
AWS
re:Invent
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PEX201

Building a sustainable practice for tomorrow

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Agenda

What is sustainability?

Industry trends

Architecting for sustainability

Sustainable offerings

Knowit – An AWS Partner’s sustainability practice

Call to action

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Sustainability areas of focus

Sustainability impacts multiple areas, and has become a strategic priority for organizations



Climate & decarbonization

- Decarbonize the global economy
- Mitigate climate risk



Water use & quality

- Minimize water use
- Keep it clean
- Adapt to scarcity



Social impact & responsibility

- Employee well-being
- Responsible procurement
- Underserved markets
- Shift consumer behaviors



Circular economy

- Zero waste
- Recycling
- Supply chains

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Trends driving sustainability

Employees, consumers, governments, and communities expect the private sector to do more than maximize profits, increasingly creating a world where doing good is also good for business



Customer demand	1	Government regulations	4
Reputational-led ESG focus	2	Employee demand	5
Activism-led investing	3	Sustainability as competitive positioning	6

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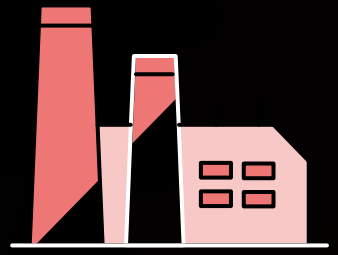
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Value map – Sustainability services

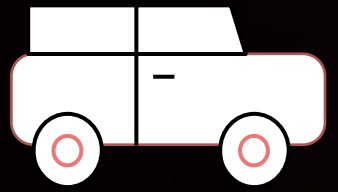
Business outcome 1	Business outcome 2	Business outcome 3
Decarbonize the business	**Reduce environmental impacts (non-carbon)**	**Sustainability strategy & product development**
Initiative • Automate carbon footprint tracking and reporting • Supply chain carbon transparency • Connect and optimize building infrastructure and operations **Use case** • Measure, track, and report on carbon footprint (scope 1, 2, and 3) • Meet government regulations and compliance • Supply chain transparency • IoT pipelines for the infrastructure and operations • Analytics across building systems like HVAC, lighting, and electrical	**Initiative** • Eliminate waste and pollution • Reduce food and medical waste • Develop new environmental services **Use case** • Packaging strategies to reduce supply shipping waste • IoT sensor data to track temperature • Develop new sustainability services for their business and market	**Initiative** • Accelerate progress toward sustainability goals • Make sustainability a competitive differentiator • Market assessment for new goods and services **Use case** • Identify gaps, and generate new areas of exploration and roadmap • Develop new end user products/services that drive sustainable behavior

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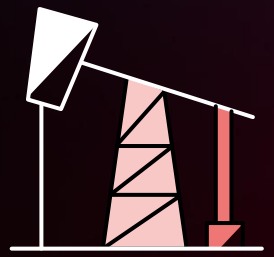
Most industries have sustainability goals



Manufacturing



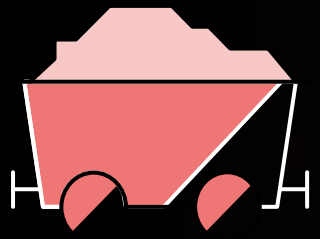
Automotive



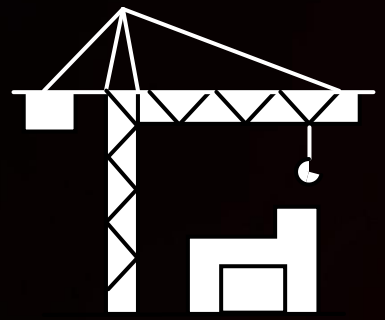
Energy



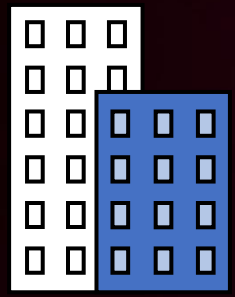
CPG/Retail



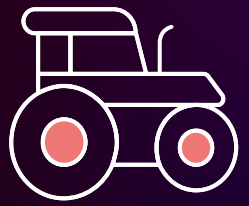
Life sciences



Construction



Real estate/
logistics



Agriculture

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Global sustainability goals



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Architecting for sustainability

“The greenest energy is the energy we don’t use.”

Peter DeSantis, VP of AWS Global Infrastructure, AWS

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It’s greener in the cloud

AWS infrastructure is

3.6x more energy efficient

than the median of the surveyed US enterprise data centers

AWS performs the same task with an

88% lower carbon footprint

Source: 451 Research, “Carbon Reduction Opportunity,” http://j.mp/451-report

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Design principles for sustainability in the cloud

1. Understand your Impact
2. Establish sustainability goals
3. Maximize utilization
4. Anticipate and adopt new, more efficient hardware and software offerings
5. Use managed services
6. Reduce the downstream impact of your cloud workloads



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Proxy metrics

Using indirect measures as proxy for carbon emissions

Typical sources include:

Application metrics AWS metrics Business metrics

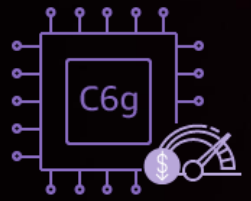
"Start making **directionally correct** decisions."

Jessica Blat, "Measuring for change: Carbon footprinting at Amazon scale," re:Invent 2020

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Areas of optimization



Compute

Reduce idle resources and maximize utilization



Databases

Managed databases, serverless databases, query optimization



Storage

Analyze data access patterns, use storage tiers, deduplicate data



Networking

Reduce size and distance of data transmitted

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Goals for optimization

Maximize

Utilization

CPU efficiency
via software design

Idle resources

Data processing

Data storage

Eliminate or minimize

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Optimization categories

In most cases, less cost is lower impact, but there are subtleties to understand

- Do less work, store less stuff
- Do work more efficiently
- Drive up utilization
- Use sustainable scheduling strategies



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How are AWS Partners optimizing for sustainability?

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AWS Graviton3 customer feedback



"Our testing has shown they are suitable for even the most demanding latency sensitive workloads while providing significant price performance benefits and expanding what is possible within Fortnite and any Unreal Engine created experience."

