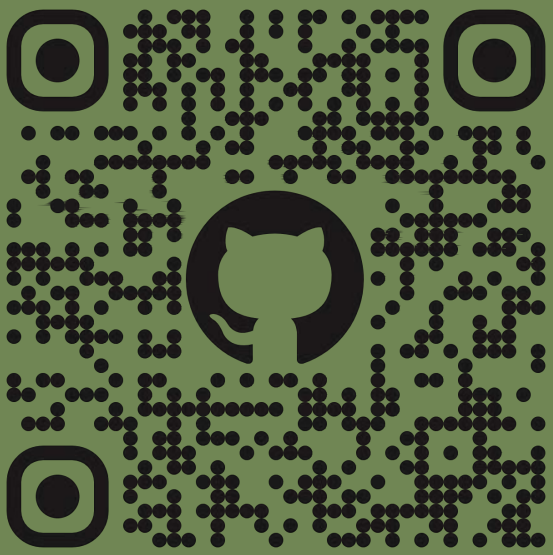
# It Isn't Easy Being Green

## Silicon Swamp

10 Oct 2024

# Link to Slides

https://github.com/making-software-greener/easy-to-be-green



# Making Software Greener, Ltd.

http://MakingSoftwareGreener.com

## Helping IT professionals and organizations:

- Cut Costs
- Reduce Environmental Impact
- Address Regulatory Issues

## We:

- Raise Awareness of Sustainable IT
- Build Skills
- Empower individuals and teams to make a lasting impact

# Who am I?

## Matt "Kelly" Williams


- Over 35 years IT experience
- International Speaker & Thought Leader in Sustainability, Cloud, and DevOps
- Creator of the Sustainable IT Manifesto
- Green Computing Foundation Advisory Board Member

# Organizations

Green Computing Foundation

greencomputingfoundation.org

Sustainable IT Manifesto

SustainableITManifesto.org



The Green Computing Foundation, a non-profit NGO in India, has adopted the Sustainable IT Manifesto as the basis for their methodologies.

While it may seem familiar, *the Sustainable IT Manifesto is absolutely not inspired by the Agile Manifesto* — not at all.

Originally shared on LinkedIn to spark interest, the manifesto quickly gained traction. Soon, it will be registered as a non-profit to ensure that no one can profit from it directly. The Foundation will also launch a pledge for organizations to adopt sustainable practices, along with a free certification program to promote these initiatives widely.

# We have a Problem

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Let’s start with an uncomfortable truth: we have a problem. It’s not just someone else’s issue. It’s all of ours. The world is increasingly dependent on technology, and that comes with consequences—many of which we don’t think about until it’s too late.

