CDP Response
Alphabet, Inc. - Climate Change 2018

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, of course, is Google. It also includes businesses that are generally pretty far afield of our main Internet products such as Access, Calico, CapitalG, GV, Nest, Verily, Waymo, and X. 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 making big bets 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. 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 revenue primarily through online advertising. Google's core products —Search, Android, Maps, Chrome, YouTube, Google Play, and Gmail—each have more than 1 billion monthly active users. We also offer a broad collection of cloud-based products and services, including G Suite business productivity apps like Docs, Drive, and Calendar and

satellite mapping and analysis platforms like Google Earth and Google Earth Engine. In recent years we've expanded into consumer electronics with products including Google Pixel, Google Pixelbook, Google Home, and Chromecast.

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 nearly two decades ago. We believe that technology is a democratizing force, empowering people through information.

Google was incorporated in California in September 1998 and reincorporated 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 11.1 million square feet of office/building space and approximately forty-five 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 the U.S., Europe, South America, and Asia.

As of December 31, 2017, we had more than $110 billion in total revenues and 80,110 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.
Any financial projections provided as examples are for illustrative purposes only and are based upon certain hypothetical assumptions that are subject to change.

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 2017	December 31 2017	No	<Field Hidden>

C0.3

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

United States of America
Other, please specify (Rest of world)

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) of the individual(s) on the board with responsibility for climate-related issues.

Position of individual(s)	Please explain
Chief Financial Officer (CFO)	Alphabet/Google's CFO was designated responsibility for climate-related issues, including signing off on our CDP report, as she has visibility across all of the company's operations. Primary responsibility for managing climate-related issues is delegated to Google's Sustainability Officer (GSO), who reports up to our CFO and updates her as needed. Our CFO meets with Alphabet's board of directors regularly and can bring up climate-related issues on an as-needed basis. We also have a non-independent internal Sustainability Board focused on scaling sustainability impact through strategic alignment. It includes senior executives from operations, ethics and compliance, investor relations, treasury, marketing, and legal. This group is chaired by a Finance vice president 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 – all meetings	Reviewing and guiding risk management policies Monitoring and overseeing progress against goals and targets	Climate-related issues may be added to the agenda for meetings of Alphabet's board of directors on an as-needed basis. Climate-related issues are integrated into our risk management process and goals/targets. Climate-related issues are a scheduled agenda item for all meetings of Google's Sustainability Board, which meets on a quarterly basis. Through the Sustainability Board, climate-related risks are integrated into our

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
	for addressing climate-related issues	organizational strategy, plans of action, management policies, performance objectives; and how we monitor progress against targets and goals.

C1.2

(C1.2) Below board-level, provide the highest-level management 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.

The highest level of direct responsibility for climate change rests with the Senior Vice President and Chief Financial Officer of Alphabet and Google, who has designated responsibility for 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. For example, Google's Sustainability Officer (GSO) has been requested to present information to the audit committee on our sustainability and climate change strategy.

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 and Development, Real Estate and Security), products (i.e. Hardware and Google Earth), ethics and compliance, investor relations, treasury, marketing, legal, and communications/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 nearly all meetings of Google's 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, 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.

Google's Sustainability Officer 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.

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
Please select
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 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.

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 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 14 global data center sites. 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.

Risks and opportunities are also assessed at an asset level by using the same models. For example, the risk and opportunity assessments at individual data centers also includes 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, which are 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 an individual appointed by the Board (the Chief Financial Officer for Alphabet and Google).

In collaboration with external consultants and other key stakeholders, Google's Sustainability Officer led development of a climate resilience strategy, 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 14 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 (WRI), 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 for Bay Area real estate development. For example, Google is engaged in a large scale master plan effort in our Mountain View and Sunnyvale locations. Sea level rise and flooding have emerged as critical climate risks that have a material impact to physical assets, 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 evaluate 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 started by looking at two frameworks: the San Francisco Estuary Institute's Vision for a Resilient Silicon Valley Landscape and the Rockefeller Foundation's City Resilience Index (CRI). 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.

To define substantive financial or strategic impact on our business, Google applies a rough rule of thumb measure of financial materiality that is approximately $1 billion annually at the P&L level.

For more information, see the 2017 Stanford Social Innovation Review article "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?

	Relevance & inclusion	Please explain
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 are also closely monitoring an Executive Order that directed the EPA to review the Clean Power Plan (CPP). We consider the CPP 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.
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

	Relevance & inclusion	Please explain
		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 ~$8M [= (2017 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.
Technology	Not relevant, explanation provided	Google's core products—Search, Android, Maps, Chrome, YouTube, Google Play, and Gmail—are not technologies that support the transition to a lower-carbon, energy efficient system.
Legal	Not relevant, explanation provided	Alphabet is a collection of businesses -- the largest of which, of course, is Google. It also includes businesses that are generally pretty far afield of our main Internet products such as Access, Calico, CapitalG, GV, Nest, Verily, Waymo, and X. 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 87% ($95,375,000,000) of total Google segment revenues from advertising in 2017. If, for example, all online economic activity decreased by 1%, we could experience a commensurate reduction in our share of this activity.
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 2017 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, the 2017 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $142 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 $142 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	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.

	Relevance & inclusion	Please explain
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, 2017, Google owned and operated 14 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 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.
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 2017, we achieved PUEs (power usage effectiveness ratios) as low as 1.08, compared with the industry average of 1.58. 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.

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 14 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 2017, Google entered into 6 more long-term renewable energy agreements which, together with our existing long-term contracts, provide nearly 3 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 driver
Policy and legal: 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 2017, our total energy consumption was 8,029,409 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

Potential financial impact

8000000

Explanation of financial impact

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 ~$8M [= (2017 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.

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 2017, we achieved PUEs (power usage effectiveness ratios) as low as 1.08, compared with the industry average of 1.58. 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 2017, we announced 6 more renewable energy commitments to procure 574 additional MW of wind and solar power in Oklahoma, Iowa, South Dakota, the Netherlands.

Cost of management
0
Comment
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.

