

GREEN ENTERPRISE TECHNOLOGY

Special Report

As environmental, social and governance (ESG) principles become increasingly tied to corporate reputation, how can enterprises mobilise digital technologies to tackle climate change?





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Let's GET moving!

When it comes to issues of sustainability there's a clear disconnect between intention and action. A recent survey by our sister company iResearch, revealed that most C-suite executives working in tech (over 500 were quizzed) thought that sustainability was important. Yet only 65% of these same leaders said they were satisfied with the level of sustainability achieved at their own companies. But whether you're a tech company, an industrial machinery manufacturer or a well-known FMCG brand, the challenge remains the same: one of the biggest hurdles with ESG policy is implementation and knowing where to start.

While there's no direct link between technology and sustainability, it's clear that digital tools that gather data, enhance supply chain visibility and optimise processes have obvious use cases in helping firms on their way towards net zero.

We hope that this Green Enterprise Technology report will support you in that journey. The first section offers an overview of the current state of climate tech and the carbon offsetting economy. The second part takes a deeper dive into some transformational technologies – many of which your IT department will already be familiar with.

Except we look at how APIs, low code/ no code platforms, AI and ML, digital twins, sensors and blockchain may be used as tools help measure, monitor and reduce your firm's carbon emissions all the way through the supply chain.

We also look at what's being done to 'green' the data centres that power these technologies as well as examining what good circular technology lifecycle management looks like – from smart procurement to best practice for information technology asset disposal (ITAD).

It's not an exhaustive report by any means, but by interspersing this with actual use cases we aim to give you some ideas of how to turn ESG policy from an PDF document on a website into an actionable platform that can help your firm reduce its carbon footprint.

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How can green tech help firms reach net zero?

Ann-Marie Corvin reports on how firms can align technology with sustainability while navigating the carbon market maze

While the corporate will to become sustainable has never been greater, and the need to act never more urgent, many businesses appear stuck in a policy quagmire and don't really know where or how to start. As Mía Diawara, a partner at Lowercarbon Capital, which invests in climate tech, observed at Slush last month: "What you often see is companies caught up in this paralysis, where they've made a commitment to sustainability – but they don't know what to do next. "It's a lofty goal that someone from the C-Suite has committed to and they don't know what to do so it gets passed down to the people below them." While there's no direct link between technology and sustainability, it's clear that digital tools that gather data, enhance supply chain visibility and optimise processes have obvious use cases in helping firms on their way towards net zero. In theory, technology should be aligned with all organisations' sus-

tainability goals in the same way that digital transformation technologies have become aligned with their business goals, but we're not at that stage yet.

Only 7% of firms in a recent Accenture survey claim to have fully integrated their technology and sustainability strategies. 33% struggled with the complexity of the solutions meanwhile, or with making their legacy systems sustainable.

It's notable that some of the early users of climate tech have come from the technology and finance sectors. Supercritical, for instance, is a software platform that claims to help asset businesses, VC funds and tech businesses, reduce and offset climate impact.

It's founder Michelle You explains its customer base are the "perfect early adopters" because "they're comfortable with risk and they understand scaling".

There's also a trend among CIOs within firms taking on the sustainability role. Jo Graham, CIO of online fashion retailer Boohoo recently led

her firm's Agenda for Change (A4C) to put an end to modern-day slavery allegations and supply chain failings.

At a recent summit she noted: "The project needed someone who had done transformation, who had done programming governance and who could work with and satisfy those people."

What to measure?

Mandatory carbon reporting – especially for companies of a certain size, but soon too for SMEs, is coming thick and fast in territories such as the EU, the UK and US – yet most of the laws being passed still don't state how granular this data needs to be. Given all this confusion and lack of current standards, how can firms make the leap from policy to implementation? And what technologies can help them do this?

To work out how much your company is emitting you need a measurement system. This is where the "scopes" – a term that originally surfaced in the Green House Gas

Protocol over two decades ago – come into play.

Scope 1, 2 and 3 have become the standard way of categorising the different kinds of carbon emissions that companies create in their own operations and within their wider value chain.

Scope 1 covers the carbon emissions a company makes directly – running boilers or vehicles, for instance; while Scope 2 covers all the emissions firms make indirectly – when the electricity they buy for heating and cooling buildings, for example, which is being produced on their behalf. Scope 1 and 2 are considered within most organisations' control but Scope 3 is harder to measure and currently accounts for 70% of all corporate carbon emissions.

In this third category go all the emissions associated, not with the company itself, but those that the organisation is indirectly responsible for, up and down its value chain. For example, from buying products from its suppliers, and from its products when customers use them.

If you're still processing all the terms, the acronyms, and the legislation tied up in world of carbon emissions, then you have the sympathy of David de Picciotto – co-founder and CEO of Pledge, an infrastructure platform that claims to make it easier to embed carbon measurement into customer experience.

