

AI & Hyperscale Datacenter – Perspectives from Microsoft

Tec Forum – March 12 2024

Primo Amrein, Cloud Lead, Microsoft Switzerland

Agenda



- Microsoft's Sustainability Focus & AI
- Shared Responsibility and Customer Tools
- Hyperscale Datacenters & Sustainability
- Datacenter and Infrastructure Innovation

Microsoft Sustainability Priorities



- Carbon negative by 2030
- Remove historical emissions by 2050
- \$1 billion climate innovation fund



- Zero waste by 2030
- Increase our reuse of servers and components up to 90% by 2025
- Invest \$30 million in circular economy



- Water positive by 2030
- Digitize water data
- Partner with Water.org and WRC members
- Invest \$10 million in water strategy fund



- Build and deploy a planetary computer
- Protect more land than we use by 2025
- Speak out on policy issues

Leadership Commitment

Accountability

Transparency

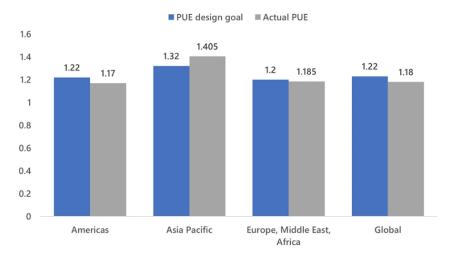
Advocacy

Co-innovation

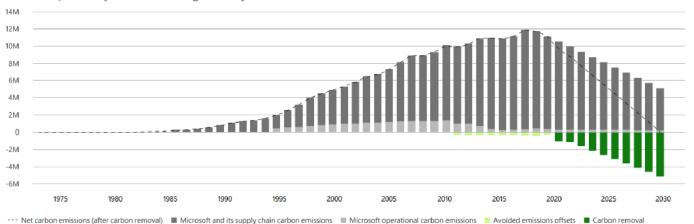
Microsoft's Pathway to Carbon Negative

CO,e

tons







1 Chart has been updated to reflect latest actual values which incorporate latest methodology and structural change adjustments.

Historic and projected emissions driven by latest actual data have also been updated for consistency. Projected removal values

have also been updated consistent with our latest projected emissions and procurement strategy.

Microsoft datacenter power usage effectiveness (PUE) = $\frac{total energy needed for facility}{total energy used for computing}$

AI Supporting Sustainability Efforts

Using AI, Microsoft and UNFCCC take aim at emissions

An Al-powered platform will analyze carbon data for Paris Agreement signatories.

_ MAEVE ALLSUP | NOVEMBER 30, 2023

Link to Article

Accelerating Sustainability with AI: A Playbook

Nov 16, 2023 | Brad Smith, Vice Chair and President, and Melanie Nakagawa, Chief Sustainability Officer

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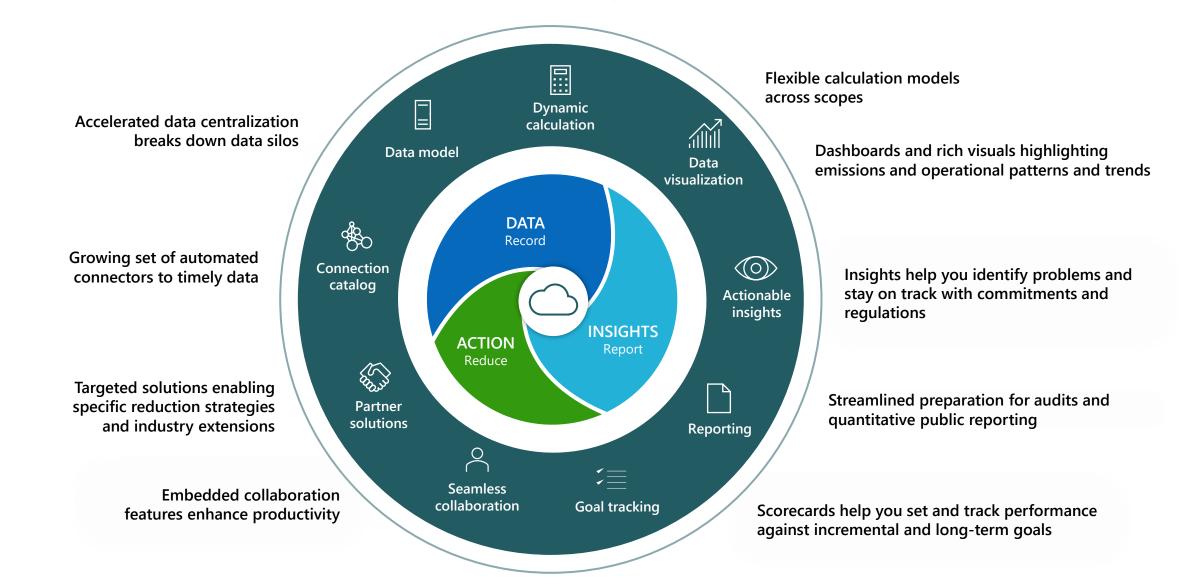
Link to Article