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 driver
Policy and legal: Increased operating costs (e.g., higher compliance costs, increased insurance premiums)
Company- specific description
We are closely monitoring opportunities for corporate end users to purchase renewable energy, as well as state renewable portfolio standards. We see these policies as critical to help drive low-carbon power sources in states where we have offices and data centers. If they are weakened, it will make it more difficult for Google to meet its renewable energy goals. We are also closely monitoring an Executive Order that directed the EPA to review the Clean Power Plan (CPP). We consider the CPP 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.
Time horizon
Short-term
Likelihood
More likely than not
Magnitude of impact
Medium
Potential financial impact
0
Explanation of financial impact

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.

Management method

We have been working directly with federal and state policymakers, NGOs, and others in industry to provide support for these policies.

Cost of management

0

Comment

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.

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 driver

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, 2017, Google owned and operated 14 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
Potential financial impact
0
Explanation of financial impact
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.
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 2017, we achieved PUEs (power usage effectiveness ratios) as low as 1.08, compared with the industry average of 1.58. 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.
Cost of management
0
Comment
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.

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 driver

Reputation: Reduced revenue from decreased demand for goods/services

Company- specific description

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 2017 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.

Time horizon

Medium-term

Likelihood

About as likely as not

Magnitude of impact

Medium

Potential financial impact

142000000

Explanation of financial impact

This risk driver could have a negative impact on our brands. For example, the 2017 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $142 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 $142 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 posts on our Environment 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: http://static.googleusercontent.com/media/www.google.com/en/us/about/datacenters/efficiency/internal/assets/machine-learning-applicationsfor-datacenter-optimization-finalv2.pdf In 2017, we entered into 6 more long-term renewable energy agreements which, together with our existing long-term contracts, provide nearly 3 GW of clean, renewable energy.

Cost of management

0

Comment

The costs associated with properly addressing climate change risks and impacts are the staff time to create and manage the associated projects.

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 driver

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

Company- specific description

Google's revenue is largely based on search 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
Potential financial impact
953750000
Explanation of financial impact
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 87% ($95,375,000,000) of total Google segment revenues from advertising in 2017. If, for example, all online economic activity decreased by 1%, we could experience a commensurate reduction in our share of this activity.
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 2016 and 2017.
Cost of management
1500000
Comment
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.

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 driver
Increased capital costs (e.g., damage to facilities)
Company- specific description
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 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. 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
Potential financial impact
1000000000
Explanation of financial impact
We are still analyzing the financial impact of this risk. To define substantive financial or strategic impact on our business, Google applies a rough rule of thumb measure of financial materiality that is approximately $1 billion annually at the P&L level.
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 driver

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

Potential financial impact

111000000

Explanation of financial impact

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, Google's annual revenue could increase by approximately $111 million (based on FY 2017 revenue of approximately $111 billion).

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. Additionally, we're the first major Internet services company to gain external certification of our high energy management standards in our data centers via a multi-site ISO 50001 certificate. Currently, very little of the world's power is from renewables like wind and solar. We're working on changing that by buying electricity directly from wind farms near our data centers. In 2017, we entered into 6 more long-term renewable energy agreements which, together with our existing long-term contracts, provide nearly 3 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. By making our products and services more efficient and matching our 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.

Cost to realize opportunity

0

Comment

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.

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 driver
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
Potential financial impact
0
Explanation of financial impact
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. In 2015 alone, Google made commitments to invest over $700m into renewable energy projects in both the US and overseas.

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.

Cost to realize opportunity

0

Comment

As of the end of 2017, Google had committed nearly $2.5 billion to investments in renewable energy projects around the world. 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.

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 driver

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), 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

Potential financial impact

142000000

Explanation of financial impact

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 2017 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $142 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 $142 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—trillions of scientific measures dating back more than 40 years—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 new technology platform, we've already begun helping scientists develop applications for detecting deforestation—the destruction of one of the Earth's important natural resources—and mapping land use trends, and have started working with individual countries to develop their own applications. For example, Global Forest Watch—an online forest monitoring system created by the World Resources Institute (WRI)—was launched in 2014 with Google and a group of more than 40 partners. Global Forest Watch uses technologies including Google Earth Engine to map the world's forests with satellite imagery, detect changes in forest cover in near-real-time, and make this information freely available to anyone with Internet access. By accessing the most current and reliable information, everyone can learn what's happening in forests around the world (see: https://ai.googleblog.com/2014/02/monitoring-world-forests-with-global.html). For more information on other similar engagements, see our response to question 12.3e.

Cost to realize opportunity

0

Comment

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.

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 driver

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 160 cities primarily in North America, Europe, South America, and Asia, and we own and operate 14 data centers across four continents. We matched 100% of the 2017 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

Potential financial impact

142000000

Explanation of financial impact

This opportunity driver could have a positive impact on our brands. For example, the 2017 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $142 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 $142 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 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 Maps has transit information for nearly 7,000 agencies, more than 3.8 million transit stations, and 20,000 towns/cities in 78 countries. It provides over 1 billion km worth of transit results every day. 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. For over 10 years, we've been building and running some of the most efficient data centers in the world. Through white papers and posts on our Environment 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 (http://static.googleusercontent.com/media/www.google.com/en/us/about/datacenters/efficiency/internal/assets/machine-learning-applicationsfor-datacenter-optimization-finalv2.pdf). All these efforts can have positive impacts on our reputation and potentially increase demand for Google's products and services.

Cost to realize opportunity

0

Comment

The costs associated with properly addressing climate change opportunities and impacts are the staff time to create and manage the associated projects.

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 driver

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 can 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 see this growth in distributed generation, accelerated by the drop in PV prices, as another opportunity to 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

Potential financial impact

0

Explanation of financial impact

IEA estimates that 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.

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.

Cost to realize opportunity

0

Comment

As of the end of 2017, Google had committed nearly $2.5 billion to investments in renewable energy projects around the world. Other costs include the staff time to source, analyze, and execute the deals.

