

June 3, 2022

To Stakeholders of Google Cloud Services:

3Degrees was engaged by Google to perform a review as described here, of the company's method for determining customer-specific greenhouse gas emissions associated with the usage of Google Cloud products. We conducted an initial review in October 2021 and a second review in April 2022 as Google updated and expanded its calculations. This letter applies to the product implementation as of Spring 2022, and encompasses relevant points of both reviews.

BOUNDARIES

The method we reviewed was developed by Google to enable the company to provide each Google Cloud customer with an estimate of the greenhouse gas emissions resulting from that customer's use of Google Cloud products.

Google Cloud products represent the company's business-to-business compute, storage, database, and application-serving offerings provided via a worldwide network of data centers and related network infrastructure. As used here, Google Cloud products do not include Google's other commercially-focused software-as-a-service products such as Google Workspace and Chrome Enterprise.

Google's customer-specific emissions method includes emissions arising from the following activities and infrastructure components as they relate to Google Cloud products:

- + Google Cloud Services electricity use, including that from Google-owned compute equipment as well as ancillary electricity services such as cooling and lighting, whether inside a Google-owned data center or a facility owned by others
- + Upstream lifecycle (embedded) emissions of data center equipment
- + Upstream lifecycle (embedded) emissions of data center buildings
- + Fossil fuels consumed onsite such as diesel for backup power, natural gas for heating, and fuels used in fleet vehicles
- + Business travel and commuting associated with employees who work at Google data centers

The methodology excludes other emissions, including those arising from the following activities:

- + Electricity generation that is subsequently lost during transmission and distribution
- + Extraction and transportation of fuels used to generate grid electricity, and the lifecycle emissions associated with the generation facilities and equipment
- + Fugitive emissions from refrigerants
- + Emissions arising from small equipment deployments at internet service providers
- + Google networking equipment deployed outside data centers
- + Downstream end-of-life treatment of data center equipment and facilities

CRITERIA FOR REVIEW

The review used the GHG Protocol *Corporate Accounting and Reporting Standard* including its *Scope 2 Guidance* document (“GHG Protocol”). Additional references include the GHG Protocol’s *Corporate Value Chain Accounting and Reporting Standard* and its *Technical Guidance for Calculating Scope 3 Emissions*. To account for emissions from electricity consumption, Google’s customer-specific emission method provides both location-based and market-based scope 2 accounting calculations as defined in the Scope 2 Guidance document.

To inform calculations concerning upstream embedded emissions, the GHG Protocol’s *Product Life Cycle Accounting and Reporting Standard* and its companion *Information and Communication Technology Sector Guidance* document were reviewed as relevant data points, though this review does not assess adherence to these separate standards.

SCOPE OF WORK

Google requested that we review the customer-specific emissions method for consistency with the GHG Protocol as noted above, as well as with our own professional view of the needs expressed by business customers when they seek emission disclosures from their suppliers.

3Degrees performed a detailed review in October 2021 and another in April 2022, in which we completed the following tasks:

- + Reviewed the method’s internal technical documentation
- + Reviewed a sample customer-specific emissions report including its user interface, help text, and user documentation
- + Reviewed an internal report which evaluated emission allocation methods Google might have employed and provided quantitative analyses on the relative performance of the methods

- + Evaluated the method for consistency with the GHG Protocol
- + Identified methodological choices which might introduce material error in the customer-specific calculation or which might be inconsistent with customer expectations
- + Identified instances where the draft user documentation was insufficiently clear or omitted important information
- + Interviewed Google team members regarding all issues identified
- + Reviewed the revised documentation for issue resolution
- + Conducted an 3Degrees-internal independent review of the project's process, judgments, and conclusions.

EXCLUSIONS

Our review was limited to the sufficiency of (a) the calculation method as described in internal Google documentation, and (b) its disclosure to Google customers, as represented by the customer-specific footprint dashboard and report, its help text, and user documentation.

Some of the data streams used for the customer-specific emissions reports differ from the data sources used by Google in its annual third-party verified emissions report. The underlying devices, processes, and systems which create these new data streams were not reviewed in the course of our work. We did not review or test Google's deployment of the method to ensure that Google's processes were consistent with the written method and performing as intended. As such, this review should not be construed as a verification or an assurance engagement.

CONCLUSIONS

Based on our review, we conclude that the method as described to us is a reasonable and appropriate means of calculating and allocating greenhouse gas emissions arising from Google Cloud products to individual customers per the GHG Protocol and typical customer expectations. In addition, we found that the user documentation is sufficiently clear and comprehensive to enable Google Cloud Services customers to make informed decisions as to their use of this data in their own greenhouse gas emission accounting, goal monitoring, and reporting.

We note that the method's treatment of upstream embedded emissions of data center equipment and buildings is inconsistent with the GHG Protocol's scope 3 guidance in the limited sense that the method amortizes these emissions over multi-year time frames instead of accounting for the entire lifetime of these embedded emissions upon purchase of the goods. The

approach used is consistent, though, with GHG Protocol life cycle accounting guidance and also with our understanding of user expectations.

We furthermore note that in our opinion, Google’s decision to use novel data sources for its customer-specific method reflects an appropriate tradeoff for Google and its customers. The data sources and processes have not been third-party verified, but their inclusion supports Google’s stated ambition to measure and manage its energy impacts on an hourly basis. They also establish a technical basis for assembling customer-specific carbon profiles via machine-level monitoring, a technique which fits the purpose of apportioning impact from a large-scale shared computing resource.

ABOUT 3DEGREES

3Degrees is a multi-faceted climate change solutions company serving Fortune 500 companies, utilities, and other organizations around the world. The 3Degrees team has deep expertise in sustainability consulting, environmental markets, renewable energy and carbon project development, transportation decarbonization solutions, and utility renewable energy programs. Together with our customers, 3Degrees helps develop and implement creative solutions that ensure environmental integrity and make good business sense. 3Degrees is a Delaware Public Benefit Corporation and a Certified B Corporation™.

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