Shared Sustainability Responsibility

Data design and usage				
Software application design				
Platform deployments and scaling				
Data storage	Code efficiency Utiliz		zation and scaling	
Servers	Cooling	Water		Waste
Data centers				Building materials
Electricity supply				

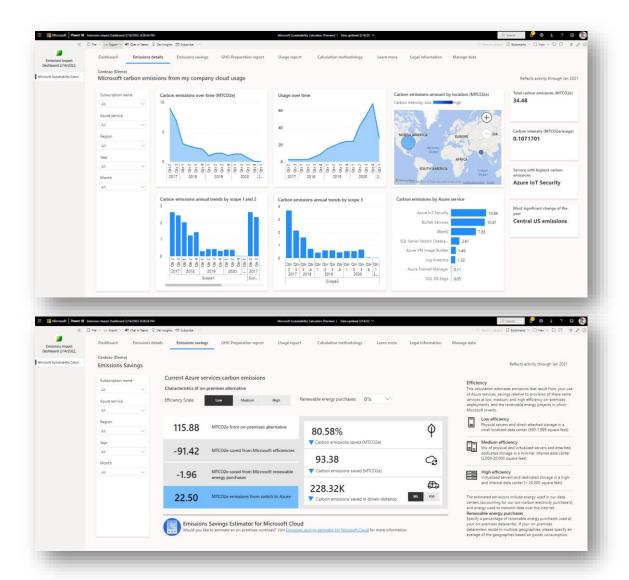
Microsoft

Microsoft Sustainability Manager



Emissions Impact Dashboard

Estimate your carbon emissions—and emissions you've already saved—related to using Microsoft cloud services



Azure Carbon Optimization (preview)

