Module: Introduction

Page: Introduction

CC0.1

Introduction
Please 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. 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. Our innovations in areas like search and advertising have made our services widely used, and our brand one of the most recognized in the world. We generate revenues primarily by delivering online advertising that consumers find relevant and that advertisers find cost-effective.

Google's core products such as Search, Android, Maps, Chrome, YouTube, Google Play, and Gmail each have over one billion monthly active users. But most important, we believe we are just beginning to scratch the surface. Our vision is to remain a place of incredible creativity and innovation that uses our technical expertise to tackle big problems.

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. On August 10, 2015, we announced plans to create a new public holding company, Alphabet Inc. (Alphabet), and a new operating structure. On October 2, 2015, we implemented the holding company

reorganization, and as a result, Alphabet became the successor issuer to Google Inc. (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 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 7.86 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 operate and own data centers in the U.S., Europe, South America, and Asia pursuant to various lease agreements and co-location arrangements.

As of December 31, 2016, we had almost $90 billion in total revenues and 72,053 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 in Alphabet’s responses to this Questionnaire are for illustrative purposes only and are based upon certain hypothetical assumptions that are subject to change. They do not constitute any undertaking, representation or guarantee of any nature.

CC0.2

Reporting Year
Please state the start and end date of the year for which you are reporting data.
The current reporting year is the latest/most recent 12-month period for which data is reported. Enter the dates of this year first.
We request data for more than one reporting period for some emission accounting questions. Please provide data for the three years prior to the current reporting year if you have not provided this information before, or if this is the first time you have answered a CDP information request. (This does not apply if you have been offered and selected the option of answering the shorter questionnaire). If you are going to provide additional years of data, please give the dates of those reporting periods here. Work backwards from the most recent reporting year.
Please enter dates in following format: day(DD)/month(MM)/year(YYYY) (i.e. 31/01/2001).

Enter Periods that will be disclosed
Fri 01 Jan 2016 - Sat 31 Dec 2016

CC0.3

Country list configuration

Please select the countries for which you will be supplying data. If you are responding to the Electric Utilities module, this selection will be carried forward to assist you in completing your response.

Select country
United States of America
Rest of world

CC0.4

Currency selection

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

USD($)

CC0.6

Modules

As part of the request for information on behalf of investors, companies in the electric utility sector, companies in the automobile and auto component manufacturing sector, companies in the oil and gas sector, companies in the information and communications technology sector (ICT) and companies in the food, beverage and tobacco sector (FBT) should complete supplementary questions in addition to the core questionnaire.
If you are in these sector groupings, the corresponding sector modules will not appear among the options of question CC0.6 but will automatically appear in the ORS navigation bar when you save this page. If you want to query your classification, please email respond@cdp.net.

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

Further Information

Module: Management

Page: CC1. Governance

CC1.1

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

Senior Manager/Officer

CC1.1a

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

The highest level of direct responsibility for climate change rests with Google's Senior Vice President of Technical Infrastructure (a senior manager -- referred to internally as a Senior VP). Google's Senior VP of Technical Infrastructure is responsible for data center operations, in addition to many other responsibilities. As data center electricity is the vast majority of Alphabet's carbon footprint, responsibility for measuring & offsetting our carbon footprint rests with this senior executive. This Senior VP reports directly to Google's Senior VP of Cloud, who leads all of Google's cloud businesses including Google Cloud Platform, Google Technical Infrastructure, and G Suite, and in turn reports to Sundar Pichai, Google’s CEO.

CC1.2

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

Yes

CC1.2a

Please provide further details on the incentives provided for the management of climate change issues

Who is entitled to benefit from these incentives?	The type of incentives	Incentivized performance indicator	Comment
Other: Data center engineers	Monetary reward	Other: Performance bonus tied to meeting targets related to reducing energy use.	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.
Energy managers	Monetary reward	Energy reduction project Efficiency project Other: Performance bonus tied to meeting targets related to reducing energy use, reducing energy spend, and increasing renewable energy procurement.	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.
Facility managers	Monetary reward	Other: Performance bonus tied to meeting targets for improving the sustainability/ energy efficiency of our operations.	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.
Environment/Sustainability managers	Monetary reward	Emissions reduction project Energy reduction project Efficiency project Behavior change related indicator Environmental criteria included in purchases Other: Performance bonus tied to meeting targets for improving the sustainability/ energy efficiency of our operations.	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.
Public affairs managers	Monetary reward	Other: Performance bonus tied to meeting targets for communicating our sustainability/ energy efficiency initiatives externally.	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

Who is entitled to benefit from these incentives?	The type of incentives	Incentivized performance indicator	Comment
			energy use, and increased renewable energy procurement.
Corporate executive team	Monetary reward	Emissions reduction target Energy reduction target	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.

Further Information

Page: CC2. Strategy

CC2.1

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

A specific climate change risk management process

CC2.1a

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

Frequency of monitoring	To whom are results reported?	Geographical areas considered	How far into the future are risks considered?	Comment
Six-monthly or more frequently	Board or individual/sub-set of the Board or committee appointed by the Board	All of Alphabet's operations globally.	> 6 years	The scope of the process considers regulatory risks due to climate change that could increase energy costs.

CC2.1b

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

The Senior VP of Technical Infrastructure 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. These risks and opportunities are 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 2016, Google entered into 5 more long-term renewable energy agreements which, together with our existing long-term contracts, provide over 2.6 GW of clean, renewable energy. 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. 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.

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.

CC2.1c

How do you prioritize the risks and opportunities identified?

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.

CC2.1d

Please explain why you do not have a process in place for assessing and managing risks and opportunities from climate change, and whether you plan to introduce such a process in future

Main reason for not having a process	Do you plan to introduce a process?	Comment

CC2.2

Is climate change integrated into your business strategy?

Yes

CC2.2a

Please describe the process of how climate change is integrated into your business strategy and any outcomes of this process

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.

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 are relentlessly focused on improving 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 2016, this tool was expanded to 42 states.

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 to 2010, our data centers now get 3.5 times the computing power from every watt of electricity we consume. 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 reach 100% renewable energy for our operations and we've made great strides towards achieving this—in 2016, we procured enough renewable energy to cover 57% of our operations and we will first reach 100% renewable energy in 2017. As an interim step towards achieving our long-term goal and as part of the White House American Businesses Act on Climate Pledge, we committed to triple our purchase of renewable energy by 2025.
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. 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 2016, 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 5 more long-term renewable energy agreements which, together with our existing long-term contracts, provide over 2.6 GW of clean, renewable energy. For example, in 2016, we were excited to announce that Google joined forces with three leading Dutch companies—AkzoNobel, DSM and Philips—to jointly source power from two new renewable energy projects in the Netherlands. This marked the first time Google teamed up with local citizens to create what is effectively a consumer-to-business energy partnership.
- We engaged directly with policymakers to call for policies that promote renewable energy and/or reduce carbon emissions. For example, in April 2016, we joined with Amazon, Apple, and Microsoft to file an Amicus Brief in support of the EPA's Clean Power Plan, to reiterate 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).

CC2.2b

Please explain why climate change is not integrated into your business strategy

CC2.2c

Does your company use an internal price on carbon?

Yes

CC2.2d

Please provide details and examples of how your company uses an internal price on carbon

We use carbon prices as part of our risk assessment model. For example, the risk assessment at individual data centers also includes using a shadow price for carbon to estimate expected future energy costs.

CC2.3

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

Direct engagement with policy makers
Trade associations
Funding research organizations
Other

CC2.3a

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	OVERVIEW OVERVIEW 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 US (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 2016, this included engagement on the following:	More local, regional, national and international policies to reduce dependence on carbon intensive power and support clean energy deployment.
Clean energy generation	Support	European Union renewables policy: - We have engaged with European Institutions including the European Commission, Council and Parliament to strengthen and improve EU directives on renewable energy and electricity market design. By 2017 or 2018, the EU will issue two legislative proposals of key importance to the European renewable energy sector: (1) a directive defining the post-2020 legislative framework for the European renewable energy sector and (2) a legislative initiative to improve the energy market design. Both will have significant impacts on the growth of renewable energy in the EU. Google filed written comments on both directives, met with key members of the European Commission, Council and Parliament, and participated and spoke at key stakeholder meetings in Brussels and the U.S. - EU Renewable Energy Directive comments: For our February 10, 2016, submission 'Preparation of a new Renewable Energy Directive for the period after 2020' (see: https://ec.europa.eu/energy/en/consultations/preparation-new-renewable-energy-directive-period-after-2020	More international policies to reduce dependence on carbon intensive power and support clean energy deployment.
Clean energy generation	Support	Taiwan energy policy: - Throughout 2016, Google met frequently with Taiwanese stakeholders at the highest levels to advocate for access to renewable energy. Google hosted Taiwanese President Tsai Ing-Wen at our data center in Changhua County to discuss our sustainability goals and opportunities for renewable energy purchasing in Taiwan. We also met repeatedly with senior stakeholders in government Ministries, NGOs, trade bodies, and academia to promote renewable energy purchasing as well as the creation of renewable energy certification systems	More national policies to reduce dependence on carbon intensive power and support clean energy deployment.
Clean energy generation	Support	U.S. federal climate policy: - We have been vocal proponents of the EPA Clean Power Plan (CPP). In April 2016, we joined with Amazon, Apple, and Microsoft to file an Amicus Brief in support of the EPA’s Clean Power Plan, to reiterate our belief that clean energy policies like the CPP are good for our businesses. (see: https://www.edf.org/sites/default/files/content/2016.04.01_major_tech_companies_amicus_brief_for_epa.pdf) - In June 2016, on the margins of the Clean Energy Ministerial meeting in San Francisco, Google hosted U.S. Secretary of Energy Ernest Moniz along with 24 of his energy Minister counterparts from major economies at our headquarters to showcase the importance of corporate leadership in fighting climate change and creating access to	More national policies to reduce dependence on carbon intensive power and support

Focus of legislation	Corporate Position	Details of engagement	Proposed legislative solution
		clean energy. We also committed as part of the CEM Corporate Renewable Energy Sourcing Campaign to convene CEM country stakeholders to discuss policy mechanisms that enable scaling up of corporate renewable energy purchasing.	clean energy deployment.
Clean energy generation	Support	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 2016, as a result of efforts by Google and others, the Georgia Public Service Commission approved Georgia Power's Integrated Resource Plan calling for 1,500 megawatts (MW) of new renewable development for the state as well creation of an additional 200 MW program for commercial and industrial customers who wish to buy renewables more directly. - North Carolina: Starting in the fall of 2016, Google participated in a month long legislative working group assembled by the state's Speaker of the House. The purpose of this working group was to develop consensus ideas for renewable energy development in the state, including a redevelopment of the Green Source Rider pilot to allow corporate customers to source renewables in NC.	More regional policies to reduce dependence on carbon intensive power and support clean energy deployment.