Mark Imbriaco, Senior Director of Engineering, Epic Games



"We tested the new Graviton3-based C7g instances. Across a number of benchmarks that we've found to be representative of the performance of Twitter workloads, we found Graviton3-based C7g instances deliver 20–80% higher performance vs. Graviton2-based C6g instances, while also reducing tail latencies by as much as 35%."

Nick Tornow, Head of Platform, Twitter



"We were able to run 30% fewer instances of C7g than C6g serving the same workload, and with 30% reduced latency."

Liz Fong-Jones, Principal Developer Advocate, Honeycomb

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honeycomb.io and Graviton

"Traffic to Honeycomb has surged in the past year, but the expense for serving and the complexity of our services hasn't. Graviton2 is a large part of how we do it."

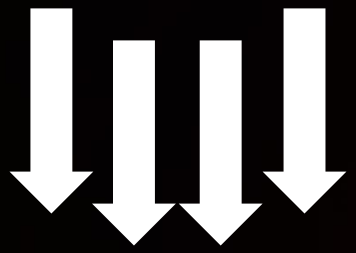
Liz Fong-Jones, "Graviton2 at Honeycomb," https://www.honeycomb.io/blog/graviton2-one-year-retrospective/



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NatWest Group and Serverless

MLOps Platform became Serverless and reduced CO_2 emissions

Cluster Architecture	SageMaker Architecture
Server runs for 15,120 hours/year	Total instances run for 7,104 hours/year
	
4.125 Million gCO_2 eq*	**1.043 Million gCO_2 eq***

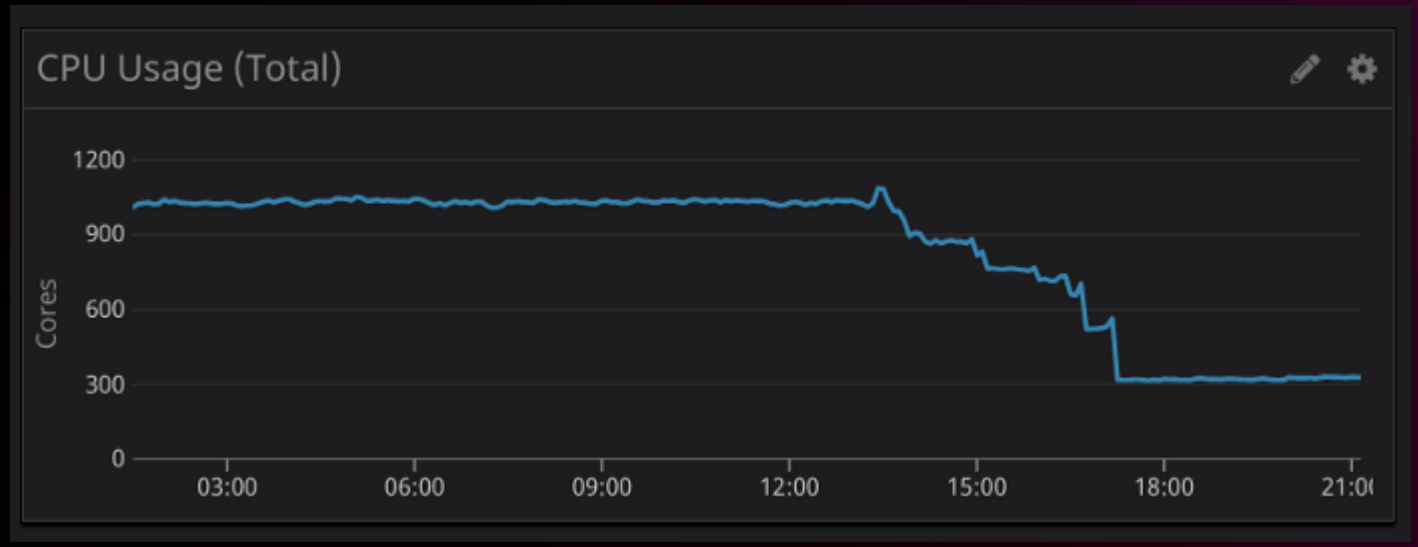
54% less running time and 75% less CO_2 emissions with SageMaker Architecture

*Calculated using https://engineering.teads.com/sustainability/carbon-footprint/estimator-for-aws-instances/

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tenable® and Rust





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Tools to analyze your workloads

Metrics



Amazon CloudWatch



Amazon S3 Storage Lens

Recommendations



AWS Trusted Advisor



AWS Compute Optimizer

Review



AWS WA Tool and carbon footprint tool

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Sustainability offerings

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Sustainability data standards start with emissions

Greenhouse gas (GHG) emissions

Gases that trap heat in the atmosphere

Scope 1 emissions

Direct GHG emissions that occur from sources that are controlled or owned by an organization

Scope 2 emissions

Indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling

Scope 3 emissions

Value chain emissions associated with indirect activities from assets not owned or controlled by the organization