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 driver

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, 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 7,000 agencies, more than 3.8 million transit stations, and 20,000 towns/cities in 78 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

Potential financial impact

0

Explanation of financial impact

Google Transit and biking/walking routes are a feature of Google Maps, a free online tool potentially monetizable through advertising. We expect that increased demand for transit directions/schedules would mean more users of Google Maps, which could potentially translate into greater potential advertising revenue. We generated 87% ($95,375,000,000) of total Google segment revenues from advertising in 2017. If, for example, due to climate change, transit use increased 10% among Google Maps users, we would expect a commensurate (though not necessarily proportional) increase in potential advertising revenue.

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 2017. 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.

Cost to realize opportunity

0

Comment

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.

C2.5

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

	Impact	Description
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 2017, the average annual Power Usage Effectiveness (PUE) for our global fleet of data centers was 1.11, compared with the industry average of 1.58. Google is also the world's largest corporate purchaser of renewable energy; since 2010, we've signed 26 agreements totaling nearly 3.0 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 (EarthEngine.Google.com), 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.

	Impact	Description
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 factored into your financial planning process.

	Relevance	Description
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 14 data centers. In 2017, our total energy consumption was 8,029,409 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.

	Relevance	Description
Capital expenditures / capital allocation	Not yet impacted	Google owns and operates 14 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 are closely monitoring an Executive Order that directed the EPA to review 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. During the year ended December 31, 2017, we completed various acquisitions and purchases of intangible assets for total consideration of approximately $322 million. 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 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. Certain renewable energy investments included in our non-marketable equity investments accounted for under the equity method are VIEs. These entities' activities involve power generation using renewable sources. We have determined that the governance structures of these entities do not allow us to direct the activities that would significantly impact their economic performance such as setting operating budgets. 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 or interruption from the effects of climate change (such as sea level rise, drought, flooding, wildfires, and increased storm severity). 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 11.1 million square feet of office/building space and approximately forty-five acres of developable land to accommodate anticipated future growth. 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.

	Relevance	Description
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 we take great care to ensure the products and services we provide serve our customers. We value efficiency in everything we do, from creating great 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, by choosing our products and services—Google Cloud Platform and G Suite products 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 pursue energy efficiency projects and design for the highest energy efficiency possible. Specifically, to mitigate future price rises in electricity costs (including those due to environmental regulation), we seek long-term contracts for renewable electricity and work to improve energy efficiency in all our facilities, including 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 to 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 impact on the environment.
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%.

ii. Physical and regulatory risks have influenced 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 this 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 also have adopted several new product lines. For example, in 2015 we launched Project Sunroof, a new online tool that helps users estimate potential solar energy production and cost savings if they were to install a rooftop solar system. In 2017, this tool expanded coverage beyond the United States into Germany, mapping 67 million rooftops across 8,900 cities, which enabled over 2 million users to make informed decisions about solar panel installation.

iii. Energy risk management remains the most important component of our short-term strategy that has been 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 within the year, which we achieved, and we have maintained carbon neutrality for the last ten 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, 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, having a smaller environmental footprint. The most important component of this long-term 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 risks mentioned above. 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 sourcing and potential regulatory risks mentioned above. Companies and users that choose our products and services can be confident that we are helping them minimize their environmental impact—even as their needs and services scale.

vi. In 2017, the most substantial business decisions we made that were influenced by climate change include signing new renewable energy contracts, regulatory work, and ongoing efficiency efforts in our data centers, as follows:
- We entered into 6 more long-term renewable energy agreements which, together with our existing long-term contracts, provide nearly 3 GW of clean, renewable energy. For example, on November 30, 2017, we announced that we had signed contracts to purchase the output of 396 MW of wind energy from three separate wind farms in Iowa and South Dakota.
- We engaged directly with policymakers to call for policies that promote renewable energy and/or reduce carbon emissions. For example, in 2017, in response to Executive Order 13783 on March 28, 2017 directing the EPA to repeal the Clean Power Plan (CPP), we issued a joint statement opposing the order and reiterating our belief that clean energy policies like the CPP are good for our businesses.
- We maintained a comprehensive energy management system (EnMS) for our data centers and a corporate, multi-site ISO 50001 certification via an external audit

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)	Google's climate baseline was established 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 what classifies high-stress and 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 because they correlate with Google's intentions to plan for the resilience of its data centers and office buildings, while also providing information about the need to take any immediate actions to improve the 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 in order 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 (IPCC) as part of its Fifth Assessment Report. The RCPs describe four possible climate futures, based on a wide range of possible changes to greenhouse gas (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 the Google 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, Google's Sustainability Officer 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 (defined as our top 23 sites by headcount) and 15 data center sites. The two key results of the scenario analysis can be summarized as follows: exposure to increased temperatures is likely to impact many of our global sites by 2050. As early as 2050, combined effects of sea level rise and flooding could be significant in our San Francisco Bay Area headquarters. 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 which will reduce risk in the future, such as expanding creek channels and raising finished floor elevation of new buildings. 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 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.

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

% reduction from base year
100

Base year
2017

Start year
2017

Base year emissions covered by target (metric tons CO2e)
931942

Target year
2017

Is this a science-based target?
No, and we do not anticipate setting one in the next 2 years

% achieved (emissions)
100

Target status
Expired

Please explain
Every year, we have a goal of being carbon neutral. As of December 31, 2017, we reached carbon neutrality for 100% of our FY2017 operational emissions, which represent Scope 1 + Scope 2 (market-based) + Scope 3 (Business travel and employee commuting). Abs1 covers Scope 1 + Scope 2 (market-based) + Scope 3 (Business 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
% 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
% achieved (emissions)
83
Target status
Underway
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 is 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, 2017, our annual greenhouse gas emissions reductions from our renewable energy projects were 2.8 million metric tonnes, which puts us 154% of the way towards this goal from an emissions reduction perspective, but 83% of the way towards this goal from an RE perspective as at the end of 2017 we had purchased nearly 3 gigawatts of renewable energy (see RE2). 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 tCO2), as compared to our annual base year emissions covered by this target (1.5 million tCO2). [(1.8 million tCO2/1.5 million tCO2)*100 = 124%]. Our market-based Scope 2 emissions represented 88% of our combined Scope 1 and market-based Scope 2 emissions in 2017.

