

## C10.2a

---

**(C10.2a) Which data points within your CDP disclosure have been verified, and which verification standards were used?**

Disclosure module verification relates to	Data verified	Verification standard	Please explain
C6. Emissions data	Product footprint verification	ISO 14040:2006 and ISO 14044:2006	We produced product environmental reports for 10 of our flagship products released in 2018 (Chromecast, Google Nest Hub, Pixel 3, Pixel 3XL, Pixel Slate, Nest Cam IQ Outdoor, Nest Hello, Nest Learning Thermostat, Nest Protect, Nest Thermostat E). These are in addition to previously published product environmental reports for Daydream View, Google Home, Google Home Mini, Google Pixel 2, Google Pixel 2 XL, and Google Pixelbook. The reports include carbon footprints based on product life-cycle assessment (LCA) studies, which detail the environmental performance of each product over its full life cycle, from design and manufacturing through usage and recycling. The product environmental reports can be found at <a href="https://sustainability.google/reports/">https://sustainability.google/reports/</a> . The LCA reports underwent and successfully passed critical review by an external individual expert. The critical review checked that: - Methods used to carry out the LCA were consistent with standards ISO 14040 and 14044; - Methods used to carry out the LCA were scientifically and technically valid; - Data used were appropriate and reasonable in relation to the goal of the study; - Interpretations reflected the limitations identified and the goal of the study; - Study documentation was transparent and consistent. Critical review statements can be made available upon request.
C8. Energy	Renewable energy products	Our carbon footprint is externally verified. Our verifier does not verify the renewable energy credits (RECs) and GOOs (Guarantees of Origin) that we use towards our market-based Scope 2 emissions, they only verify how we apply them against our Scope 2 emissions.	Our carbon footprint is externally verified. Our verifier does not verify the renewable energy credits (RECs) and GOOs (Guarantees of Origin) that we use towards our market-based Scope 2 emissions, they only verify how we apply them against our Scope 2 emissions.
C8. Energy	Other, please specify (Total electricity consumption)	The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)	We verify our emissions data, emissions breakdown, and energy. Total electricity consumption is verified as part of our GHG inventory verification.

## C11. Carbon pricing

---

### C11.1

---

**(C11.1) Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?**  
Yes

### C11.1a

---

**(C11.1a) Select the carbon pricing regulation(s) which impacts your operations.**  
EU ETS

### C11.1b

---

**(C11.1b) Complete the following table for each of the emissions trading systems in which you participate.**

**EU ETS**

**% of Scope 1 emissions covered by the ETS**

1.54

**Period start date**

January 1 2018

**Period end date**

December 31 2018

**Allowances allocated**

981

**Allowances purchased**

981

**Verified emissions in metric tons CO2e**

981

**Details of ownership**

Facilities we own and operate

**Comment**

---

## C11.1d

**(C11.1d) What is your strategy for complying with the systems in which you participate or anticipate participating?**

Members of Google's data center Environmental Health and Safety, Energy, and Public Policy teams monitor current and emerging energy- and emissions-related regulations.

The scope of the revised EU ETS legislations covered small emitters and, as a result, our EU data centers were required to apply for ETS Permits. The EU ETS directive requires operators of installations, which are included in the scope to hold a valid GHG emission monitoring plan issued by the relevant Competent Authority, to monitor and report their emissions, to have the reports verified by an independent and accredited verifier, and to purchase and surrender the equivalent number of allowances on an annual basis through approved operators holding accounts on the Union Registry. Our strategy for compliance is to continue to follow these directives of the EU ETS.

---

## C11.2

**(C11.2) Has your organization originated or purchased any project-based carbon credits within the reporting period?**

Yes

---

## C11.2a

**(C11.2a) Provide details of the project-based carbon credits originated or purchased by your organization in the reporting period.**

**Credit origination or credit purchase**

Credit purchase

**Project type**

Landfill gas

**Project identification**

Oneida Herkimer Landfill Ava, NY (CAR674)

**Verified to which standard**

CAR (The Climate Action Reserve)

**Number of credits (metric tonnes CO2e)**

103255

**Number of credits (metric tonnes CO2e): Risk adjusted volume**

103255

**Credits cancelled**

Yes

**Purpose, e.g. compliance**

Voluntary Offsetting

---

## C11.3

---

**(C11.3) Does your organization use an internal price on carbon?**

Yes

## C11.3a

---

**(C11.3a) Provide details of how your organization uses an internal price on carbon.**

**Objective for implementing an internal carbon price**

Other, please specify (Risk assessment)

**GHG Scope**

Scope 2

**Application**

We use carbon prices as part of our risk assessment model, to support strategic decision-making related to future capital investments. For example, the risk assessment at individual data center facilities also includes using a shadow price for carbon to estimate expected future energy costs.

**Actual price(s) used (Currency /metric ton)**

**Variance of price(s) used**

We do not disclose the exact carbon price we use, how we determine it, or its variance as we consider this to be competitive information.