Carbon footprint

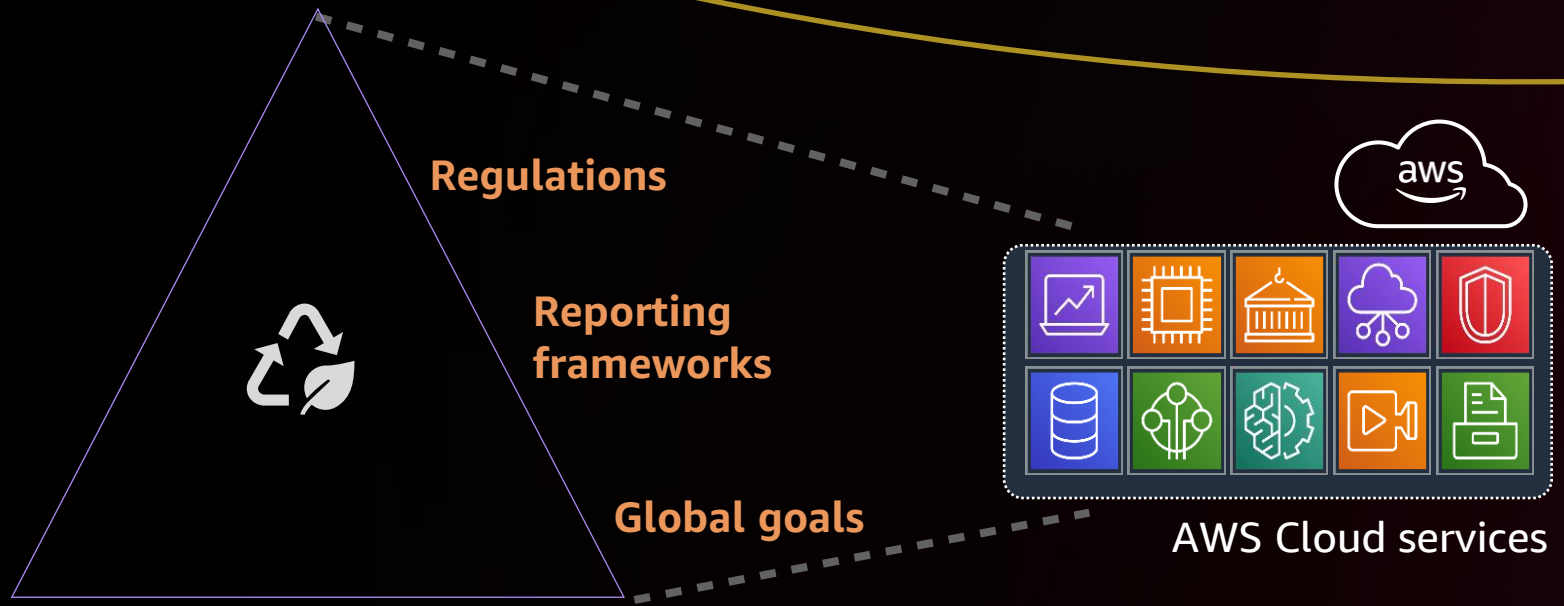
Total emitted GHG emissions, often expressed in CO2 equivalent (CO2e)

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Sustainability offerings

Take a **data-driven** approach to accelerate sustainability outcomes, for our **customers** and for our **planet**



Sustainability advisory & **implementation** offerings

- Sustainability strategy and transformation
- Carbon footprint framework
- Sustainable buildings and operations
- Smart energy management
- Sustainable packaging
- Sustainable chill chain

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Advisory services

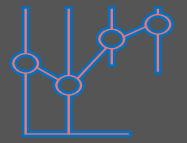
Assessing risks and identifying opportunities to maximize sustainable impact, our advisors play a key role in supporting the development and implementation of mechanisms for evaluating the sustainable progress of an organization



Sustainable strategy and transformation advisory service

Engagements may include:

- Sustainability assessments
- Roadmap development
- Innovation and ideation
- Continuous improvement
- Areas of impact study
- Culture, governance, and organizational change for sustainability
- Internal/external training best practices



Sustainable solutions

Use cases may include:

- Innovate consumer facing ESG-focused products/services/ business models
- Water/Energy management or optimization
- Supplier engagement and value chain analysis
- Waste/Packaging reduction
- Operations management and predictive maintenance
- End-use reporting (e.g., extended producer responsibility)
- ESG investing and due diligence

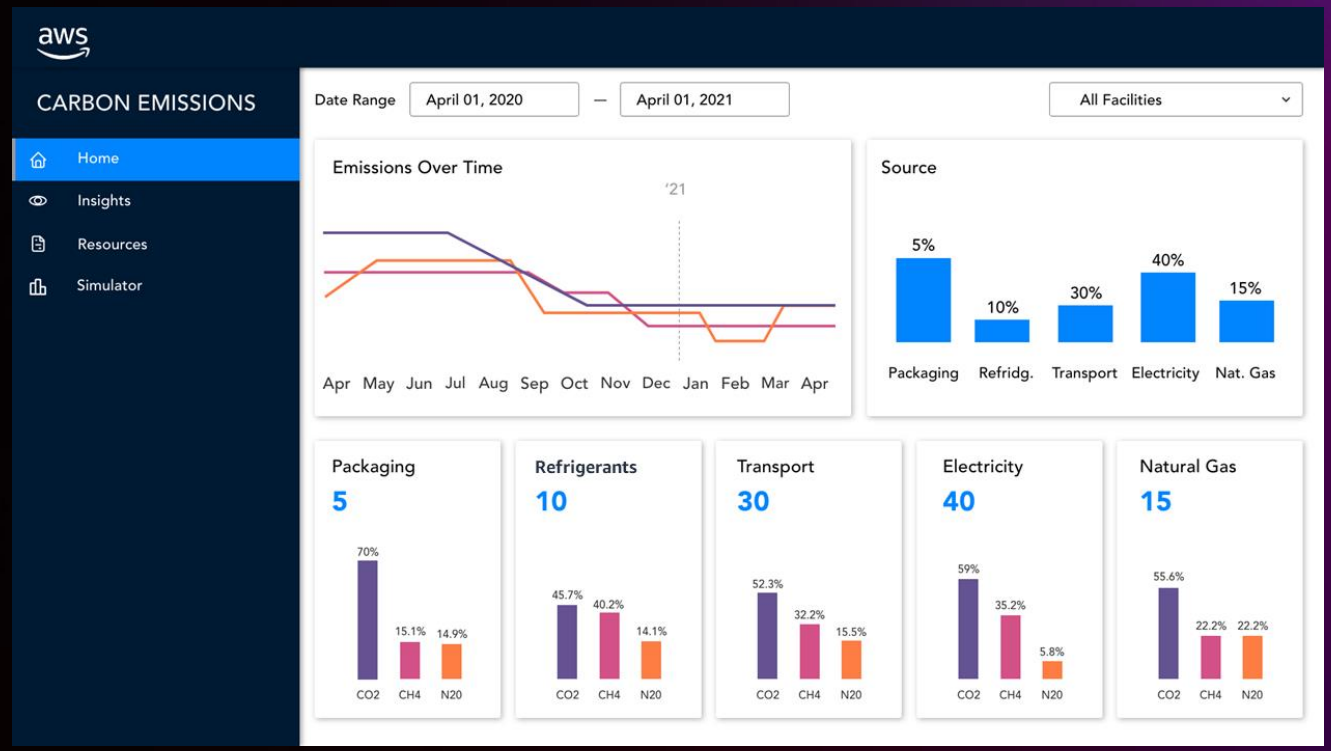
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What is the carbon footprint framework?