Target reference number
Abs 3
Scope
Scope 1 +2 (market-based)
% emissions in Scope
100
% reduction from base year
100
Base year
2015
Start year
2015
Base year emissions covered by target (metric tons CO2e)
1451418
Target year
2040
Is this a science-based target?
No, and we do not anticipate setting one in the next 2 years
% achieved (emissions)

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, 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 2017, our annual GHG reductions from our renewable energy projects were 2.8 million metric tonnes. This puts us 154% 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 26 agreements totaling nearly 3.0 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 tCO2 of emissions (our Abs2 target) sometime before 2040. The actual reduction in tCO2 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
% reduction from baseline year
50
Metric
Metric tons CO2e per unit FTE employee
Base year
2011
Start year
2011
Normalized baseline 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
% achieved (emissions)
96
Target status
Underway
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 FTE employee by 2030 and instead work to a 50% reduction in metric tonnes CO2e per FTE employee by 2025 from 2011 baselines for Scope 1 and 2 emissions. Google is committed to reducing our Scope 1 and 2 emissions per FTE (full-time employee) by 50% in our New York City office by 2025. As of Dec.31, 2017, we have achieved a 48% reduction of Scope 1 and 2 emissions per FTE through various energy efficiency and emissions reductions projects, putting us 96% of the way towards this goal. 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 energy 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

Expired

Please explain

RE1 is the Scope 2 portion of Ab3. 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, 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 megawatt-hour (MWh) of electricity our data center and office operations consume annually. Google is the largest cumulative corporate purchaser of renewable energy in the world. Since 2010, we've signed 26 agreements totaling nearly 3.0 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 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). As an interim target towards our 100% renewable energy goal, we committed to tripling our purchases of renewable energy by 2025 (see Abs2 and https://www.theclimategroup.org/news/google-joins-re100-target-triple-renewable-energy-purchases-2025).

Part of emissions target

Abs3

Is this target part of an overarching initiative?

RE100

Target

Renewable energy 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

83

Target Status

Underway

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.theclimategroup.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, 2017, we had entered into 26 long-term renewable energy agreements which, together, are estimated to represent 3.0 GW of installed production capacity, putting us 88% 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 projects at each stage of development, and for those in the implementation stages, the estimated CO2e savings.

	Number of projects	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	4	

	Number of projects	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
To be implemented*	3	596
Implementation commenced*	1	221
Implemented*	64	1406
Not to be implemented	3	

C4.3b

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

Activity type

Energy efficiency: Building services

Description of activity

Other, please specify (Various energy efficiency projects)

Estimated annual CO2e savings (metric tonnes CO2e)

252

Scope

Scope 1

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in CC0.4)

1282198

Investment required (unit currency – as specified in CC0.4)

13772456

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 2017, significant progress was made on 5 projects. 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).

Activity type
Energy efficiency: Building services
Description of activity
Other, please specify (Various energy efficiency projects)
Estimated annual CO2e savings (metric tonnes CO2e)
138
Scope
Scope 2 (market-based)
Voluntary/Mandatory
Voluntary
Annual monetary savings (unit currency – as specified in CC0.4)
164397
Investment required (unit currency – as specified in CC0.4)
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 2017, 31 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).

Activity type
Energy efficiency: Building services

Description of activity
Other, please specify (Various energy efficiency projects)
Estimated annual CO2e savings (metric tonnes CO2e)
677
Scope
Scope 1
Scope 2 (market-based)
Voluntary/Mandatory
Voluntary
Annual monetary savings (unit currency – as specified in CC0.4)
58541
Investment required (unit currency – as specified in CC0.4)
97394
Payback period
1-3 years
Estimated lifetime of the initiative
6-10 years
Comment
Pursual of LEED EB:O&M Gold certification for our office in Hyderabad, India, which includes 7 energy efficiency projects implemented in 2017. 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).

Activity type
Energy efficiency: Building services
Description of activity
Other, please specify (Various energy efficiency projects)
Estimated annual CO2e savings (metric tonnes CO2e)
52
Scope
Scope 2 (market-based)
Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in CC0.4)

26224

Investment required (unit currency – as specified in CC0.4)

12135

Payback period

1-3 years

Estimated lifetime of the initiative

Ongoing

Comment

Implementation of 5 fine-tuning initiatives to improve energy management at our office in Kirkland, Washington in 2017. 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).

Activity type

Energy efficiency: Building services

Description of activity

Other, please specify (Various energy efficiency projects)

Estimated annual CO2e savings (metric tonnes CO2e)

186

Scope

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in CC0.4)

27766

Investment required (unit currency – as specified in CC0.4)

9517

Payback period

1-3 years

Estimated lifetime of the initiative

Ongoing

Comment

Implementation of 12 fine-tuning initiatives to improve energy management at our office in Dublin, Ireland in 2017. 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).

Activity type

Energy efficiency: Building services

Description of activity

Lighting

Estimated annual CO2e savings (metric tonnes CO2e)

86

Scope

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in CC0.4)

18000

Investment required (unit currency – as specified in CC0.4)

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 2017. 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).

Activity type
Energy efficiency: Building services
Description of activity
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 CC0.4)
150000
Investment required (unit currency – as specified in CC0.4)
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 2017. 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 (including G Suite for Education) 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. More than 2 million paying businesses use G Suite. G Suite includes: Gmail, Drive, Docs, Sheets and 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 60 million G Suite for Education users worldwide.
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 (PDF), 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 CO2. 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

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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 currently 1 billion 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 recently 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 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 CO2 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)

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. Google services, while also reaping the benefits of our commitment to renewable energy and our on-going work to increase efficiency. 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 helps assist people as they navigate and explore the world, wherever they are. With Google Maps you get all the information you need in one place including business information, ratings and reviews, and more for 100+ million places around 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 has transit information for nearly 7,000 agencies, more than 3.8 million transit stations, and 20,000 towns/cities in 78 countries. We provide over 1 billion km worth of transit results every day. 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

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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. From 2015 to 2017, Project Sunroof has mapped more than 67 million rooftops in 8,900 cities. For more information, see: https://www.google.com/get/sunroof

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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 2017, Google Earth Outreach worked with the Environmental Defense Fund (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 Google Street View cars equipped with air quality sensors. At least 3 peer-reviewed science articles have been published around this work.