He used to work for a firm with a big focus on ESG and saw how tedious it was to understand and report on the specifics of climate metrics. He advises:

"The best place to start is by thinking about what net zero means. Net zero is a target to negate greenhouse emissions caused directly and indirectly by your business.

"There are four key steps in that journey – there's measuring emissions; reducing emissions; removing emissions and then reporting on the progress until you reach the end of your journey."

"So, you need to have the data and then understand which methodology you need to apply to compute emission in a way that is accurate as possible," he adds.

Stephen Mellor, CTO of Responsible Computing – a membership consortium founded by Dell and IBM that is pushing for greener IT operations – suggests finding your organisation's sustainability North Star ("or Southern Cross if you're operating in the southern hemisphere").

He says: "Measure what it is that you currently care about. We're all wor-

ried about energy, obviously, because of prices, but you might also need to think about materials and about waste. But they're going to differ by business. What a car plant cares about are not going to be the same as a logistics firm or a healthcare business."

The consortium is currently formulating a self-assessment questionnaire that firms can fill in which then offers recommendations on the best course of action to take.

"Not all the suggestions are necessarily tied back to ROI," adds Mellor, "but companies are not going to do this unless there's a strong incentive, so the focus is around how can they make their businesses more efficient, more effective and more profitable."

Carbon reporting

Whether it's plotting carbon emissions on a spreadsheet or using automated solutions such as SaaS-based reporting tools, most experts agree that measurement is a good first step towards becoming carbon neutral. It's only once you know where your emissions are coming from that you can then come up with a plan to reduce them.

In terms of tech platforms – from IBM's Envizi and Salesforce's Cloud Net Zero to the plethora of start-ups out there focussed on industry-specific tasks – there are plenty to choose from – although be aware that many are still at the proof-of-concept stage.

You explains the benefits of using a specialist software platform and advisor to support companies on this journey. "I've seen companies struggle with spreadsheets and try and do it themselves – but it takes expertise – it's good to have guidance to advise on the low hanging fruit," she says.

The founder explains another mistake companies make is in neglecting to measure the full supply chain emissions. "Not just energy-related scope 1 or 2 but further up the value chain – your cloud usage, your work from home emissions...that is all what has to be measured and reduced," she adds.

Carbon offsets

Once firms know where their emissions are coming from, they need to come up with a plan to reduce and, where they can't reduce, they can offset – and the latter is often where things start to get more confusing than they probably need to be. Companies can account for their unavoidable emissions by buying carbon credits from certified activities that

support carbon avoidance schemes such as community development, protecting ecosystems or investing in clean energy plants.

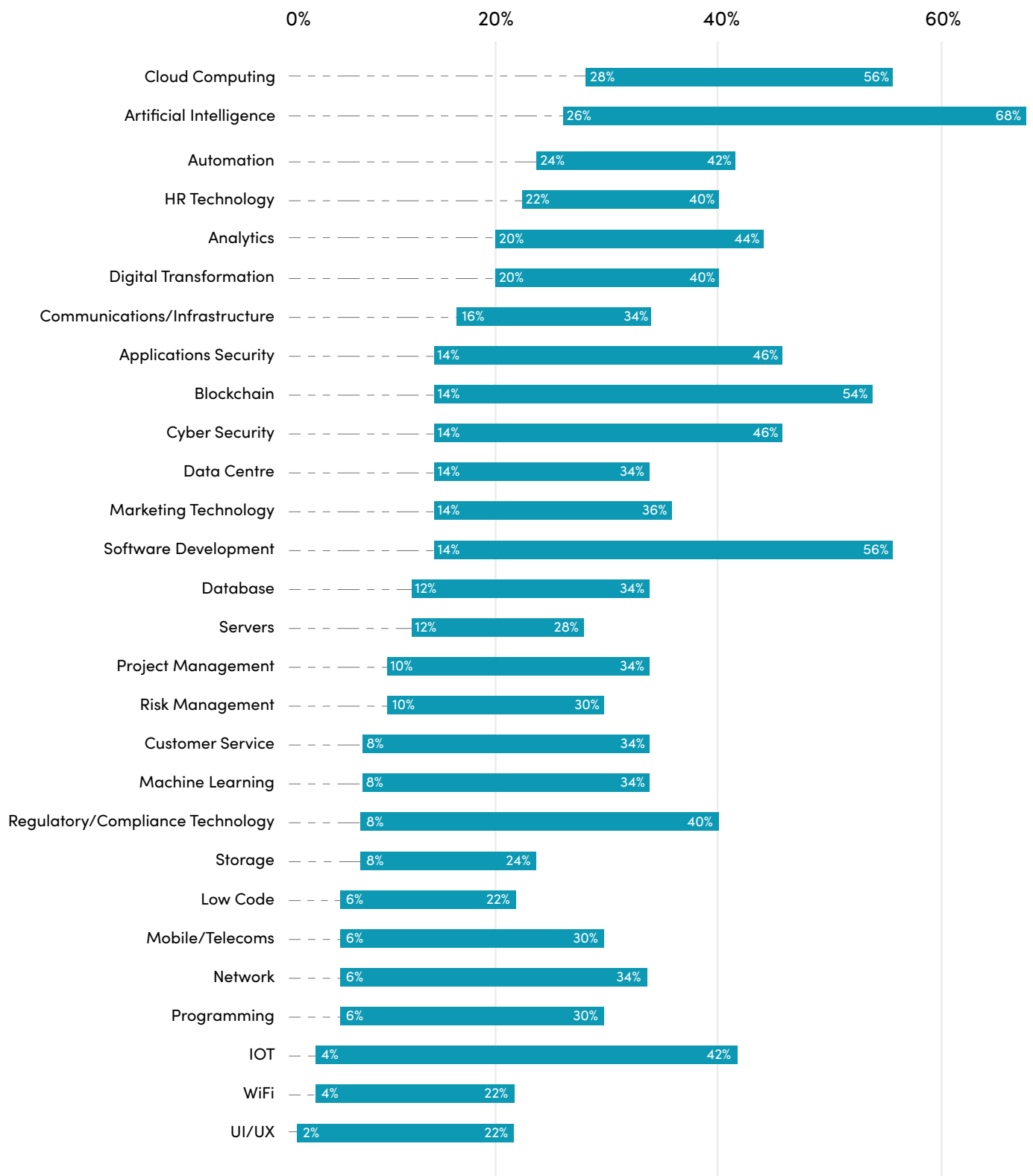
These projects are typically paid for through the purchase of carbon credits and account for around 95% of the projects invested in today. The other 5% of projects are focussed on carbon removal, which are offset projects that adsorb additional carbon back from the atmosphere to remove the greenhouse gas potential. Some of these involve engineering methods: Microsoft, for example has invested millions into funding companies working on the development of direct air capture – a process of capturing carbon dioxide directly from the air and generating a concentrated stream of the gas which is then either stored underground permanently or recycled for further use. Nature-based initiatives, meanwhile, include planting forests and mangroves.



