Google Cloud

Introducing
Web Sustainability Guidelines

Sept 2023

What are the W3C Web Sustainability Guidelines and how you can help your customers build and operate more sustainable products and services and how they can help us achieve Google Cloud sustainability objectives.

Speaker introduction

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Public Sector

Principal Architect, Public Sector CE Team

Joined Google Sept 2023

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My Journey

00

Setting the stage

What are the Web Sustainability Guidelines?

The **Web Sustainability Guidelines (WSG) 1.0** explains how to design and implement digital products and services that put people and the planet first. The guidelines are best practices based on measurable, evidence-based research; aimed at end-users, web workers, stakeholders, tool authors, educators, and policymakers.

on Sept 13, W3C launched
Web Sustainability Guidelines

Who is the W3C?

The World Wide Web Consortium (W3C) develops standards and guidelines to help everyone build a web based on the principles of accessibility, internationalization, privacy and security.

- Web standards apply to rendering of web pages, accessibility, linking, authoring and more
- WCAG is the underpinning of Canadian Public Sector accessibility requirements
- go/accessibility
- go/gar

01

The Context

The Climate Crisis

01

Environmental impact

IPCC Report endorsed by world governments at Cop 21, Paris (2015) puts a target to reduce global emissions to below 1.5 ºC above pre-industrial levels.
Source: IPCC

02

Emissions growth

The digital industry is now responsible for between 2-5% of global emissions.
Source: Lancaster University, EU Commission

03

Carbon Footprint of ICT

If the Internet were a country it would be one of the top five polluters.
Source: 2021 study by Freitag et al.

04

Continued Growth

Since 2010, the number of internet users worldwide has more than doubled, while global internet traffic has expanded 25-fold.
Source: IEA

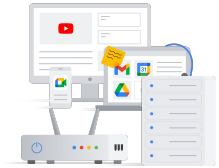
05

More Content

Since 2015, average page size has increased by over 70% on desktop and 140% on mobile.
Source: HTTP Archive

Areas of concern

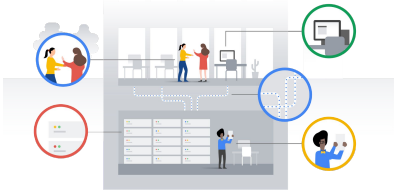
Power
(Server & Client)



e-Waste
(Server & Client)

Water
(Cooling)

Paper
(Printing)



Carbon Traps
(...more)

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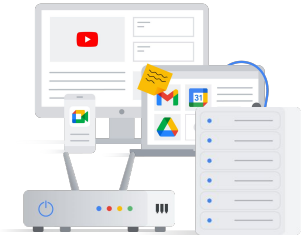

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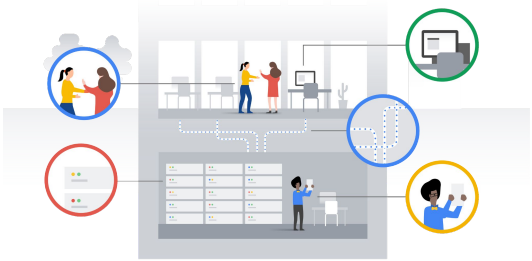


Carbon Traps
(...more)

Public

How rising awareness is encouraging change within all levels of industry.

Industry

How the web industry is rising to the challenge of digital sustainability.

Regulatory

Existing standards, the laws guiding them, and the legislation still to come.

The Market

Public

How rising awareness is encouraging change within all levels of industry.

Industry

How the web industry is rising to the challenge of digital sustainability.

Regulatory

Existing standards, the laws guiding them, and the legislation still to come.

02

The Guidelines

Four Categories

User Experience Design

- Research and ideation, journey design, content and assets, and quality assurance.

Web Development

- Development sustainability, code optimization, coherence, and security.

Hosting, Infrastructure, and Systems

- Environment commissioning, minimizing environment and data, and minimizing human disruption.

Business Strategy and Product Management

- Reporting, disclosure, strategy, and policies from both an organizational and website and product level.

Stats

In addition, there are many more resources and examples to compliment the guidelines.