A framework to develop real-time dashboards for measuring, tracking, and managing carbon footprint on a product, process, and entity level

Transforms customer activity into actionable metrics using proven science-based approaches to various reporting bodies such as CDP, SASB, TCFD



GHG simulation and reporting

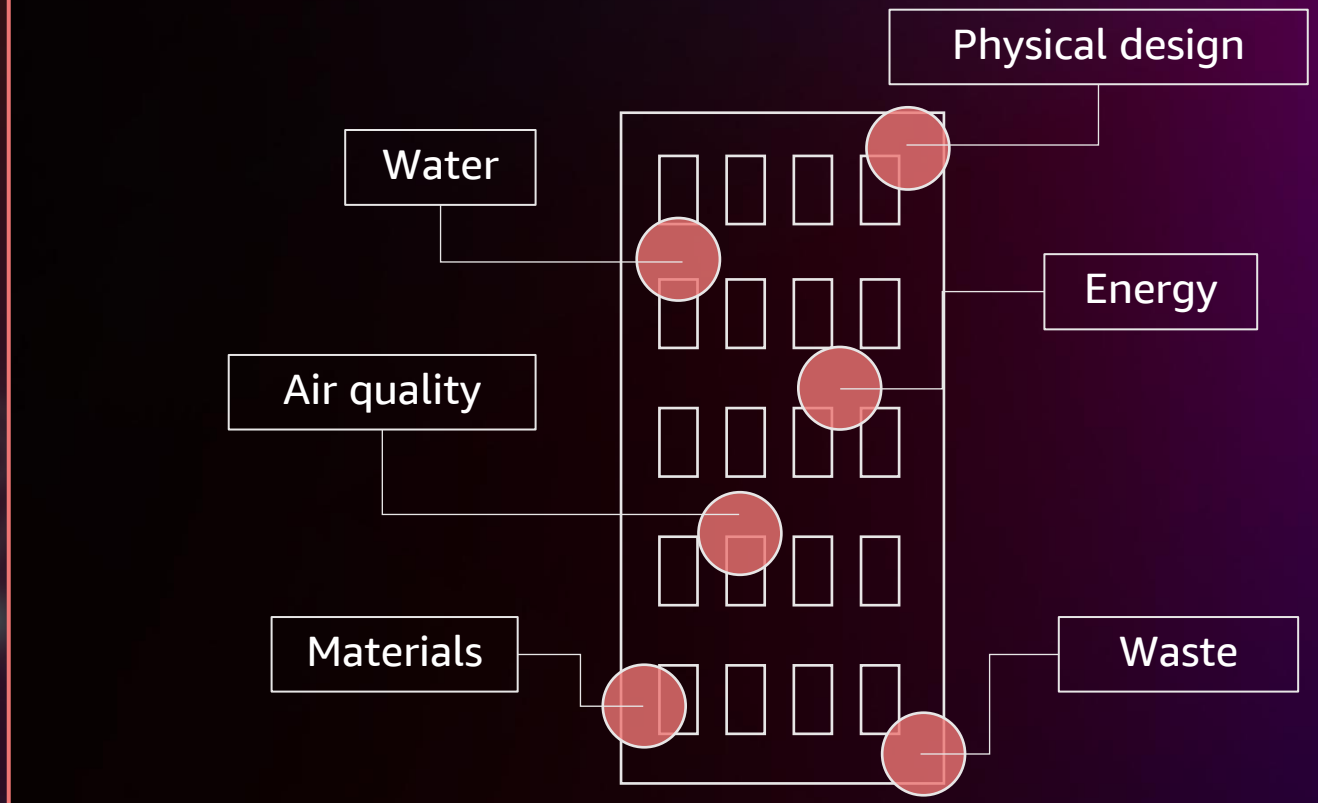
Automated data ingestion from existing systems into a centralized platform to create/manage carbon models; real-time carbon calculations and the ability to simulate changes to see effects

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Sustainable buildings and operations

Sustainable buildings provide a productive indoor environment with minimal negative impacts on the external environment; they are designed to minimize resource consumption and use renewable energy to offset carbon-intense fuel sources

They also consider comfort, health, and productivity of occupants

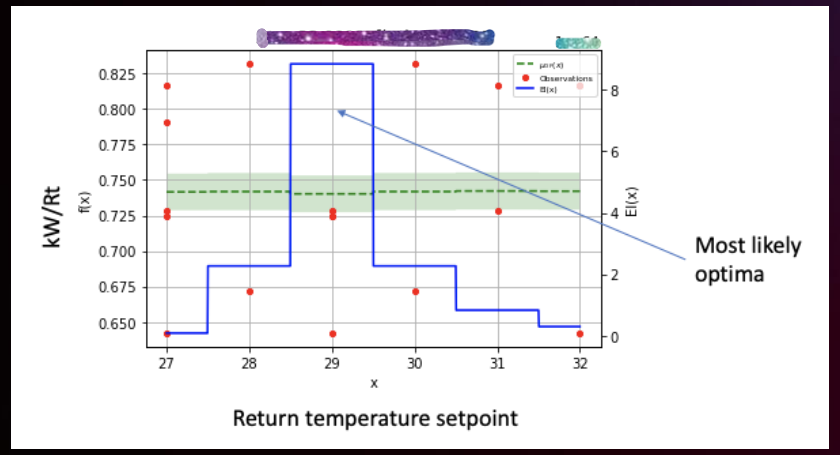


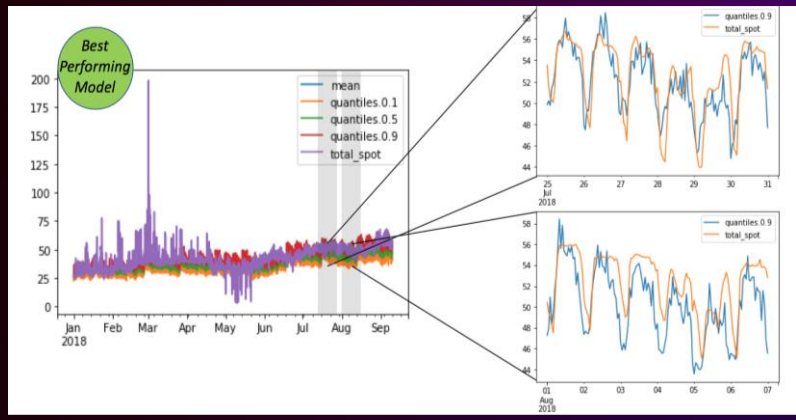
Using data collection (IoT sensors, BMS), AI, and ML to ensure buildings are operating at maximum efficiency to reduce carbon footprint and material consumption

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What is energy management on AWS?