CC2.3b

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

Yes

CC2.3c

Please enter the details of those trade associations that are likely to take a position on climate change legislation

Trade association	Is your position on climate change consistent with theirs?	Please explain the trade association's position	How have you, or are you attempting to, influence the position?
U.S. Partnership for Renewable Energy Finance	Consistent	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	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

Trade association	Is your position on climate change consistent with theirs?	Please explain the trade association's position	How have you, or are you attempting to, influence the position?
(Founding Member) (US PREF)		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/	leadership of the key trade associations in which we are members.
American Council on Renewable Energy (ACORE)	Consistent	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/	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.
WRI/WWF Corporate Renewable Energy Buyer's Principles	Consistent	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/	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.
RE100	Consistent	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/	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	Is your position on climate change consistent with theirs?	Please explain the trade association's position	How have you, or are you attempting to, influence the position?
North Carolina Sustainable Energy Association (NCSEA)	Consistent	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/	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.
South Carolina Clean Energy Business Alliance (SCCEBA)	Consistent	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/	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.
The Wind Coalition	Consistent	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/	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.

CC2.3d

Do you publicly disclose a list of all the research organizations that you fund?

Yes

CC2.3e

Please 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.

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
http://blogs.edf.org/energyexchange/2016/12/13/managing-methane-new-jerseys-largest-utility-using-better-data-for-better-decisions/
See PSE&G's press release announcing results of project (Dec 2016: PSE&G Teams with Google, EDF to Stop Methane Leaks
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.

The World Resources Institute is also working with Google to develop better information and tools related to energy systems and decarbonization planning (see: http://www.wri.org/our-work/topics/climate). Through GlobalPowerWatch.org, we're bringing transparency and accountability to the global power sector to accelerate the shift to a clean energy future.

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, support cutting-edge geospatial data analysis and, in some cases also produce and disseminate public work on climate change. For example, in 2016, an award went to Christopher Doughty at Oxford University to create and verify global maps of tropical forest productivity, a key part of understanding carbon stocks. For more information and the complete list of award recipients, see: http://research.google.com/university/relations/ee_awards.html.

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.

In 2016, Google funded several other research studies related to energy and/or climate change that were led by academic institutions, NGOs, and other partners. These studies focused on topics such as the energy impacts of internet services and data flows as well as tools for measuring climate and energy data. For example, Google provided a seed grant to the Center for Resource Solutions (CRS), a San Francisco-based NGO that leads the Green-E program amongst other initiatives, to explore the creation of renewable energy certification systems in Asia, starting in Taiwan (see https://blog.google/topics/environment/laying-foundation-for-renewable-energy/). This research has led governments in markets like Taiwan to begin thorough evaluations of the role of measurement and verification in renewable energy markets.

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 2016, this paper has received over 1500 citations. (see:
http://www.sciencemag.org/content/342/6160/850)

We also support organizations working on climate change issues. For example, in 2016, we were a platinum sponsor of CDP's annual spring workshop, which we hosted at Google's campus in Sunnyvale, California. Google is also a global partner of the Ellen MacArthur Foundation, which is working to accelerate the transition to a circular economy.

CC2.3f

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

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.

CC2.3g

Please explain why you do not engage with policy makers

Further Information

RESPONSE TO 2.3 CONTINUED: 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 2.3c as well as many others. MORE INFORMATION ON BUSINESS STRATEGY For more information on how climate change is integrated into our business strategy, see the resources below, as well as the attachments in section 4 'Communication': RENEWABLE ENERGY In 2016, we entered into 5 more long-term renewable energy agreements which, together with our existing long-term contracts, provide over 2.6 GW of clean,

renewable energy. The complete list of new projects are: 1. A PPA for 200 MW of wind in Kansas 2. A PPA for 76 MW of wind in Sweden 3. A PPA for 160 MW of wind in Norway 4. A PPA for 26 MW of wind in The Netherlands 5. A PPA for 103 MW of wind in Sweden OUR OVERALL ENVIRONMENTAL STRATEGY Google's Environment website: https://environment.google Google's Environmental Report: https://static.googleusercontent.com/media/www.google.com/en//green/pdf/google-2016-environmental-report.pdf RENEWABLE ENERGY PROCUREMENT 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 2013 white paper 'Google's Green PPAs: What, How, and Why': http://static.googleusercontent.com/external_content/untrusted_dlcp/cfz.cc/en/us/green/pdfs/renewable-energy.pdf HOW WE HELP USERS BECOME MORE EFFICIENT 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 OTHER Google's Supplier Code of Conduct: http://www.google.com/about/company/responsible-manufacturing.html

Page: CC3. Targets and Initiatives

CC3.1

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

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

CC3.1a

Please provide details of your absolute target

ID	Scope	% of emissions in scope	% reduction from base year	Base year	Base year emissions covered by target (metric tonnes CO2e)	Target year	Is this a science-based target?	Comment

ID	Scope	% of emissions in scope	% reduction from base year	Base year	Base year emissions covered by target (metric tonnes CO2e)	Target year	Is this a science-based target?	Comment
Abs1	Other: Scope 1 + 2 (market-based) + Scope 3 (Business travel and employee commuting)	100%	100%	2016	1898889	2016	No, and we do not anticipate setting one in the next 2 years	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 carbon neutrality strategy.
Abs2	Scope 1+2 (market-based)	100%	100%	2015	1451418	2025	No, and we do not anticipate setting one in the next 2 years	Abs2 is the same as RE2 and is our interim target for Abs3. 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). This is expected to result in installed production capacity of 3.4GW of renewable power by 2025. This equates to 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. 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

ID	Scope	% of emissions in scope	% reduction from base year	Base year	Base year emissions covered by target (metric tonnes CO2e)	Target year	Is this a science-based target?	Comment
								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 96% of our combined Scope 1 and market-based Scope 2 emissions in 2016.
Abs3	Scope 1+2 (market-based)	100%	100%	2015	1451418	2040	No, and we do not anticipate setting one in the next 2 years	Abs3 is the same as RE1. Google's long-term goal is to reach 100% renewable energy for our global operations. Reaching our 100% renewable purchasing goal means that Google will buy 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. 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). Since we're using Abs2 as our interim target for Abs3 and it would be difficult to predict our emissions in 2040 (the target year for Abs3), we're using most of the

ID	Scope	% of emissions in scope	% reduction from base year	Base year	Base year emissions covered by target (metric tonnes CO2e)	Target year	Is this a science-based target?	Comment
								same data here for Abs3 as we did for Abs2. As we pursue our 2040 target (Abs3), 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, and/or the year we hit 100% renewable energy. Fore more information, see Abs2.

CC3.1b

Please provide details of your intensity target

ID	Scope	% of emissions in scope	% reduction from base year	Metric	Base year	Normalized base year emissions covered by target	Target year	Is this a science-based target?	Comment
Int1	Scope 1+2 (market-based)	0.47%	50%	Metric tonnes CO2e per unit FTE employee	2011	0.14	2025	No, and we do not anticipate setting one in the next 2 years	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.

CC3.1c

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

ID	Direction of change anticipated in absolute Scope 1+2 emissions at target completion?	% change anticipated in absolute Scope 1+2 emissions	Direction of change anticipated in absolute Scope 3 emissions at target completion?	% change anticipated in absolute Scope 3 emissions	Comment
Int1	Decrease	0.48	No change	0	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.

CC3.1d

Please provide details of your renewable energy consumption and/or production target

ID	Energy types covered by target	Base year	Base year energy for energy type covered (MWh)	% renewable energy in base year	Target year	% renewable energy in target year	Comment
RE1	Electricity consumption	2015	5221476	48%	2040	100%	Abs3 is the same as RE1. Google's long-term goal is to reach 100% renewable energy for our global operations. For more information, see our 2016 white paper: https://static.googleusercontent.com/media/www.google.com/en//green/pdf/achieving-

ID	Energy types covered by target	Base year	Base year energy for energy type covered (MWh)	% renewable energy in base year	Target year	% renewable energy in target year	Comment
							100-renewable-energy-purchasing-goal.pdf By signing long-term contracts for renewable power, Google provides financial security to renewable generation projects and brings more green electricity on to the grid. Additionally, we hold ourselves to the highest standards when purchasing renewables, and our contracts meet strict criteria to ensure that our purchases are of the highest quality. Whenever we purchase renewable energy, we strive to meet three criteria. First, they create new sources of green power on the grid, to ensure "additionality". Second, the renewable attributes from the agreements are applied to our power consumption in the same year the energy is generated. And third, we purchase an equal quantity of "bundled" energy and green attributes in the same purchase. For more information, see our Dec 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 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). We've made great strides towards our 100% renewables goal. Google is the largest cumulative corporate purchaser of renewable energy in the world. Since 2010, we've signed 20 agreements totaling 2.6 gigawatts. In 2016, we procured enough renewable energy to cover 48% of our operations, which equates to a 44% reduction of our market-based Scope 2 emissions. We continue to work on increasing this percentage going forward and we will first reach 100% renewable energy for our operations in 2017.
RE2	Electricity consumption	2015	5221476	48%	2025		RE2 is the same as 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:

ID	Energy types covered by target	Base year	Base year energy for energy type covered (MWh)	% renewable energy in base year	Target year	% renewable energy in target year	Comment
							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 by 2025.