93 Guidelines

232 Success criteria

Components

The Guideline

Success Criteria

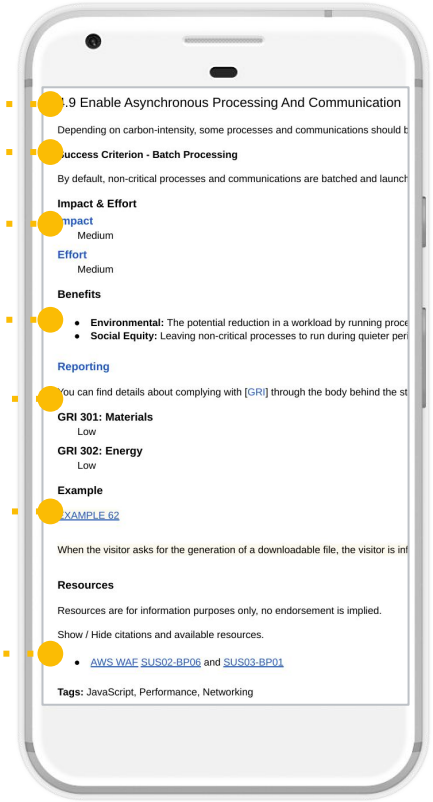
Impact & Effort

Benefits

Reporting

Example

Resources



The Guideline

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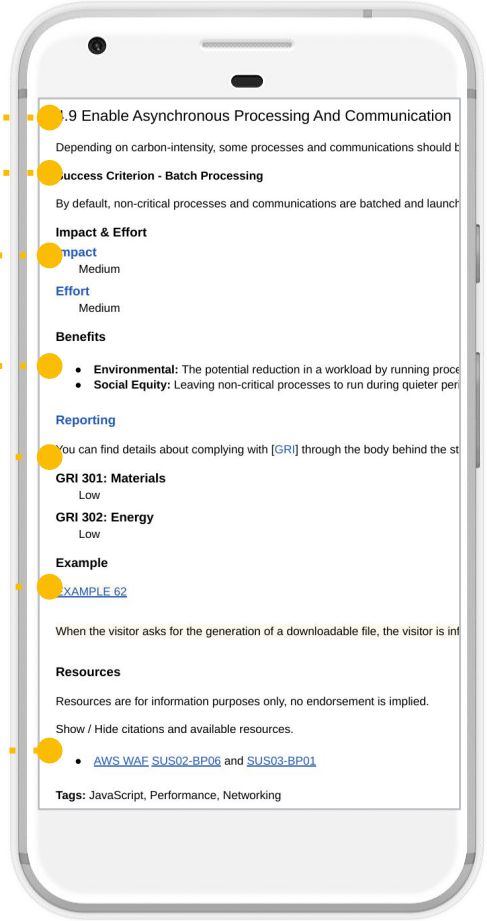

User-Experience Design

- 2.1Undertake Systemic Impacts Mapping
- 2.2Assess And Research Visitor Needs
- 2.3Research Non-visitor's Needs
- 2.4Consider Sustainability In Early Ideation
- 2.5Account For Stakeholder Issues
- 2.6Create a Frictionless Lightweight Experience By Default
- 2.7Avoid Unnecessary Or An Overabundance Of Assets
- 2.8Ensure Navigation And Way-finding Is Well-structured
- 2.9Respect The Visitor's Attention
- 2.10Use Recognized Design Patterns
- 2.11Avoid Manipulative Patterns
- 2.12Document And Share Project Outputs
- 2.13Use A Design System To Prioritize Interface Consistency
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- 2.21Support Non-Graphic Ways To Interact With Content
- 2.22Give Useful Notifications To Improve The Visitor's Journey
- 2.23Reduce The Impact Of Downloadable Or Physical Documents
- 2.24Create A Stakeholder-focused Testing & Prototyping Policy
- 2.25Conduct Regular Audits, Regression, And Non-regression Tests
- 2.26Analyze The Performance Of The Visitor Journey
- 2.27Incorporate Value Testing Into Each Major Release-cycle
- 2.28Incorporate Usability Testing Into Each Minor Release-cycle
- 2.29Incorporate Compatibility Testing Into Each Release-cycle