Use AI/ML and advanced analytics for energy management to solve use cases such as condition-based monitoring, optimize equipment efficiency, and predict future energy usage demand based on various factors





Energy analytics and forecasting (ML/AI)

Online optimization based on ML-based digital twin models along with time-series forecasting

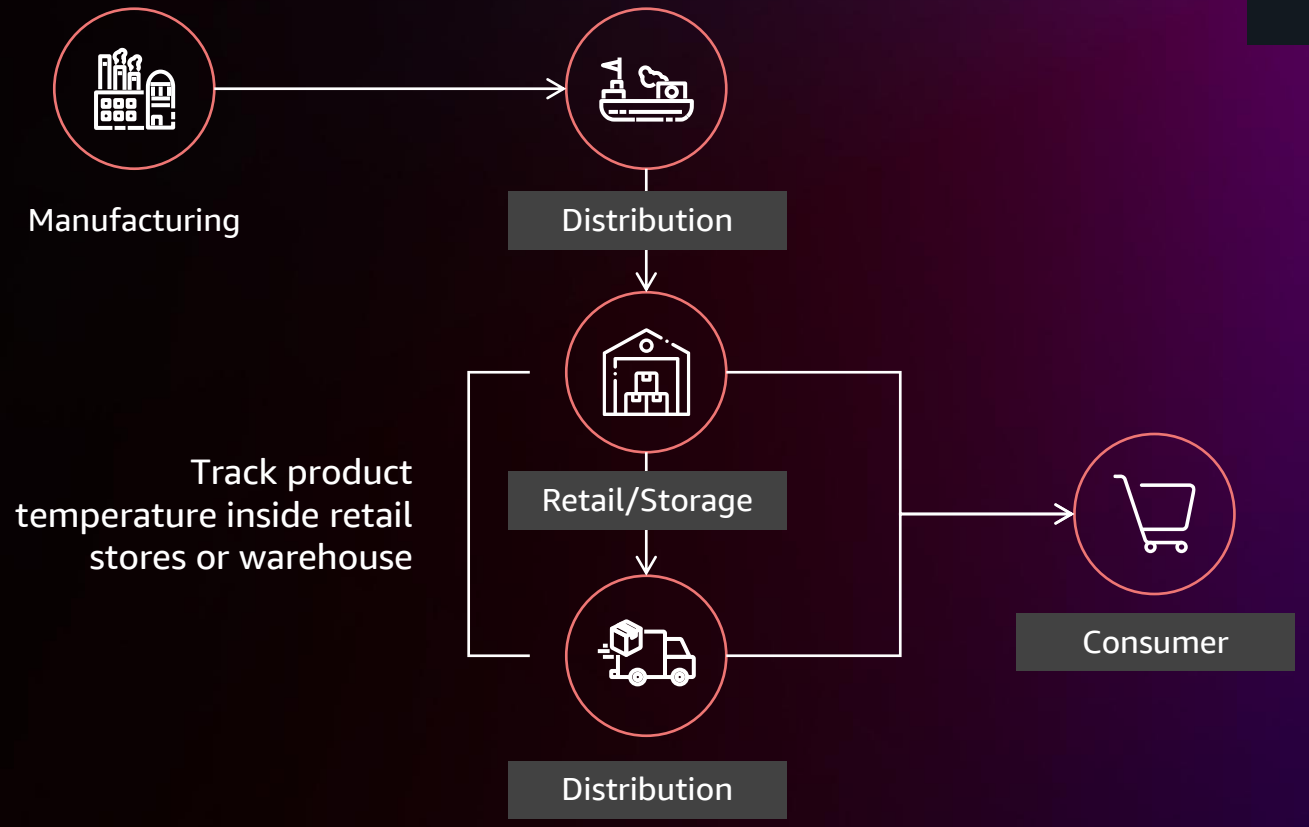
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What is a sustainable chill chain?

Sustainable chill chain is designed to minimize the cradle-to-cradle resource consumption with a focus on reducing product waste and it's impact on environment or employee health

Scope: manufacturer to end consumer

Sustainable operations



Using data collection from IoT sensors, and applying AI and ML to ensure product transport/storage is operating at optimum temperature to reduce product waste

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Case studies

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Case study: Energy analytics and forecasting (ML/AI)

Coca-Cola İçecek, with distribution to 400 million consumers

Improved clean-in-place (CIP) process

Saved 20% on energy annually

Saved 9% on water annually

Time and performance gains

34 days annual process gains/year

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Knowit – Nordic powerhouse

Cloud sustainability practice

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About

knowit

- Nordic IT consultancy
- Stocklisted in Sweden
- 4,000 employees
- AWS Premier Partner



Rolf Koski
VP of Technology
Knowit Cloud Partnerships

rolle
therolle

- “Guy with the sticker”
- Advisor and Evangelist
- Community Leader
- AWS Hero and AWS Ambassador
- AWS Well-Architected Lead

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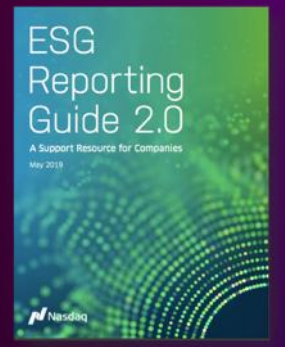
Makers of a sustainable future

Knowit's vision is to build a sustainable and humane society through digitization and innovation