Level of aggregation
Product
Description of product/Group of products
Nest Learning 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. The Nest Learning Thermostat controls residential heating and cooling systems, reduces home energy consumption, and helps achieve collective savings. It uses 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 the 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. Energy savings studies conducted by Nest and independent parties show that, on average, the Nest Thermostat saves US customers about 10-12% on their heating bills and about 15% on their cooling bills. As of December 31, 2017, Nest Thermostats have helped customers save more than 17 billion kWh of energy combined, based on average savings studies—enough energy to power all of San Francisco’s electricity consumption for three years. That’s equivalent to avoiding 5.7 million

tCO2e of emissions. Nest's Rush Hour Rewards program works in partnership with utilities to reduce energy use during times of peak demand. During the 2017 solar eclipse, Nest launched a special Rush Hour program with an opt-in feature that allowed Nest Thermostats to automatically pre-cool customers' homes, reducing demand on the grid at a time when solar energy production dropped by thousands of megawatts. More than 750,000 Nest Thermostats worked together across the United States to reduce energy demand by 700 MW. For more information, see "Solar Eclipse, Meet the Nest Thermostat," Inside Nest (blog), August 10, 2017, https://nest.com/blog/2017/08/10/solar-eclipse-meet-the-nest-thermostat/. For more information on how Nest helps users save energy, see: - 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

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Level of aggregation
Product
Description of product/Group of products
Makani
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, a project in X, is working to make clean energy accessible for everyone by developing energy kites, a new type of wind turbine that can access stronger and steadier winds at higher altitudes to generate more energy with less materials. These high-performance aerodynamic energy kites can eliminate 90% of the materials of conventional wind turbines, generate 50% more energy and be sited in more locations while requiring less ground space, thus bringing electricity to locations where access to energy is limited. For more information, see: https://x.company/makani/

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 Maps, Google Play, Search, and YouTube each have over one billion monthly active users. YouTube has over a billion users - almost one-third of all people on the Internet - and everyday people watch hundreds of millions of hours on YouTube and generate billions of views.

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.

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 CO2e)

10919

Comment

Scope 2 (location-based)

Base year start

January 1 2009

Base year end

December 31 2009

Base year emissions (metric tons CO2e)
1147991
Comment
Scope 2 (market-based)
Base year start
January 1 2009
Base year end
December 31 2009
Base year emissions (metric tons CO2e)
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?
Row 1
Gross global Scope 1 emissions (metric tons CO2e)
66549

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?
Row 1
Scope 2, location-based
3301392
Scope 2, market-based (if applicable)
509334

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-CO2 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 the source is excluded

Other chemicals such as methane (CH4) and nitrous oxide (N2O) 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 CO2e

747564

Emissions calculation methodology

This year we're transitioning to collecting Alphabet allocated supplier scope 1 and 2 GHG emissions data directly from our hardware contract manufacturers and component suppliers through the CDP Supply Chain Program. Until we have CDP supplier data reported to Alphabet, we're adopting an interim approach leveraging data reported last year by our suppliers to Alphabet and to CDP. GHG emissions were estimated by using Alphabet's 2017 inventory PO spend data to scale Alphabet's 2016 GHG footprint data and financial intensity data publicly reported by suppliers to CDP in 2017. The quality of the estimate is likely moderate, given that Alphabet's GHG footprint data and CDP supplier data might not be fully representative of the purchased technology, geography and allocated embodied GHG emissions.

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

Explanation

Capital goods

Evaluation status

Relevant, calculated

Metric tonnes CO2e

1319196

Emissions calculation methodology

To calculate emissions from capital goods for hardware manufacturing, we similarly adopted an interim approach leveraging data reported last year by our suppliers to Alphabet and to CDP. GHG emissions were estimated by using Alphabet's 2017 inventory PO spend data to scale Alphabet's 2016 GHG footprint data and financial intensity data publicly reported by suppliers to CDP in 2017. To estimate emissions from data center construction, we used published

construction emissions data and applied 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

Explanation

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

Evaluation status

Not relevant, calculated

Metric tonnes CO2e

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 and 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 CO2e

296204

Emissions calculation methodology

We calculated GHG emissions from transportation and warehousing of our consumer products and data center equipment by third party logistics providers, both inbound and outbound, paid for by Alphabet. Some transportation providers reported customer allocated GHG emissions 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 (CBECS 2012) 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

90

Explanation

Waste generated in operations

Evaluation status

Not relevant, explanation provided

Metric tonnes CO2e

Emissions calculation methodology

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.

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

Explanation

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 CO2e

233376

Emissions calculation methodology

We estimated business 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 CO2e

122683

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. 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 CO2e

Emissions calculation methodology

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

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 the Commercial Buildings Energy Consumption Survey (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 CO2e

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 CO2e
Emissions calculation methodology
Percentage of emissions calculated using data obtained from suppliers or value chain partners
Explanation
We do not sell intermediate goods that require further processing.
Use of sold products
Evaluation status
Not relevant, explanation provided
Metric tonnes CO2e
Emissions calculation methodology
Percentage of emissions calculated using data obtained from suppliers or value chain partners
Explanation
In 2017, 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 Environment site. 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
Not relevant, explanation provided
Metric tonnes CO2e
Emissions calculation methodology
We have begun to calculate 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.
Percentage of emissions calculated using data obtained from suppliers or value chain partners
Explanation

Given the small size of our product portfolio, emissions associated with end-of-life treatment of sold products were estimated to be de minimis relative to our overall footprint.

Downstream leased assets

Evaluation status

Not relevant, explanation provided

Metric tonnes CO2e

Emissions calculation methodology

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

Explanation

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

Franchises

Evaluation status

Not relevant, explanation provided

Metric tonnes CO2e

Emissions calculation methodology

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

Explanation

We do not have franchises.

