



Department for Digital, Culture, Media & Sport

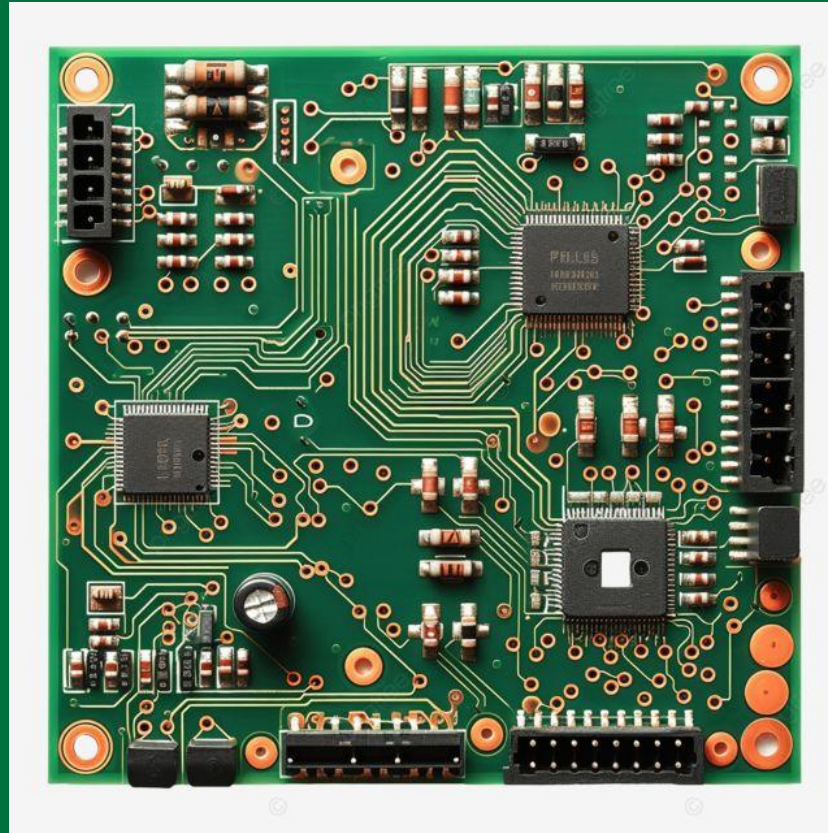


Emma Albury

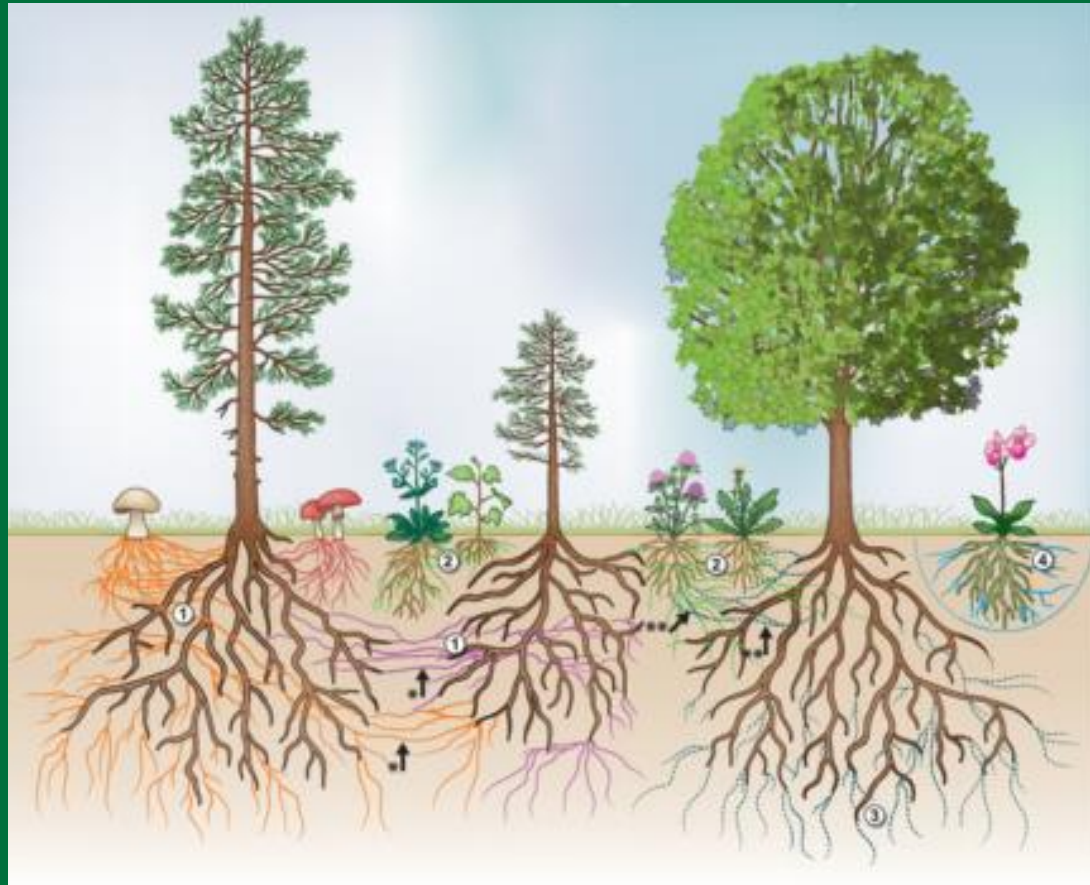
Digital Sustainability Lead

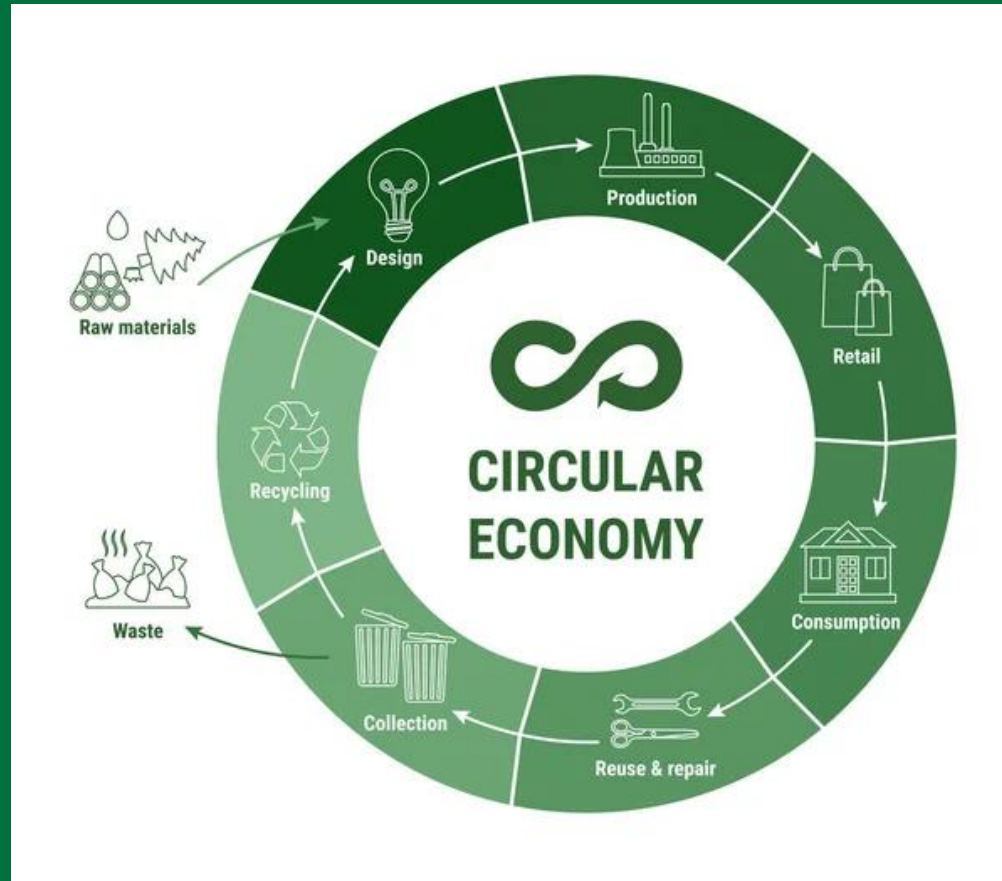
One Login

Government Digital Service



```
104      # End game if collision between player and enemy or treasure
105      # Close game if we lose and restart game loop if we win
106      if player.detect_collision(enemy_0):
107          is_game_over = True
108          did_win = False
109          text = font.render('You Lose!', True, BLACK_COLOR)
110          self.game_screen.blit(text, (275, 350))
111          pygame.display.update()
112          clock.tick(1)
113          break
114      elif player.detect_collision(dest):
115          is_game_over = True
116          did_win = True
117          text = font.render('You Win!', True, BLACK_COLOR)
118          self.game_screen.blit(text, (275, 350))
119          pygame.display.update()
120          clock.tick(1)
121          break
122
```





