# Transform

## Towards Sustainable AI:
## How can we establish a Net Positive approach?

**By Claire Robinson**
Director of Sustainable Business Consulting

With Generative AI models leading to increased cloud carbon emissions, many organisations are facing the question - how can I invest in AI AND meet my Net Zero targets? This thought piece, by our Director of Sustainable Business Consulting, Claire Robinson covers how businesses can best approach this with a 'Net Positive' mindset - measuring the social, environmental and economic benefits of AI use cases in the short term, while supporting the green compute revolution and adopting new sustainable and renewable AI innovations in the longer term.

## A balanced viewpoint, considering present and future

In its present form, AI compute is having a negative effect on the environment, often guzzling fossil-fuel power as renewable energy demand far outstrips supply in most countries, using up precious raw earth materials for hardware, often mined in questionable human rights scenarios.

But there are incredible positives too - life-saving cancer research, democratising global access to relevant, personalised education, empowering people with disabilities, enabling water security, powering smart energy grids and the rising promise of agentic AI to automate mundane tasks.

AI is not a single technology, but many, and is far from new – machine learning algorithms have been used for decades to solve problems beyond human capacity. It is the recent explosion in Generative AI use by the public that is driving emissions sky-high, becoming international news.

I believe that it's impossible to achieve the UN's sustainable development goals without using machine learning, as this is the only way to form a complete understanding of the world's resources to enable broader sharing of access. This is backed up by new research from Nature.com, suggesting that AI solutions will positively contribute to achieving 79% of the SDGs:



Source: Springer Nature Sustainability Community
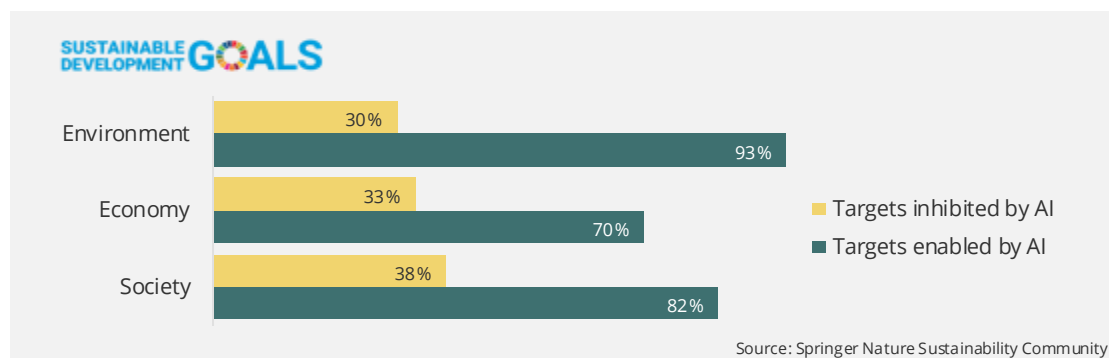
Ironically, we can't even model the climate crisis to understand impacts and create effort-focusing adaptation strategies without using resource-intensive machine learning compute. Exciting new breakthroughs like Google's brand-new Neural GCM technology enable us to understand and adapt as a species, creating opportunities to evolve and survive in a changing world.

This belief that AI can be sustainable is predicated on achieving 3 things:
- The **"Greening of AI"** (ensuring materials and energy is planet and people positive), and
- Supporting **Greening by AI** (systems and services are fueled by ethical and environment positive use cases), whilst:
- **Adopting Net Positive decision making** in the near term

Transform

# 1. Driving the greening of AI – get on board the sustainable compute revolution

Many businesses who are using AI and digging into their Scope 3 carbon emissions data (upstream into supply chain and downstream into usage of products and services), will have seen a large jump in their carbon emissions, especially if using Large Language Models like Chat GPT.

The carbon impact of these Generative AI models really hit in 2023, as they can use up to 30x more energy per prompt than a simple search, shifting the balance of energy consumption from the training of the model to the inference stage – customer usage. It is the use of these tools by the public that is driving Cloud giants like Microsoft and Google to report + 30% and +50% emissions respectively, potentially jeopardising their net zero pledges.

If models are trained and used responsibly (see the patterns project by GSF), they are absolutely compatible with a sustainable future. Managing the Carbon Intensity of AI downwards is both an infrastructure issue, and an ethical one – with decisions in the hands of businesses, governments and citizens.