## Current Information & Communications Technology (ICT) Growth is *not* Sustainable.

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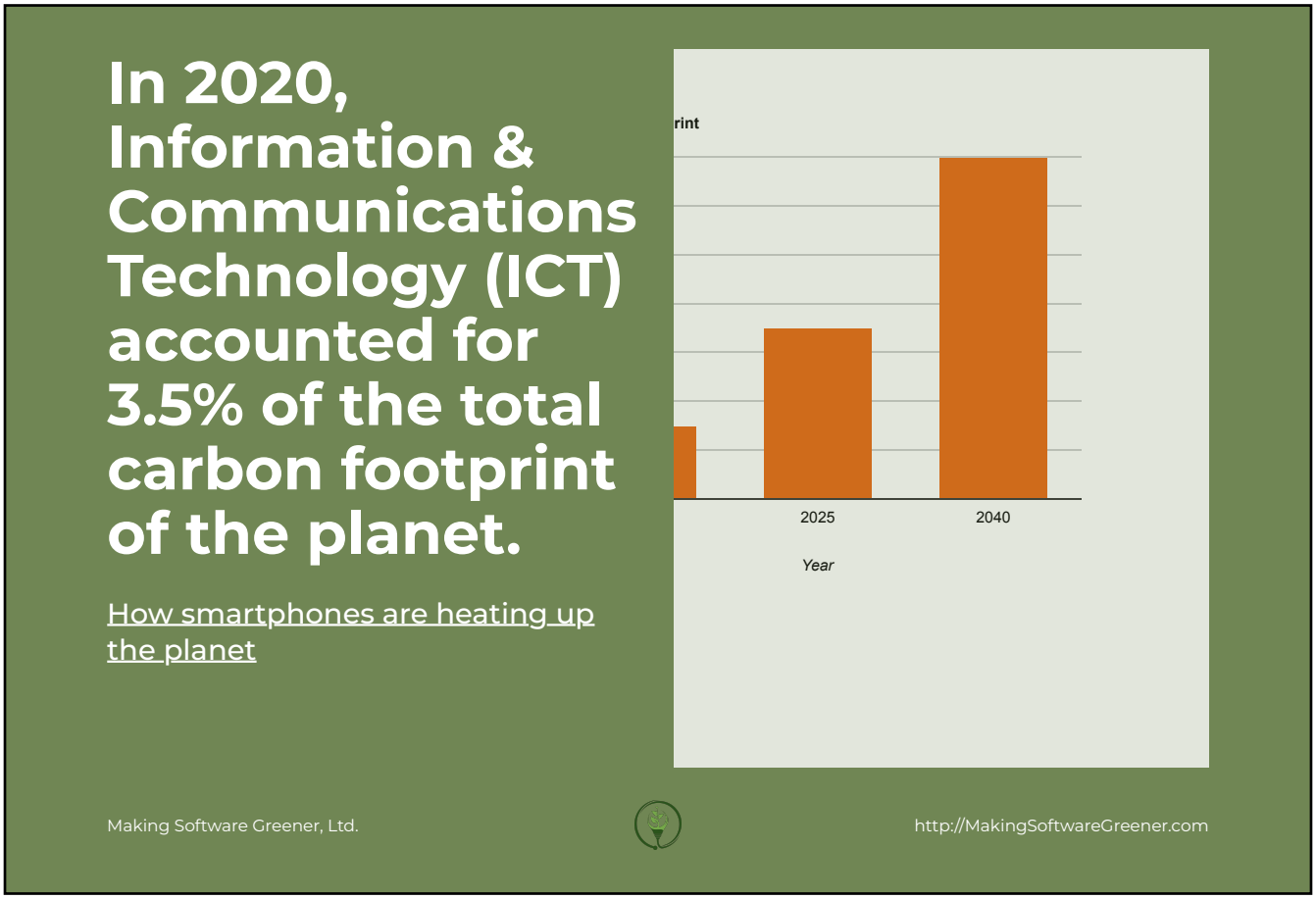
So, what exactly needs fixing right now? We often look at our tech-driven world and admire the advancements, but we rarely stop to ask: at what cost? Today, we're going to focus on the environmental impact of our tech use and what we can do to change it.




In 2020, Information and Communication Technology (ICT) accounted for 3.5% of the world's carbon footprint. That's equivalent to the global airline industry. And here's the kicker—it's projected to double by 2025 and then again by 2040. If we keep this trajectory, we'll be flying blind into a tech future that our planet can't support.

*"Every company today is a technology company..."*
*-- Jacob Morgan, Author of **The Future of Work***

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Technology has infiltrated every aspect of our lives. Whether you're running a restaurant, a hospital, or a Fortune 500 company, you rely on technology. But we need to recognize that with great tech comes great responsibility. And we can’t afford to ignore it any longer.

# Problems Give Opportunities for Improvement

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The good news is that every problem creates opportunities for improvement. We’re living in a time when sustainability is within our reach—if we take action. From improving data centers to smarter coding, there are so many ways we can reduce tech's environmental footprint. The key is to start.



We might think that we need a hero. However, we can all be heroes and heroines.

# Sustainable IT

*Practices that meet current tech needs without compromising future resources.*

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So, what is sustainable IT? It's about meeting our current tech needs without sacrificing future resources. It's about being mindful of the energy, water, and raw materials our industry consumes. And it's about creating systems that are not only efficient but also ethical.


I'd like to propose a very simple and easy to follow three step plan to promote sustainability.

# Our Plan

1. Talk about sustainability
2. ???
3. Save the World (Profit!)

# The Ostrich Effect

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Many companies and individuals prefer to bury their heads in the sand, pretending that sustainability isn’t their problem. But ignoring it won’t make it go away. In fact, avoiding it only makes the solution harder to achieve down the road. Let’s confront the reality head-on.

Unfortunately, it's not a a problem which a simple three step plan can solve. So, let's step back and examine a more realistic and approach.


When we think of IT and sustainability, most people jump to electricity use. But that’s just one piece of the puzzle. There’s water use in cooling systems, e-waste piling up in landfills, and the environmental cost of sourcing raw materials. We need to address the entire lifecycle of technology.