Direct air capture in action

There's currently no central body that regulates either offset project types and various companies have carved out a niche brokering carbon credits and certifying standards. Verra, the largest issuer of avoidance credits is currently in the process of overhauling its methodologies to help the market scale-up and following repeated media stories about the validity of the credits it produces. One such investigation by The Guardian and Greenpeace found that carbon credits generated by forest protection schemes were based on a flawed system and well-known airlines that bought credits were thus overstating their carbon-neutral flight claims.

Green Tech and Climate Solutions: 'Range of levels of areas of technology embracing sustainable practices across countries



"Research carried out by iResearch Services, who spoke to 550 C-Suite execs working in tech across the globe."



11 digital tools to help reduce your firm's carbon footprint

While many deep tech climate solutions are still being developed, there's an array of digital tools you can use right now help with your firm's net zero journey. Adrian Pennington investigates

Carbon calculators

"The key for a successful incorporation of green technology as part of an overall digital transformation is first for companies to measure their existing carbon footprints and then act on improving them," advises Leah Goldfarb, environmental impact officer, Platform.sh.

Granularity matters here, and not just because of accuracy. Change can only happen when you have actionable information in the hands of decision makers. In manufacturing industries – this is the product development and procurement teams. For product teams, granularity means having information at the part or material level to give them the ability to compare alternative designs.

"For procurement teams, you need

to increase that granularity to become supplier specific to give them the ability to compare materials from different suppliers," explains Neil Dsouza, CEO and founder of Makersite. "Granularity means vast amounts of information needs to be managed and this is not possible without modern technologies."

A plethora of software-based measurement tools can be plugged into all aspects of production process and across the supply chain to chart a single product or entire company's carbon footprint.

Some are sector-specific, others more general, some work in conjunction with technology like sensors. Among them is Envizi, a data analytics startup acquired by IBM and deployed to help track and report progress against IBM's

internal goals in renewable electricity procurement and GHG emissions reduction.

Cycloid's GreenOPs, meanwhile, is a cloud computing energy optimisation tool, which allows users to see, in graphic form, how much CO₂ their cloud services are producing. Platform.sh offers carbon audits and carbon measurement tools to give companies like Nestle an accurate overview of where they can act. "For the average SME, access to capital is hard which would make investing in sustainable technology trickier for them to justify," says Goldfarb. "However, there are carbon accounting companies that serve SMEs such as Greenly [with which Platform.sh is partnered]" Global credit ratings agency Creditinfo has launched VERA, a platform

to help financial services establish a standardised view of their ESG performance. This platform is not to be confused with Verra – a non-profit that runs the world's main carbon crediting programme.