Investments

Evaluation status

Not relevant, explanation provided

Metric tonnes CO2e

Emissions calculation methodology

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

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

Not relevant, explanation provided

Metric tonnes CO2e

Emissions calculation methodology

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

Explanation
We do not have other relevant upstream impacts.
Other (downstream)
Evaluation status
Not relevant, explanation provided
Metric tonnes CO2e
Emissions calculation methodology
Percentage of emissions calculated using data obtained from suppliers or value chain partners
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.

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.
14708

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
0.00000519
Metric numerator (Gross global combined Scope 1 and 2 emissions)
575883

Metric denominator
unit total revenue
Metric denominator: Unit total
110855000000
Scope 2 figure used
Market-based
% change from previous year
70.41
Direction of change
Decreased
Reason for change
The primary reason for this decrease is emissions reduction activities associated with our procurement of renewables, which we significantly increased in 2017 as compared to 2016. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that the vast majority of this decrease can be attributed to our additional procurement of renewables in 2017 (above that in 2016). In 2017, our wind and solar deals 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/).

Intensity figure
7.6
Metric numerator (Gross global combined Scope 1 and 2 emissions)
575883
Metric denominator
full time equivalent (FTE) employee
Metric denominator: Unit total
75750
Scope 2 figure used
Market-based
% change from previous year
67.45
Direction of change

Decreased

Reason for change

The primary reason for this decrease is emissions reduction activities associated with our procurement of renewables, which we significantly increased in 2017 as compared to 2016. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that the vast majority of this decrease can be attributed to our additional procurement of renewables in 2017 (above that in 2016). In 2017, our wind and solar deals 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/). This FTE employee intensity figure was calculated by taking our combined 2017 Scope 1 and market-based Scope 2 emissions divided by our average 2017 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

78.62

Direction of change

Decreased

Reason for change

The primary reason for this decrease is emissions reduction activities associated with our procurement of renewables, which we significantly increased in 2017 as compared to 2016. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that the vast majority of this decrease can be attributed to our additional procurement of renewables in 2017 (above that in 2016). In 2017, our wind and solar deals 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/). This MWh intensity figure was calculated by taking our 2017

market-based Scope 2 emissions of our data centers divided by the 2017 electricity consumption at our datacenters. For confidentiality reasons, we are not disclosing the numerator and denominator.

C7. Emissions breakdowns

C7.1

(C7.1) Does your organization have greenhouse gas emissions other than carbon dioxide?

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 CO2e)	GWP Reference
CO2	66549	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 CO2e)
United States of America	52340
Other, please specify (Rest of world)	14209

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 CO2e)	Scope 2, market-based (metric tons CO2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low-carbon electricity, heat, steam or cooling accounted in market-based approach (MWh)
United States of America	2563108	5394		
Other, please specify (Rest of world)	738284	503940		

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?

Decreased

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
Other emissions reduction activities	1409553	Decreased	89	The impact of emission reduction activities in 2017 is a 89% reduction compared to the emissions we reported last year. In 2017, emissions reduction activities accounted for a large share of our emission reductions, primarily from two activities -- (1) In 2017, our green power purchases (in excess of our 2016 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 2017, our additional renewable power purchases (in excess of our 2016 renewable power purchases) (1,408,147 tCO2e) and our energy efficiency efforts (1,406 tCO2e) together resulted in an additional reduction of 1,409,553 tCO2e beyond our 2016 emissions reduction activities. In 2017, our total Scope 1 and market-based Scope 2 emissions were 575,883 tCO2e. Therefore we arrived at 89% as follows: [(1,408,147+1,406)/575,883]*100= 89%. 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.
Change in output	1008979	Decreased	64	As a large and complex multi-national company, there are many factors impacting our emissions and it is impossible to isolate perfectly any one particular factor and quantify it exactly. Based upon the comparison of 2016 to 2017 reported data, growth of our business created a 64% decrease in our emissions compared to the emissions we reported last year. This change in output was calculated by taking our 2017 Scope 1 and market-based Scope 2 emissions minus the 2016 Scope 1 and market-based Scope 2 emissions, divided by the 2016 Scope 1 and market-based Scope 2 emissions, then multiplied by 100. This percent change would be a 13% increase if this figure were calculated using our location-based Scope 2 emissions.

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)	96461	323860	420321

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total MWh
Consumption of purchased or acquired electricity	<Field Hidden>	6533642	1061539	7595181
Consumption of self-generated non-fuel renewable energy	<Field Hidden>	9553	<Field Hidden>	13907
Total energy consumption	<Field Hidden>	6639657	1389752	8029409

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 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)

Biodiesel

Heating value

LHV (lower heating value)

Total fuel MWh consumed by the organization

90720

MWh fuel consumed for the self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self- cogeneration or self-trigeneration
0

Fuels (excluding feedstocks)
Jet Kerosene
Heating value
LHV (lower heating value)
Total fuel MWh consumed by the organization
23830
MWh fuel consumed for the self-generation of electricity
0
MWh fuel consumed for self-generation of heat
0
MWh fuel consumed for self- cogeneration or self-trigeneration
0

Fuels (excluding feedstocks)
Landfill Gas
Heating value
LHV (lower heating value)
Total fuel MWh consumed by the organization
5742
MWh fuel consumed for the self-generation of electricity
5742
MWh fuel consumed for self-generation of heat
0
MWh fuel consumed for self- cogeneration or self-trigeneration
0

Fuels (excluding feedstocks)
Motor Gasoline
Heating value
LHV (lower heating value)

Total fuel MWh consumed by the organization
45190
MWh fuel consumed for the self-generation of electricity
0
MWh fuel consumed for self-generation of heat
0
MWh fuel consumed for self- cogeneration or self-trigeneration
0

Fuels (excluding feedstocks)
Natural Gas
Heating value
LHV (lower heating value)
Total fuel MWh consumed by the organization
219298
MWh fuel consumed for the self-generation of electricity
0
MWh fuel consumed for self-generation of heat
219298
MWh fuel consumed for self- cogeneration or self-trigeneration
0

Fuels (excluding feedstocks)
Other, please specify (Diesel/gas oil)
Heating value
LHV (lower heating value)
Total fuel MWh consumed by the organization
35541
MWh fuel consumed for the self-generation of electricity
33387
MWh fuel consumed for self-generation of heat
0
MWh fuel consumed for self- cogeneration or self-trigeneration

0

C8.2d

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

Biodiesel
Emission factor
9.46
Unit
kg CO2 per gallon
Emission factor source
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)
Comment
Biogenic emissions. Emission factor for 100% biodiesel. Blends' (x% biodiesel with diesel) emission factors are calculated using the blend specific emission factor or the percent composition.