**Type of internal carbon price**

Shadow price

**Impact & implication**

Google faces the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). To the extent that this price is passed on to us from a regulated entity, the cost of running our operations will increase. However, we already operate some of the most efficient data centers in the world, procure renewable power for our data centers, and generate onsite renewable energy at several of our offices, all of which reduce our exposure to this risk. In addition, we already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. Finally, we are carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations. If a carbon price of e.g. \$14/metric tonne were established through regulation (price of carbon/tonne at AB32 Auction in May 2014), this could increase our costs by ~\$10.5 million [= (2018 Scope 1 + market-based Scope 2) \* \$14], assuming these costs were passed through to electricity consumers and we were not further able to reduce our carbon footprint. The financial impact would likely be less as we already voluntarily purchase carbon offsets. Note that this is a hypothetical example and not our actual internal carbon price.

---

## C12. Engagement

---

### C12.1

---

**(C12.1) Do you engage with your value chain on climate-related issues?**

Yes, our suppliers

Yes, our customers

Yes, other partners in the value chain

### C12.1a

---

**(C12.1a) Provide details of your climate-related supplier engagement strategy.**

**Type of engagement**

Engagement & incentivization (changing supplier behavior)

**Details of engagement**

Run an engagement campaign to educate suppliers about climate change

Climate change performance is featured in supplier awards scheme

**% of suppliers by number**

92

**% total procurement spend (direct and indirect)**

88

**% Scope 3 emissions as reported in C6.5**

90

**Rationale for the coverage of your engagement**

In 2018, our Responsible Supply Chain program was directly engaged with 450 active suppliers supporting hardware manufacturing and related services. Of those, 413 (92%), have signed our Supplier Code of Conduct (SCOC), which forms the basis of our supplier sustainability profile survey and our supplier onsite audits and articulates our overall requirements for resource efficiency, including energy and emissions. All suppliers are required to sign our SCOC (included in our contracts) and we're working to complete the remaining signatures as we select and onboard new suppliers. In 2018, our active hardware suppliers who signed our SCOC covered 88% of our total spend and 90% of manufacturing emissions from our direct hardware suppliers. Spend is calculated based on our purchase orders with suppliers providing manufacturing services or products. The % Scope 3 emissions metric was estimated for manufacturing emissions based on Tier 1 supplier data and excludes full upstream emissions for which we do not have direct supplier relationships. In 2018, we used the CDP Supply Chain platform and custom surveys to request climate and water data from 122 suppliers and provided individualized feedback on their performance for key KPIs (e.g. emission reduction targets). We've integrated sustainability criteria into our supplier sourcing and performance management processes, which include assessments about a supplier's practices to report, manage and reduce their emissions. The data is also used to help set goals and priorities for our sustainability program by supplier, commodity and region and to verify data, refine allocations and continually improve our analyses of supply chain GHG emissions. In 2018, our Energy Efficiency and Renewable Energy program engaged our suppliers to baseline their energy performance and energy management practices in their manufacturing locations, implement energy conservation measures to maximize energy savings and payback, and develop a comprehensive energy efficiency and renewable energy plan. We also collaborated with suppliers and other stakeholders in our value chain on innovative projects for circular economy pathways. Together with project partners, we successfully developed proof-of-concept disk drives built with recovered rare-earth magnets and quantified the life cycle environmental impacts of this and other value recovery options.

**Impact of engagement, including measures of success**

Our measures of success from engaging our suppliers in GHG emissions reporting and reduction include: response rate, proportion of suppliers reporting GHG emissions and proportion of suppliers with GHG emissions reduction targets. We consider a response rate of at least 90%, 80% of our suppliers reporting GHG emissions, and 50% of suppliers having a GHG emissions reduction target to be successful. Impact of engagement: In 2018, we achieved a response rate of 93% to our climate change survey requests, 88% of our suppliers reported at least one source of GHG emissions (Scope 1 and/or Scope 2 emissions) and 66% of our suppliers had set a GHG emissions reduction target.

**Comment**

Our Supplier Code of Conduct can be found at: <http://www.google.com/about/company/responsible-manufacturing.html>

---

**C12.1b**

---

**(C12.1b) Give details of your climate-related engagement strategy with your customers.**

**Type of engagement**

Education/information sharing

**Details of engagement**

Run an engagement campaign to educate customers about the climate change impacts of (using) your products, goods, and/or services