CC3.1e

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

ID	% complete (time)	% complete (emissions or renewable energy)	Comment
Abs1	100%	100%	Every year, we have a goal of being carbon neutral. As of December 31, 2016, we reached carbon neutrality for 100% of our FY2016 operational emissions, which represent Scope 1 + Scope 2 (market-based) + Scope 3 (Business travel and employee commuting).
Abs2	18%	77%	Abs2 is the same as RE2 and is our interim target for Abs3. On July 27, 2015, Google committed to tripling our purchases of renewables (then 1.1GW) by 2025, which equates to an installed production capacity of 3.4GW of renewable power. This equates to 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, 2016, our annual greenhouse gas emissions reductions from our renewable energy projects were 1.4 million metric tonnes, which puts us 77% of the way towards this goal.
Abs3	8%	47%	Abs3 is the same as RE1. Google's long-term goal is to reach 100% renewable energy for our global operations and we've made great strides towards this goal. In 2016, we procured enough renewable energy to cover 57% of our operations, which equates to a 48% reduction of our market-based Scope 2 emissions compared to our location-based Scope 2 emissions and a 47% reduction of our combined Scope 1 and market-based Scope 2 emissions compared to our combined Scope 1 and location-based Scope 2 emissions. We continue to work on increasing this percentage going

ID	% complete (time)	% complete (emissions or renewable energy)	Comment
			forward and expect to achieve 100% renewable energy for the first time in reporting year 2017.
RE1	8%	57%	RE1 is the same as Abs3. Google's long-term goal is to reach 100% renewable energy for our global operations and we've made great strides towards this goal. In 2016, we procured enough renewable energy to cover 57% of our operations, which equates to a 48% reduction of our market-based Scope 2 emissions compared to our location-based Scope 2 emissions. We continue to work on increasing this percentage going forward and expect to achieve 100% renewable energy for the first time in reporting year 2017.
RE2	18%	64%	RE2 is the same as Abs2 and is our interim target for RE1. On July 27, 2015, Google committed to tripling our purchases of renewables (then 1.1GW) by 2025, which equates to an installed production capacity of 3.4GW of renewable power per year by 2025, 2.3GW of which will be achieved in the target period. As of December 31, 2016, we had entered into 20 long-term renewable energy agreements which, together, are estimated to represent 2.6GW of installed production capacity. As of December 31, 2016, we had signed 1.5GW of new contracts since setting our target, putting us 64% of the way towards this goal.
Int1	40%	89%	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, 2016, we have achieved a 44% reduction of Scope 1 and 2 emissions per FTE through various energy efficiency and emissions reductions projects, putting us 89% of the way towards this goal.

CC3.1f

Please explain (i) why you do not have a target; and (ii) forecast how your emissions will change over the next five years

CC3.2

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

Yes

CC3.2a

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

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
Group of products	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	Low carbon product	Other: Our own methodology			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

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
	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.					
Product	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.	Low carbon product	Other: Our own methodology			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.

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
						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)
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	Low carbon product	Other: Our own methodology			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 to 5 years ago, Google Infrastructure can now deliver over 3.5 times as much compute power for the same amount of energy. Businesses and developers using Google Cloud Platform gain the scale and performance of working on the same green infrastructure that powers 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	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
	Google Cloud Platform, see: https://cloud.google.com/products/					
Product	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.	Avoided emissions	Other: 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 6,500+ agencies, 3.5 million transit stations, and more than 20,000 cities and towns in 70 countries. We provide over 1 billion km worth of transit results every day. Buses, trains, trams and subways included in Google Maps travel 200 million kilometers daily, the equivalent of driving every road in the world three times. 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
Product	Project Sunroof	Avoided emissions	Other: Avoided emissions represent the third party's Scope 1 and/or			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

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
			Scope 2 emissions.			solar. By the end of 2016, Project Sunroof offered solar estimates for over 43 million houses across 42 states. For more information, see: https://www.google.com/get/sunroof
Product	Project Air View	Avoided emissions	Other: 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 2016, one of the largest U.S. utilities, PSE&G announced that they used data and maps from our Street View mapping effort to prioritize the replacement of gas mains, as part of their approved multi-million dollar pipeline replacement program. This enabled them to reduce methane emissions from targeted areas by 83 percent, by replacing 35 percent fewer miles of pipe than if the utility had not used the data.
Product	Nest Learning Thermostat	Avoided emissions	Other: Avoided emissions represent the third party's Scope 1 and/or Scope 2 emissions			The Nest Learning Thermostat 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. In 2016, we added another energy saving service called Time of Savings, where Nest helps customers make the most of their energy company’s Time of Use plan, automatically

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
			.			(https://nest.com/blog/2016/06/21/its-time-for-time-of-savings/). We also introduced Eco Temperatures to give customers another option to save energy, even when they're home (https://nest.com/blog/2016/10/17/say-hello-to-eco-temperatures/). 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
Product	Makani	Avoided emissions	Other: 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/
Company-wide	Other: Alphabet and Google offer many products and services in addition to those	Low carbon product	Other: Our own methodology			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 to 5 years ago,

Level of aggregation	Description of product/Group of products	Are you reporting low carbon product/s or avoided emissions?	Taxonomy, project or methodology used to classify product/s as low carbon or to calculate avoided emissions	% revenue from low carbon product/s in the reporting year	% R&D in low carbon product/s in the reporting year	Comment
	mentioned above, including Search, Chrome, Android, Play, Travel, Translate, Payments, Fiber, Photos, and YouTube. There are currently over 1.4 billion 30-day active Android users around the world. 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.					our infrastructure can now deliver over 3.5 times as much compute power for the same amount of energy.

CC3.3

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

Yes

CC3.3a

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

Stage of development	Number of projects	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	0	
To be implemented*	4	221
Implementation commenced*	0	0
Implemented*	43	432
Not to be implemented	3	

CC3.3b

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

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/ Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the initiative	Comment
Energy efficiency: Building services	Energy efficiency projects in our San Francisco Bay area offices. In 2016, 29 individual projects were implemented.	18	Scope 2 (market-based)	Voluntary					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).
Energy efficiency: Building services	Ongoing implementation of 7 multi-year energy efficiency projects in our New York office as part of the NYC Carbon Challenge. In 2016, significant progress was made on each of these projects.	366	Scope 1 Scope 2 (market-based)	Voluntary	1271792	11783107	4-10 years	21-30 years	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).
Energy efficiency: Building services	Small pilot to upgrade fluorescent fixtures to LEDs with smart controls at our Iowa data center.	11	Scope 2 (market-based)	Voluntary	4000	13000	4-10 years	16-20 years	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

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/ Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the initiative	Comment
									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).
Energy efficiency: Building services	Replace two-stage filtration with single-stage filtration for rooftop HVAC units at our Iowa data center.	16	Scope 2 (market-based)	Voluntary	150000	0	1-3 years	11-15 years	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).
Energy efficiency: Building services	Reduce generator heating operating hours at two data center sites by working with manufacturer to reduce coolant set point temperatures.	20	Scope 2 (market-based)	Voluntary			<1 year	Ongoing	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).

Activity type	Description of activity	Estimated annual CO2e savings (metric tonnes CO2e)	Scope	Voluntary/ Mandatory	Annual monetary savings (unit currency - as specified in CC0.4)	Investment required (unit currency - as specified in CC0.4)	Payback period	Estimated lifetime of the initiative	Comment
									Payback periods are post-incentive (they do incorporate any potential rebates earned).

CC3.3c

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.

CC3.3d

If you do not have any emissions reduction initiatives, please explain why not

Further Information

Page: CC4. Communication

CC4.1

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

Publication	Status	Page/Section reference	Attach the document	Comment
In mainstream reports (including an integrated report) but have not used the CDSB Framework	Complete	Pages 6, 14	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/20161231_alphabet_10K.pdf	In our 10-K for the fiscal year ended December 31, 2016, we include applicable information in the following sections: - Page 6: Under 'PART I', ITEM 1. BUSINESS', subsection 'Other Items', we discuss climate change as a global challenge, including our commitment to improving our energy consumption, our long-term goal to reach 100% renewable energy, and our progress towards that goal - Page 14: Under 'ITEM 1A. RISK FACTORS', subsection 'Risks Related to Our Businesses and Industries', subsection 'Interruption or failure of our information technology and communications systems could hurt our ability to effectively provide our products and services, which could damage our reputation and harm our operating results.', we discuss the effects of climate change
In mainstream reports (including an integrated report) but have not used the CDSB Framework	Complete	Pages 1, 4, 58	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_google_annual_report.pdf	In our Annual Report for the fiscal year ended December 31, 2016, we include applicable information in the following sections: - Page 1: In PART I, ITEM 1. Business, subsection 'The power of machine learning', we mention how machine learning is showing great promise in helping us tackle big issues like data center energy efficiency. - Page 4: In ITEM 1. BUSINESS, subsection 'Other Items', we discuss climate change as a global challenge, including our commitment to improve our energy consumption; and our long term goal to reach 100% renewable energy for our operations that we expect to achieve in 2017. - Page 58: In 'NOTE 3. Non-Marketable Investments', subsection 'Non-Marketable Equity Investments', we discuss our renewable energy investments.
In voluntary communications	Complete	Pages 1-69	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_12_06 - Google-2016-environmental-report.pdf	Google's first comprehensive global Environmental Report, published December 6, 2016. This 72-page publication provides a detailed overview of our environmental strategy, including our goals and progress towards them. (https://static.googleusercontent.com/media/www.google.com/en//gre