## Businesses

Businesses like DeepGreen and Heatacompute are helping drive the change towards measurably sustainable, more circular AI compute, repurposing waste heat for social good, but the power of scale sits with the big 3: Cloud Hyperscalers Google, Microsoft and Amazon have the clout to drive the transition towards renewable energy (eg OpenAI's investment in Helion a nuclear Fusion player).

In the shorter term, the cloud giants need to report carbon more granularly to help their customers use energy when and where the grid is greenest, rather than leaving it to innovators like GreenPixie and GreenAlgorithms to provide AI and cloud carbon footprinting.

Props to Meta in this space who have recently released the carbon footprint of Llama 3 – I'm looking forward to seeing more transparent measurement and sharing of proven carbon reduction strategies.

## Governments

Governments can create incentives and legislation to drive this forward – like the EED (Energy Efficiency Directive), really promising legislation from the EU earlier this year which required data centres to report on: floor area, installed power, data volumes, energy consumption, PUE, temperature set points, waste-heat utilisation, and water and renewable-energy usage – in Germany, data centres will be required to be 100% renewably powered by 2027.

Incentivising green energy, investing in battery technology and taxing carbon emissions would all perform a valuable role in ensuring companies can decarbonise more quickly.

The UN is calling for countries to measure the environmental impact of AI's lifecycle 'end-to-end' in its recent issue note, but this has yet to translate into a common, trusted and comparable approach.

## Citizens

If humans were continuously made conscious of the impact of their choices to use LLMs – if we could see that a prompt was using X litres of water and X watts of power, would we be as frivolous with our usage? We don't leave taps streaming or car engines running idle, because we understand the value of fuel and water.

Often, waste compute is generated by people using the wrong model for the task, when a simpler or smaller model would be more than sufficient – this is inefficient for planet and profit. Education, clearer nudges and guidance towards the right size model could support users make better choices in their use of AI.

If more people valued data and compute in this way, aligning it with an economic, environmental and social cost – shifting perception from an abundance to a scarcity mindset - would this reduce consumption?

Clearly, we need to continue to innovate, measure and reduce unnecessary consumption until we can support AI compute sustainably, putting the right guardrails at organisational and societal level in the meantime. **And that leads to the next pillar of Sustainable AI: what is that compute designed to do?**

**Transform**

## 2. Towards greening by AI – use cases which create good outcomes

The negative uses of AI are well publicised – helping locate more oil reserves or creating more biased citizen surveillance, often by companies with the largest R&D budgets.

However, as demand for sustainable products increases with changing public attitudes, and a more socially motivated Gen Z flourishes in the workforce, I believe the scale of renewable and sustainable innovations driven BY AI will far outweigh the negative.

It's clear that only AI can help address some complex environmental and social issues - there are some knotty global sustainability problems that are impossible to tackle without beyond-human level intelligence.

Google DeepMind researchers have recently discovered 2.2 million crystal structures, including 380,000 stable materials that can be synthesised in a lab and could power future technologies such as batteries, computer chips and solar panels – this could potentially reduce reliance on finite materials and mining which has terrible consequences for the environment and human rights.