Jet Kerosene
Emission factor
9.43
Unit
kg CO2 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 CO2 per m3
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 CO2 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 CO2 per million Btu
Emission factor source
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)
Comment

Other
Emission factor
10.13
Unit
kg CO2 per gallon
Emission factor source
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)
Comment
Diesel/gas oil

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	13907	13907	9553	9553
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

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

6533642

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 2017, we matched 100% of the electricity consumption of our operations with renewable energy purchases.

C9. Additional metrics

C9.1

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

Description

Energy use

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

8

Direction of change

Decreased

Please explain

Google's data center energy metric is the ratio of noncomputing overhead energy use divided by IT equipment energy use. That ratio was 0.12 in 2016, dropping to 0.11 in 2017. That's an 8% decrease, indicating improved efficiency. 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 2017, the average annual PUE for our global fleet of data centers was 1.11, compared with the industry average of 1.58—meaning that our data centers use about five 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
CDP Verification Statement Alphabet CY2017v.1.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
CDP Verification Statement Alphabet CY2017v.1.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
CDP Verification Statement Alphabet CY2017v.1.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

CDP Verification Statement Alphabet CY2017v.1.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.	In 2017, we produced product environmental reports for 6 of our flagship products (Daydream View, Google Home, Google Pixel 2, Google Pixel 2 XL, Google Home Mini, and Google Pixelbook). These included 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 https://store.google.com/us/magazine/sustainability. The life-cycle assessment (LCA) reports underwent and successfully passed critical review by an external individual

Disclosure module verification relates to	Data verified	Verification standard	Please explain
			expert. The critical review checked that: - Methods used to carry out the LCA were consistent with standards ISO14040 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 are included in the appendices of each LCA report and 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
1.37
Period start date
January 1 2017
Period end date
December 31 2017
Allowances allocated
915
Allowances purchased
915
Verified emissions in metric tons CO2e
915
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?
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
Berkeley County Landfill Gas Project (CAR574)
Verified to which standard
CAR (The Climate Action Reserve)
Number of credits (metric tonnes CO2e)
12096
Number of credits (metric tonnes CO2e): Risk adjusted volume
12096
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 ~$8M [= (2017 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

86

% total procurement spend (direct and indirect)

95

% Scope 3 emissions as reported in C6.5

90

Rationale for the coverage of your engagement

In 2017, our Responsible Supply Chain program was directly engaged with 400+ active suppliers supporting hardware manufacturing and related services. Of those, 352 (86%), have signed our Supplier Code of Conduct which articulates our overall requirements for energy and emissions. All suppliers are required to sign our Supplier Code of Conduct and we are working to complete the remaining signatures as we select and onboard new suppliers. Spend is calculated based on our purchase orders with suppliers providing manufacturing services or products. In 2017, our active hardware

suppliers who signed our Supplier Code of Conduct covered 95% of our total spend and 90% of our hardware supplier manufacturing emissions. Google's Supplier Code of Conduct addresses resource efficiency and other environmental indicators. This Supplier Code of Conduct is included in our contracts and forms the basis of our supplier sustainability profile survey and our supplier audits. Our Supplier Code of Conduct can be found here: http://www.google.com/about/company/responsible-manufacturing.html We work with our suppliers to understand their environmental impacts through surveys, onsite audits and direct engagement with our suppliers. We engage with our suppliers to identify GHG sources to prioritize for reduction actions and develop their capacity to report and minimize their greenhouse gas emissions. Many of our suppliers have robust programs to manage their greenhouse gas emissions. We have integrated sustainability criteria into our supplier sourcing and supplier performance management processes. These sustainability criteria include assessments about a supplier's practices to report, manage and reduce their emissions (and other environmental indicators). We gather data directly from our most strategic suppliers on their environmental impacts. This data is used to prioritize by supplier, by commodity, and by region. We have expanded the number and detail of the LCAs we conduct on our products, and use other inputs such as primary data to verify data, refine allocations and continually improve our analysis. We are continuing to analyze and refine our estimates of supply chain greenhouse gas emissions, while also requesting that suppliers report their targets and emissions tracking to us in our supplier sustainability profile survey.

Impact of engagement, including measures of success

Of our 400+ active suppliers supporting hardware manufacturing and related services, 45 suppliers representing 80% of our spend provided environmental data to Alphabet in 2017. Of our 174 audited supplier factories in 2017, 87% tracked their (energy, water, waste) consumption and had set environmental reduction targets. We use the data we get from suppliers to help us validate the greenhouse gas emissions data obtained through our lifecycle assessment process and to help set goals for our supplier sustainability program.

Comment

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

Size of engagement

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. 14 customers requested this data from Alphabet for FY2017. 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 new 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 published a blog post about why building on an environmentally responsible cloud matters (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. 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. We hosted a Cloud OnAir webinar about why building on an environmentally responsible Cloud matters. 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 environment microsite (https://cloud.google.com/environment/) 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 Etsy 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 other 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 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, Google Earth Outreach 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
- https://www.edf.org/climate/methanemaps/pseg-collaboration?_ga=2.268426062.1314427762.1535331945-803036495.1515518828
- http://blogs.edf.org/energyexchange/2016/12/13/managing-methane-new-jerseys-largest-utility-using-better-data-for-better-decisions/
- 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, Google Earth Outreach worked with the Environmental Defense Fund (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 3 peer-reviewed science articles have been published around this work.