Optimize your resource utilization to lower your carbon emissions and costs

Emission Trends Emission Details Emission Reductions Search resources, services, and docs (G+/) I Emission Trends **Emission Details** Emission Reductions Export to CSV 🚯 Analyze e Export to CSV 📑 Analyze emission Resource occurs are All Projections tune are Scope 1.2 and 3 ibscription == Contoso's SAP Systems Resource group == All Emissions type == Scope 1.2 and 3 Export to CSV Subscriptions Resource arouns Resources Services Location Subscription == Contoso's SAP Systems Resource group == 95 selected Recommendation status : Active Emissions by service 16,137.3 kgCO2 16,137.3kgCO2 Total recommendation Potential monthly emissions reductions Carbon reductions equivalent (i) Potential monthly cost savings () 1,292.2 kgCO2e Scope3 1,279.6 Scope2 0 Scope1 12.7 55 285.1kgCO2e 5 planted trees \$3,663 1,292.2kgCO2e more equivalent p 2023 285.1kgC02a Virtual Machines⁶ 708.9kgCO2e antial monthly emissions reductions (i) Subscription Emissions Reductions 1 Cost Saving Resource aroun Resource Recommendation 285.1kgCO2e Virtual Machines Licens 176kgCO2e Contoso's SAP System: contoso-10 CS5DBVM0 Change from Standard E32ds v4 to Standard E... 26.9 kgCO2e \$342.00 Storage 116kqCO2e Scope1 Scope2 Scope Contoso's SAP Systems CS8VM Change from Standard E32ds v4 to Standard E... 26.9 kaCO2e \$342.00 Azure Firewall 100.6kgCO2e tual Machines Licenses 📕 Storage 📕 Azure Firewall 📕 Functions 📕 Azure Bastion 📕 Functions 25.8kgCO2e Contoso's SAP System: CS3VM Change from Standard E32ds v4 to Standard E 26.2 kgCO2e \$344.00 Azure Bastion 13kgCO2e Contoso's SAP Systems contoso-6 CH1DBVM0 Change from Standard_M32ts to Standard_M8.. 14.6 kgCO2e \$202.00 1.292.2 1,292.2 ervice Name MoM% Others 25.1kgCO2e Irtual Machine 729.1 kgCO2 708.9 kgCO2 1 20.2 kgCO2 **↑2.8%** Contoso's SAP System: contoso-6 CH1DBVM Change from Standard_M32ts to Standard_M8-.. 14.6 kgCO2e \$202.00 intual Machines I 223.6 koCO2 176.0 kgCO2e ↑47.6 kgCO2e **↑27%** Contoso's SAP Systems It2-redhat-ro LT2DBVM1 Change from Standard_M32ts to Standard_M8-... 14.6 kgCO2e \$202.00 Fact US West US 3 Fact US 2 140.8 kgCO2 116.0 kgCO2e 1 24.8 kgCO2 **小21.4 %** Contoso's SAP Systems CH3DBVMPR Change from Standard_E16ds_v4 to Standard_E... \$160.00 12.6 kgCO2e Ture Firewa 98.9 kgCO2e 100.6 kgCO2e ↓ 1.7 kgCO2e Top reductions opportunities (See all reduc 56.0 kgCO2e 25.8 kgCO2e 1 30.2 kgCO2e 小1168% Save 26.9 kpCO2e Save 26.9 kgCO2e Save 26.2 kpCO2e Save 14.6 kgCO2e Contoso's SAP Systems acss-demo-rg2 DM2DBVM0 Change from Standard_E16ds_v5 to Standard_E... 12.6 kgCO2e \$160.00 zure Rastio 13.9 kgCO2e 13.0 kgCO2e 1954.3 gmCO2e A74% CS3VM: Channe from Standard F32ds w CSRVM: Channe from Standard F32ds vi CH1D8VM0: Change from Standard M32t Standard_E32ds_v4 to Standard_E2ds_v4 to Standard_E4-2as_v4. to Standard_M8ms. to Standard E2ds v4. Contoso's SAP Systems acss-demo-rg2 DM2DBVM1 Change from Standard E16ds v5 to Standard E., 12.6 kgCO2e \$160.00 7.2 kgCO2 **↑23%** rure Firewall **↑2.3 9** 5.4 kgCC D01DBVM Contoso's SAP Systems Change from Standard E16ds v4 to Standard ... 11.5 kgCO2e \$143.00 acss-demo ackup 3.8 kgCO2 < 1 2 3 4 5 >

Carbon Aware Computing

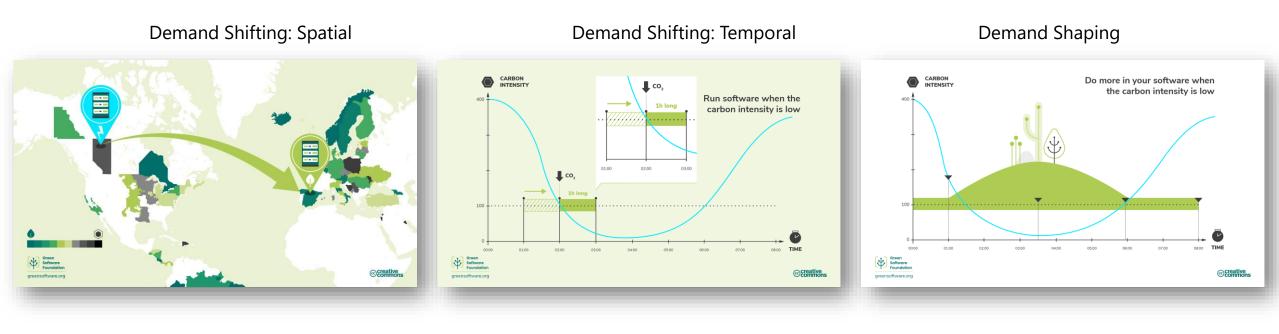
Do more when energy comes from low carbon sources and do less when energy comes from high carbon sources