**% of customers by number**

30

**% Scope 3 emissions as reported in C6.5**

**Please explain the rationale for selecting this group of customers and scope of engagement**

Alphabet reports to CDP's Supply Chain program, to make our carbon footprint data available to our customers. 12 customers requested this data from Alphabet for FY2018. We believe that environmental impact should be an important consideration—alongside factors such as price, security, openness and reliability—when it comes to data storage, processing and development. Therefore, we have produced and promoted content to our Cloud customers about our sustainability and climate change strategy and performance. For example, we launched a microsite to help businesses understand the environmental impact of their operations and how switching to Google Cloud can help reduce it (see <https://cloud.google.com/renewable-energy/>). We continue to publish content on the importance of taking sustainability into account with regards to infrastructure and application development (see <https://www.blog.google/products/google-cloud/why-building-environmentally-responsible-cloud-matters/>, which was promoted on Twitter by the Google Cloud Platform account), and hosted a Cloud OnAir webinar about why building on an environmentally responsible Cloud matters. We included information on our carbon footprint in the Google Cloud newsletter, and provided a subset of our customers with a module for their carbon emissions in their Monthly Operations Report. We also include information on our climate change strategy and performance at events such as Google Cloud Next, our annual event for current and prospective Google Cloud customers. For Earth Day 2018 we created a multi-channel campaign, sharing our work across customers, Google Cloud, energy and data center teams, which included webinars, a blog (<https://cloud.google.com/blog/topics/google-cloud-next/our-heads-in-the-cloud-but-were-keeping-the-earth-in-mind>) and social promotion. We offer a sustainability presentation to customers who come to our Executive Briefing Center and we have also trained our sales team to communicate these key messages to prospective and existing customers.

**Impact of engagement, including measures of success**

Our measures of success include: unique views for our Google Cloud sustainability microsite (<https://cloud.google.com/sustainability/>) and blogs, message pull-through by media and press, social media impressions from tweets related to this content, attendees at climate-focused Cloud-on-Air webinars, and the number of prospective and new customers asking about or mentioning the environmental performance of Google Cloud. This engagement has impacted the decision of customers to use Google Cloud products, including National Geographic, Etsy, Spotify, and Lush. For example, we published a blog post in which Etsy's CTO talks about how Google's commitment to sustainability factored into their decision to use Google Cloud Platform (see <https://www.blog.google/products/google-cloud/engineered-renewal-google-cloud-etsy-and-sustainability/>).

---

## C12.1c

**(C12.1c) Give details of your climate-related engagement strategy with other partners in the value chain.**

In addition to engagement with suppliers and customers, we also engage with partners on climate-related issues in various capacities.

We engage with organizations that are performing research and disseminating public work related to climate change and energy. The Google Earth Outreach (Geo) and Earth Engine teams have helped organizations accelerate climate research. Google created the Earth Outreach program, which works directly with nonprofits and public benefit groups to help them get the mapping resources needed to create knowledge about the environment and communicate it effectively to decision makers.

Since 2011, Geo has partnered with the Environmental Defense Fund (EDF) to measure and map methane leaks under city streets. We've deployed methane analyzers mounted on Google Street View cars to build insights that have helped community groups, utilities, and regulators get a better understanding of methane leaks and identify opportunities for improvements. For example, based

on this data, New Jersey's PSE&G approved a plan to replace up to 510 miles of old pipe. For more details, see:

- <https://www.edf.org/methanemaps>
- <http://googleforwork.blogspot.com/2016/04/Environmental-Defense-Fund-finds-methane-leaks-and-helps-slow-climate-change-using-Google-Maps-APIs.html>

We've also mapped other air pollutants with our partners, including carbon dioxide, particulate matter, ozone, nitrogen dioxide, nitrous oxide, and more. In 2017, Geo worked with EDF and Aclima to release heat maps with hyper-local air quality information for three regions in California that contained hundreds of millions of ambient air quality data points measured by the Google Street View cars equipped with air quality sensors. Over three peer-reviewed science articles have been published around this work.

With the World Resources Institute, the Global Energy Observatory, KTH Royal Institute of Technology in Stockholm, and the University of Groningen, we released a global database of power plants (see <http://powerexplorer.org/> and [https://developers.google.com/earth-engine/datasets/catalog/WRI\\_GPPD\\_power\\_plants](https://developers.google.com/earth-engine/datasets/catalog/WRI_GPPD_power_plants)). This database standardizes power sector information and makes it easily accessible to everyone, helping to bring transparency and accountability to the global power sector to accelerate the shift to a clean energy future. For more information, see <https://www.blog.google/products/earth/new-public-energy-tool-reduce-emissions/>

In 2018, Google partnered with the Global Covenant of Mayors (GCoM) and Bloomberg Philanthropies through the Innovate4Cities Accelerator to empower cities by launching the Environmental Insights Explorer ([insights.sustainability.google](https://insights.sustainability.google)) tool. The partnership entails working collaboratively with GCoM's network partners and committed cities to accelerate climate action planning. For more information, see <https://www.blog.google/products/earth/more-you-know-turning-environmental-insights-action/>

Google's products help drive carbon mitigation efforts and inform climate science. Our Google Earth Engine geospatial analysis platform makes more than 40 years of satellite imagery available online so scientists and researchers can analyze real-time changes to the Earth's surface. Through the Climate Data Initiative, we provided one petabyte of cloud storage for data and climate/weather models, plus 50 million hours of high-performance cloud computing. We commit to continuing to develop products and platforms that can help reduce emissions and bring the power of cloud computing to climate science.