Creditinfo's director of sustainability, Reynir Smári Atlason, explains, "The climate emergency is undeniably one of the most pressing issues that humanity faces, but we also need to evaluate multiple other factors when analysing individual companies' operations. For example, it is important to analyse workers' conditions in the supply and value chain of a companies' products as well as their history of compliance. "This type of analysis is often done under the umbrella of risk management, where we try to manage external operational risks for the company, but also associated risks with the impact the company has on ESG matters."

The EU Emissions Trading System –



Namrata Sandhu
founder of carbon tracking software
Vaayu

which places an absolute carbon cap on the total amount of greenhouse gasses that companies can emit each year – is set to expand soon to include even more sectors.

This will further penalise companies which are not compliant. In addition, the price of carbon credits has doubled in the past two years making pollution uneconomic.

Meanwhile, companies with good ESG performance have better access to financing, says Atlason, "especially with the rapid growth of the sustainable bond market where investors actively seek out companies with good ESG performance."

German startup Vaayu (see case study) offers carbon measurement for retailers. Its software integrates

with point-of-sale systems such as Shopify and Webflow either by via a company's shop platform or using Vaayu's API.

"Traditional models for calculating carbon emission outputs are broken and lack any kind of specificity," says Namrata Sandhu, CEO and founder. "They fail to take into account the activity involved in the production and distribution of retail products that make up the environmental impact."

Vaayu can help a fashion retailer, for example, plan the effect a change in warehouse location, shipping route, or a garment material can have on its overall carbon emissions. Its customers include Missoma, Ace&Tate and Organic Basics.

Measurement is hard, but action is harder. To reduce the Scope 3 impact of a company, it must address its products and supply chains. This responsibility sits squarely in product development and procurement," says Dsouza.

"These teams need access to carbon information within the tooling environments that they use daily. High-level dashboards or expert tools are unhelpful in regard as they do not integrate into standard workflows."

Carbon offsetting tools

CHOOOSE, headquartered in Norway, calculates the carbon impact of a flight and provides technology that is integrated into the booking system to enable offsetting initiatives. On the back end, the company audits and maintains relationships with offsetting projects, like sustainable aviation fuels (SAF), so airlines can better channel the money in a way that meets their strategy. Notable clients include Japan Airlines, Iberia, British Airways and Booking.com.

"For an airline to be so-called net-zero today in the real world the only tool available at scale now are offsets," says CEO Andreas Slettvoll.

"The key to making use of offsets viable is to ensure it's the high-quality climate projects that are supported. This is highly verified climate financing of important projects that make a real change elsewhere."

In parallel, customers, governments, airports, NGOs and investors, need to do all they can to scale the production and use of SAF and other low emission alternatives.

"Lack of transparency, lack of education on carbon footprints, and lack of frictionless solutions are the main barriers to adoption of carbon-offsetting initiatives," says Slettvoll.

"Many companies lack the bandwidth, resources or knowledge to launch effective climate initiatives. From a consumer standpoint, there's a lack of understanding of what carbon-offsetting initiatives do and where their money goes should they be offered the option to 'opt in' to one

Businesses must be as transparent



Chooose
CEO Andreas Slettvoll

as possible on how they operate carbon offsetting programmes – and show CO2 calculations and where the money goes – to help the consumer understand how and why addressing those emissions is important."

For any carbon-offsetting initiative to be effective, choosing to take part must be frictionless – and this is where technology can play a key part.

"The time for random offset projects or planting of a tree is over," says Slettvoll. "Carbon must be treated as an integral part of the product or service you are buying, including addressing the carbon emissions involved."

Addressing the carbon footprint of a flight with high-quality offsets is not ducking the issue, he insists. It is educating travellers by acknowledging and informing them about their CO2 emissions. It is also putting a price on carbon.

"We change the emissions at their root cause and within the core businesses by replacing fossil fuels with a low-emission alternative. In the real world, this unfortunately takes years. In the meantime, utilising verified high-quality offsets is a lot better than closing our eyes and doing nothing."

Smart Procurement

Sustainable Procurement is the incorporation of ESG principles into procurement processes and policies, ensuring that business with suppliers is conducted in a manner that aligns with corporate social responsibility (CSR) strategies. In reality, supply chains are the source of 70%-80% of business carbon emissions – and this simply isn't being measured by most organisations. In fact, research shows just 21% have plans in place for reducing carbon emissions across the supply chain. "The single biggest challenge to addressing Scope 3 emissions is that most industries suffer from inaccurate, incomplete and unreliable supplier data that is dispersed in silos," says Alex Saric, a smart procurement expert at Ivalua. "They have only partial visibility into immediate suppliers and virtually none into sub-tier suppliers, where much of Scope 3 emissions are generated. Therefore, a smarter approach to procurement is critical.

"It will enable organisations to gain a 360-degree view of their entire supply chain, by bringing together supplier and third-party data on everything from environmental impact to supplier capabilities. This single source of truth will include



Alex Saric

a smart procurement expert at Ivalua

data from immediate suppliers, sub-tier suppliers, and subcontractors – which helps to ensure that green promises are not just surface-level." Ivalua supports an organisations' global sustainable supply chain strategy, helping to digitise its purchasing ecosystem and use data capturing, usage, and analysis via AI and machine learning to measure environmental impact accurately.