For instance, Microsoft's usage of water between 2021 and 2022 increased by 36%. This is *before* LLMs took off and gained their popularity. LLMs are not going to go away, but we can make conscious, responsible choices about our use of AI and its impact.

## Why Sustainability Matters

*The planet is fine. The people are f*****d. Because the everyone is trying to save the planet. The planet doesn't need that. The planet will take care of itself.*

*...*

*The planet isn't going anywhere; we are! We're going away! Pack your sh*t, folks! We're going away and we won't leave much of a trace either, thank God for that. Maybe a little Styrofoam, maybe. Little Styrofoam. The planet will be here, we'll be long gone; just another failed mutation; just another closed-end biological mistake; an evolutionary cul-de-sac. The planet will shake us off like a bad case of fleas, a surface nuisance.*
*-- George Carlin – The Planet Is Fine | Genius*

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As George Carlin once pointed out, the planet will be just fine—it's humanity that's in trouble. The earth has a way of bouncing back from damage, but we might not. So, the question isn't about saving the planet; it's about saving ourselves. And Mars is not an option.

That's why sustainability in IT matters—it's about securing a future we can live in.

## Sustainable IT Practices and Principles:

- Reduce Costs
- Reduce Environmental Impact
- Reduce Waste

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Sustainable IT is about reducing costs, environmental impact, and waste. But it's also about rethinking how we operate—how we can make the technology we rely on more efficient and less damaging to the environment.

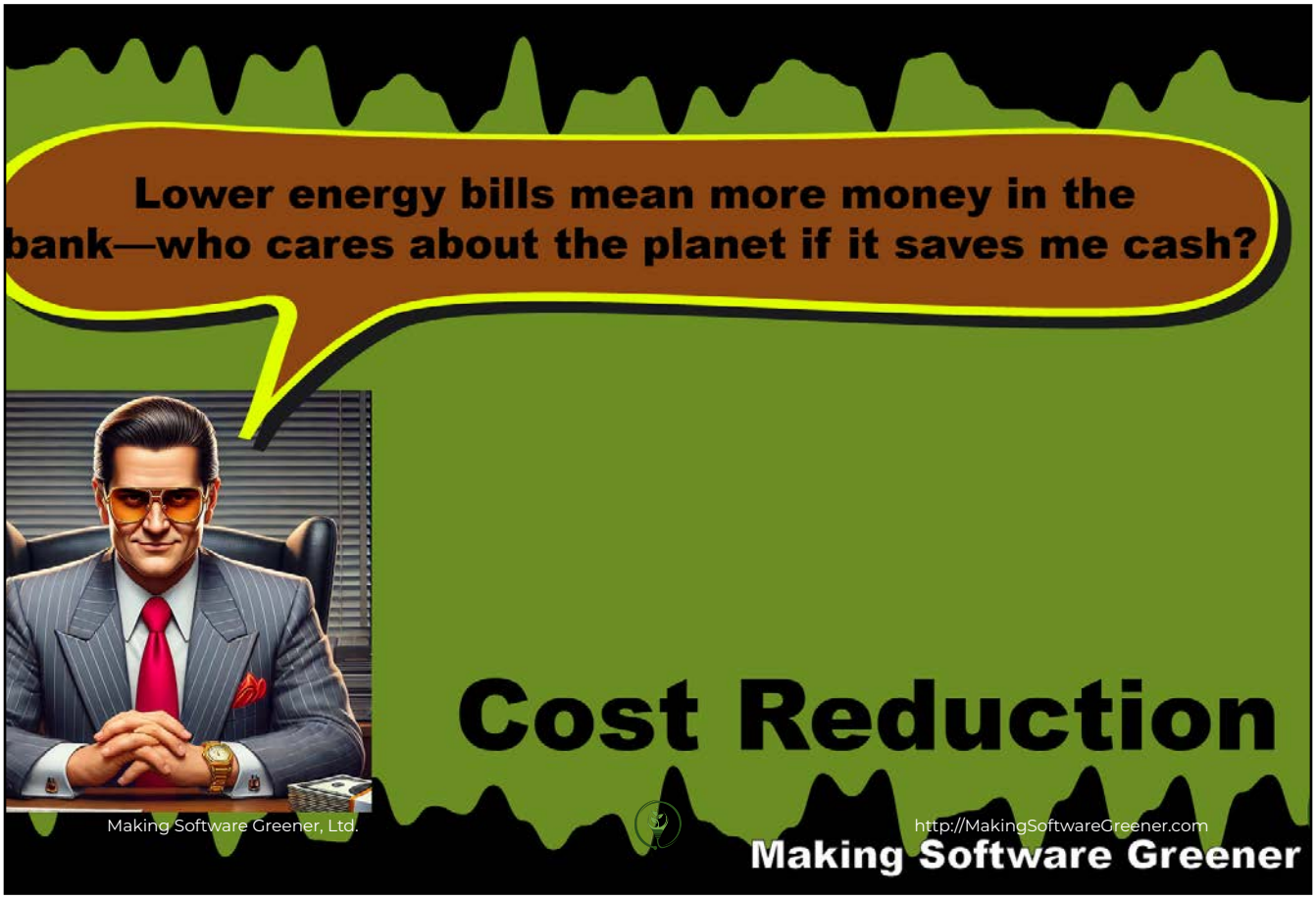
# Organizational Drivers of Sustainable IT