Additionally, Google's tools help further the dissemination of climate information through the Google for Nonprofits program. This program offers eligible nonprofit organizations access to Google tools like Gmail, Google Calendar, Google Drive, Google Ad Grants, YouTube for Nonprofits and more -- all at no charge. This effort aims to support the social impact of nonprofits through easy access to Google's highly efficient products and services. Nonprofits can use Google's free tools to find new donors and volunteers, work efficiently and get supporters to take action on topics like climate change.

These efforts align with our climate change strategy because many of the nonprofits, such as the Natural Resources Defense Council (NRDC), engage in research and disseminate public work related to climate change. For example, NRDC uses G Suite to communicate effectively and Ad Grants to drive more traffic to their website. They also use Google Maps and Google Earth to make vivid their environmental concerns and to share the data they've collected publicly in a visual, understandable way. For more information, see: <https://www.google.com/nonprofits> and <https://www.google.com/nonprofits/casestudies/defense-council.html>.

Lastly, Google is an active member of a number of coalitions working to address climate change and provide greater access to renewables. This includes the organizations listed in our response to question 12.3c as well as many others.

## C12.3

---

### **(C12.3) Do you engage in activities that could either directly or indirectly influence public policy on climate-related issues through any of the following?**

- Direct engagement with policy makers
- Trade associations
- Other

## C12.3a

### (C12.3a) On what issues have you been engaging directly with policy makers?

Focus of legislation	Corporate position	Details of engagement	Proposed legislative solution
Clean energy generation	Support	<p>Google has served as a catalyst for policy change through targeted advocacy at the international, national and state levels. Members of Google's energy and public policy teams have engaged directly with policymakers from the U.S. (including the White House, the U.S. Congress and Governors) and other countries to call for policies that promote renewable energy and/or reduce carbon emissions. In 2018, this included:</p> <ul style="list-style-type: none"><li>European Union renewables policy: - In 2018, the European Parliament and European Council negotiated legislative proposals of key importance to the growth of the renewable energy sector. To help ensure a favorable outcome for renewable energy in Europe, Google organized and signed multiple letters to the European Parliament and European Council that called for ambitious renewable energy targets in the new directives and urged EU policymakers to remove barriers to corporate renewable energy PPAs.</li><li>Google also helped launched the RE-Source Platform (<a href="http://resource-platform.eu/">http://resource-platform.eu/</a>), a new association bringing together corporate renewable energy buyers and developers to raise awareness about and remove policy barriers to corporate renewable energy PPAs throughout Europe. Google is a founding Strategic Partner of the platform and a member of the Steering Group. Google also sponsored the second annual RE-Source conference in Amsterdam, which brought together over 800 government officials and business leaders dedicated to accelerating corporate purchasing of renewable energy in Europe.</li><li>Taiwan energy policy: - In 2018, Google met with Taiwanese stakeholders in the Ministry of Economic Affairs, Bureau of Energy, and Bureau of Standards, Metrology, and Inspection to advocate for the effective design of regulatory and contractual structures that allow end-users to purchase renewable energy for their operations. With effective structures in place, this allowed Google to sign the first corporate PPA in Taiwan and Google's inaugural PPA in Asia. We will purchase the output of a 10 MW solar PV array in Tainan City to boost the carbon-free profile of Google's data center in Changhua County.</li></ul>	<p>More local, regional, national and international policies to reduce dependence on carbon intensive power and support clean energy deployment. Details of engagement continued:</p> <ul style="list-style-type: none"><li>U.S. federal climate policy: - We have continued to be vocal proponents of the EPA Clean Power Plan (CPP). In April 2018, Google filed comments in response to the EPA's proposed rulemaking to repeal the Clean Power Plan (see: <a href="https://www.theverge.com/2018/4/25/17282818/google-clean-power-plan-repeal-public-comment-apple-epa-pruit">https://www.theverge.com/2018/4/25/17282818/google-clean-power-plan-repeal-public-comment-apple-epa-pruit</a>) - Google was a vocal participant at the Global Climate Action Summit in San Francisco, California in September 2018. Google was a key sponsor of the event, and launched a new tool at the Summit called the Environmental Insights Explorer (<a href="https://blog.google/products/earth/more-you-know-turning-environmental-insights-action/">https://blog.google/products/earth/more-you-know-turning-environmental-insights-action/</a>) designed to help city policy makers develop climate action plans, and had senior Googlers join discussions on pathways for climate action.</li><li>We supported trade groups of which we are a member, namely the American Council on Renewable Energy (ACORE), the American Wind Energy Association (AWEA), and the Advanced Energy Buyers Group (AEBG), promoting the growth of renewable energy installations and jobs in the United States.</li><li>We led the establishment of the Renewable Energy Buyers Alliance (REBA), the world's largest organization of corporate renewable energy buyers. REBA's mission is to create a resilient zero-carbon energy system where every company has a viable, speedy, and cost-effective pathway to renewable energy, to grow the market from 50 buyers today to 50,000 buyers in the years to come.</li><li>In 2018, a Google representative was elected as Chair of the Interim Board of Directors.</li><li>U.S. state climate and energy policy: We have engaged U.S. states to preserve and promote renewable energy policies and establish first-of-their-kind state utility renewable energy purchase programs. For example:</li><li>- Google worked with the Tennessee Valley Authority (TVA) to design and execute an agreement to purchase the output of 413 MW of new solar energy for our data centers in Alabama and Tennessee.</li></ul>

## C12.3b

### (C12.3b) Are you on the board of any trade associations or do you provide funding beyond membership?

Yes

## C12.3c

### (C12.3c) Enter the details of those trade associations that are likely to take a position on climate change legislation.