Web Development

- 3.1Identify Relevant Technical Indicators
- 3.2Minify Your HTML, CSS, And JavaScript
- 3.3Use Code-splitting Within Projects
- 3.4Apply Tree Shaking To Code
- 3.5Ensure Your Solutions Are Accessible
- 3.6Avoid Code Duplication
- 3.7Rigorously Assess Third-party Services
- 3.8Use HTML Elements Correctly
- 3.9Resolve Render Blocking Content
- 3.10Provide Code-based Way-finding Mechanisms
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- 3.13Use CSS Preference And Media Queries
- 3.14Develop A Mobile-first Layout
- 3.15Use Beneficial JavaScript And Its API's
- 3.16Ensure Your Scripts Are Secure
- 3.17Manage Dependencies Appropriately
- 3.18Include Files That Are Automatically Expected
- 3.19Use Plaintext Formats When Appropriate
- 3.20Avoid Using Deprecated Or Proprietary Code
- 3.21Align Technical Requirements With Sustainability Goals
- 3.22Use The Latest Stable Language Version
- 3.23Take Advantage Of Native Features
- 3.24Run Fewer, Simpler Queries As Possible

.Hosting, Infrastructure And Systems

- 4.1Choose A Sustainable Hosting Provider
- 4.2Optimize Browser Caching
- 4.3Compress Your Files
- 4.4Use Error Pages And Redirects Carefully
- 4.5Limit Usage Of Additional Environments
- 4.6Automate To Fit The Needs
- 4.7Frequency For Refresh Is Relevant To Visitor Needs
- 4.8Be Mindful Of Duplicate Data.
- 4.9Enable Asynchronous Processing And Communication
- 4.10Use Edge Computing
- 4.11Use The Lowest Infrastructure Tier Meeting Business Requirements
- 4.12Store Data According To Visitor Needs

Business Strategy And Product Management

- 5.1Have An Ethical And Sustainability Product Strategy
- 5.2Assign A Sustainability Representative
- 5.3Raise Awareness And Inform
- 5.4Communicate The Ecological Impact Of User Choices
- 5.5Estimate A Product Or Service's Environmental Impact
- 5.6Define Clear Organizational Sustainability Goals And Metrics
- 5.7Verify Your Efforts Using Established Third-party Business Certifications
- 5.8Implement Sustainability Onboarding Guidelines
- 5.9Support Mandatory Disclosures And Reporting
- 5.10Create One Or More Impact Business Models
- 5.11Follow A Product Management And Maintenance Strategy
- 5.12Implement Continuous Improvement Procedures
- 5.13Document Future Updates And Evolutions
- 5.14Establish If A Digital Product Or Service Is Necessary
- 5.15Determine The Functional Unit
- 5.16Create A Supplier Standards Of Practice
- 5.17Share Economic Benefits
- 5.18Share Decision-making Power With Appropriate Stakeholders
- 5.19Use Justice, Equity, Diversity, Inclusion (JEDI) Practices
- 5.20Promote Responsible Data Practices
- 5.21Implement Appropriate Data Management Procedures
- 5.22Promote Responsible Emerging Technology Practices
- 5.23Include Responsible Financial Policies
- 5.24Include Organizational Philanthropy Policies
- 5.25Plan For A Digital Product Or Service's Care And End-Of-Life
- 5.26Include E-waste, Right-to-repair, And Recycling Policies
- 5.27Define Performance And Environmental Budgets
- 5.28Use Open Source Tools

User Experience and Design

Research and ideation, journey design, content and assets, and quality assurance.

- Research, consult, assess thoughtfully and consider sustainability in early ideation
- Build automated value regression testing into the solution
- If you're building apps or tools, there are a lot of guidelines for content and design considerations

Example: 2.26 Analyze The Performance Of The Visitor Journey

...ethically measure how efficient a visitor's experience is, ... and reduce the energy burden of loading unnecessary page ... only collect the data required to provide a streamlined and effective user-journey

Web Development

Development sustainability, code optimization, coherence, and security.

- Mostly speaks to client-side technologies, empowering customers to build and test with technologies like Lighthouse would be valuable
- Building performance and sustainability testing into CI/CD, and operationalizing performance measurement
- Building for security

Example: 3.17 Manage Dependencies Appropriately

...JavaScript ... can cause very high emissions in terms of CPU load due to the rendering process... check for unused dependencies, keep dependencies up to date

https://bundlephobia.com/

https://pkg-size.dev/

Hosting, Infrastructure, and Systems

Environment commissioning, minimizing environment and data, and minimizing human disruption.

- Rightsizing, automation, batch processing
- Sustainable data practices, only keeping what's needed
- Minimize transfer, use edge computing
- Async processing and computing
- Being carbon aware

Example: 4.5 Limit Usage Of Additional Environments

Decommission or switch off additional environments, such as testing, staging

Business Strategy and Product Management

Reporting, disclosure, strategy, and policies from both an organizational and website and product level.