- Cost Savings
- Regulatory Requirements
- Environmental, Social, and Governance (ESG) Reporting
- Reputation
- Company Culture





There are many reasons for organizations to adopt sustainable IT practices: cost savings, compliance with regulations, ESG reporting, and enhancing their reputation. But beyond that, sustainability should be a part of company culture. It should reflect who you are as an organization and what you value.




A survey, in Europe a few years ago found that the incentives for becoming more sustainable had different results between engineers and managers. A majority of managers wanted to reduce costs and save money. A majority of Engineers, however, wanted to save the planet.

*“If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.”*
*— H. James Harrington, Author of* ***Business Process Improvement***

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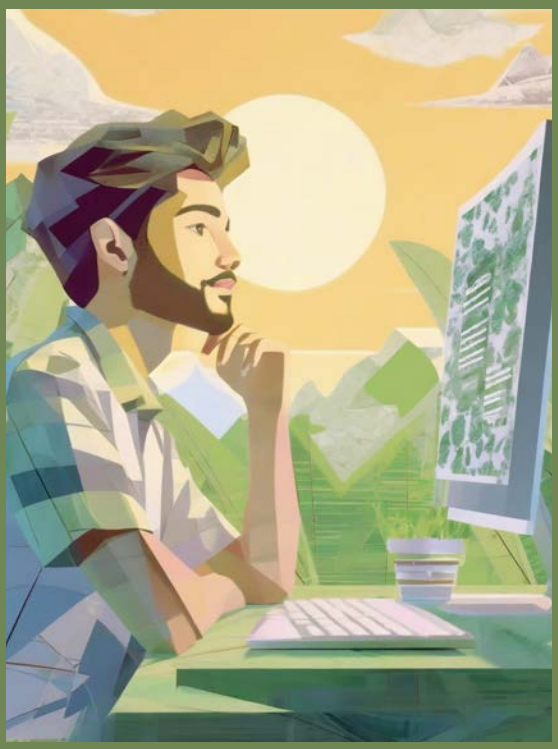
H. James Harrington said it best: if you can’t measure something, you can’t improve it. This is where metrics come in. Without understanding the data, there’s no way to know where you stand or how far you’ve come. And it’s this measurement that will drive real change.

# What can I do?



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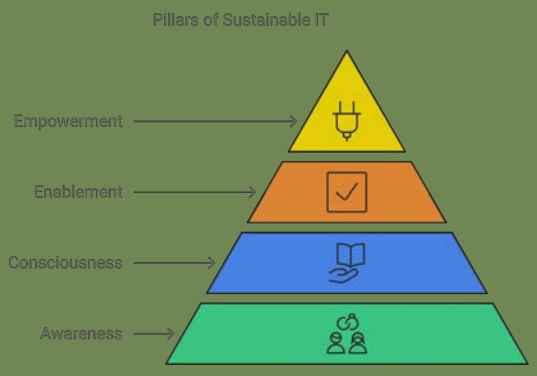
Now the big question: what can you do? It can feel overwhelming, but change starts with awareness. Once you're aware, you can start making conscious decisions. You have the ability to influence your environment—no matter your role in tech.

# Four Pillars of Sustainable IT

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It all starts with Awareness. You need to be aware of the problem.

Once aware, you can then become conscious of issues and how they manifest.

Once you are conscious, you can then gain the skills and ability to make changes to reduce the environmental impact.

Then, once a few small changes and improvements have been made, you can feel and become empowered.