#### Trade association

U.S. Partnership for Renewable Energy Finance (Founding Member) (US PREF)

#### Is your position on climate change consistent with theirs?

Consistent

#### Please explain the trade association's position

US PREF is a coalition of senior level financiers who invest in all sectors of the energy industry, including renewable energy. PREF members meet with policymakers to provide their perspectives on how renewable energy finance policies affect the market, and how proposed policies could affect the market. US PREF is not a lobbying organization or an advisory committee to government, rather it is an educational program that provides expert input on how the renewable energy finance market works. For more

information about US PREF, see <https://acore.org/pref/>

**How have you influenced, or are you attempting to influence their position?**

Google is a founding member of US PREF. We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

American Council on Renewable Energy (ACORE)

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

ACORE, a 501(c)(3) non-profit membership organization, is dedicated to building a more secure and prosperous America with clean, renewable energy. ACORE provides a common educational platform for a wide range of interests in the renewable energy community, focusing on technology, finance and policy. It convenes thought leadership forums and creates energy industry partnerships to communicate the economic, security and environmental benefits of renewable energy. For more information about ACORE, see <http://www.acore.org/>

**How have you influenced, or are you attempting to influence their position?**

We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

WRI/WWF Corporate Renewable Energy Buyer's Principles

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

The Buyers' Principles represent large customers' renewable energy needs and help them streamline solutions for buying cost-effective renewable energy. With facilitation by WWF and WRI, a group of large energy buyers developed the Buyers' Principles to spur progress on renewable energy and to add their perspective to the future of the U.S. energy and electricity system. For more information about the Buyer's Principles, see <http://buyersprinciples.org/>

**How have you influenced, or are you attempting to influence their position?**

We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

RE100

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

Convened by The Climate Group in partnership with CDP, RE100 is a collaborative, global initiative of influential businesses committed to 100% renewable electricity, working to massively increase demand for—and delivery of—renewable energy. For more information about RE100, see <http://there100.org/>

**How have you influenced, or are you attempting to influence their position?**

Google joined RE100 in December 2015 (see: <http://www.theclimategroup.org/what-we-do/news-and-blogs/google-joins-re100-with-target-to-triple-renewable-energy-by-2025/>). We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

North Carolina Sustainable Energy Association (NCSEA)

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

NCSEA drives public policy & market development to create clean energy jobs, business opportunities, and affordable energy to benefit North Carolina. For more information about NCSEA, see <http://www.energync.org/>

---

**How have you influenced, or are you attempting to influence their position?**

We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

South Carolina Clean Energy Business Alliance (SCCEBA)

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

SCCEBA promotes the success of the clean energy industry in South Carolina, representing the needs and interests of this growing industry through policy development, educational outreach to decision makers and strategic economic development. SCCEBA was instrumental in getting enactment of S.1189 in 2014 (a third party solar bill). For more information about SCCEBA, see <http://www.scceba.org/>

**How have you influenced, or are you attempting to influence their position?**

We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

Advanced Power Alliance

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

The Advanced Power Alliance is the industry trade association created to promote the development of wind and solar energy resources as clean, reliable, affordable, and infinite sources of power. The Alliance is the advanced power industry's voice within the fourteen states of the Electric Reliability Council of Texas (ERCOT) and Southwest Power Pool (SPP) systems: Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas and Wyoming. For more information about the Advanced Power Alliance, see <https://poweralliance.org/>

**How have you influenced, or are you attempting to influence their position?**

We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

Advanced Energy Buyers Group

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

The Advanced Energy Buyers Group (AE Buyers Group) is a coalition of leading advanced energy purchasers who have come together to engage on the energy policy issues that will help them achieve their ambitious clean energy targets. For more information, see <https://www.advancedenergybuyersgroup.org/>

**How have you influenced, or are you attempting to influence their position?**

Google joined this group in 2017, when it was formed. We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

Wind Europe

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

WindEurope is the voice of the wind industry in Europe, actively promoting wind power in Europe and worldwide. They have over 400 members, active in over 35 countries. Their membership comprises wind turbine manufacturers, component suppliers, research institutes, national wind and renewables associations, developers, contractors, electricity providers, finance companies, and buyers of renewable electricity. For more information, see <https://windeurope.org/>

**How have you influenced, or are you attempting to influence their position?**

---

Google joined this group in 2018. We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

Solar Power Europe

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

SolarPower Europe is Europe's solar energy trade association. They represent over 200 upstream and downstream across the solar energy industry, as well as buyers of solar electricity like Google. For more information, see <http://www.solarpowereurope.org/>

**How have you influenced, or are you attempting to influence their position?**

Google joined this group in 2018. We are not on the Board of this trade association and do not provide funding beyond membership. However, we maintain regular engagement with top leadership of the key trade associations in which we are members.