- Speaks to the business of building and operating a digital product
- Setting org-level sustainability goals
- Implementing sustainability onboarding training or guidelines
- Use open-source software

Example: 5.5 Estimate A Product Or Service's Environmental Impact

Conduct a full life-cycle Analysis (LCA) based on the functional unit (ex. per workload, per API call, per user)

Software Carbon Intensity considers power consumed (server and client) plus embedded carbon

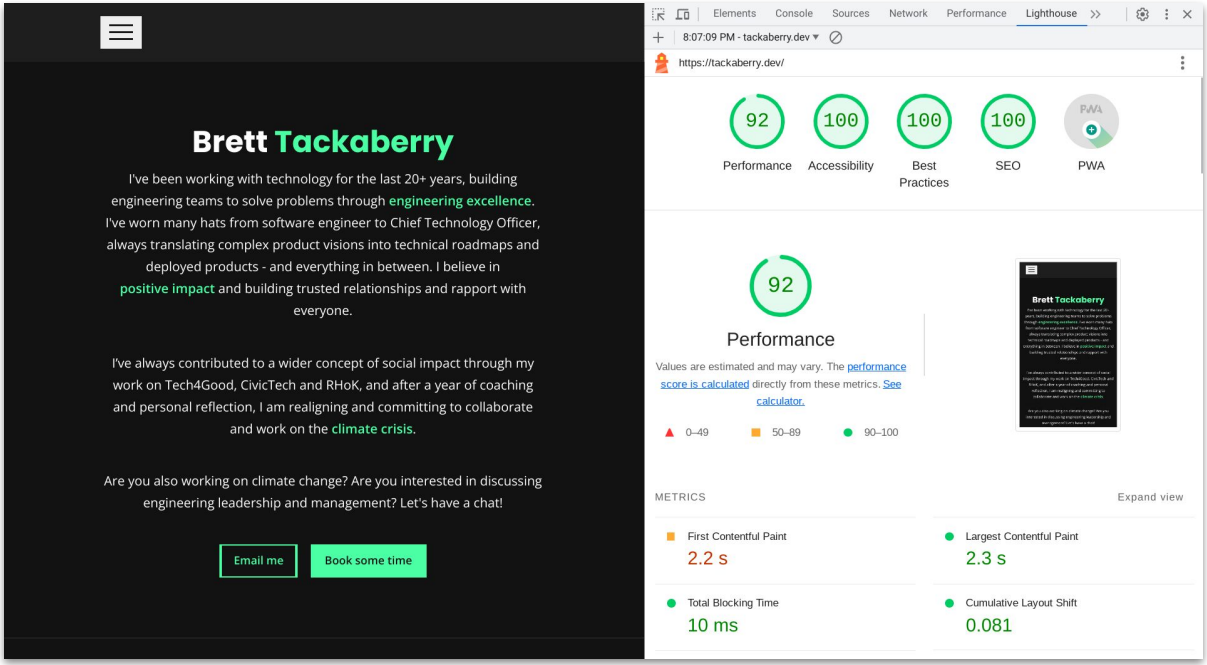
03

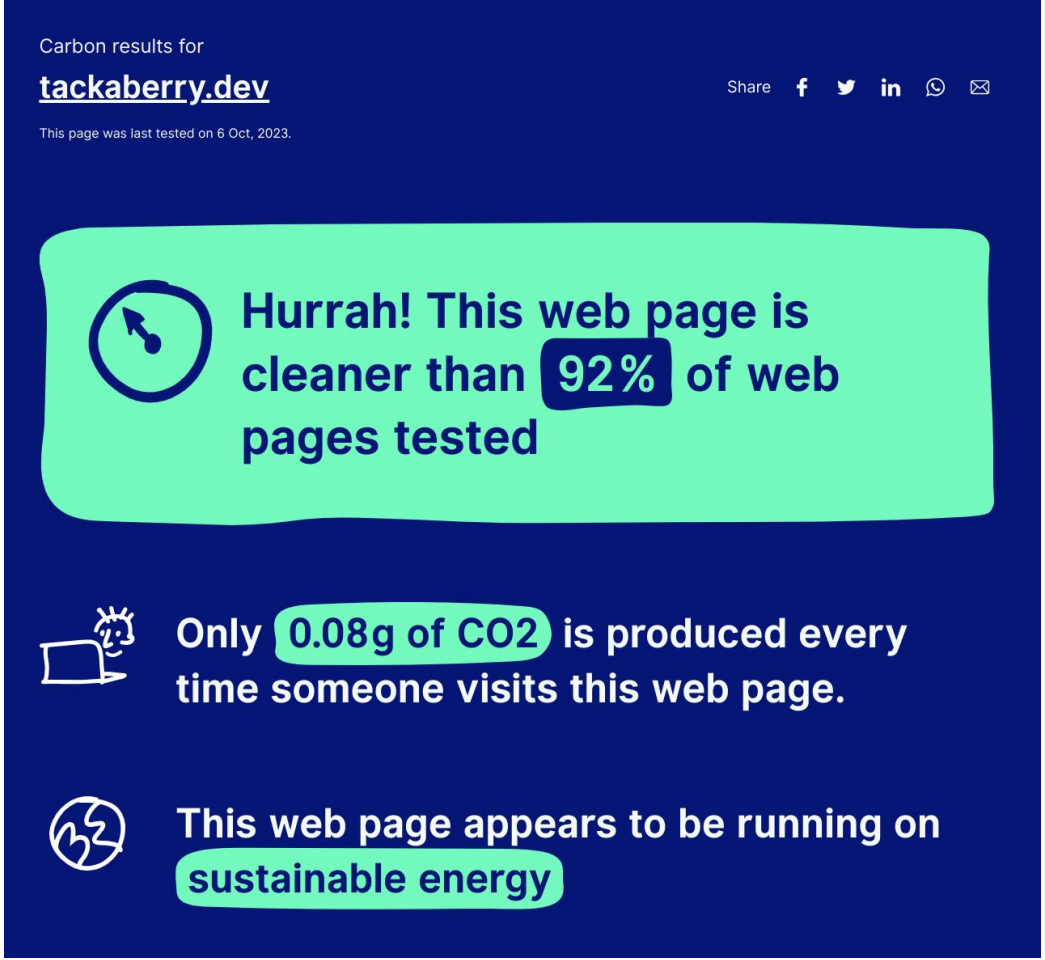
Beyond the Guidelines