In this same vein, Transform are working with a Polymer manufacturing company, to use machine learning to find new, more environmentally friendly polymers. This level of discovery would not be possible by human scientists, taking many hundreds of years.
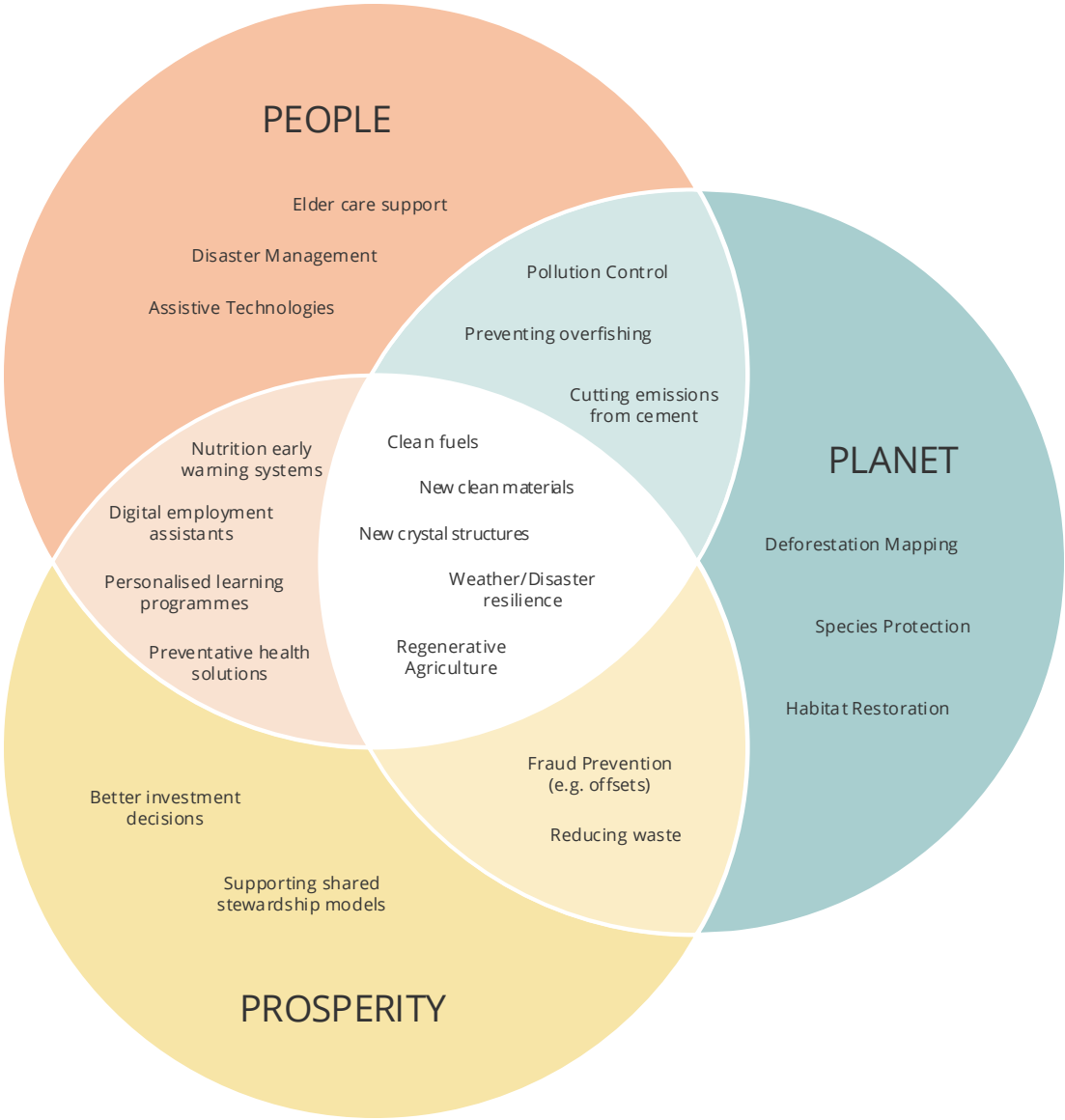
AI can support Planetary health in other ways, preventing overfishing through detection of illegal activity, and Mapping Deforestation to direct regenerative action, connecting people to projects (check out the ClimateProjectExplorer launched at COP29).

Machine learning is Helping solve the waste crisis, Reducing the emissions of cement and supporting Disaster management, so it's clear that benefits can outweigh the negatives in many cases.

**Transform**

Transform are working with a Polymer manufacturing company, to use machine learning to find new, more environmentally friendly polymers.

# AI use cases contributing to a sustainable future

**PEOPLE**

Elder care support

Disaster Management

Assistive Technologies

**PLANET**

Pollution Control

Preventing overfishing

Cutting emissions from cement

Nutrition early warning systems

Clean fuels

New clean materials

Digital employment assistants

New crystal structures

Personalised learning programmes

Weather/Disaster resilience

Preventative health solutions

Regenerative Agriculture

Deforestation Mapping

Species Protection

Habitat Restoration

Fraud Prevention (e.g. offsets)

Reducing waste

Better investment decisions

Supporting shared stewardship models

**PROSPERITY**

From a social perspective, AI is also improving global human health through food security predictions – the Hunger Map and Nutrition early warning system both excellent examples.

Continuing in the social benefits realm, AI tools can provide unprecedented access, experiences and education for people with disabilities; products like MyEye 2.0 help people with sight impairments navigate the world.