Sustainability isn't just the responsibility of one department or one role. Every IT professional contributes to it. Whether you’re a developer, a systems architect, or a product owner, your choices matter. Small decisions, like writing efficient code or selecting energy-efficient hardware, add up

# Agile Practitioners / Scrum Masters

- Facilitate sustainability discusions
- Encourage continuous improvement



# Analysts

- Data center optimizations
- Tracking sustainability metrics



# DevOps

- Energy-efficient infrastructure
- Follow "The Three Ways"

# Developers

- Energy-efficient coding & serverless computing.
- Reduce Technical Debt
- Make good choices

# End-user Support

- Educate users
- Recommend energy-efficient settings and practices



# Hardware Engineers/Designers

- Design energy efficient hardware components
- Minimize environmental impact



# Leadership

- Set clear organizational goals around sustainability
- Make decisions that promote long-term sustainability over short-term gains



# Managers

- Sustainable project management
- Ethical vendor selection



# Product Owners

- Set a clear vision for product
- Prioritize green aligning features/tasks



# Quality Assurance (QA) Testers

- Identify inefficiencies in software
- Collaborate to ensure product is both functional and green

# Systems Architects

- Ensure systems can support green practices




We have to rethink the way we operate. It's not about grand gestures—it's about making thoughtful, measurable changes. From implementing DevOps practices to reducing e-waste, every small action pushes us toward a more sustainable future.

*I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it*
*-- Lord Kelvin*

# Have good metrics; this helps compliance & lets you track improvements (and cost savings!!!)

# Good DevOps Practices

- The Three Ways
- Infrastructure as Code
- Metrics

# Cloud Optimization

- Use services that adjust according to demand.
- Use servers more efficiently
- Evaluate your needs

# Energy-Efficient Hardware

Invest in tech with longer life-cycles and lower energy consumption.

# E-waste Management

Proper disposal and recycling of IT equipment.

# Sustainable Coding

- Streamlined and efficient code reduces processing demand.
- Choose good algorithms
- Language choice matters

## Comparison of Languages Performing a Bubble Sort

| Language | 1000 Elements | 10000 Elements | 100000 Elements | 1000000 Elements |
|---|---|---|---|---|
| C [1] | 0.00s | 0.24s | 32.26s | 55m 30.74s |
| Static C [2] | 0.00s | 0.24s | 32.27s | 55m 28.6s |
| Golang | 0.00s | 0.05s | 11.09s | 19m 47.46s |
| Java | 0.13s | 0.47s | 12.83s | 21m 0.46s |
| Python [3] | 0.05s | 4.74s | 8m 3.46s | 18h 18m 0.5s |
| Ruby [4] | 0.11s | 7.25s | 12m 1.23s | 20h 49m 2s |
| Ruby [5] | 0.11s | 7.34s | 12m 2.73s | |

1. Dynamically Linked
2. Statically Linked
3. Average of 2 runs for 1000000 elements
4. Preallocated array; the array is created before it is populated. 1 run of 1000000 elements.
5. Dynamically allocated array; the elements are appended and the array resizes as needed 1 run of 1000000 elements..

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For this "shootout", bubble sort was chosen because it is CPU bound and is fairly well known to IT professionals. All of the tests ran in the same container (Alpine), on the same laptop. Compiled languages were compiled in the same container. The goal was to make it as much as an apples to apples test.

The second ruby test was not run due to constraints and dynamic memory generation vs pre allocation did not make much of a difference. I do plan to re-run the test using jruby and perhaps other ruby interpreters which are faster than MRI.

# Green Hosting Options





Choose providers committed to renewable energy.

It's generally true that cloud providers, because they utilize resources more efficiently, have a smaller environmental foot print than on-prem or private data centers. However, this is not always the case. A couple of years back, the government of Scotland decided that they would be greener and move to the cloud. The only problem was that their electricity came from renewable resources like wind and wave. The cloud data center was located in London and its power was generated by coal.

# Smart Testing





Do you really need to do a full regression every time code is checked into the system? Maybe you do because of regulatory or cultural reasons. If not, it's definitely something to consider.

Likewise, do you need 100% code coverage?

# Resource Management





- How many copies of data
- Network Traffic - how close is the data to where it is being used?
- Are you over provisioned?

# Continuous Improvement





- Find a pain point & reduce pain
- Measure the Impact
- Rinse & Repeat

# Benefits of Sustainable IT

- Reduced Operating Costs
- Avoiding Regulatory Complications
- Positive Environmental Impact
- Enhanced Company Reputation


The main points of the talk are, as follows:

# Be Pragmatic





It's been said that the perfect is the enemy of the good. We don’t need perfection, we need progress. It’s better to make small, meaningful improvements now rather than waiting for the perfect solution. One small win leads to more. With time, these changes compound, and that’s when we see real transformation.