---

**Trade association**

RE-Source

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

The RE-Source Platform is a European alliance of stakeholders representing clean energy buyers and suppliers working to expand corporate renewable energy sourcing in Europe. This platform pools resources and coordinates activities to promote a better framework for corporate renewable energy sourcing at EU and national level. For more information, see <http://resource-platform.eu/>

**How have you influenced, or are you attempting to influence their position?**

Google was actively involved in the creation of the RE-Source Platform and is one of its founding Strategic Partners and a member of the Steering Group. Google also sponsored the annual RE-Source conference in Amsterdam in 2018, which brought together over 800 government officials and business leaders dedicated to accelerating corporate purchasing of renewable energy in Europe.

---

**Trade association**

Renewable Energy Buyers Alliance (REBA)

**Is your position on climate change consistent with theirs?**

Consistent

**Please explain the trade association's position**

The Renewable Energy Buyers Alliance is a newly formed national trade organization dedicated to unlocking the marketplace for all non-residential energy buyers to create a resilient zero-carbon energy system where every organization has a viable, expedient, and cost-effective pathway to renewable energy. It includes over 300 renewable energy buyers, developers, and service providers dedicated to scaling up corporate purchasing of clean energy. For more information, see <https://rebuyers.org/>

**How have you influenced, or are you attempting to influence their position?**

Google was actively involved in the creation of this national trade organization in 2018, serving as the chair of the Interim Board of Directors during the transition from an NGO-led effort into a corporate-led trade organization. Google also provided financial support for the development of the organization.

---

**C12.3e**

**(C12.3e) Provide details of the other engagement activities that you undertake.**

In addition to engagement with policy-makers and trade associations, we also engage with organizations that are performing research and disseminating public work related to climate change and energy.

Google was born in Stanford's Computer Science department, so strong relationships with universities and research institutions are in our DNA. To cultivate these collaborations, we administer a variety of programs that provide resources and support to the academic and external research communities. For more information, see <https://ai.google/research/outreach>.

The Google Earth Outreach and Earth Engine teams have helped organizations accelerate climate research. Google created the Earth Outreach program, which works directly with nonprofits and public benefit groups to help them get the mapping resources needed to create knowledge about the environment and communicate it effectively to decision makers.

As an example, Google's Project Sunroof is a product that helps users decide whether or not to go solar. The product estimates potential rooftop solar energy production and makes it easy for users to connect with solar installers and take the next step towards going solar. Project Sunroof data was used by the City of San José, CA for their city-wide solar assessment to achieve a proposed 1GW target. For more information, see: <https://www.google.com/get/sunroof>.

In 2018, Google launched the Environmental Insights Explorer (EIE), a new online tool we created in collaboration with the Global Covenant of Mayors for Climate & Energy (GCoM), which is designed to make it easier for cities to access, and act upon, new climate-relevant datasets. By analyzing Google's comprehensive global mapping data together with standard greenhouse gas emission factors, EIE estimates city-scale building and transportation carbon emissions data, as well as renewable energy potential, leading to more globally-consistent baselines from which to build policies, guide solutions, and measure progress.

There have been over 2,700+ publications to date from researchers using Earth Engine on cutting edge geospatial data analysis and in some cases also producing scientifically published work on climate change.

Google employees were also co-authors on a number of public research papers, including one that quantifies global forest change and recognizes the importance of forest ecosystem services using Google Earth Engine. As of the end of 2018, this paper has received over 3,200 citations. (See: <http://www.sciencemag.org/content/342/6160/850>).

We also support organizations working on climate change issues. For example, we work closely with the World Resources Institute to bring technology and expertise to many of their climate and energy programs, including decarbonization scenarios and energy planning tools. Google is also a global partner of the Ellen MacArthur Foundation, which is working to accelerate the transition to a circular economy.

Additionally, Google's tools help further the dissemination of climate information through the Google for Nonprofits program. This program offers eligible nonprofit organizations access to Google tools like Gmail, Google Calendar, Google Drive, Google Ad Grants, YouTube for Nonprofits and more -- all at no charge. This effort aims to support the social impact of nonprofits through easy access to Google's highly efficient products and services. Nonprofits can use Google's free tools to find new donors and volunteers, work efficiently and get supporters to take action on topics like climate change.