Publication	Status	Page/Section reference	Attach the document	Comment
				en/pdf/google-2016-environmental-report.pdf)
In voluntary communications	Complete	Pages 1-5	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/Google Environment site - Approach.pdf	The approach page of Google's Environment website (environment.google), as of July 9, 2016. Google's Environment website provides many resources to learn more about our sustainability commitments and initiatives. For videos about our green initiatives, see: https://www.youtube.com/user/googlegreen/videos
In voluntary communications	Complete	Pages 1-4	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_12_06 - Urs letter 100 percent renewable.pdf	December 6, 2016 letter by Urs Hölzle '100% renewable is just the beginning', announcing that Google will achieve 100% renewable energy for our global operations in 2017 (https://environment.google/projects/announcement-100/)
In voluntary communications	Complete	Pages 1-13	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_12_06 - White paper_achieving-100-renewable-energy-purchasing-goal.pdf	Google white paper 'Achieving Our 100% Renewable Energy Purchasing Goal and Going Beyond', published December 6, 2016. (https://static.googleusercontent.com/media/www.google.com/en//green/pdf/achieving-100-renewable-energy-purchasing-goal.pdf)
In voluntary communications	Complete	Pages 1-9	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/Google Supplier Code of Conduct_Responsible Manufacturing.pdf	Google's Supplier Code of Conduct (http://www.google.com/about/company/responsible-manufacturing.html)
In other regulatory filings	Complete	Pages 1-10	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_01_21 - FINAL Google Federal Plan and MTR Comments.pdf	In January 2016, we filed comments on several CPP implementation tools. In particular, we commented on the Federal Implementation Plan, the Model Trading Rules, and the Clean Energy Incentive Program.
In voluntary communications	Complete	Pages 1-9	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_02_08 - Blog - Understanding our RE goal.pdf	Google Environment blog from February 8, 2016 'Understanding our goal: What it means to reach 100% renewable energy purchasing' (https://www.blog.google/topics/environment/google-green-blog-what-it-means-to-be_8/)
In other regulatory filings	Complete	Pages 1-28	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_02_10 - EC submission FINAL.pdf	Our February 10, 2016, comments submitted to the EU's 'Preparation of a new Renewable Energy Directive for the period after 2020'
In other regulatory filings	Complete	Pages 1-35	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_04_01 -	Amicus brief in support of the EPA's Clean Power Plan filed jointly in the U.S. Court of Appeals for the D.C. Circuit by Amazon, Apple, Google and Microsoft.

Publication	Status	Page/Section reference	Attach the document	Comment
			Major_tech_companies_amicus_brief_for_epa.pdf	
In other regulatory filings	Complete	Pages 1-69	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC4.1/2016_06_29 - Commercial Group Proposed Order.docx	On June 29, 2016, we filed comments as part of "The Commercial Group" in Georgia, advocating for a commercial and industrial customer renewable purchasing program. (See http://www.psc.state.ga.us/factsv2/Document.aspx?documentNumber=164263)

Further Information

Module: Risks and Opportunities

Page: CC5. Climate Change Risks

CC5.1

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

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

CC5.1a

Please describe your inherent risks that are driven by changes in regulation

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Carbon taxes	We have very few direct emissions of greenhouse gases, therefore we do not expect our operations to be directly impacted by climate policy in the US, nor do we expect to participate in any current or future compliance markets for carbon trading in the US. Google does, however, face the risk of increased costs of energy if a price on carbon is applied through legislation such as cap and trade (or other mechanisms such as taxation). To the extent that this price is passed on to us from a regulated entity, the cost of running our operations will increase. However, we already operate some of the most efficient data centers in the world, procure renewable power for our data centers, and generate onsite renewable energy at several of our offices, all of which reduce our exposure to this risk. In addition, we already include a shadow price for carbon in our data center siting analysis so we take this risk into account even before we build a data center. Finally, we are carbon-neutral through the purchase of high-quality carbon offsets, so in effect, we already include a carbon price in our operations. For example, in June 2015, we announced our first-ever data center to be located on the site of a coal plant being scheduled for shutdown: the Widows Creek site in Alabama (see: https://googleblog.blogspot.com/2015/06/a-power-plant-for-internet-our-	Increased operational cost	1 to 3 years	Indirect (Client)	Unlikely	Medium	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 ~$22M [= (2016 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.	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 2016, we achieved PUEs (power usage effectiveness	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.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	newest.html). In addition, we worked out an arrangement with the Tennessee Valley Authority to power the facility with 100% renewable energy from day 1. We did not announce any new data center sites in 2016.						The financial impact would likely be less as we already voluntarily purchase carbon offsets.	ratios) as low as 1.09, whereas industry standard is in the 1.5-2.0 range. 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	

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
								prices. In 2016, we announced 5 more renewable energy commitments to procure 598 additional MW of wind and solar power in Kansas, Sweden, Norway, and the Netherlands.	
Lack of regulation	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. Through the end of 2016, we also monitored the potential for an Executive Order that would direct the EPA to review the Clean Power Plan (CPP). We consider the CPP an important policy to bring renewable energy onto the grid,	Increased operational cost	1 to 3 years	Direct	More likely than not	Medium	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	We have been working directly with federal and state policymakers, NGOs, and others in industry to provide support for these policies	The costs of this engagement are headcount on our public policy team, travel costs for trips to states where renewable portfolio standards are under attack, and dues paid to national

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	particularly in markets where we have a data center presence but have limited access to purchase renewables.						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.		trade organizations.

CC5.1b

Please describe your inherent risks that are driven by changes in physical climate parameters

Risk driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Change in mean (average) temperature	Nature of the physical effect concerned: We must cool our data centers to keep them in operation, and the amount of energy needed for the cooling 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. Location of the physical effect concerned: 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, 2016, Google owned and operated 13 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	Increased operational cost	>6 years	Direct	Very likely	Low-medium	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 temper	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 2016, we achieved PUEs (power usage effectiveness ratios) as low as 1.09, whereas industry standard is in the 1.5-2.0 range. 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. For more information, see: - Google data center PUE performance: http://www.google.com/about/datacenters/efficiency/internal/ - 2014 Google white paper 'Machine Learning Applications for 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	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

Risk driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							ature 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 efficien		efficiency, reduce our emissions, and reduce our operational costs.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							cy. This would have a low-medium negative financial impact.		

CC5.1c

Please describe your inherent risks that are driven by changes in other climate-related developments

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Reputation	Disclosing and properly addressing	Reduced demand for goods/services	>6 years	Direct	About as likely as not	Medium	This risk driver could have a negative impact on	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	The costs associated with properly

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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						our brands. For example, the 2016 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $133 billion. Using Interbrand's estimated brand value, a hypothetical reputational risk resulting in a 0.1% decrease in brand value	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 2016, we entered into 5 more long-term renewable energy agreements which, together with our existing long-term contracts, provide over 2.6 GW of clean, renewable energy.	addressing climate change risks and impacts are the staff time to create and manage the associated projects.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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						could result in a loss of future brand equity of approximately $133 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.		

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	2016 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.								

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Fluctuating socio-economic conditions	Nature of the effect concerned: At Google, our innovations in search and advertising have made our website widely used and our brand one of the most recognized in the world. Google's revenue is largely based on search advertising. Advertisers	Reduced demand for goods/services	>6 years	Direct	Unlikely	Medium	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	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. For more information on our clean energy policy engagement, see our response to question CC2.3a.	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$M/year recurring operating

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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-						consumer economic activity. That said, we generated 89% ($79,383,000,000) of total Google segment revenues from advertising in 2016. If, for example, all online economic activity decreased by 1%, we could experience a commensurate reduction in our share of this activity.		expense.

Risk driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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.								

CC5.1d

Please explain why you do not consider your company to be exposed to inherent risks driven by changes in regulation that have the potential to generate a substantive change in your business operations, revenue or expenditure

CC5.1e

Please explain why you do not consider your company to be exposed to inherent risks driven by changes in physical climate parameters that have the potential to generate a substantive change in your business operations, revenue or expenditure

CC5.1f

Please explain why you do not consider your company to be exposed to inherent risks driven by changes in other climate-related developments that have the potential to generate a substantive change in your business operations, revenue or expenditure

Further Information

Page: CC6. Climate Change Opportunities

CC6.1

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

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

CC6.1a

Please describe your inherent opportunities that are driven by changes in regulation

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Fuel/energy taxes and regulations	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	Increased demand for existing products/services	1 to 3 years	Direct	About as likely as not	Medium	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	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	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.

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	cloud, which is highly efficient and operates under a 100% renewable energy goal. This could create additional demand for Google’s existing products and/or services.						yielded an unpredictable 0.1% increase in revenue, Google’s annual revenue could increase by approximately $90 million (based on FY 2016 revenue of $90 billion).	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	

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
								directly from wind farms near our data centers. In 2016, we entered into 5 more long-term renewable energy agreements which, together with our existing long-term contracts, provide over 2.6 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 running on renewable energy, Google is creating an alternative	

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
								solution for business that will be beneficial should regulation come forth, allowing our customers to hedge against future energy costs.	
Cap and trade schemes	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	Investment opportunities	1 to 3 years	Direct	About as likely as not	Medium-high	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 (NEF) estimates that $7 trillion will be spent through 2020 for renewable	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	As of the end of 2016, 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

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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						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	internal investment committee as well as from senior executives. We also have an asset management team for ongoing management of these investments.	of these investments.

Opportunity driver	Description	Potential impact	Timeframe	Direct/Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	same time making investments that have an attractive risk-adjusted return. We continue to look for opportunities for further investments around the globe.						renewable energy projects in both the US and overseas.		

CC6.1b

Please describe your inherent opportunities that are driven by changes in physical climate parameters

Opportunity driver	Description	Potential impact	Timeframe	Direct / Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
Induced changes in natural resources	Our products help drive carbon mitigation efforts and inform climate science. We see an opportunity to help raise awareness about the physical	Wider social benefits	Up to 1 year	Direct	Virtually certain	Medium	To date, Google Earth Engine has primarily been a philanthropic project	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	The main costs associated with our Earth Engine efforts are headcount,

Opportunity driver	Description	Potential impact	Timeframe	Direct / Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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						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.	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 and Google Maps 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: http://googleresearch.blogspot.com/2014/02/monitoring-worlds-forests-with-global.html). For more information on other similar engagements, see our response to question 2.3e.	software development, petabytes of data storage and the processing of this data (i.e. running scientific algorithms) in our data centers.

Opportunity driver	Description	Potential impact	Timeframe	Direct / Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	Earth may result in increased brand loyalty for Google.						For example, the 2016 Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $133 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 $133		

Opportunity driver	Description	Potential impact	Timeframe	Direct / Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							million via brand loyalty created by wider social benefits.		