- Member of UN Global Compact sustainability initiative
- Nasdaq ESG Transparency Partner
- Author and reviewer of 1.5°C Business Playbook
- Member of the Exponential Roadmap Initiative
- Participating in UN's Race to Zero
- Annual GHG emission assessment
- Launched Knowit Sustainable Cloud practice in March 2022
- Close sustainability collaboration with AWS















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Our cloud sustainability rationale

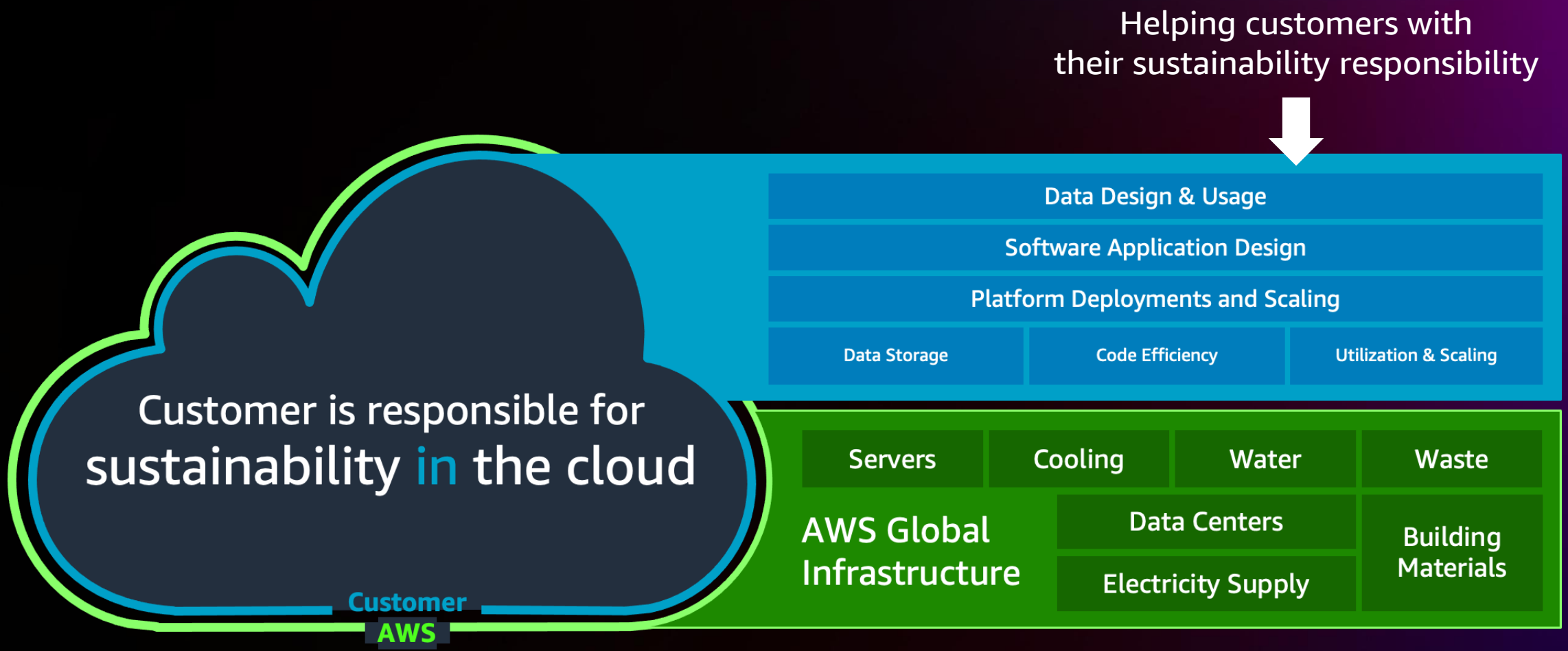
- By 2050, Europe plans to become the **first climate-neutral continent**
- A clear majority of European businesses have, or are planning, **formal sustainability** initiatives or policies
- Sustainability impacts a company's **trustworthiness** and **reputation**
- Investors increase their **investment allocation** to companies that excel in **ESG** factors
- **IT departments** play a huge role in sustainability efforts
- COVID-19 forced to delay or cancel plans to reduce emissions – now initiatives are **added** or **accelerated**
- IT leaders say sustainability is important when selecting a cloud provider, with most stating it as a **major consideration**
- More than half of businesses prioritize **energy consumption** of IT resources, choose suppliers that share their **sustainability aspirations**, and work to reduce use of plastics
- Virtually all enterprises assess vendors based on sustainability credentials, with requirements for **tangible proof** of sustainability credentials



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Shared sustainability model



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Roadmap

1. Planning | **2. Implementation** | **3. Go live** | **4. Iteration**

1. Anchoring the new **Knowit Sustainable Cloud** framework idea with the Group management and marketing teams

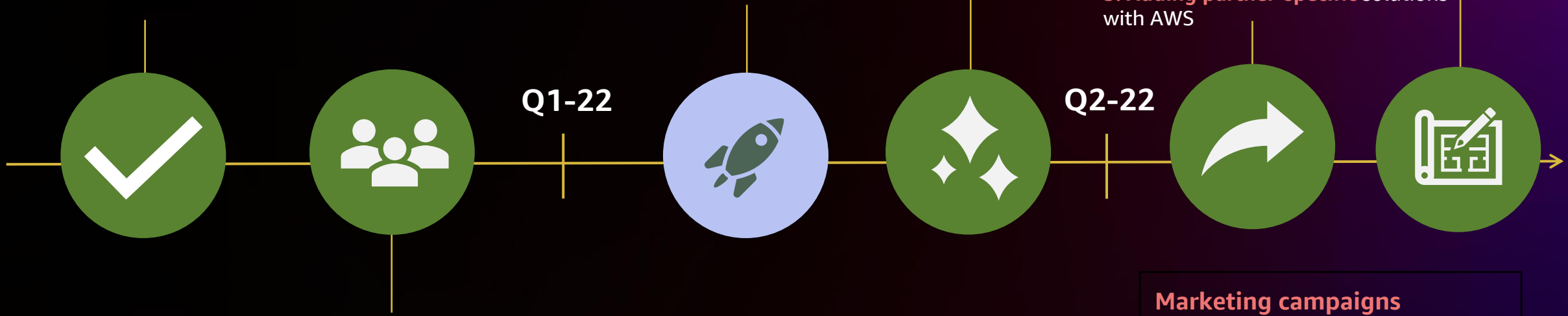
2. Set up a core team to create an MVP with a strategy, roadmap, and go-to-market plan

3. Press release in mid-March by the Group's PR department, followed by marketing campaigns

4. Adding new cloud tooling/calculators connected to the framework

5. Adding partner-specific solutions with AWS

6. Aligning our existing and new cloud offerings and solutions under the framework



Marketing campaigns
1. Overall brand awareness
2. Toolbox and calculators
3. Partner-specific solutions

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Why Knowit Sustainable Cloud?