# Make better choices

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As IT professionals we have the ability to make choices about how we go about implementing solutions. There is very seldom a *best* solution -- we have choices and need to balance the costs associated with implementations. It's important in order to understand the associated costs and make our decisions based upon these costs and limitations. Sometimes it's as simple as making a *good* choice over a *bad* choice.

With time, practice, and experience we'll be better able to identify better choices.

# Reduce pain points and make small gradual improvements

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Just like agile development, agile sustainability should have short cycles -- there's much less risk involved with smaller changes and you'll also be able to see and/or isolate the impact individual changes make, which will help to prioritize other changes/improvements.

# It's a Journey

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Sustainability isn’t a destination; it’s a journey. Just like with DevOps, it takes time, effort, and commitment. The good news? Every step you take is one in the right direction, and every improvement, no matter how small, matters.

# Conclusion



# Sustainability in IT is not just a trend, but a responsibility.

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We do not inherit the Earth from our ancestors, we borrow it from our children.

# Every IT professional plays a pivotal role.

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This means you. Yes, you, in the back row. You have a role in shaping sustainability.

# Small steps can lead to significant change.

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Just like in Agile Methodologies, small changes add up over time. And by making small changes, with measurements and feedback, you can confidently make other changes and gradually improve your footprint.


# Only you can promote sustainability

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If there's one thing I want you to take away from today, it's this: only you can promote sustainability. It's a shared responsibility, but it starts with individual action. Together, we can shape a future that works for both our industry and our planet.

# Questions?

# Link to Slides

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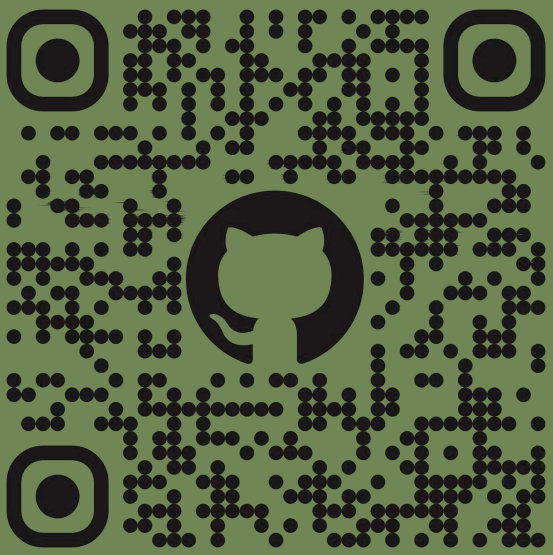

# Organizations & Events

- Green Computing Foundation I Making IT Sustainable
- Green Software Foundation | GSF
- SustainableIT.org
- Decarbonize Software | Coming in November 2023
- Sustainable IT Meetup

# Tools

- Cloud Computing And Sustainability Tools | Amazon Web Services
- Cloud Computing And Sustainability Tools | Amazon Web Services
- Website Carbon Calculator v3 | What's your site's carbon footprint?
- Carbon Footprint (US) - Greenly
-

# More Resources

- Greening Software
- The Sustainable IT Manifesto
- Green Software Ingrained in the Corporate Fabric - Meet Savannah Goodman of Google
- The Three Ways: The Principles Underpinning DevOps | Gene Kim

# More Resources

- Bridging the gap: Sustainability cannot be a siloed approach
- Optimizing your AWS Infrastructure for Sustainability, Part I: Compute | AWS Architecture Blog
- Understanding your customer carbon footprint tool overview - AWS Billing
- Estimating AWS EC2 Instances Power Consumption | by Benjamin DAVY | Teads Engineering | Medium

# More Resources

- Are you aware of your digital carbon footprint? - Capgemini UK
- Introduction to ESG
- You Can't Manage What You Can't Measure | Growthink
- You Are What You Measure
- On the perpetuation of ignorance: system dependence, system justification, and the motivated avoidance of sociopolitical information

# More Resources

- The Ostrich Effect : NPR
- Promoting International Cooperation for Sustainable IT Methods
- Making Software Greener: An Introduction to Sustainable Software Practices

# More Resources - Ecology & Environmentalism

- Why we need to stop trying to 'save the planet' and just realise our place in it
- By Preserving Resources, We're Protecting People, Too | Scientific American
- When we protect nature, nature protects us