The platform also allows greater integration with suppliers across the entire value chain, enabling greater collaboration.

"If organisations don't have the technology to improve visibility into supplier emissions, or the tools to work together and reduce environmental impact, they will struggle to reach net zero 2030 or 2050 targets," Saric insists. "This also puts businesses in the crosshairs of non-compliance with increasing regulatory frameworks if they don't follow through with green initiatives, increasing the risk of fines and reputational damage."

AI/ML

Because up to 80% of a company's emissions stem from its supply chain the chances of it knowing where its emissions come from are very low, says Neil Dsouza, CEO and Founder of automated digital twin outfit Makersite.

"The more downstream and complex your products, the more of your impact will sit in the supply chain. But it is not just about the supply chain – for energy consuming products like automotives, electronics and others, the major impact most often comes from their use. Therefore, understanding a product across its lifecycle is key in identifying and reducing environmental impacts," he says. That's where artificial intelligence comes in. Stuttgart-based Makersite offers an AI tool that it says enables emission reporting and management at scale. Working with the likes of Microsoft, Vestas, and P&G, the startup's AI automatically maps a company's portfolio of products and suppliers, to help them to make more sustainably led decisions about what to buy and from where.

"The biggest barriers to scaling 'eco-design' are speed of the process and expertise on sustainability," says Dsouza. "One cannot compromise accuracy for speed, otherwise it defeats the purpose of doing the exercise in the first place which is to provide actionable data to enable change."

One of the most time-consuming tasks for experts is collecting data from different sources – internal PLM, ERP, procurement systems, external data from suppliers, and third-party data that enable the calculation of the impacts themselves – and then connecting them to create models of the products or processes they are evaluating.

"Certain kinds of AI are relatively good at automating these tasks

and this can tremendously reduce the amount of time for calculating impacts, but also, more importantly, reduce the dependence on experts for this unenjoyable step," Dsouza says. "Filling gaps and identifying outliers quickly are also other areas where we have found good use for AI."

Data is never complete and consist-



Neil Dsouza

CEO and founder of Makersite

ent. Organisations store, catalogue, and format data differently, which can create compatibility issues when trying to analyse environmental impact across the supply chain. Even within an organisation, data is often siloed or incomplete.

"Automation powered by AI or ML can help to clean this data, removing duplicates, and bringing it all together in the cloud to create a single source of truth for organisations and their partners," explains Alex Saric, Smart Procurement Expert at Ivalua whose clients include L'Oréal and IKEA.

"Organisations can use automation to allow for real-time carbon impact tracking across the supply chain, creating dashboards that show emissions levels and give organisations the tools to shift gear by managing their carbon footprint proactively, rather than reactively."

A multi-criteria approach is one more requirement to enable change. Information about cost, risk and regulatory compliance is crucial to enable the jump from having an insight, to affecting change.

According to Dsouza, multi-criteria simulations are computationally intensive and rely on complex models with the need for vast amounts of background information which means heavy reliance on modern

technology architectures and data ecosystems.

Another area where AI is immensely useful is finding patterns in data to identify improvement potentials. Developing insights is one of the most valuable tasks of experts and AI can amplify their impact by, for example, identifying similar cases where their insight can add value.

Sensors

Sensors and IoT devices play a huge role in collecting data to feed into AI tools. Among other things they

can help track energy consumption, monitor water quality and air pollution.

The City of Chicago, for instance, offers a water quality data streaming program that enables access to water temperature and turbidity, and more data.

Companies may want to get data out of disparate building management systems, energy metres, or energy storage assets, but joining them up for complete visibility is a tricky task. That's the gap that firms like Leeds-based Hark are targeting. Its software taps data from industri-

al devices, assets and sensors on the edge, in the cloud and on-premises to obtain information about measures such as energy use.

Additional analytics tools can then issue alerts to its clients, including Sainsbury's, pinpointing excessive wastage with the aim of saving that company electricity costs, for example, or increasing yield.

Hark defines yield as the output of a production line, the output of an energy asset, or the output of how a building performs or how an asset performs for that building.



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How APIs and Digital Twins are “greening” the enterprise stack

From green data centres and reducing digital waste, Adrian Pennington looks at the digital tools being used to help firms achieve their zero carbon plans



Green APIs

APIs are a key means by which companies can easily and quickly add a variety of software apps across their systems.

So-called Green APIs are built with the intent of advancing sustainability, environmental awareness, or specific climate action initiatives. In an increasingly internet connected world the use of them can provide the ‘glue’ joining disparate data silos together.