If you'd like to include your project on this map, or if there's something we've missed, here's an interactive version for your updates (PW: aiforgood)

These use cases of AI are building a more sustainable world for all and beg the question:

How can your organisation ensure the AI use cases you explore will deliver social and planetary good?

**Transform**

## 3. Adopting Net Positive decision making, building in Sustainability by Design

Until the grid is 100% renewable, materials for hardware are sourced sustainably, and access to AI solutions is distributed equitably, we will need to make value-based decisions, using human judgement, on whether we're delivering net benefits in each use case.

The choice of when to use AI and when not to is entirely in our gift as technologists. Right now, Generative AI is still in its infancy, its truth not always reliable, and Artificial General Intelligence (that matches or surpasses human cognitive capabilities across a wide range of cognitive tasks) still feels a long way away, so it's about establishing the right kind of guardrails for the near term.

Sustainable design and decision making is becoming the default. This has clear parallels to the Government Digital Service revolution and 'digital by default' – again, we need to build the 'sustainable by default' muscle consciously until it is second nature.

This means bringing sustainable thinking further upstream so the decisions whether to create a product or service, and how to build it in service of planet and broader humanity is considered. The era of User Centred Design is giving way to a more expansive practice which considers the environment and social justice.

We're seeing Planet-Centred Design from Defra, groups like the Government Digital Sustainability Alliance, and working groups in the DWP measuring the carbon as well as financial cost of their end-to-end services. The direction towards more Sustainable AI is clear, but we still have a way to go.

Beyond this, we're working towards a 'Net Positive' metric, incorporating social environmental and economic scores, measuring what we can, but also taking into account what isn't currently measurable. We're balancing positives and negatives, to ensure benefits outweigh harms, across:

**Economic value.** This is how typical business cases are formed, but we're focussing beyond short term ROI, towards longer-term citizen prosperity.

**Social value.** Can we use the project to deliver community benefits? How can we measure impact on local communities? Can we get their input? Can we drive towards inclusion for all?.

**Environmental value.** Projected carbon, water and materials impact. Biodiversity and Nature metrics. Are there predicted hotspots to focus mitigative action?

At Transform, we're committed to ensuring the services we design and build are sustainable by design, and environmental impact is considered alongside organisational and commercial value. Our proposition is to deliver Net Positive services with our clients, and these services may well be enhanced through the use of AI.

We have always worked with our clients to ensure that technology is the enabler not the end-game, anchoring solutions in organisational outcomes and user needs – be they commercial, citizen or stakeholder. AI is no different – but right now in danger of occupying the overpopulated space of "solution looking for a problem".

We help our clients use the right technology for the right outcome – when overlaid with a sustainability lens this includes consideration of:
- Do we understand the short- and long-term cost – in £ and resources?
- Are we creating future technical debt?
- Is the solution scalable or disposable?
- Will AI enhance the solution significantly; will the outcome offset the input?

Our clients are equally invested in doing the right thing in the right way – so we work to ensure we all hold a collective understanding of delivering net benefits to citizens, considering social and environmental, as well as economic factors.

**Emma Robertson**
CEO at Transform

# Sustainable AI – building the muscle within organisations

So – we need to incorporate sustainability into our decision making, ensure the way we work is socially and environmentally sustainable, and that we're keeping on top of existing innovations whilst also finding new use cases. How can we tell where we are on the journey? How can we model that?

At present, because in many organisations AI is nascent rather than 'BAU', many of us are in Dunning's 'Unconscious incompetence' stage (we don't know what we don't know).