Green

Software Foundation

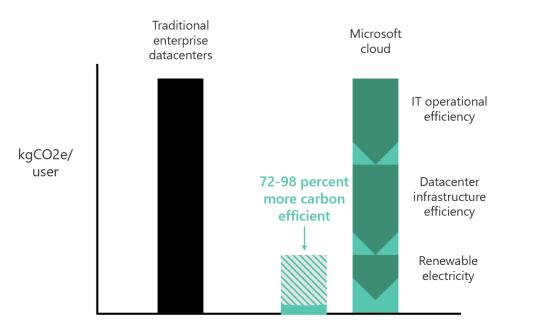
WBS

₩attTime





Better Sustainability thanks to Hyperscale Datacenters



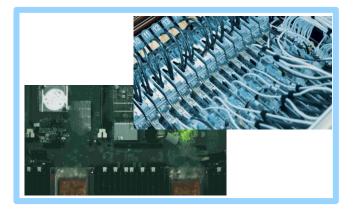


www.microsoft.com/sustainability

Link to the study

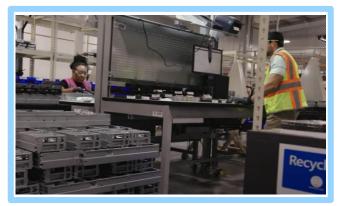
- Very high economies of scale result in much greater IT operational efficiency than smaller data centers
- More specialized, more efficient IT equipment alone reduces power consumption by 10 percent or more
- Advanced infrastructure technologies in hyperscale data centers reduce energy requirements for common tasks such as lighting, cooling, and power conditioning
- Large-scale green electricity purchases and renewable energy projects due to high consolidated demand

Microsoft Innovation in Hyperscale Datacenters



Energy efficiency

Reduced energy consumption thanks to liquid cooling



Circular Economy

Circular Centers recycle ITcomponents onsite



Microsoft datacenter batteries to support growth of renewables on the power grid

Renewables storage

DC batteries temporarily store renewable energy



Hydrogen Fuel Cells

R&D for more sustainable backup power needs

Azure Al Infrastructure

Al-optimized hyperscale infrastructure



Network Hollow Core Fiber (HCF)

47x Improvement in networking speed



Performance

Azure Boost: Offloads server virtualization, freeing up CPU resources for improved performance

300 +

Datacenters worldwide

- Networking speeds up to 200 GBps networking speeds
- Remote storage up to 12.5 GBps throughput 650K IOPS
- Local storage up to 17.3 GBps throughput 3.8M IOPS

Chip to cloud AI innovation

Hicrosoft



Azure Cobalt (CPU) Fastest of any cloud provider

Azure Maia (Al accelerator)

More efficient LLM training & inference

1225 100

Azure NCCv5* (GPU) Azure Confidential GPU VMs for AI. Codesigned by Microsoft + Nvidia

ND H200 v5* (GPU) Larger models and faster inferences

AMD MI300X* (AI accelerator) for AI optimized Azure VMs

AI Hardware Innovations



A custom-built rack for the Maia 100 AI Accelerator and its "sidekick" inside a thermal chamber at a Microsoft lab in Redmond, Washington. The sidekick acts like a car radiator, cycling liquid to and from the rack to cool the chips as they handle the computational demands of AI workloads. Photo by John Brecher for Microsoft.