Green APIs, for instance, can help monitor air and water quality, expose carbon emissions data and enable smart connections for analysis. “APIs play a critical role by enabling the growth of distributed generation technologies such as solar by accessing rate and incentive calculators, solar resource data, to

streamline quoting and sales, and by making it possible to integrate incentive and interconnection application processes,” says Heather Van Schoiack, Snr Marketing Manager for Clean Power Research.

The Clean Power Research group suite of APIs include the Power-Bill API for analysing energy value, and the Clean Power Estimator for financial analysis of solar projects. Its SolarAnywhere API provides irradiance data (sunlight predictions based off geographic positioning) to be integrated into applications that encourage solar alternatives. The Green Web Foundation is a Dutch non-profit pushing for a ‘fossil-free’ internet infrastructure from data centres to web hosting. Its API allows developers to update information about the digital infra-

structure a company is using, the services it provides to others, and to see the status of providers in their own supply chain.

Greening the Data Centre

The easiest way for many companies to improve their carbon footprint is to move their IT systems to the cloud. “It’s the equivalent of joining a carpool or using public transport, rather than using their own vehicles,” describes Ashish Arora, VP, Cloud and Infrastructure Services at Indian IT consultancy HCLTech. “Having your own servers on-premises requires hardware, facilities equipped with power supplies and cooling units to avoid overheating.” AWS estimates that this can reduce carbon emissions by as much as 88% compared to on-premise systems

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that are inefficiently utilised and need constant cooling.

Analyst IDC estimates that cloud computing could eliminate a billion metric tons of CO2 emissions by the end of 2024. This is because cloud-based services are hosted at much larger data centres which use newer, more energy efficient hardware, and have carbon reduction measures in place. Cloud providers also use high, and increasing, proportions of emission free energy.

Google has been vocal about the progress it has made, claiming to be the first organisation of its size to operate with 100% renewable energy. Google's data centres run on wind farms and solar panels, and AI/ML are used to adjust cooling technologies to ensure servers are protected, but also that energy is not wasted.

By 2030 Microsoft aims to be carbon negative, and by 2050 it has pledged to remove from the environment all the carbon the company has emitted either directly or by electrical consumption since it was founded in 1975. Cloud is one of the steps such progress will be made.

AWS data centres in Virginia meanwhile, account for almost three quarters of the world's internet traffic and Amazon says all its facilities will be powered by renewable sources by 2025. It has also pledged to reach net-zero carbon across its entire business by 2040.

"If businesses join a 'carpool' with major cloud service providers they will be in line to reduce costs and operate more efficiently, with applications consuming less energy per user," says Arora. "Businesses will also be better equipped to support remote workers, further reducing carbon emissions involved in creating and maintaining large office spaces.

"Of course, the cloud provider will still be using data centres, but the big players are all harnessing their resources to work towards carbon-neutrality," he adds.

Location-based Scope 2 emissions (calculated based on the average emissions intensity of a local power grid) is forcing companies to be more transparent. From 1 January 2023, companies in France need to back any 'carbon-neutral' communication with publicly available data.

"For SMEs working in or with technology, there are some quick wins for them to make greener decisions, particularly when it comes to cloud," says Leah Goldfarb, environmental impact officer of French-based Plat-

form.Sh. "The first question to ask is, where is your data being stored? Are your projects being run on clean grids or data centres? This is determined by location-based reporting. In a location-based approach, the electricity grid that supports the data centre should be the source to determine how green the data is." However, there are concerns com-



Ashish Arora
VP, Cloud and Infrastructure Services at
IT consultancy HCLTech

panies might be downgrading their commitments because they feel that moving the cloud ticks their 'green' box: a digital leadership report found that surprisingly few leaders in the UK (22%) were electing to use tech to measure their carbon footprint.

"Simply moving from an on-premises virtualized infrastructure to a [cloud] vendor's hypervisor will not accomplish this goal," says W. Curtis Preston, chief technical evangelist, at data-protection-as-a-service provider Druva. "While you may move the problem of power acquisition to a different entity you don't remove it altogether."

An alternative, he says, is for companies to "refactor on-premises applications" to make use of on-demand infrastructure (e.g on-demand VMs, containers, and serverless applications), and reduce overall power consumption, while also reducing overall IT spend: "If enough organisations did this, it could make a real dent in the power crisis." Preston adds.

Tools like GreenOps from Cycloid help organisations improve the sustainability of their cloud infrastructure by automating the process of turning servers on and off when not in use.

Digital Waste

According to the Global E-waste Monitor 2020, 54 million metric tonnes of e-waste was produced in 2019 and it is projected to reach 74.7m by 2030. Governments are cracking down on illegal waste exports through stricter background checks and compulsory digital waste tracking.

Legislation in the UK's Environmental Act 2021 requires that firms record information from the point waste is produced to the stage it is disposed of, recycled and reused. Data analytics platform Topolytics is one of the firms that has won funding from the UK government to develop WasteMap, a technology that helps firms track manufacturing waste and identifies assets that can be extracted and returned to production.

