



Berlin

AI FOR INCLUSIVE CLIMATE ACTION

IMPACT TREND
REPORT 2024

Trends, Innovations and Business Opportunities in
Sustainable Food, Circular Economy, Green Tech
and Diversity, Equity & Inclusion



WELCOME —

AI to make impact work

Introduction to the 2024 Trend Report by Harsha Jagasia, Director Programmes at Impact Hub Berlin

At Impact Hub Berlin, we're all about scaling solutions that matter. We help impact-driven businesses find their market fit, scale up, and embed sustainability into their business models. But the world is changing fast, and keeping pace means more than just adapting—it means leading. That's where our trend research comes in: to inspire and guide you towards harnessing trends to create a more sustainable and equitable world.

In a rapidly evolving landscape it's easy to get lost in the noise. But by identifying key trends, we can step back, see the bigger picture, and transform these opportunities into meaningful action. Trends aren't just indicators of change; they can be the guiding compass steering us toward an economy that prioritises people and the planet.

This year, our trend report delves into nine trends shaping the future of society and business. They all centre around Artificial Intelligence (AI) as a megatrend with extraordinary potential—and real challenges. Generative AI could add trillions of dollars in value to the global economy, hence increasing the impact

of all artificial intelligence by 15% to 40%, according to a 2023 report by McKinsey. From advancing climate action to revolutionising healthcare, AI is already making significant strides. However, as AI becomes more pervasive, the challenge lies in ensuring that its disruptive nature is for the good of our social and environmental fabric.

Unlocking AI's potential, responsibly, means embedding ethics, inclusivity, and sustainability at the core of technological developments. We need AI which is made to serve — and made to serve everyone, not just a select few. As you explore this report, we invite you to reflect on how these trends in sustainable and inclusive innovation, driven by AI, can be leveraged in your own impact work. Let's not just observe the future—let's actively shape it by turning these insights into concrete, impactful steps for your business, your community, and our planet. The opportunities are here—let's make impact work, together.

Harsha Jagasia
Director Programmes
at Impact Hub Berlin



“The most dangerous phrase in the language is, ‘We’ve always done it this way.’”

— Grace Hopper

IMPACT ECOSYSTEMS

Trends across the Impact Eco-system

What do we mean by Impact Hub Berlin's Impact Ecosystem?

At Impact Hub Berlin, we've been pioneering the impact space for over 10 years: building our unique Impact Ecosystem to help impact driven businesses succeed is at the heart of what we do.

Why? Because we believe that impact-driven businesses, founders and professionals are the key drivers towards a sustainable and inclusive future. They build solutions for future generations and the planet through entrepreneurship, innovation and radical collaboration. They can shape the course of the 21st century by responding to complex challenges across rapidly changing societies and economies.

But impact-driven businesses can't do this alone. They often face limited access to knowledge, opportunities, supportive infrastructure and capital, as well as tight regulations. In order to overcome these challenges and help us reach a sustainable and inclusive future, they need a strong ecosystem — including access to growth opportunities, supportive infrastructure and enabling policies, as well as a collaborative community — around them. This is the fruitful Impact Ecosystem that Impact Hub provides.

Through innovation programmes for startups, corporates and public organisations, we empower our Impact Ecosystem to create and scale inclusive and sustainable products and services. Combined with coworking and events for our community of 630+ impact professionals and beyond, we enable innovation and radical collaboration to make impact work.

In 2023 alone, we delivered 9 innovation programmes, leveraging our unique expertise and

networks to support participants in developing 76 impact solutions. With over 90 in-house events and 3000 attendees, the impact professionals in our programmes and community are primed and ready to scale their innovations through collaboration and partnerships.

All our ecosystem-building activities are anchored in the 3500 sqm circular house located in Berlin-Neukölln — a place grounded in transformation and community. However, our Impact Ecosystem extends beyond our roots in Berlin. We are part of the largest global network of impact innovators, with innovation hubs in over 130 locations and a network of over 380,000 changemakers.

What unites us in times of polarisation and controversy? The belief that impact cannot happen in isolation. Shaping a sustainable and inclusive future is a systemic challenge which demands a systemic approach. We need collective action from all stakeholders in the impact space to make impact work at scale.

We need policy makers to craft policies, laws and regulations that support and encourage sustainable and inclusive innovation and business. We need corporates with the resources and influence to invest in strategic partnerships to create a better future. We need entrepreneurs and founders with the courage to create disruptive innovations which challenge the status quo of our extractive economy.

Collective action by these key stakeholders from across the impact space can create a sustainable and inclusive future. To support this critical transformation, we unite stakeholders in our Impact Ecosystem around four focus topics: sustainable food, green tech, circular economy, and diversity, equity and inclusion (DEI). These four topics lend themselves to collaboration and are well aligned with our pioneering expertise, community and networks.