With the World Resources Institute (WRI), 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://globalpowerwatch.org and http://datasets.wri.org/dataset/globalpowerplantdatabase). 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/

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	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 2017, this included: European Union renewables policy: - In 2017, the European Parliament and European Council began negotiations on 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. We also hosted high-level forums with key officials to raise the profile of renewable energy in Europe and show our support for ambitious renewable energy policies, including a February 2017 event at our Brussels with European Commission Vice President for the Energy Maroš Šefčovič and MEP Kathleen Van Brempt. In October, Google sponsored the inaugural Re-Source event in Brussels, the largest gathering of government officials and business leaders dedicated to accelerating corporate purchasing of renewable energy in Europe. Taiwan energy policy: - Throughout 2017, Google met frequently with	More local, regional, national and international policies to reduce dependence on carbon intensive power and support clean energy deployment. Details of engagement continued: U.S. federal climate policy: - We have continued to be vocal proponents of the EPA Clean Power Plan (CPP). In March 2017, in response to President Trump's executive order directing a repeal of the Clean Power Plan we joined with Amazon, Apple, and Microsoft to issue a statement opposing the repeal and reiterating our support for federal policies that bring new renewable energy onto the grid (see: https://blogs.microsoft.com/green/2017/03/30/joint-tech-amici-statement-on-clean-power-plan/) - Seeking to encourage the United States to remain in the Paris Agreement, we sent a joint letter to President Trump in April 2017 (see: https://c2es.org/site/assets/uploads/2017/04/business-letter-white-house-paris-agreement-final-04-26-2017-1.pdf), and we joined full page advertisements in the New York Times and Wall Street Journal on May 8th and June 1st 2017 addressing our concerns to President Trump (see: https://www.c2es.org/content/business-support-for-the-paris-agreement/), - When President Trump announced his intent to withdraw the United States from the Paris Agreement, our CEO Sundar Pichai expressed his opposition to the decision (see: https://www.theverge.com/2017/6/1/15726980/silicon-valley-google-microsoft-trump-paris-climate-deal) - We supported trade groups of which we are a member, namely the American Council on Renewable Energy (ACORE) and the Advanced Energy Buyers Group (AEBG) in opposing the imposition of import tariffs on solar cells and panels that would threaten to slow the growth of renewable energy installations and jobs in the United States. 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: - Georgia Power IRP: In August 2017, as a result of efforts by Google and others, the Georgia Public Service Commission approved Georgia Power's Commercial & Industrial Renewable Energy Development Program. Participating customers of Georgia Power were able to purchase energy and RECs from 177 MW of new solar projects in Georgia.

Focus of legislation	Corporate position	Details of engagement	Proposed legislative solution
		Taiwanese stakeholders in the Ministry of Economic Affairs, Bureau of Energy, and Bureau of Standards, Metrology, and Inspection to advocate for effective access to renewable energy for end-users. Following extensive consideration in 2015 and 2016, Taiwan's legislature passed an amendment to their Electricity Act that will allow sales of renewable energy to end-users. In 2017, Google met frequently with Taiwanese officials and stakeholders to support their design of the implementing regulations and contracts that will enable renewable energy sales to end users.	

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 http://www.uspref.org/

How have you, or are you attempting to, influence the 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, or are you attempting to, influence the 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, or are you attempting to, influence the 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, or are you attempting to, influence the 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, or are you attempting to, influence the 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. SCEEBA 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, or are you attempting to, influence the 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

The Wind Coalition

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association's position

The Wind Coalition is the industry trade association created to promote the development of wind energy as a clean, reliable, affordable, and infinite source of power. The Wind Coalition is the wind energy industry's voice within the Electric Reliability Council of Texas (ERCOT) and Southwest Power Pool (SPP) systems, which include Texas, Kansas, Oklahoma, Nebraska, Arkansas, Missouri, New Mexico, and Louisiana. For more information about the Wind Coalition, see http://windcoalition.org/

How have you, or are you attempting to, influence the 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.

How have you, or are you attempting to, influence the 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.

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.

Google Earth Engine Research Awards, structured as unrestricted gifts to universities to support the work of world-class full-time faculty members at top universities around the world, supported cutting-edge geospatial data analysis and, in some cases also produced and disseminated public work on climate change. There have been over 1,800+ publications to date.

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 2017, this paper has received over 2500 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

20171231_alphabet_10K.pdf

Content elements

Strategy
Risks & opportunities
Other metrics
Other, please specify (Pages 6 and 15 of Alphabet's FY2017 10-K)

Publication

In voluntary sustainability report

Status

Underway – previous year attached

Attach the document

google-2017-environmental-report.pdf

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets
Other metrics
Other, please specify (Google's FY2016 Environmental Report)

Publication

In voluntary sustainability report

Status

Underway – previous year attached

Attach the document

2016-Responsible-Supply-Chain-Report.pdf

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets
Other metrics
Other, please specify (FY2016 Responsible Supply Chain report)

Publication
In voluntary communications
Status
Underway – previous year attached
Attach the document
Content elements
Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets
Other metrics
Other, please specify (https://environment.google/)

Publication
In voluntary communications
Status
Complete
Attach the document
achieving-100-renewable-energy-purchasing-goal.pdf
Content elements
Strategy
Risks & opportunities
Other metrics
Other, please specify (2016 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 ENVIRONMENTAL STRATEGY
Google Environment website (https://environment.google)
Google Environmental Report (https://environment.google/environmental-report/)

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://environment.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://environment.google/projects/ppa/)
2017 spotlight: Northern Exposure: How Our Nordic Renewable Deals Are Reaping Rewards
(https://environment.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/)

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://environment.google/projects/landfill-NewYork/)

HOW WE HELP USERS & CUSTOMERS BECOME MORE EFFICIENT
Google Cloud Environment website (https://cloud.google.com/environment/)
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)
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)
Google Maps Transit Information (http://googleblog.blogspot.com/2014/05/hop-on-boardand-go-almost-anywherewith.html)

SUPPLY CHAIN
Responsible Supply Chain website (https://www.google.com/about/responsible-supply-chain/)
Google's Supplier Code of Conduct (http://www.google.com/about/company/responsible-manufacturing.html)

PRODUCTS
2018 reports: 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)

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
I am submitting my response	Public	Investors Customers

Please confirm below

I have read and accept the applicable Terms