Its research found that most manufacturers lack visibility into the waste material once it enters downstream, but 90% said that knowing more about what happens to their waste is a high priority.

E-waste is also the fastest growing waste stream in the EU. Two new EU directives – the Corporate Sustainability Reporting Directive and the Corporate Sustainability Due Diligence Directive – are due to come into effect between 2024 and 2026 and will compel thousands of companies with an EU presence – including US and UK multinationals – to provide detailed information about how they address environmental (and human rights) risks across their entire value chain. Circular technology lifecycle management offers a blueprint for aligning tech strategies to some of the critical points of the new regulatory framework but requires a different way of thinking about devices – as something to use and reuse, not own and discard.

Not having a strategy that looks at the entire lifecycle of a device – from procurement to information technology asset disposal (ITAD) – is simply no longer an option.

"It is increasingly urgent that enterprises, public sector organisations and governments consider sustainable alternatives that extend device life," says Russ Ernst, CTO, Blancco Technology Group, a provider of secure sustainable data erasure and mobile lifecycle solutions.

The staggering e-waste mountain stems from "mishandling IT equipment and devices that have reached end-of-life," Ernst says.

He adds: “Enterprises lack proper awareness of the alternatives to physical destruction. Rather than destroy the IT asset, businesses should explore data sanitisation processes that enable them to repurpose, repair, resell or recycle the device, promoting greater engagement with the Circular Economy. Shredded refuse only adds to growing e-waste concerns.” Unregulated and unregistered asset disposal puts data security at risk. Without complete transparency and proper supplier assessment



W. Curtis Preston
chief technical evangelist, data-protection-as-a-service provider Druva

when it comes to ITAD, companies think they are being compliant and responsible when the reality may be very different.

This could lead to cries of (albeit accidental) greenwashing – accusations that a company is making false, unsubstantiated or exaggerated statements or marketing claims about its environmental or other ESG efforts.

Of the 550 C-suite execs working in the tech sector who were interviewed recently by our sister company iResearch, over 90% believed that some if not all tech companies have indulged in greenwashing. “Increasing regulations against greenwashing should help tech vendors to reduce making overstatements as we move forward,” adds Manuel Aguirre, global sustainability manager at Florida-based IT solutions provider TD SYNEX.

“IT distributors need vendors to provide reliable and comparable ESG data that can be passed on to customers. It is not by chance that digital applications for supply chain optimisation have become one of the

emerging trends in the green tech space.”

To make ITAD a strategic business practice organisations should only consider providers that guarantee a strict chain of custody, complete audit trail for every device, digital tracking of IT assets, secure data destruction, and environmentally responsible repair and refurbishment. Organisations are also advised to look for ISO-certified processes to guarantee compliance with international laws, as well as best-practice handling of data and environmental procedures.

Low code

The overhaul of processes and systems that have been in place for many years can be a daunting prospect, one that many organisations believe will be far too complicated and costly to manage. But it doesn't have to be.

“For too long companies have thrown more metal at IT problems, instead what needs to happen is code optimisation,” says Goldfarb. “Tech teams need to write better code and run it on efficient servers.” By leveraging Platform-as-a-Service (PaaS) tools such as low-code, businesses needn't take a rip and replace approach to legacy systems, she argues.

Instead, existing systems can be updated and built upon using a building block approach that allows for iterative and pragmatic development using a host of Intelligent Automation (IA) tools like Artificial Intelligence (AI), Robotic Process Automation (RPA) and Machine Learning (ML) to name a few.

Low code at its widest means software tools to enable employees to develop processes using drag and drop interfaces. More narrowly, low-code Application Platforms enable enterprises to develop processes and applications between three and ten times more quickly than traditional approaches.

Such an approach can help companies achieve greater efficiency toward ‘green goals’ while retaining legacy equipment.

“There are some very simple and direct emissions benefits that are easy to calculate,” says Richard Farrell, chief innovation officer at IT firm Netcall. “For example, in healthcare, the use of a low-code platform provides patient information digitally, reducing the need for printing and postage whilst continuing to

use legacy Patient Administration Systems (PAS).

“Process efficiency benefits include reduction in travel. For example, an insurance business can conduct remote inspections at building sites, dramatically reducing travel, and increasing capacity. This also applies to such things as facilitating remote hospital appointments, maximising patient attendance, reducing paper form-filling, and improved utilisation of facilities.”

Netcall partnered with low-code specialist DI Blue to develop the myFirstClimate app for First Climate which supports organisations in achieving their climate objectives. “Through the app, customers can calculate their carbon footprint, which in turn helps them to reduce their future emissions and offset any remaining emissions,” says Farrell. Low-code platforms are typically hosted in the cloud. Connectivity with company systems is ideally achieved via APIs, although other techniques including file transfers and use of RPA (are sometimes required for less open or older systems).

APIs can be made available from some platforms (including Netcall Liberty Create), so that authorised applications in an organisation can interact with low-code data and processes.