#SustainableFood

Food plays a central role in the transition towards a sustainable and inclusive economy. The whole value chain — how we produce, process, distribute and consume our food — shapes our health and the health of the planet. Through collective action in the area of sustainable food, we believe we can transition to a circular, interconnected and regenerative agri-food system, which ensures a secure supply of nutritional food to all citizens, while protecting nature and people's wellbeing.

#GreenTech

To enable such a transition in not just our food system, but also in the energy and mobility sector and other industries, we need green tech innovations to help decarbonise the global economy. Developments in software and hardware solutions which drive both climate mitigation — minimising global warming and further environmental degradation — and climate adaptation — to cope with the current and future effects of climate change — are accelerating. We aim to give these solutions the sustainable rocket fuel they need to save our planet.

#CircularEconomy

Innovation, scaling and growth are all important drivers of a sustainable and inclusive future for all. At the same time, impact-driven businesses and their partners must embrace circular economy principles in order to preserve and promote our ecological and societal makeup. We act as a convergence point for key stakeholders in circularity, bridging the gaps and closing the loops.

#DEI

As we look at closing gaps in product life-cycles, we must also look to close the unacceptable equality gaps we see at the local and global level. Everyone, from politicians to business leaders, has a responsibility to transform our social, economic and political landscapes. Impact-driven businesses, founders and professionals are paving the way for a more diverse and inclusive world. However, the only way to realise a just, sustainable society is if it is designed by everyone, for everyone.

These four focus topics play a critical role in the transition to a sustainable and inclusive society, and as such, take centre stage in this report.

Our goal is to inspire, educate and enable innovators and other impact-driven professionals. Through inclusive climate action we can transform extractive systems and create regenerative ways of doing business.

TRENDS

Why and how we look at trends in the Impact Ecosystem

Our Impact Ecosystem, with a focus on sustainable and inclusive innovations, offers a pivotal lens to examine one of today's biggest trends: the rise of AI. When we explored AI trends in the impact landscape, we had three key goals in mind:

1. Demonstrate the potential for AI to positively impact people, business and the planet by driving social and ecological transformation.
2. Highlight innovations in AI relevant to our community of impact professionals in the areas of sustainable food, green tech, circular economy and DEI.
3. Inspire to consider how you can use and shape AI for good, while being mindful of its challenges (see megatrend, Empowered by AI).

We focused the scope of our trend research according to impact potential, geography, maturity, and diverse stakeholder involvement:

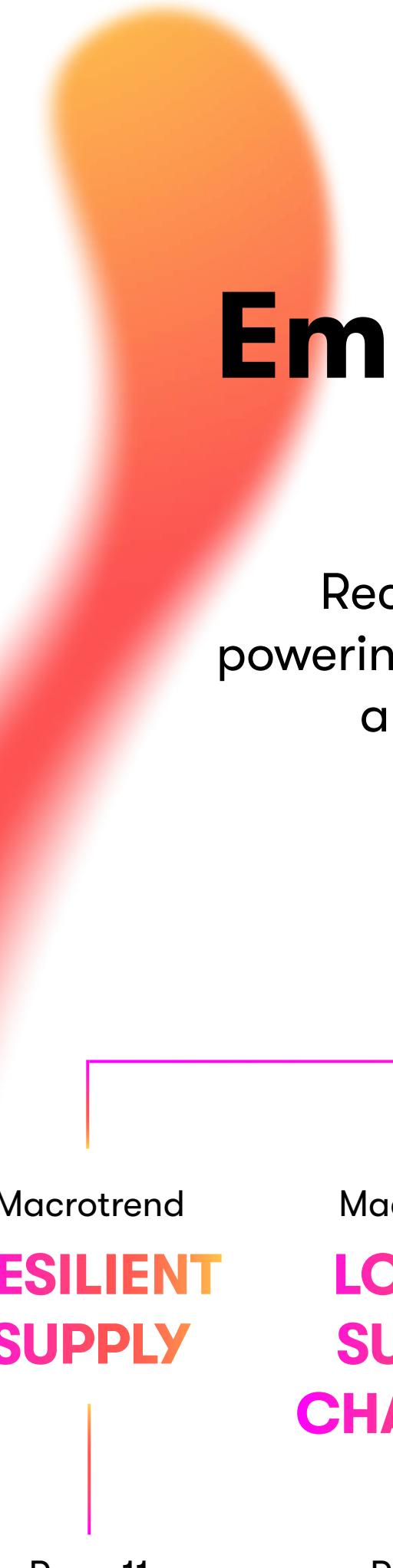
- **Impact potential:** Trends which not only indicate innovation in AI and are likely to play a role in shaping the future, but also have the potential to positively impact people and planet.
- **Geography:** Launching and scaling innovations in the DACH region (Germany, Austria, Switzerland) comes with its own challenges, such as legal hurdles and high consumer expectations, so we focused on trends relevant to our Impact Ecosystem.
- **Maturity:** In-market trends based on technological innovations that have already successfully moved from research to real-world applications.
- **Diverse stakeholder involvement:** Innovations and trends that involve startups, corporates, public organisations, NGOs, and collaborations across the impact space.