CC6.1c

Please describe your inherent opportunities that are driven by changes in other climate-related developments

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
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	Increased demand for existing products /services	>6 years	Direct	About as likely as not	Medium	This opportunity driver could have a positive impact on our brands. For example, the 2016	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 more than 6,500 agencies, 3.5 million transit stations, and more than 20,000 cities and towns in 70 countries. 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,	The costs associated with properly addressing climate change

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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, Gmail, and Google Cloud Platform each have over 1 billion monthly active users. Addressing climate change opportunities head on could result in an increased demand for our goods and services by positively impacting our reputation. We own and lease additional office and building space, research and development labs, and sales and support offices across more than 150 cities primarily in North America, Europe, South America, and Asia, and we own and						Best Global Brands report, produced independently by Interbrand, estimates Google's brand value at approximately $133 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	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.	opportunities and impacts are the staff time to create and manage the associated projects.

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	operate 13 data centers across four continents. We will reach 100% renewable energy for our global operations in 2017, which could positively impact our reputation in regions where we operate.						approximately $133 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.		
Induced changes in human and cultural	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	Investment opportunities	Up to 1 year	Indirect (Client)	Very likely	Medium	IEA estimates that the world will spend $26 trillion over the next two	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	As of the end of 2016, Google had committed

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
environments	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						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	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.	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.

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	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.						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		

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							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		

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							investments.		
Changing consumer behavior	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 Transit, which provides public transit directions and walking and biking routes in Google Maps. As can be seen at www.google.com/transit, Google 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 more than 6,500	Increased demand for existing products/services	Up to 1 year	Direct	Very likely	Low-medium	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	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 2016. For agencies around the world, Google Maps is a cost-effective solution targeted at transit novices and seasoned travelers alike. We make Google Maps available in 69 different languages and it is compatible with screen readers for the visually impaired. We have made the Transit and Biking Directions on Google Maps feature available on selected mobile devices through Google Maps for mobile, and we have also included public transportation information in Google Earth. Google has a team of employees that manage Google Maps and Google Transit.	The main costs associated with our Google Transit efforts and Google Maps features are the team's headcount of engineers, product managers, and partner managers, as well as softwar

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
	transportation agencies, 3.5 million transit stations, bus stops, and ferry terminals, and more than 20,000 cities and towns in 70 countries. It provides over 1 billion km worth of transit results every day. Buses, trains, trams and subways included in Google Maps travel 200 million kilometers every day - that's the equivalent of driving every single road in the world three times. 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.						potentially translate into greater potential advertising revenue. We generated 89% ($79,383,000,000) of total Google segment revenues from advertising in 2016. If, for example, due to climate change, transit use increased 10% among Google Maps users, we would expect a commens		e development costs.

Opportunity driver	Description	Potential impact	Timeframe	Direct/ Indirect	Likelihood	Magnitude of impact	Estimated financial implications	Management method	Cost of management
							urate (though not necessarily proportional) increase in potential advertising revenue.		

CC6.1d

Please explain why you do not consider your company to be exposed to inherent opportunities driven by changes in regulation that have the potential to generate a substantive change in your business operations, revenue or expenditure

CC6.1e

Please explain why you do not consider your company to be exposed to inherent opportunities driven by changes in physical climate parameters that have the potential to generate a substantive change in your business operations, revenue or expenditure

CC6.1f

Please explain why you do not consider your company to be exposed to inherent opportunities driven by changes in other climate-related developments that have the potential to generate a substantive change in your business operations, revenue or expenditure

Further Information

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

Page: CC7. Emissions Methodology

CC7.1

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

Scope	Base year	Base year emissions (metric tonnes CO2e)
Scope 1	Thu 01 Jan 2009 - Thu 31 Dec 2009	10919
Scope 2 (location-based)	Thu 01 Jan 2009 - Thu 31 Dec 2009	1147991
Scope 2 (market-based)	Thu 01 Jan 2009 - Thu 31 Dec 2009	1147991

CC7.2

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

Please select the published methodologies that you use
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

CC7.2a

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

CC7.3

Please give the source for the global warming potentials you have used

Gas	Reference
CO2	Other: IPCC

CC7.4

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

Fuel/Material/Energy	Emission Factor	Unit	Reference
Other: Please see the attachments in the Further information section below.			EMISSIONS FACTORS Location-based Scope 2: Electricity: US regional emissions factors are from US EPA, Emissions & Generation Resource Integrated Database (eGRID) Eleventh edition with year 2014 data (Revised Release, version 2), released 2/27/2017; China and Taiwan emissions factors are from the Greenhouse Gas Protocol, GHG Protocol Calculation Tools, Emissions Factors Cross-Sector Tools (March 2017 version); Rest of World emissions factors are from the International Energy Agency (IEA), CO2 Emissions from Fuel Combustion (2016 edition) (2014 data) CO2 per kWh of electricity purchased from IEA. Market-based Scope 2: Residual mix is only available for the EU countries: European Residual Mixes 2015, Reliable Disclosure Systems for Europe – Phase II (RE-DISS II); for the other geographies, we used the same emissions factors as for the location-based category. All other factors: All other emissions factors are pulled from the Greenhouse Gas Protocol, GHG Protocol Calculation Tools, Emissions Factors Cross-Sector Tools (March 2017 version)

Further Information

EMISSIONS FACTORS Location-based Scope 2: Electricity: US regional emissions factors are from US EPA, Emissions & Generation Resource Integrated Database (eGRID) Eleventh edition with year 2014 data (Revised Release, version 2), released 2/27/2017; China and Taiwan emissions factors are from the Greenhouse Gas Protocol, GHG Protocol Calculation Tools, Emissions Factors Cross-Sector Tools (March 2017 version); Rest of World emissions factors are from the International Energy Agency (IEA), CO2 Emissions from Fuel Combustion (2016 edition) (2014 data) CO2 per kWh of electricity purchased from IEA. Market-based Scope 2: Residual mix is only available for the EU countries: European Residual Mixes 2015, Reliable Disclosure Systems for Europe – Phase II (RE-DISS II); for the other geographies, we used the same emissions factors as for the location-based category. All other factors: All other emissions factors are pulled from the Greenhouse Gas Protocol, GHG Protocol Calculation Tools, Emissions Factors Cross-Sector Tools (March 2017 version)

Attachments

https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/ClimateChange2017/CC7.EmissionsMethodology/Q7.4_AIB_2015_Residual_Mix_Results_FINAL_2016-05-13v2.pdf
https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/ClimateChange2017/CC7.EmissionsMethodology/Q7.4_eGRID2014_SummaryTables_v2.pdf
https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/ClimateChange2017/CC7.EmissionsMethodology/Q7.4_Emission_Factors_from_Cross_Sector_Tools_March_2017.xlsx

https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/ClimateChange2017/CC7.EmissionsMethodology/Q7.4_IEA CO2kWh Data.xlsx

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

CC8.1

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

Operational control

CC8.2

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

66218

CC8.3

Please describe your approach to reporting Scope 2 emissions

Scope 2, location-based	Scope 2, market-based	Comment
We are reporting a Scope 2, location-based figure	We are reporting a Scope 2, market-based figure	

CC8.3a

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

Scope 2, location-based	Scope 2, market-based (if applicable)	Comment
2902554	1518643	

CC8.4

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

Yes

CC8.4a

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

Source	Relevance of Scope 1 emissions from this source	Relevance of location-based Scope 2 emissions from this source	Relevance of market-based Scope 2 emissions from this source (if applicable)	Explain why the source is excluded
Non-CO2 sources of emissions are excluded from the chemical boundary	Emissions are not relevant	Emissions are not relevant	Emissions are not relevant	Other chemicals such as methane (CH4) and nitrous oxide (N2O) are considered negligible to our operations and were excluded from the chemical boundary.

CC8.5

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

Scope	Uncertainty range	Main sources of uncertainty	Please expand on the uncertainty in your data
Scope 1	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	Alphabet's Scope 1 emissions come primarily from vehicles and equipment where direct metering is not feasible. Instead, we rely on a combination of fuel records and assumptions, which results in a small amount of uncertainty. Our quantitative assessment of the amount of uncertainty (less than or equal to 5%) is based on the materiality applied to our independent verification, not based on analysis of each source of uncertainty.
Scope 2 (location-based)	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	A small amount of Alphabet's location-based Scope 2 emissions comes from sources where direct metering is not feasible. Instead, we rely on some assumptions, which results in a small amount of uncertainty overall. Our quantitative assessment of the amount of uncertainty (less than or equal to 5%) is based on the materiality applied to our independent verification, not based on analysis of each source of uncertainty.
Scope 2 (market-based)	More than 2% but less than or equal to 5%	Assumptions Metering/ Measurement Constraints	A small amount of Alphabets's market-based Scope 2 emissions comes from sources where direct metering is not feasible. Instead, we rely on some assumptions, which results in a small amount of uncertainty overall. Our quantitative assessment of the amount of uncertainty (less than or equal to 5%) is based on the materiality applied to our independent verification, not based on analysis of each source of uncertainty.