IMAGINE



Green Prompt Engineering

Prompt design practices that aim to maintain or improve performance while reducing the environmental impact of inference.

Be Precise

Use **clear, concise, unambiguous** instructions to minimize retries and computation time required to generate an answer.

Give Clear Directions

Clearly **define** what you want and any **constraints**, such as **tone, format, or length**.

Avoid Multimodal Inputs and Responses

Avoid multimodal tasks where **input** is **different** to **output** i.e. image generation from text input is far more energy intensive than consistent formats.

Avoid Bloat and Unnecessary Responses

Avoid verbosity by using directives like “prioritize efficiency,” “list only essentials,” or “exclude background narrative”. **Avoid politeness**, including "thank you" responses.

Batch Similar Tasks and Avoid Repetition

Combine multiple **related requests** together when possible and avoid restating the same instruction in different ways

Avoid Deep Reasoning

Avoid requests like "step-by-step", "explain in detail", "discuss the pros and cons". Instead **use lower compute alternatives**, when possible, such as "list steps concisely" or "give high-level overview".

Few-short Examples

Provide a few **examples** for AI to generate similar outputs. Use small, effective examples, not large datasets.

Persona-based Prompting

State the **persona** or **professional context** you wish the response to be tailored to, to avoid the need for redundant prompts

Avoid Extensive Analysis

Avoid broad tasks such "analyse" and instead request more **confined tasks** such as "summarize", "list", "classify", "define", or "extract"

USER-CENTRED DESIGN	Do user research to ensure you're building what is actually WANTED and NEEDED instead of making assumptions and wasting resources		
DATA ANALYSTS	Source and reuse datasets	Cache data	Clear data
PROJECT MANAGERS	Get senior leadership onboard to prioritise sustainability	Keep aligning your team by asking “Do we really need to use AI?” and “is this the most sustainable way we could do this?”	
DELIVERY MANAGERS	Encourage teams to slow down! Get it right the first time so services are built efficiently so resources are not wasted on excessive fixes.	Schedule half a day per month for your team to delete legacy systems, unused data, and logs	

ENGINEERS

Measure your algorithms using the [Green Algorithms Calculator](#)

Choose smallest, most task specific and open-source model if possible

Use compression (distillation, quantization, pruning) to reduce the overall model size

Select a **hosting solution** that is sufficiently **scalable** and **manages resources efficiently** i.e. right-sizing

Edge AI: Run locally on prem or on-device whenever possible

Schedule training for a time of day when the **carbon intensity** of the grid is **lower** using the [National Energy System Operator's Carbon Intensity service](#)

Batch Processing - process groups of queries collectively within set intervals

Measure, monitor and improve your systems to make them more energy efficient

Close idle sessions
Kill zombie systems

BUYING

Require resource **measurement** and **reporting** for transparency from **model**, **hosting** and **hardware** suppliers to understand and manage AI's environmental footprint. Demand full transparency along the entire life cycle.

For hardware; suppliers and your organisation should **have an e-waste management strategy** that involves **reusing**, **refurbishing** or **recycling** old components

Avoid landfill

Opt for hardware with a **A Digital Product Passport (DPP)**. This traces materials, origin, repairability, and environmental performance

Research if your supplier engages in **slave trade practices** (at the mining, manufacturing, e-waste, and AI data labelling stages)

There is a lot of empty promises and **greenwashing** taking place. Learn what is truly sustainable and what isn't. **Avoid offsetting**, opt for **carbon reduction** over **carbon capture**, ask for **location-based emissions accounting**, not **just market-based**.