Organize the world's information and make it universally accessible and useful.

Google Lighthouse

Measure and monitor page performance.





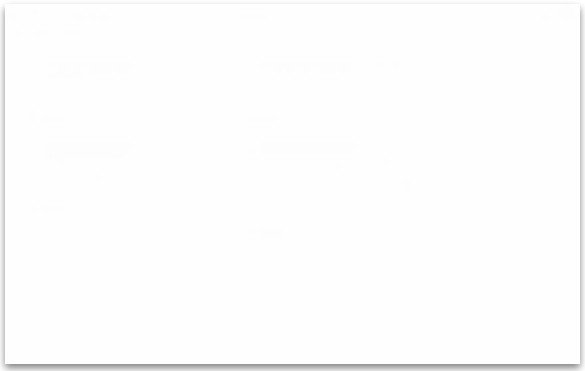
SSG on GCS + Global LB w CDN

- All Google CDN servers register as low CO2
- Edge storage minimizes distance to transfer
- Could restrict storage to regions that are more applicable to reduce duplicate data

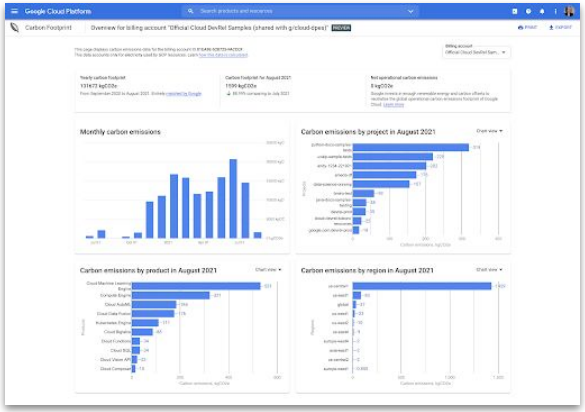
https://www.websitecarbon.com/website/tackaberry-dev/

Carbon Sense suite makes it easy to accurately report and reduce IT carbon emissions