CC8.6

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

Third party verification or assurance process in place

CC8.6a

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

Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/section reference	Relevant standard	Proportion of reported Scope 1 emissions verified (%)
Annual process	Complete	Limited assurance	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC8.6a/CDP Verification Letter_Alphabet CY2016.pdf	Pages 1 to 4	ISO14064-3	100

CC8.6b

Please provide further details of the regulatory regime to which you are complying that specifies the use of Continuous Emission Monitoring Systems (CEMS)

Regulation	% of emissions covered by the system	Compliance period	Evidence of submission

CC8.7

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

Third party verification or assurance process in place

CC8.7a

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

Location-based or market-based figure?	Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 2 emissions verified (%)
Location-based	Annual process	Complete	Limited assurance	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC8.7a/CDP Verification Letter_Alphabet CY2016.pdf	Pages 1 to 4	ISO14064-3	100
Market-based	Annual process	Complete	Limited assurance	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC8.7a/CDP Verification Letter_Alphabet CY2016.pdf	Pages 1 to 4	ISO14064-3	100

CC8.8

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

Additional data points verified	Comment
Other: Carbon dioxide emissions from biologically sequestered carbon (CC8.9a)	Verification and assurance details are the same as those referenced in our response to question CC8.7a

CC8.9

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

Yes

CC8.9a

Please provide the emissions from biologically sequestered carbon relevant to your organization in metric tonnes CO2

9480

Further Information

Page: CC9. Scope 1 Emissions Breakdown - (1 Jan 2016 - 31 Dec 2016)

CC9.1

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

Yes

CC9.1a

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

Country/Region	Scope 1 metric tonnes CO2e
United States of America	54646
Rest of world	11572

CC9.2

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

CC9.2a

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

Business division	Scope 1 emissions (metric tonnes CO2e)

CC9.2b

Please break down your total gross global Scope 1 emissions by facility

Facility	Scope 1 emissions (metric tonnes CO2e)	Latitude	Longitude

CC9.2c

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

GHG type	Scope 1 emissions (metric tonnes CO2e)

CC9.2d

Please break down your total gross global Scope 1 emissions by activity

Activity	Scope 1 emissions (metric tonnes CO2e)

Further Information

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

CC10.1

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

Yes

CC10.1a

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

Country/Region	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low carbon electricity, heat, steam or cooling accounted in market-based approach (MWh)
United States of America	2321921	874355		
Rest of world	580633	644288		

CC10.2

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

CC10.2a

Please break down your total gross global Scope 2 emissions by business division

Business division	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)

CC10.2b

Please break down your total gross global Scope 2 emissions by facility

Facility	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)

CC10.2c

Please break down your total gross global Scope 2 emissions by activity

Activity	Scope 2, location-based (metric tonnes CO2e)	Scope 2, market-based (metric tonnes CO2e)

Further Information

Page: CC11. Energy

CC11.1

What percentage of your total operational spend in the reporting year was on energy?

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

CC11.2

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

Energy type	MWh
Heat	0
Steam	0
Cooling	0

CC11.3

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

304528

CC11.3a

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

Fuels	MWh
Biodiesels	85887
Diesel/Gas oil	24791
Jet kerosene	19592
Landfill gas	12076
Motor gasoline	35582
Natural gas	126599

CC11.4

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

Basis for applying a low carbon emission factor	MWh consumed associated with low carbon electricity, heat, steam or cooling	Emissions factor (in units of metric tonnes CO2e per MWh)	Comment
Off-grid energy consumption from an on-site installation or through a direct line to an off-site generator owned by another company	6108	0	We have various on-site renewable installations in place at our offices globally. These facilities include landfill gas and solar PV. All power is consumed on-site.
Direct procurement contract with a grid-connected generator or Power Purchase Agreement (PPA), supported by energy attribute certificates	2811805	0	This green power comes from 12 large, long-term power purchase agreements or contracts we've signed in the US (8) and in Europe (4). We categorize these as "Other" since we purchase power and RECs from the same supplier (so not "tracking instruments"), because we manage the RECs (so not "supplier specific"), and because they are backed by instruments (so not "PPAs not backed by instruments). For all the US projects, we receive the green-e eligible RECs and retire them. In Europe, the guarantees of origin (GOs) are transferred to our accounts and left to expire, because the retirement cannot be completed if the power is not consumed in the same country where it is generated (for instance, we have PPAs in Sweden and the consumption occurs in Finland). For more information on these contracts, please see https://environment.google/resources/

CC11.5

Please report how much electricity you produce in MWh, and how much electricity you consume in MWh

Total electricity consumed (MWh)	Consumed electricity that is purchased (MWh)	Total electricity produced (MWh)	Total renewable electricity produced (MWh)	Consumed renewable electricity that is produced by company (MWh)	Comment
6209191	6202265	6927	6108	6108	

Further Information

Page: CC12. Emissions Performance

CC12.1

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

Increased

CC12.1a

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

Reason	Emissions value (percentage)	Direction of change	Please explain and include calculation
Emissions reduction activities	22	Decrease	The impact of emission reduction activities in 2016 is an 22% reduction compared to the emissions we reported last year. In 2016, emissions reduction activities accounted for a large share of our emission reductions, primarily from two activities -- (1) In 2016, our green power purchases (in excess of our 2015 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

Reason	Emissions value (percentage)	Direction of change	Please explain and include calculation
			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 2016, our additional renewable power purchases (in excess of our 2015 renewable power purchases) (317,899 tCO2e) and our energy efficiency efforts (432 tCO2e) together resulted in an additional reduction of 312,975 tCO2e beyond our 2015 emissions reduction activities. In 2015, our total Scope 1 and market-based Scope 2 emissions were 1,451,418 tCO2e. Therefore we arrived at 22% as follows: [(317,899+432)/1,415,418]*100= 22%. We also continued to make improvements in our PUE, though our average PUE for 2016 was 1.12, which is unchanged from 2015. 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.
Divestment			
Acquisitions			
Mergers			
Change in output	9	Increase	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 2015 to 2016 reported data, growth of our business created a 9% increase in our emissions compared to the emissions we reported last year. This change in output was calculated by taking our 2016 Scope 1 and market-based Scope 2 emissions minus the 2015 Scope 1 and market-based Scope 2 emissions, divided by the 2015 Scope 1 and market-based Scope 2 emissions, then multiplied by 100. This percent change would be a 18% increase if this figure were calculated using our location-based Scope 2 emissions.
Change in methodology			
Change in boundary			
Change in physical operating conditions			
Unidentified			
Other			

CC12.1b

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

Market-based

CC12.2

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

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator: Unit total revenue	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
0.00001756	metric tonnes CO2e	90272000000	Market-based	9.29	Decrease	The primary reason for this decrease is emissions reduction activities associated with our aggressive procurement of renewables, which we significantly increased in 2016 as compared to 2015. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that at least 50% of this decrease can be attributed to our additional procurement of renewables in 2016 (above that in 2015). 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://environment.google/projects/machine-learning/).

CC12.3

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

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator	Metric denominator: Unit total	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
23.4	metric tonnes CO2e	full time equivalent (FTE) employee	67848	Market-based	6.43	Decrease	The primary reason for the decrease in our FTE employee intensity figure is emissions reduction activities associated with our aggressive procurement of renewables, which we significantly increased in 2016 as compared to 2015. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that at least 50% of this decrease can be attributed to our additional procurement of renewables in 2016 (above that in 2015). 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 2016 Scope 1 and market-based Scope 2 emissions divided by our average 2016 headcount.
0.227	metric tonnes CO2e	megawatt hour (MWh)		Market-based	6.23	Decrease	(This answer is the same as our answer to question 6.3 in the ICT module and relates to our defined additional activity of data centers.) The primary reason for the decrease in our MWh intensity figure is emissions reduction activities associated with our aggressive procurement of renewables, which we significantly increased in 2016 as compared to 2015. As a large and complex multi-national company, it's impossible to determine the exact cause of emissions reductions, but we estimate that at least 50% of this decrease can be attributed to our additional procurement of renewables in 2016 (above that in 2015). In addition, we continue to deliver more and better services and products to more users using less energy and fewer emissions, as well

Intensity figure =	Metric numerator (Gross global combined Scope 1 and 2 emissions)	Metric denominator	Metric denominator: Unit total	Scope 2 figure used	% change from previous year	Direction of change from previous year	Reason for change
							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 2016 market-based Scope 2 emissions of our data centers divided by the 2016 electricity consumption at our data centers.

Further Information

Page: CC13. Emissions Trading

CC13.1

Do you participate in any emissions trading schemes?

Yes

CC13.1a

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

Scheme name	Period for which data is supplied	Allowances allocated	Allowances purchased	Verified emissions in metric tonnes CO2e	Details of ownership
European Union ETS	Fri 01 Jan 2016 - Sat 31 Dec 2016	0	1085	1068	Facilities we own and operate

Scheme name	Period for which data is supplied	Allowances allocated	Allowances purchased	Verified emissions in metric tonnes CO2e	Details of ownership

CC13.1b

What is your strategy for complying with the schemes 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.

CC13.2

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

Yes

CC13.2a

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

Credit origination or credit purchase	Project type	Project identification	Verified to which standard	Number of credits (metric tonnes CO2e)	Number of credits (metric tonnes CO2e): Risk adjusted volume	Credits canceled	Purpose, e.g. compliance
Credit purchase	Landfill gas	Berkeley County Landfill Gas Project (CAR574)	CAR (The Climate Action Reserve)	10744	10744	Yes	Voluntary Offsetting

Further Information

Page: CC14. Scope 3 Emissions

CC14.1

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

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Purchased goods and services	Relevant, calculated	0	These emissions were estimated using supplier inputs, life cycle inventory (LCI) and environmentally-extended input output (EEIO) datasets. The quality of the estimate is likely moderate, given that as the LCI datasets and EEIO sector averages might not be fully representative of the technology and geography, there might be a lack of specificity in both the process-based data and in the		We are not breaking this data out specifically for business reasons. The total is included in the "Other" category below.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
			EEIO methodology. For data obtained from our top suppliers, we worked closely with them to validate the information and allocate their impacts to our business. We primarily used financial based allocation but in some cases we allocated based on capacity.		
Capital goods	Relevant, calculated	0	For hardware manufacturing, we performed an analysis of hardware components added to our fleet using a streamlined model based on environmentally-extended input output (EEIO) data, life cycle inventory and also using data provided directly by our key suppliers. For allocation we used primarily revenue based allocation though in some instances we allocated their broader emissions based on capacity. To estimate data center construction emissions 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.		We are not breaking this data out specifically for business reasons, to protect competitive information. Instead, we provide the value as part of the "Other" category below.
Fuel-and-energy-related activities (not included in Scope 1 or 2)	Not relevant, calculated	0	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.		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	Relevant, calculated	0	We estimated upstream transportation and distribution emissions by extrapolating 2015 logistics emissions using hardware deployment data and emissions associated with the transport of our sold products (calculated through our LCA studies conducted in		We are not breaking this data out specifically for business reasons, to protect competitive information. Instead, we provide the value as part of the "Other" category below.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
			conformance with ISO 14040). Due to limited collection of transportation data, the estimates are of only moderate quality.		
Waste generated in operations	Not relevant, explanation provided		For the emissions associated with waste generated in our operations, we performed an analysis using our annual spend and annual waste generation, and used life cycle inventories and EEIO datasets to estimate the total emissions. Overall, the data quality is estimated to be low, as the LCI and EEIO datasets might not be fully representative of the geographies and technologies used in the counties and municipalities where we operate.		Emissions associated with waste from our operations were estimated to be de minimis relative to our overall footprint.
Business travel	Relevant, calculated	202383	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.		
Employee commuting	Relevant, calculated	111644	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.		