- Measurably understand the level of sustainability throughout your cloud journey
- Increase the transparency for sustainability within the organization and toward the market
- Be prepared for new sustainability regulations and legislations
- Verify and ensure a responsible supply chain in cloud services
- Sustainability goals aligned – not disconnected – from business outcomes



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Knowit Sustainable Cloud – what is it?

- Sustainable Cloud is a set of tangible tools and best practices to make your cloud's sustainability impact measurable, visible, and manageable
- Includes a **Carbon Footprint Calculator** for daily monitoring
- Includes a **Cloud Scorecard** for tracking your sustainability-related business indicators
- A Cloud Operation Sustainability report every 6 months
- Sustainability-driven application modernization advisory on request

www.knowit.eu/sustainablecloud



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Sustainability in 3 stages

1. Understand

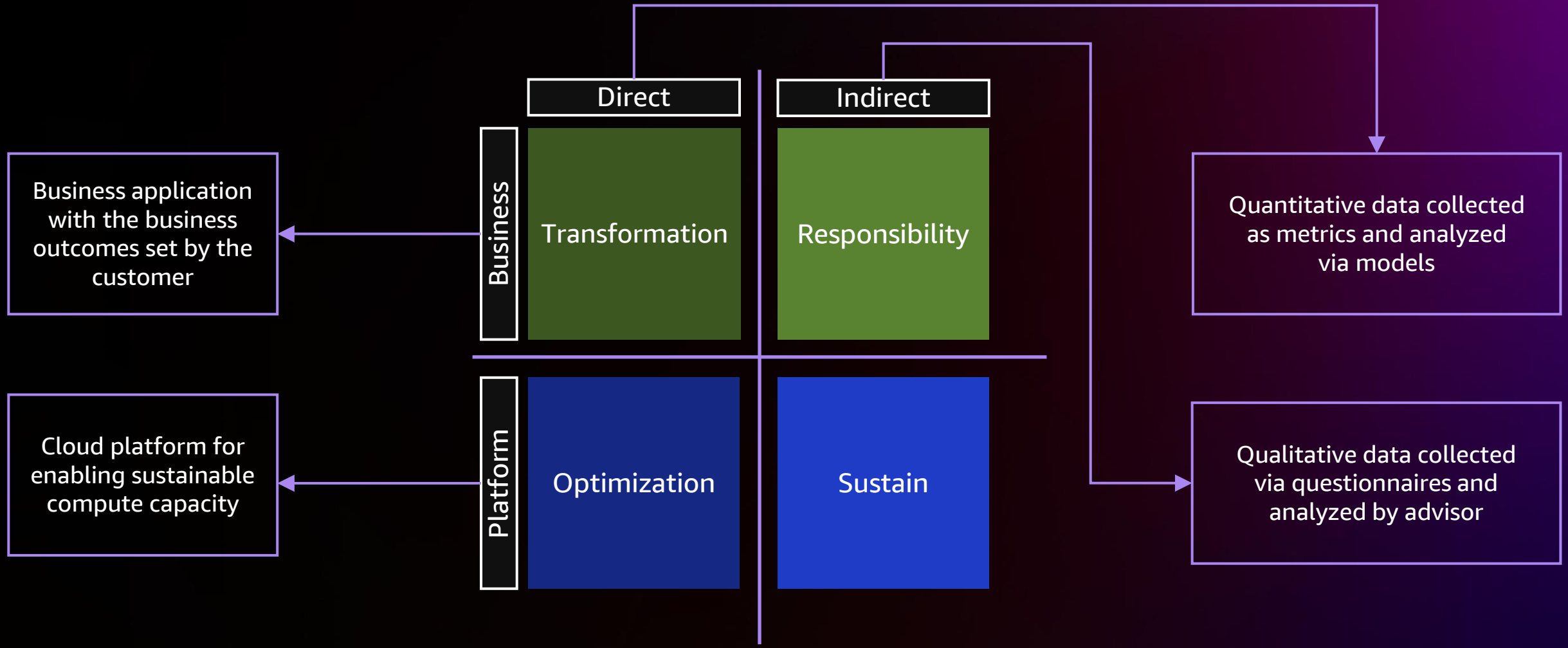
2. Optimize

3. Transform



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Sustainability impact matrix



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Direct impact

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

Enabling impact

Direct impact – energy usage and GHG emissions from cloud projects

Enabling impact – possible enabling effects of cloud projects

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SUSTAINABLE DEVELOPMENT GOALS

Examples of tangible deliverables

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Cloud Carbon Footprint Dashboard



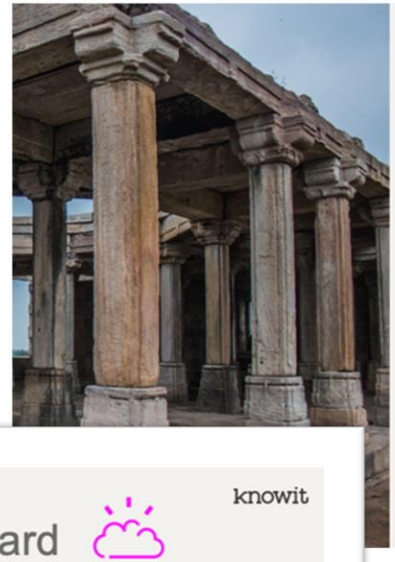
- ✓ Dynamic dashboard
- ✓ Connected to your cloud usage
- ✓ Cloud tec
- ✓ Offsetting
- ✓ Recomm

knowit

Cloud Sustainability Scorecard

	Direct Impact		Enabling Impact
	Cloud Native	On Premises – Benchmark	Contribution to Agenda 2030
7 AFFORDABLE AND CLEAN ENERGY	Energy Usage 1.2 MW/day Renewables 85 %	Energy Usage 1.9 MW/day Renewables 20 %	+++ ++ + -
13 CLIMATE ACTION	CO2e emissions 0.31 tonnes/day	CO2e emissions 1.1 tonnes/day	