These efforts align with our climate change strategy because many of the nonprofits, such as the Natural Resources Defense Council (NRDC), engage in research and disseminate public work related to climate change. For example, NRDC uses G Suite to communicate effectively and Ad Grants to drive more traffic to their website. They also use Google Maps and Google Earth to make vivid their environmental concerns and to share the data they've collected publicly in a visual, understandable way. For more information, see: <https://www.google.com/nonprofits> and <https://www.google.com/nonprofits/casestudies/defense-council.html>.

Lastly, Google is an active member of a number of coalitions working to address climate change and provide greater access to

renewables. This includes the organizations listed in our response to question 12.3c as well as many others.

## C12.3f

---

### (C12.3f) 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?

All activities related to engagement on climate policy are coordinated and managed by designated members of our operations team who handle policy, our public policy team, and members of our communications team. These employees coordinate the drafting and review of all public-facing content related to our overall energy, sustainability and climate change strategy. Material is tracked centrally for reference and use by other employees and to further ensure consistency. These employees ultimately report to our Chief Legal Officer, who oversees our policy and communications organizations. Sustainability teams throughout the organization use this team for review to ensure consistency with our overall climate change strategy. An opt-in organization-wide sustainability e-mail list also exists to update those interested on happenings with our overall climate change strategy and actions taken to support it.

## C12.4

---

### (C12.4) 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

In mainstream reports

#### Status

Complete

#### Attach the document

20180204\_alphabet\_10K (CDP).pdf

#### Page/Section reference

Pages 6, 15, 16

#### Content elements

Strategy

Risks & opportunities

Other metrics

#### Comment

See Pages 6, 15-16 of Alphabet's FY2018 10-K

---

#### Publication

In voluntary sustainability report

#### Status

Underway – previous year attached

#### Attach the document

Google\_2018-Environmental-Report (CDP).pdf

#### Page/Section reference

Pages 2 to 53

#### Content elements

Governance

Strategy

Risks & opportunities

Emissions figures

Emission targets

Other metrics

#### Comment

See Google's FY2017 Environmental Report

---

**Publication**

In voluntary sustainability report

**Status**

Underway – previous year attached

**Attach the document**

Google\_2018-RSC-Report (CDP).pdf

**Page/Section reference**

Pages 2 to 28

**Content elements**

Governance  
Strategy  
Risks & opportunities  
Emissions figures  
Emission targets  
Other metrics

**Comment**

See Google's FY2017 Responsible Supply Chain Report

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document****Page/Section reference**

Google's Sustainability Website

**Content elements**

Governance  
Strategy  
Risks & opportunities  
Emissions figures  
Emission targets  
Other metrics

**Comment**

For more information, please visit <https://sustainability.google>

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document**

24x7-carbon-free-energy-data-centers (CDP).pdf

**Page/Section reference**

Pages 1 to 27

**Content elements**

Strategy  
Risks & opportunities  
Other metrics

**Comment**

See Google's case study on "Moving toward 24x7 Carbon-Free Energy at Google Data Centers: Progress and Insights"

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document**

2018-Ecology-Book (CDP).pdf

**Page/Section reference**

Pages 1 to 17

**Content elements**

Strategy  
Risks & opportunities  
Other metrics

**Comment**

See Google's case study on "Seeding Resilience with Ecology"

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document****Page/Section reference**

Website

**Content elements**

Governance  
Strategy  
Risks & opportunities  
Emissions figures  
Emission targets  
Other metrics

**Comment**

For more information, please see Google's official blog, The Keyword, for updates on sustainability topics:  
<https://www.blog.google/outreach-initiatives/sustainability/>

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document**

10-years-carbon-neutrality (CDP).pdf

**Page/Section reference**

Pages 1 to 3

**Content elements**

Strategy  
Risks & opportunities  
Other metrics

**Comment**

See Google's case study on "10 Years of Carbon Neutrality"

---

**Publication**

In voluntary communications

**Status**

Underway – previous year attached

**Attach the document**

achieving-100-renewable-energy-purchasing-goal (CDP).pdf

---

**Page/Section reference**

Pages 1-13

**Content elements**

Strategy  
Risks & opportunities  
Other metrics

**Comment**

See Google's Renewable Energy White Paper

---

## C14. Signoff

---

### C-FI

---

**(C-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.**

For more information on how climate change is integrated into our business strategy, see the resources below, as well as the attachments in section 12.4 'Communication':

#### OVERALL SUSTAINABILITY STRATEGY

Google Sustainability website

<https://sustainability.google>

Google Environmental Report

<https://sustainability.google/reports/environmental-report-2018>

#### ENERGY EFFICIENCY

Google Data Centers website: Efficiency: How We Do It

<https://www.google.com/about/datacenters/efficiency/internal/>

2016 spotlight: Machine Learning Finds New Ways for Our Data Centers to Save Energy

<https://sustainability.google/projects/machine-learning/>

#### RENEWABLE ENERGY

2016 white paper: Achieving Our 100% Renewable Energy Purchasing Goal and Going Beyond

<https://static.googleusercontent.com/media/www.google.com/en//green/pdf/achieving-100-renewable-energy-purchasing-goal.pdf>

2016 spotlight: Greening the Grid: How Google Buys Renewable Energy

<https://sustainability.google/projects/ppa/>

2017 spotlight: Northern Exposure: How Our Nordic Renewable Deals Are Reaping Rewards

---

<https://sustainability.google/projects/northern-exposure/>

2018 blog post: Meeting Our Match: Buying 100 Percent Renewable Energy

<https://www.blog.google/outreach-initiatives/environment/meeting-our-match-buying-100-percent-renewable-energy/>

2018 blog post: The Internet is 24x7. Carbon-free energy should be too.