Drilling into the environmental and social consequences of AI leads us into 'Conscious incompetence' (we now know what we don't know) and the awareness of this knowledge gap drives us to learn more, leading towards 'Conscious competence' – (knowing what we know but practicing it very deliberately and consciously).
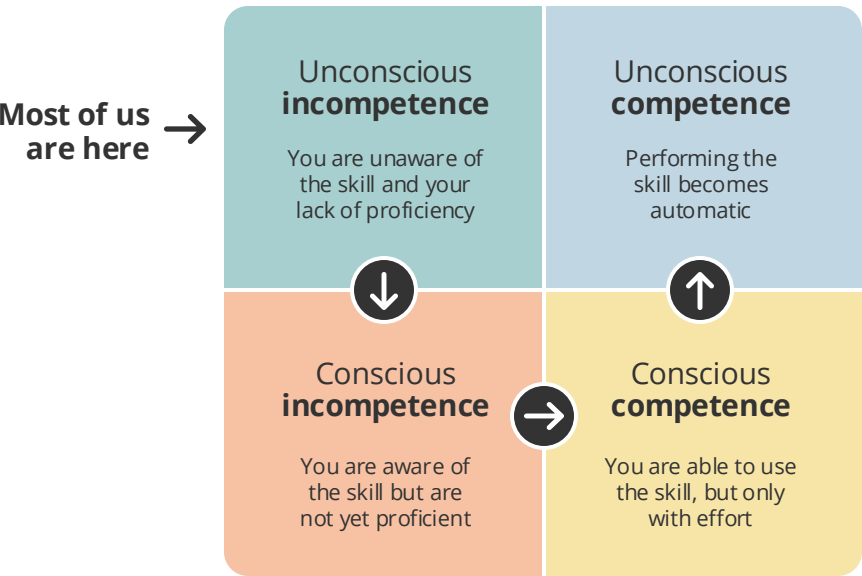
I would argue that no actor or organisation is yet in the 'Unconscious competence' stage with AI (where the skills to decide which AI use cases represent net positivity are so ingrained they're unconscious) – we are still forming in this space.

We're working with clients through 3 stages – running 101 Academies to move from Stage 1 to 2, and AI labs to move from 2 to 3, supporting the journey towards conscious competence by building the organisational muscle to make more responsible decisions

**Straddling the 3 Pillars of Sustainable AI**

Our practice at Transform brings together the pillars, we:

• **Drive the Greening of AI by measuring and reducing** the environmental footprint of our software, reducing digital waste, using the greenest compute, and working with cloud providers to get more accurate information to baseline from.

• **Drive Greening by AI through adopting relevant new models** designed to deliver social and environmental good for citizens. We regular review changing landscapes – as more renewable solutions become available, we weave them into our practice.

• **Adopt Net Positive analysis and decision making** in the AI use cases we work on; ensuring we're supporting clients towards 'Conscious Competence'

**Most of us are here** →

| Unconscious **incompetence** | Unconscious **competence** |
|---|---|
| You are unaware of the skill and your lack of proficiency | Performing the skill becomes automatic |
| Conscious **incompetence** | Conscious **competence** |
| You are aware of the skill but are not yet proficient | You are able to use the skill, but only with effort |

**Transform**

# Dystopia or Utopia: The Responsibility is Ours

With each new piece of damning evidence or news of world-changing breakthrough (and the effects of recency bias), I often oscillate between hope and worry on the topic of AI. Sometimes the dystopian future seems more likely… but then it's overtaken by positive news, and a sense of keen responsibility.

The AI train has well and truly left the station. Some of the uses have very negative consequences for the environment and for common people. However, it's the easy route to throw stones at the tech billionaires and say that it'll never be sustainable – it's the harder route to support positive uses and help guide the industry in the right direction.

I believe this is about human responsibility. It's up to us to contribute to the future we want, taking part to steer it.

If we believe in fairness, equity, access, and climate justice, it's on us, within businesses to create and share the positive and mitigate and limit the negative. It's on us, within governments, to legislate sensibly. It's on us as citizens to consume responsibly.

As climate powerhouse Solitaire Townsend often says – humans invented how the world works today through our ideas and imagination – so we have the power to reinvent it in new sustainable ways.

Working for a data and technology consultancy who builds services for citizens, my role gives me opportunities to support our clients and AI teams in weaving ethical, social and environmental considerations into their decision making. This helps decrease backlogs, ensuring all citizens are benefitting from advances in technology, not just a select few. For me, this is an extension of the responsibility I feel on Sustainability (my personal 'why' post is here), and my choice is to actively engage.

My belief is that AI can be sustainable, but only by the active involvement of humans working ethically together. My belief is that businesses, governments and citizens can all co-ordinate a positive set of actions to protect the world for future humans. And this future shines brightly as my North Star.

## This is about human responsibility - it's up to us to contribute to the future we want, taking part to steer it.

We'd love your thoughts and inputs to this paper, especially in building out the 'AI for Good' use cases – do get in touch and let us know if you're working on a project which we should include.

**Claire Robinson**
Director of Sustainable Business Consulting
Email: Claire.Robinson@TransformUK.com

## Transform

60 Great Portland St
London, W1W 7RT
Tel: +44 (0)20 3128 8000
TransformUK.com