+++ Major impact
++ Moderate impact
+ Minor impact
- Negative impact



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AWS Well-Architected Pillars

Operational Excellence
Ability to run systems at cloud scale and being able to continually improve implementation and processes

Security
Ability to protect information and systems at scale in controlled manner using automated controls

Reliability
Ability to build resilient systems, anticipate failure and quickly recover from failures utilizing automation

Performance Efficiency
Ability to utilize resources at efficient manner and being able to use correctly timed resources at correct workloads

Cost Optimization
Ability to analyze, predict and optimize costs based on actual needs

Sustainability
Ability to minimize the environmental impacts of running cloud workloads

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Customer user stories

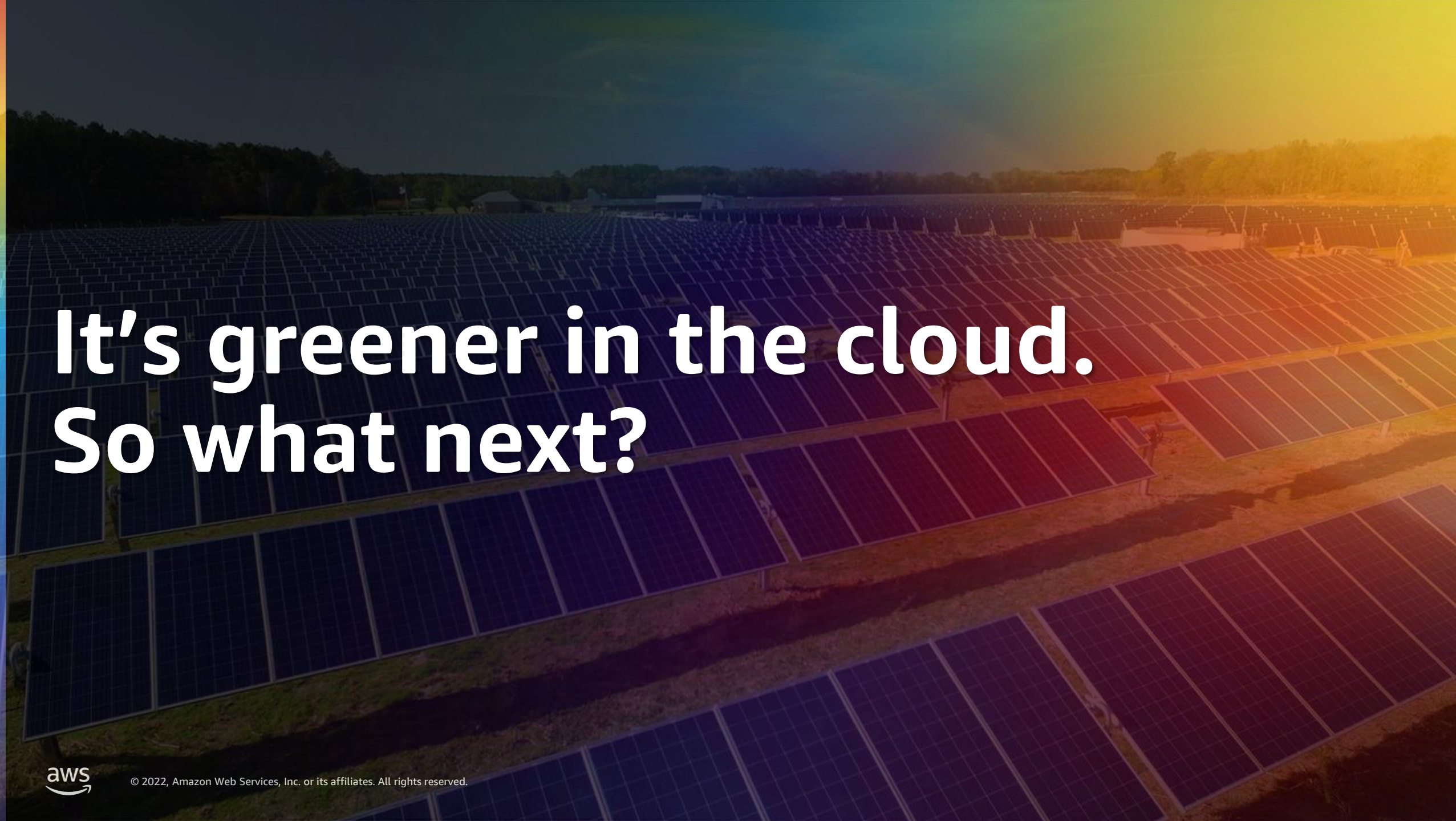
“I have regulation-based responsibility to report on my business in annual reports. This solution gives me directly the data I need from our Application.”

“We are a values-based company and it is important for us to show transparently our impact on the environment.”

“It is easier for us to demonstrate the importance of sustainability within our organization through [a] concrete and predefined model. This helps us to get stakeholder and leadership commitment.”

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It’s greener in the cloud. So what next?

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Put sustainability best practices into action!

Establish a baseline, make optimizations, review results



Business metrics

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Potential next steps in your sustainability journey

- Engage with the AWS Digital Innovation for Sustainability team
- Sustainability architecture review
- AWS customer carbon footprint tool
- Sustainability GameDay



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Move workloads to AWS



Migration to the cloud/ cloud optimization

Evaluate migrations; engage in architecture reviews



AWS Professional Services engagement/digital innovation

Turn to sustainability technologists and solutions, and innovate across your business



Build with AWS services and AWS Partner services

Identify use cases; select AWS technologies and partners



Industry products co-development

Strategic collaboration to develop new products together

aws

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