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Upstream leased assets	Relevant, calculated	14077	For onsite fuel consumption in leased buildings, we estimated our emissions by taking the square footage of our leased space and multiplying it by standard office fuel usage and emissions factors from 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	Relevant, calculated		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.		We are not breaking out most of the Scope 3 categories due to business reasons, to protect competitive information.
Processing of sold products	Not relevant, explanation provided				We do not sell intermediate goods that require further processing.
Use of sold products	Not relevant, explanation provided				Given the small size of our product portfolio, emissions associated with use of sold products were estimated to be de minimis relative to our overall footprint.
End of life treatment of sold products	Not relevant, explanation provided		We have begun to calculate emissions associated with the end-of-life treatment of sold products through our life cycle assessment process and will continue to expand this assessment over time. Our initial assessments identify this category to be one that does a not have significant impact. We continue to develop programs to extend the life of our products and also to ensure efficient management of end-of-life materials.		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.

Sources of Scope 3 emissions	Evaluation status	metric tonnes CO2e	Emissions calculation methodology	Percentage of emissions calculated using data obtained from suppliers or value chain partners	Explanation
Downstream leased assets	Not relevant, explanation provided				We do not have any significant activity leasing assets to other organizations.
Franchises	Not relevant, explanation provided				We do not have franchises.
Investments	Not relevant, explanation provided				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)	Not relevant, explanation provided				We are not breaking this data out specifically for business reasons, to protect competitive information. Instead, any emissions in this Other (upstream) category are provided as part of the "Other (downstream)" category below.
Other (downstream)	Relevant, calculated	964163	The methodology for tracking these emissions was described in previous line items, where we note in the explanation that the emissions are included in this "Other" category for business reasons.		As mentioned above, we are not breaking out most of the Scope 3 categories due to business reasons, to protect competitive information. This category includes both upstream and downstream emissions.

CC14.2

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

Third party verification or assurance process in place

CC14.2a

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

Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Attach the statement	Page/Section reference	Relevant standard	Proportion of reported Scope 3 emissions verified (%)
Annual process	Complete	Limited assurance	https://www.cdp.net/sites/2017/16/7616/Climate Change 2017/Shared Documents/Attachments/CC14.2a/CDP Verification Letter_Alphabet CY2016.pdf	Pages 1 to 4	ISO14064-3	10

CC14.3

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

Yes

CC14.3a

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

Sources of Scope 3 emissions	Reason for change	Emissions value (percentage)	Direction of change	Comment
Employee commuting	Change in output	6	Decrease	As our company grows, so do our employee commuting emissions. We continue to work to drive down these emissions through aggressive transportation programs designed to get employees out of single occupancy vehicles. Google shuttles and corporate electric vehicles result in net annual savings of 33,000+ metric tons of CO2, equivalent to taking 6,500 cars off the road or avoiding 95M vehicle miles every year. Google is committed to reducing single occupancy vehicle commuting in our Bay Area headquarters to 45%, transitioning our employees to shuttles, carpool, public transit, biking, and walking, and setting a new standard for vehicle reduction in a suburban office park. In 2016, our total emissions from employee commuting decreased by 6% while our total FTEs increased by 17%. This is a result of programs we've implemented, including but not limited to increased usage of biofuels, decreased single-occupancy vehicle usage, and increased shuttle ridership.

CC14.4

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

Yes, our suppliers
Yes, our customers
Yes, other partners in the value chain

CC14.4a

Please give details of methods of engagement, your strategy for prioritizing engagements and measures of success

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. We will be increasing our efforts in this area going forward. Our Supplier Code of Conduct can be found here: http://www.google.com/about/company/responsible-manufacturing.html
1. Description of engagement: 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 have worked with our suppliers to develop their capacity to report and minimize their greenhouse gas emissions. We gather data directly from our most strategic suppliers on their environmental impacts.

2. Strategy for prioritization and 3. how success is measured: 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. We have expanded the number and detail of the LCAs we conduct on our products, and use other inputs such as primary data and EIO modeling to verify data, refine allocations and continually improve our analysis. This data is used to prioritize by supplier, by commodity, and by region. Success is measured by the following methods: % of surveyed suppliers reporting that they track and report GHG emissions (>80%), % of surveyed suppliers reporting reduction targets (>75%) and the number of audited suppliers who have some environmental reduction or efficiency targets (>95%).

CC14.4b

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

Type of engagement	Number of suppliers	% of total spend (direct and indirect)	Impact of engagement
Active engagement	400	95%	Spend is calculated based on our purchase orders with suppliers providing manufacturing services or products. We engage with our suppliers to identify GHG sources to prioritize for reduction actions. Many of our suppliers have robust programs to manage their greenhouse gas emissions. We work with our suppliers to understand their environmental impacts through surveys, onsite audits and direct engagement with our suppliers. Through our Supplier Code of Conduct, we have requirements for suppliers to drive resource efficiency and through our audits we gather data about their programs. In terms of impact, of our 400 suppliers, >80% report that they track and report GHG emissions and of our 131 audited suppliers >95% have environmental reduction or efficiency targets. Success is measured by the following methods: % of surveyed suppliers reporting that they track and report GHG emissions (>80%), % of surveyed suppliers reporting reduction targets (>75%) and the number of audited suppliers who have some environmental reduction or efficiency targets (>95%). 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. Our supplier engagement has enabled us to improve our climate change strategy in several ways. For example, by working to reduce air travel (and thus emissions) in our transportation logistics. Our Supplier Code of Conduct can be found here: http://www.google.com/about/company/responsible-manufacturing.html

CC14.4c

Please explain why you do not engage with any elements of your value chain on GHG emissions and climate change strategies, and any plans you have to develop an engagement strategy in the future

Further Information

Module: Sign Off

Page: CC15. Sign Off

CC15.1

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

Name	Job title	Corresponding job category
Joseph Kava	Vice President, Google Data Centers	Other: Vice President, Data Centers

Further Information

Module: ICT

Page: ICT1. Data center activities

ICT0.1a

Please identify whether "data centers" comprise a significant component of your business within your reporting boundary

Yes

ICT1.1

Please provide a description of the parts of your business that fall under “data centers”

Google’s data centers are the heart of our company, powering products like Search, Gmail, and YouTube for billions of people around the world, 24/7. We own and operate 13 data centers on four continents and continue to add new sites. For more than a decade, 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.
Our data centers use 50% less energy than typical data centers. To achieve this, we first outfit each data center with high-performance servers that we’ve custom designed to use as little energy as possible. We improve facility energy use by installing smart temperature and lighting controls and redesigning how power is distributed to reduce energy loss. We employ advanced cooling techniques, relying primarily on energy-efficient evaporative cooling and using non-potable water whenever possible. Finally, we apply machine learning to drive energy efficiency even further.

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. Research from the Lawrence Berkeley National Laboratory suggests that if all office workers in the United States moved their email and documents to the cloud, it would reduce IT energy use by up to
87%—enough to power the city of Los Angeles for one year. Beyond the general environmental benefits of cloud computing, the Google Cloud is particularly resource efficient. Providing an active user one month of Google services creates about the same amount of GHG emissions as driving a car
one mile. A business using Gmail can reduce the GHG emissions impact of its email service by up to 98% compared with running email on local servers.

To learn more about Google's data centers, see https://www.google.com/about/datacenters/. To learn more about our data center efficiency initiatives, see https://www.google.com/about/datacenters/efficiency/ and pages 12-24 and 55 of our Environmental report (https://environment.google/projects/environmental-report-2016/).

ICT1.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the data centers component of your business

Business activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment
Data centers					

ICT1.3

What percentage of your ICT population sits in data centers where Power Usage Effectiveness (PUE) is measured on a regular basis?

Percentage	Comment

Percentage	Comment
95%	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/green/efficiency/datacenters/ We track PUE in all large Google owned and operated data centers, which account for the vast majority of our IT gear. However, PUE may not be tracked in some smaller facilities that we use but do not own and/or operate.

ICT1.4

Please provide a Power Usage Effectiveness (PUE) value for your data center(s). You can provide this information as (a) an average, (b) a range or (c) by individual data center - please tick the data you wish to provide (tick all that apply)

Average

ICT1.4a

Please provide your average PUE across your data centers

Number of data centers	Average PUE	% change from previous year	Direction of change	Comment
	1.12	0	No change	The average annual PUE for our global fleet of data centers was 1.12 for 2016. Our PUE figures include data from facilities that meet our 5 MW threshold for reporting and have been in operation for at least 6 months, since these typically represent our stable operations. For more information on PUE of our data centers, see: http://www.google.com/about/datacenters/efficiency/internal/#tab0=1

ICT1.4b

Please provide the range of PUE values across your data centers

Number of data centers	PUE Minimum Value	% change of PUE Minimum Value from previous year	PUE Maximum Value	% change of PUE Maximum Value from previous year	Direction of change	Comment

ICT1.4c

Please provide your PUE values of all your data centers

Data center reference	PUE value	% change from previous year	Direction of change	Comment

ICT1.5

Please provide details of how you have calculated your PUE value

Green Grid, or Total Facility Power divided by IT Equipment Power

ICT1.6

Do you use any alternative intensity metrics to assess the energy or emissions performance of your data center(s)?

Yes

ICT1.6a

Please provide details on the alternative intensity metrics you use to assess the energy or the emissions performance of your data center(s)

In addition to monitoring the overall efficiency of the data center, we monitor the efficiency of each of the components that make up the data center infrastructure, as well as the efficiency of our ICT equipment. As a rule of thumb, we monitor energy in and energy out all along the power chain. If values go outside set parameters, we investigate the cause and set things right. For our ICT gear, we track utilization as well as work output.