Example Toolkit to Build a More Sustainable AI System Part 1

Need

Ask “Do I need to use AI for this?” Will it serve the **SDG's**? Does a similar system already exist? **Tool library**. Conduct an environmental risk assessment **ISO Standards**



Design

Greener Service Principles, ISO Standards



Purchasing Hardware

Greening government: ICT and digital services strategy



Data Collection

Use open-source data **Hugging Face**



Example Toolkit to Build a More Sustainable AI System Part 2

Hosting

Select data centres in regions with renewable energy **Carbon Intensity API**, **Renewable Energy Planning Database**, Measure Data centre Efficiency **PUE, CUE, and WUE**



Development

Use **Green Algorithms calculator**. Pick the smallest most task specific, open-source model **Hugging Face**, choose a model with the lowest environmental impact **AI Energy Score Leaderboard**, optimise **Optuna**



Training

Predict energy consumption with **Carbontracker**, use the **Energy Dashboard** to inform when to schedule training using the most renewable energy



Measure

Code Carbon, **Software Carbon Intensity (SCI)**, **Experiment Impact Tracker**, **Water Footprint Calculator**, **Recommendation ITU-T L.1801**



Example Toolkit to Build a More Sustainable AI System Part 3

Deploy – ment

Optimize and deploy efficiently Kepler, Kubecost,
Scaphandre



Inference

Green Prompt Engineering, AI Wattch, EcoLogits, Message Batches API



Monitoring

Code Carbon, Cloud Carbon Footprint, or Eco2AI



End of Life

Reuse and share systems and data sets. Re-purpose, Refurbish or Recycle devices and hardware IT Reuse for Good Charter



Search Engines

Web Browsers that don't Incorporate AI in them *check each update



DuckDuckGo

BUT you must [opt out](#) of AI features



Vivaldi

You can read an article by them about [Why Vivaldi won't follow the current AI trend.](#)



Orion

Kagi search does have an "AI summary" option in their search engine, but not in their browser.



Tor

Prioritizes user privacy and anonymity over convenience features like AI.



Waterfox

A fork of Firefox which supports high levels of privacy and security for its users

How will we develop methods to assess the environmental impacts of using AI tools in the NHS?

We will use ambient voice technology as a case study, and:

1. Evaluate how well we can estimate the environmental impact of ambient voice technology in NHS settings using a tool called Green Algorithms.
2. Speak with clinical, digital, and procurement leads about what to measure and how to feed this back when trying to understand the environmental impact of AI tools.
3. Host workshops to explore how patients and the public weigh the benefits of such tools against their environmental impacts.

Source: <https://www.thisinstitute.cam.ac.uk/research/projects/methods-to-assess-the-environmental-impact-of-ai-tools-in-the-nhs/>



Defra

Environment Agency

Northumberland County Council

Using AI to:

- analyse weather/sensor data to improve flood risk forecasting
- enables real-time prediction for rapid response catchments

For the first time, this tool can provide **entire communities** with accurate flood warnings in real time



GDSA 7 working groups:

- Circularity and Waste Reduction
- Emissions
- Planetary Impact
- Resilience
- Social Impacts
- Disruptive Technology
- Embedding Sustainability

Brief Mission

Mission 1
Develop principles for sustainable implementation and use of innovative technologies

Mission 2
Produce and publish a horizon scan of emerging technology & sustainability considerations

Mission 3
Identify pilot opportunities that deliver sustainability benefits



UK Government

X-Government AI Sustainability Working Group

- Discussions between suppliers and procurement teams
- Creating an AI Impact Assessment Guide
- Green prompt engineering guide

Bad for the environment



Higher energy demand (and emissions) than classic tech



Higher water demand for cooling, manufacturing, etc.



Higher material demand and waste generation



Many gaps in reporting



Good for the environment



Reduces resources required to run and deliver services



Supports better data and scientific analysis



Monitors and predicts environmental risks



Optimises resource efficiency

- AI Playbook on the AI Knowledge Hub
- Data and AI Ethics Framework
- Data and AI Ethics Self Assessment Tool
- Greener Service Principles
- The Technology Code Of Practice
- A Well Adapted UK

- The IT Reuse for Good charter
- AI Opportunities Action Plan
- UK Compute Roadmap
- Blueprint for modern digital government
- Greening Government Commitments
- Service Manual
- Greener Service Principles
- Service Standard

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