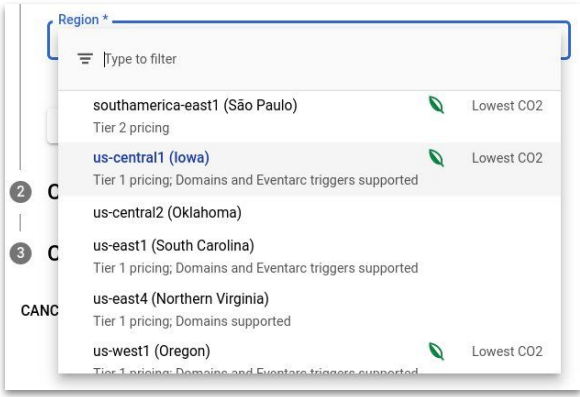
Active Assist



Carbon Footprint



Region Picker



Also see: https://cloud.withgoogle.com/region-picker/

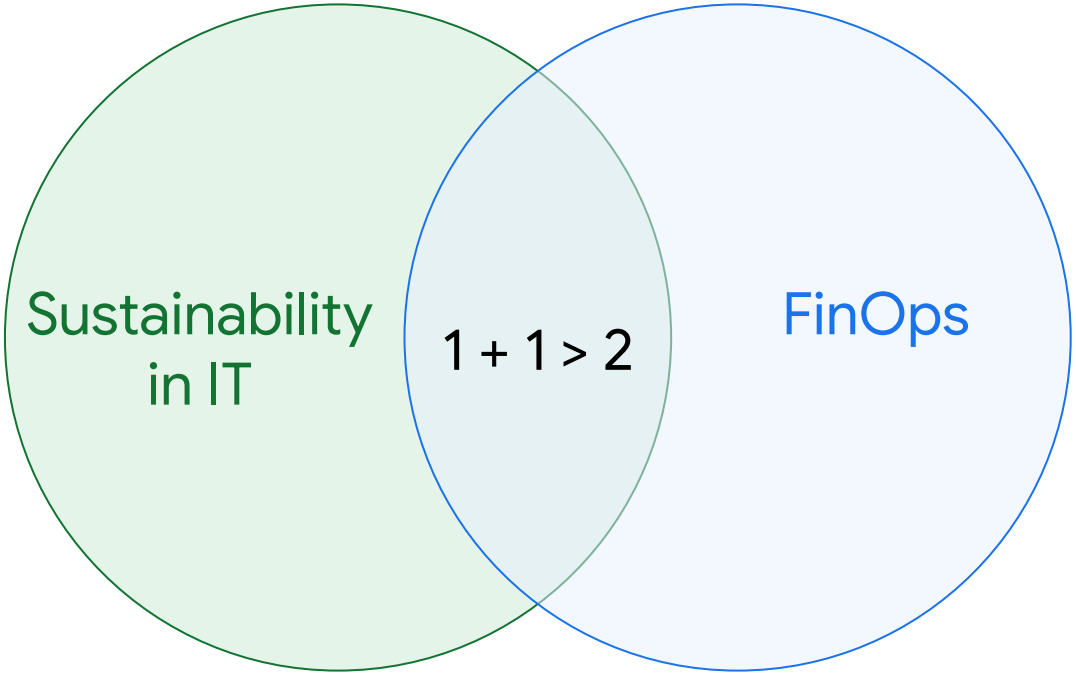


Diagram from: https://www.linkedin.com/pulse/finops-greenops-sustainable-future-simar-arora-/

gTech Sustainability

go/gtechsustainability

Ads Carbon Reporting
Reporting emissions associated with ad spend. Coming Q4 ‘23

Industry Body Partnership
Partnerships and customer support to improve media-based business

Digital Sustainability
Improve ad conversion with website performance improvement. They also work to reduce greenwashing.

CircularNet
AI driven value and insights helping brands and waste management industry keep recyclables from landfills