ICT1.7

Please identify the measures you are planning or have undertaken in the reporting year to increase the energy efficiency of your data center(s)

Status in reporting year	Energy efficiency measure	Comment
Implemented	Other	We have conducted in-depth research on data center design to maximize energy efficiency. For more information, see: https://www.google.com/about/datacenters/efficiency/internal/#tab0=1
Implemented	Other	We have many efficiency projects that are planned or in various stages of implementation. For more information, see our responses to questions 3.3a and 3.3b of the regular CDP questionnaire.

ICT1.8

Do you participate in any other data center efficiency schemes or have buildings that are sustainably certified or rated?

Yes

ICT1.8a

Please provide details on the data center efficiency schemes you participate in or the buildings that are sustainably certified or rated

Scheme name	Level/certification (or equivalent) achieved in the reporting year	Percentage of your overall facilities to which the scheme applies
Other: ISO 50001	Google has a strong commitment to energy efficiency and maintains a corporate, multi-site external certification to the ISO 50001 Energy Management standard. This certificate applies to all of our owned and operated data centers in the United States, Europe, and Asia-Pacific. We are the only major internet services company to obtain and maintain this certification throughout their data center fleet. In 2013, Google became the first company in North America to achieve a multi-site ISO 50001 energy management system (EnMS) certificate. In 2016, our external EnMS audit confirmed that we have a comprehensive EnMS at our data centers with a strong energy policy, a robust internal auditing program, ambitious energy performance improvement objectives and targets, and an effective program to continually monitor, assess, and respond to energy performance. (See:	

Scheme name	Level/certification (or equivalent) achieved in the reporting year	Percentage of your overall facilities to which the scheme applies
	http://googlegreenblog.blogspot.com/2013/07/pushing-our-energy-performance-even.html and http://googlepolicyeurope.blogspot.com/2014/04/improving-our-data-centre-energy.html).	

ICT1.9

Do you measure the utilization rate of your data center(s)?

Yes

ICT1.9a

What methodology do you use to calculate the utilization rate of your data center(s)?

We monitor the utilization of IT resources such as server CPU and RAM, as well as the utilization of physical resources such as power and cooling capacity.

ICT1.10

Do you provide carbon emissions data to your clients regarding the data center services they procure?

Yes

ICT1.10a

How do you provide carbon emissions data to your clients regarding the data center services they procure?

We publish annual information on our most recent carbon footprint, our renewable energy purchases, our CO2 footprint before offsets, and our zero CO2 footprint after offsets in our annual environmental report (see https://environment.google/projects/environmental-report-2016/). We publish additional information on our

environmental initiatives on our public environmental site (https://environment.google/).

We have calculated that, for a hypothetical active Google user, the CO2 emissions (before offsets) associated with one month of using Google services is roughly equivalent to the CO2 emissions from driving a car one mile. After you factor in our renewable energy and offsets, the CO2 footprint of using Google services is zero.

Information on Google's data centers and how we drive efficiency can be found on Google's Data Centers web site (https://www.google.com/about/datacenters/efficiency/index.html) and in pages 12-24 and 55 of Google's Environmental Report (https://environment.google/projects/environmental-report-2016/).

In addition, Google has published or supported publicly available papers on the energy efficiency of digital services, including:
- 2011 Google paper on Gmail efficiency, '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 Google paper on Google Apps efficiency, '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
- 2013 Lawrence Berkeley National Laboratory paper on cloud software efficiency. This study was supported by Google, but the results are for generic cloud services that are not specific to Google. 'The Energy Efficiency Potential of Cloud-Based Software: A U.S. Case Study':
http://crd.lbl.gov/assets/pubs_presos/ACS/cloud_efficiency_study.pdf

ICT1.11

Please describe any efforts you have made to incorporate renewable energy into the electricity supply to your data center(s) or to re-use waste heat

Google's goal is to achieve 100% renewable energy for our operations and we've made great strides towards this. In 2016, we procured enough renewable energy to cover 57% of our operations and we are currently the largest cumulative corporate purchaser of renewable energy in the world. As of Dec 31, 2016, we've signed 20 contracts to purchase over 2.6 gigawatts of renewable energy (equivalent to taking nearly 1.2 million cars off the road) and with which we expect to reach 100% renewable energy in 2017.

To achieve our goal, we're buying renewable electricity directly from wind and solar farms around the world through Power Purchase Agreements (PPAs), and we're also working with our utility partners to make more renewable energy available to us and others through renewable energy tariffs and bilateral contracts. We hold ourselves to the highest standards when purchasing clean power. First, our contracts must create new sources of renewable power on the grid. Second, we purchase renewable energy in the same grid regions from which we're withdrawing power. And third, we purchase "bundled" energy and RECs, meaning the same quantity of energy and RECs at the same time.

For more details on our renewable energy purchases, see:
- Dec.6, 2016 announcement '100% renewable is just the beginning': https://environment.google/projects/announcement-100/
- Dec.6, 2016 Google Environment blog post 'We're set to reach 100% renewable energy — and it's just the beginning':
https://www.blog.google/topics/environment/100-percent-renewable-energy/
- Dec.6, 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

- Google’s Environmental Report, pages 25-41: https://environment.google/projects/environmental-report-2016/
- Sept.17, 2013 white paper on PPAs: https://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdfs/renewable-energy.pdf
- Apr.19, 2013 white paper on renewable energy tariffs: https://static.googleusercontent.com/media/www.google.com/en//green/pdf/renewable-energy-options.pdf

At some of our data centers, we re-use waste heat from the servers to provide heat to the office building. Air from the hot aisles in the datacenter, which would normally be exhausted outside, is instead drawn over an air-to-air heat exchanger, where it is used to heat up incoming fresh air for the office area. In this way, no additional source of heat, such as a natural gas boiler, is required to heat the office building.

Further Information

Page: ICT2. Provision of network/connectivity services

ICT0.1b

Please identify whether "provision of network/connectivity services" comprises a significant component of your business within your reporting boundary

ICT2.1

Please provide a description of the parts of your business that fall under "provision of network/connectivity services"

ICT2.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the provision of network/connectivity services component of your business

Business activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment

ICT2.3

Please describe your gross combined Scope 1 and 2 emissions or electricity use for the provision of network/connectivity services component of your business as an intensity metric

Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

ICT2.4

Please explain how you calculated the intensity figures given in response to Question ICT2.3

ICT2.5

Do you provide carbon emissions data to your clients regarding the network/connectivity services they procure?

ICT2.5a

How do you provide carbon emissions data to your clients regarding the network/connectivity services they procure?

Further Information

Page: ICT3. Manufacture or assembly of hardware/components

ICT0.1c

Please identify whether "manufacture or assembly of hardware/components" comprises a significant part of your business within your reporting boundary

ICT3.1

Please provide a description of the parts of your business that fall under "manufacture or assembly of hardware/components"

ICT3.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the manufacture or assembly of hardware/components part of your business

Business activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment

ICT3.3

Please identify the percentage of your products meeting recognized energy efficiency standards/specifications by sales weighted volume (full product range)

Product type	Standard (sleep mode)	Percentage of products meeting the standard by sales volume (sleep mode)	Standard (standby mode)	Percentage of products meeting the standard by sales volume (standby mode)	Standard (in use mode)	Percentage of products meeting the standard by sales volume (in use mode)	Comment

ICT3.4

Of the new products released in the reporting year, please identify the percentage (as a percentage of all new products in that product type category) that meet recognized energy efficiency standards/specifications

Product type	Standard (sleep mode)	Percentage of new products meeting the standard (sleep mode)	Standard (standby mode)	Percentage of new products meeting the standard (standby mode)	Standard (in use mode)	Percentage of new products meeting the standard (in use mode)	Comment

ICT3.5

Please describe the efforts your organization has made to improve the energy efficiency of your products

ICT3.6

Please describe the GHG emissions abatement measures you have employed specifically in your ICT manufacturing operations

ICT3.7

Do you provide carbon emissions data to your clients regarding the hardware/component products they procure?

ICT3.7a

How do you provide carbon emissions data to your clients regarding the hardware/component products they procure?

Further Information

Page: ICT4. Manufacture of software

ICT0.1d

Please identify whether "manufacture of software" comprises a significant component of your business within your reporting boundary

ICT4.1

Please provide a description of the parts of your business that fall under "manufacture of software"

ICT4.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the software manufacture component of your business

Business activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment

ICT4.3

Please describe your gross combined Scope 1 and 2 emissions for the software manufacture component of your business in metric tonnes CO2e per unit of production

Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

ICT4.4

What percentage of your software sales (by volume) is in an electronic format?

ICT4.5

Do you provide carbon emissions data to your clients regarding the software products they procure?

ICT4.5a

How do you provide carbon emissions data to your clients regarding the software products they procure?

Further Information

Page: ICT5. Business services (office based activities)

ICT0.1e

Please identify whether "business services (office based activities)" comprise a significant component of your business within your reporting boundary

ICT5.1

Please provide a description of the parts of your business that fall under "business services (office based activities)"

ICT5.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the business services (office based activities) component of your business

Business activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment

ICT5.3

Please describe your gross combined Scope 1 and 2 emissions for the business services (office based activities) component of your business in metric tonnes per square meter

Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

ICT5.4

Please describe your electricity use for the provision of business services (office based activities) component of your business in MWh per square meter

Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

Further Information

Page: ICT6. Other activities

ICT0.1f

Please identify whether "other activities" comprise a significant component of your business within your reporting boundary

ICT6.1

Please provide a description of the parts of your business that fall under "other"

ICT6.2

Please provide your absolute Scope 1 and 2 emissions and electricity consumption for the identified other activity component of your business

Activity	Scope 1 emissions (metric tonnes CO2e)	Scope 2 emissions (metric tonnes CO2e)	Annual electricity consumption (MWh)	Electricity data collection method	Comment

ICT6.3

Please describe your gross combined Scope 1 and 2 emissions for your defined additional activity using an appropriate activity based intensity metric

Activity	Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

ICT6.4

If appropriate, please describe your electricity use for your defined additional activity using an appropriate activity based intensity metric

Activity	Intensity figure	Metric numerator	Metric denominator	% change from previous year	Direction of change from previous year	Reason for change	Comment

Further Information