<https://www.blog.google/outreach-initiatives/sustainability/internet-24x7-carbon-free-energy-should-be-too/>

2018 white paper: Moving toward 24x7 Carbon-Free Energy at Google Data Centers: Progress and Insights

<https://storage.googleapis.com/gweb-sustainability.appspot.com/pdf/24x7-carbon-free-energy-data-centers.pdf>

## **OUR CARBON FOOTPRINT**

2011 white paper: Google's Carbon Offsets: Collaboration and Due Diligence

<https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-carbon-offsets.pdf>

2017 white paper: 10 Years of Carbon Neutrality

<https://storage.googleapis.com/gweb-environment.appspot.com/pdf/10-years-carbon-neutrality.pdf>

2017 spotlight: Capturing Value from Waste in Upstate New York

<https://sustainability.google/projects/landfill-NewYork/>

## **CLIMATE RESILIENCE**

2018 case study: Seeding Resilience with Ecology

<https://storage.googleapis.com/gweb-sustainability.appspot.com/pdf/2018-Ecology-Book.pdf>

## **HOW WE HELP USERS & CUSTOMERS BECOME MORE EFFICIENT**

Google Cloud Sustainability website

<https://cloud.google.com/sustainability/>

Google Cloud Renewable Energy website

<https://cloud.google.com/renewable-energy/>

2011 white paper 'Google's Green Computing: Efficiency at Scale'

[http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdfs/google-green-computing.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdfs/google-green-computing.pdf)

2012 white paper 'Google Apps: Energy Efficiency in the Cloud'

[http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdf/google-apps.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/google-apps.pdf)

Google Maps Transit Information

<http://googleblog.blogspot.com/2014/05/hop-on-boardand-go-almost-anywherewith.html>

## SUPPLY CHAIN

Responsible Supply Chain website

<https://sustainability.google/responsible-supply-chain/>

Google's Supplier Code of Conduct

<https://about.google/supplier-code-of-conduct/>

## PRODUCTS

Product Environmental reports

<https://store.google.com/magazine/sustainability>

## C14.1

---

**(C14.1) Provide details for the person that has signed off (approved) your CDP climate change response.**

	Job title	Corresponding job category
Row 1	Senior Vice President and Chief Financial Officer, Alphabet Inc. and Google LLC.	Chief Financial Officer (CFO)

## SC. Supply chain module

---

### SC0.0

---

**(SC0.0) If you would like to do so, please provide a separate introduction to this module.**

### SC0.1

---

**(SC0.1) What is your company's annual revenue for the stated reporting period?**

	Annual Revenue
Row 1	136819000000

### SC0.2

---

**(SC0.2) Do you have an ISIN for your company that you would be willing to share with CDP?**

Please select

### SC1.1

---

**(SC1.1) Allocate your emissions to your customers listed below according to the goods or services you have sold them in this reporting period.**

## SC1.2

---

**(SC1.2) Where published information has been used in completing SC1.1, please provide a reference(s).**

## SC1.3

---

**(SC1.3) What are the challenges in allocating emissions to different customers, and what would help you to overcome these challenges?**

Allocation challenges	Please explain what would help you overcome these challenges
-----------------------	--

## SC1.4

---

**(SC1.4) Do you plan to develop your capabilities to allocate emissions to your customers in the future?**

Please select

## SC2.1

---

**(SC2.1) Please propose any mutually beneficial climate-related projects you could collaborate on with specific CDP Supply Chain members.**

## SC2.2

---

**(SC2.2) Have requests or initiatives by CDP Supply Chain members prompted your organization to take organizational-level emissions reduction initiatives?**

Please select

## SC3.1

---

**(SC3.1) Do you want to enroll in the 2019-2020 CDP Action Exchange initiative?**

Please select

## SC3.2

---

**(SC3.2) Is your company a participating supplier in CDP's 2018-2019 Action Exchange initiative?**

Please select

## SC4.1

---

**(SC4.1) Are you providing product level data for your organization's goods or services?**

Please select

Submit your response

---

**In which language are you submitting your response?**

English

**Please confirm how your response should be handled by CDP**

	Public or Non-Public Submission	I am submitting to	Are you ready to submit the additional Supply Chain Questions?
I am submitting my response	Public	Investors Customers	Yes, submit Supply Chain Questions now

**Please confirm below**

I have read and accept the applicable Terms