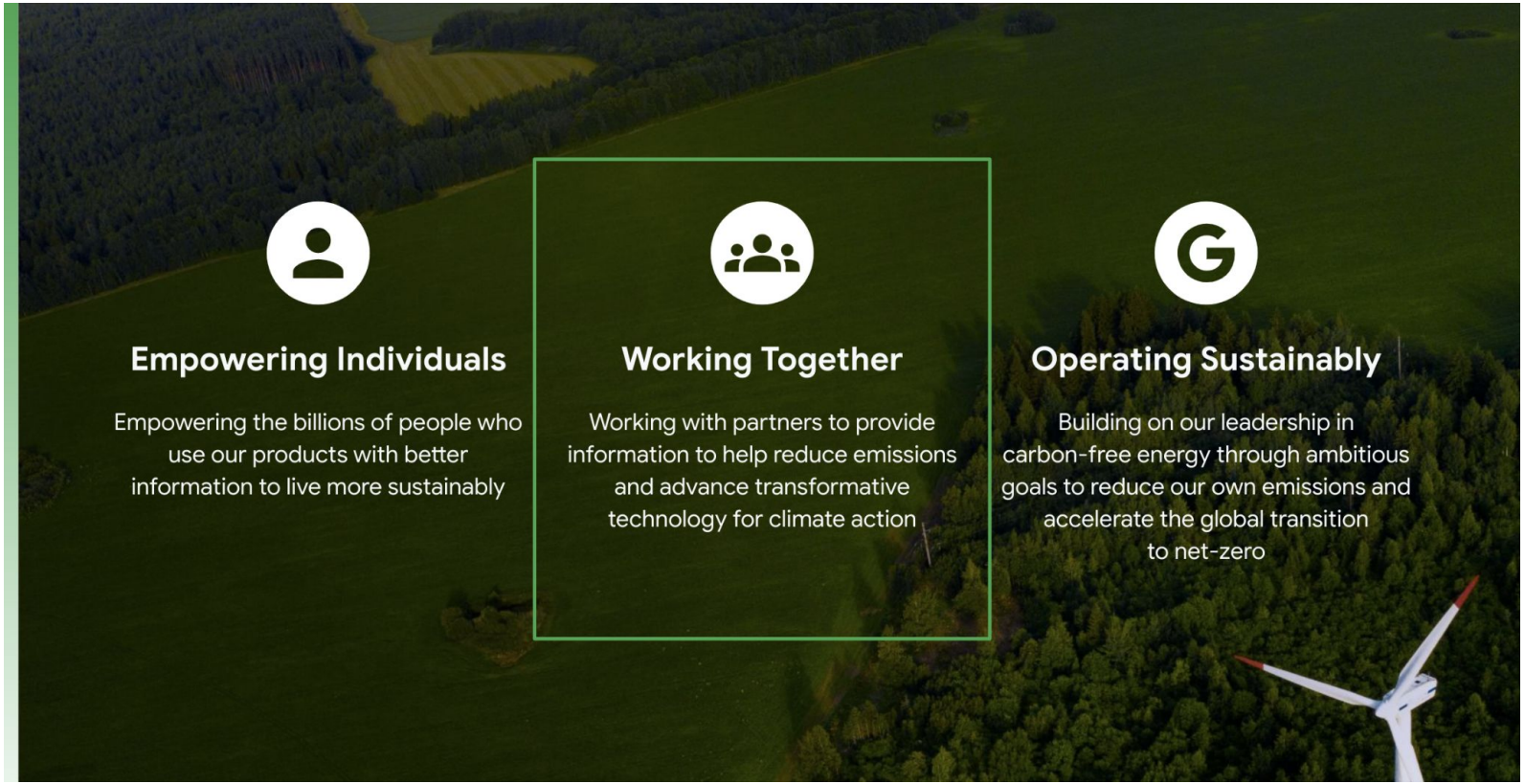
04

Google Cloud Context

“We are entering a new era of sustainability driven business transformation”

Thomas Kurian
CEO, Google Cloud

Quote from Google Cloud Sustainability Summit ‘22



Empowering Individuals

Empowering the billions of people who use our products with better information to live more sustainably

Working Together

Working with partners to provide information to help reduce emissions and advance transformative technology for climate action

Operating Sustainably

Building on our leadership in carbon-free energy through ambitious goals to reduce our own emissions and accelerate the global transition to net-zero

How do we help

Cloud

- Powering business transformation

Data

- Data-driven decisions, data sharing
- ESG process transformation, esg data and drive action

AI

- Driving trends & route optimization, forecasting,

Geospatial

- Environmental monitoring for risk management, research, protection, adaptation support

Customer Context

Your customers will need you to know:

Emerging regulations

FinOps ⇒ GreenOps and cost avoidance

Sustainability goals (KPIs) and business transformation

Supporting Climate risk, climate adaptation

Accessibility, Inclusion, Performance ⟶ increase productivity, less waste, better service, better conversions

Automation leads to error avoidance

Thank you.

Google Cloud

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Web Development

Development approach

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- 3.21 - Align Technical Requirements With Sustainability Goals

Code minimization

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Commission sustainable environments

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Minimize environments

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Reduce human disruption

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Business Strategy and Product Management

Reporting and disclosure

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Strategy and policies

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