Digital Twins

Digital Twins – digital replicas of real-world entities and processes – establish an environment for analysis to answer questions, suggest alterations and help identify the optimal decision – all with the objective of improving sustainability.

One of the key benefits is that the right decision can be identified up to 80% faster than with more traditional methods, according to Sling-shot Simulations.

The UK startup is using its digital twin specialism to help organisations like The Rainforest Trust protect endangered natural environments, globally, including private areas, national parks, community forests and indigenous property. These changes can be implemented through digital twin technology, testing if the changes will help to make a difference to the proposed natural environment. If this is not the case, a different strategy can then be introduced.

Pete Mills, Slingshot's development director explains, “We create a virtual digital copy of what exists in the physical world to help better



Work with The Rainforest Trust

plan how to tap into resources and reduce conflict without causing large-scale destruction.

Alex Trout, an application engineer, adds, "We're taking that data, mapping it simulating it, looking for correlations between climate and deforestation to provide a more in-depth picture of what is going on in these rainforests that is not necessarily reported or clearly visible on the ground.

The data is then shared with local communities and stakeholders – "the more eyeballs there are on these hotspots the more pressure comes to bear to effect change and the greater the incentive is to feed in more data to improve the digital twin," Mills says.

One of the biggest open development platforms on which to build enterprise level digital twins for industrial and scientific use is the Nvidia Omniverse. California headquartered electronics designer Cadence, for example, allows users of its software in the Omniverse to create digital twins of data centres. "This enable teams to plan, test, and validate every aspect before the physical data centre is built," explains senior product manager, Mark Fenton. "Our software enables engineers to simulate data centre cooling design changes and conduct 'what-if' analysis ultimately reducing the need to build new facilities until absolutely necessary."

These 3D models are connected to real-time data and accurately present multiple real-world physics, including mechanical and thermal, fluid dynamics. Once a data centre is fully constructed, the sensors, control system, and telemetry can be

connected to the digital twin inside the Omniverse, enabling real-time monitoring of operations. Engineers can then simulate power peaking or cooling system failures, optimise layout, and validate software and component upgrades before deployment.

However, there is a dark side to all this data that must be addressed. With more data being hoovered than ever before, estimates suggest that 80% remains dark – data that is not used to derive insights or decision making.

Worse, the energy required to simply store dark data results in millions of tonnes of CO2 emissions a year. Slingshot – which has tools to model dark data – estimates that up to 52% of all information an organisation produces and stores is dark.

Blockchain

Organisations traditionally track supplier performance using paper records, auditing and a degree of trust. Not only a labour-intensive process, but there are also inevitable gaps in the chain and the data can be easy to falsify.

With information often unconnected across suppliers, obtaining a comprehensive and holistic and transparent picture is a challenge. Blockchain technology promise to address the lack of accountability in the supply chain.

"Blockchain can build trust in a system by providing traceability and auditability," says blockchain and energy entrepreneur Simone Acconero, also CEO at FlexiDAO. "During the last year, traction has increased dramatically in regard to blockchain sustainability initiatives."

Blockchain technology enables all participants in a brand's supply chain to record information about their activities in a single, chronological and unchangeable record. Blocks of data are stored in a digital chain within a system called distributed ledger technology. Every time a new transaction occurs on the blockchain, a record is added to every participant's 'ledger' in a way that makes it near impossible to change, hack, or cheat the system. FlexiDAO's blockchain claims to enable companies and governments to operate on carbon-free energy, by certifying and tracing their electricity and its true carbon content, around the clock.

"This is possible through a digital process called 'tokenisation of electricity', through which units of electricity become digital goods, assets, or environmental commodities," explains Acconero.

"This permits automatic certificate generation (time-stamping), as well as transfers and ownership-tracking based on cryptographic proof."

Digital time-stamped energy certificates can only be cancelled once, preventing double counting of renewable energy. Auditors can trace electricity consumed in the supply chain back to any stage of its life cycle via blockchain.

"Ultimately, when requested, we can tokenize this electricity produced by a specific renewable asset on a specific grid at a specific time, and accurately match this with a company's consumption using blockchain as a digital notary."

FlexiDAO counts energy buyers like Google, Microsoft, and Vodafone using its system as well as energy sellers like Acciona and Fortum.

Blockchain can also be used to track carbon offsetting commitments. Clothing brand Tentree plants 10 trees for every item sold and tracks this on the blockchain. Its partners input data such as GPS coordinates, site images, planting details, along with ground-based sensors with timestamps that are permanently recorded on the blockchain.

Meanwhile web3 technologists Trst01 and Rubix have joined forces in India to offer companies operating there a blockchain authenticated 'plastics credit' system. Plastic credits are described by Trst01 as measurable, verifiable and transferable units representing a specific quantity of plastic collected from the environment or recycled.

This is intended to help companies authenticate their conformity with national recycling standards.



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