Each trend in AI that we identified is connected to our focus topics: sustainable food, circular economy and green tech as well as diversity, equity and inclusion (DEI). DEI is not just a topic, but a dimension of impact that cuts across all trends — hence, it is given particular emphasis under the “Why now” of each macro trend.

Before diving into the macro trends in AI emerging in our four focus topics, we first explore the megatrend Empowered by AI — a pattern of change reshaping the fabric of our society.

Then, for the eight macro trends that we highlight as relevant for impact-driven businesses and our Impact Ecosystem, we explain the trend, current drivers, AI innovations already making an impact in the market, and emerging opportunities for innovators and businesses.

*Our Impact Ecosystem offers a pivotal lens to examine one of today's biggest trends:
the rise of AI.*



MEGATREND

Empowered by AI

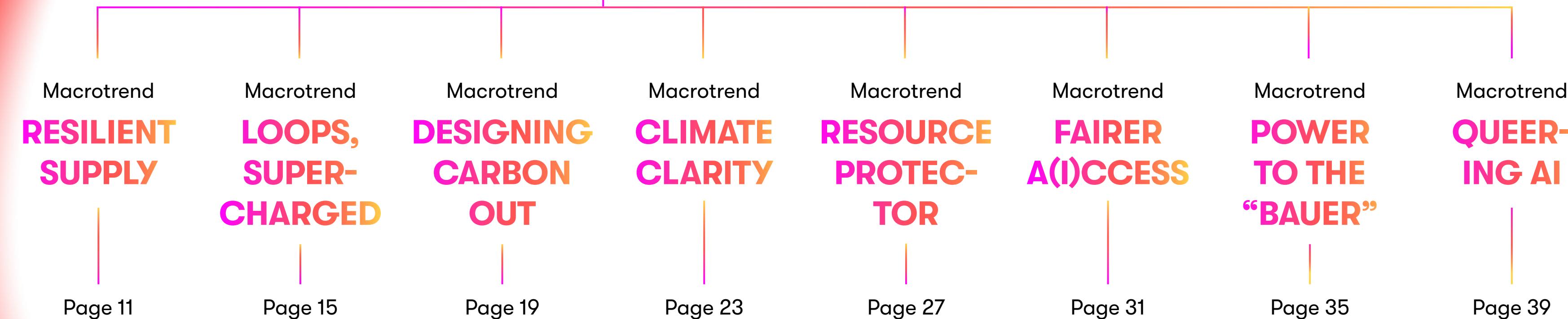
Recent AI innovations are powering up the shift towards a more sustainable and inclusive economy.

Consider the Doughnut economy — an economic model which balances a social foundation that ensures global access to necessities, think: electricity, housing, healthcare, and an ecological ceiling that prevents the overuse of Earth's resources, think: protecting biodiversity and keeping carbon, land and water systems in check.

AI can help hit the sweet spot between life-sustaining needs and life-supporting systems by making core provisions such as electricity more accessible, boosting decarbonising technologies which protect nature, enabling supply chains to bounce back from potential socio-logical or ecological shocks, supporting the circularity of natural and technical systems,

and helping us better understand climate risks. Of course, AI, like technologies before it, is no silver bullet. It carries ethical and environmental considerations — from AI's own ecological impact to big questions around human rights and governance.

We address these below as open questions and return to them throughout this report. At Impact Hub Berlin, we're courageously stepping into the equally exciting and complicated world of AI and its role in shaping societal change, from global justice to climate action. We see the challenges around AI's application as both an ethical responsibility and an opportunity to shape its development and unlock its impact potential.



Why now?

Explosive growth in generative AI

Recent advancements in AI have gained significant attention. In particular, we've seen explosive growth in generative AI and Large Language Models (LLMs) since 2022, and solutions such as Chat GPT are now a household name. This growth has been largely driven by technological developments which enable larger, faster and more accurate models capable of mapping more complex parameters and utilising fresh datasets direct from the web. Coupled with human supervision to ensure quality training, models can engage in almost 'human' conversations and respond to complex requests. Models like DALL-E 3 and Midjourney enable users to generate high-quality images from a simple text description. Other models are capable of generating text, audio, video, and even code: GitHub Copilot and OpenAI's Codex generate and complete code snippets and could revolutionise software development.

Size isn't everything

Slowly, the benefits of ever-larger models and datasets are showing diminishing returns in newer generations. Hence, researchers and practitioners are shifting their focus to efficiency, reducing computational requirements, and enhancing precise decision-making, data analysis, and reinforcement learning with analytical AI.

There's also a growing emphasis on developing fair, transparent, and ethically aligned AI models to address biases and safety concerns. And, while general-purpose models like GPT-4 may capture people's attention and imagination, specialised models, optimised for certain domains or tasks are diversifying the AI landscape and its potential applications.

Power to empower

Innovators are recognizing the opportunity to use the momentum of AI to create solutions for change, and shape AI development responsibly, sustainably, and equitably. AI projects addressing social and environmental issues have shown tangible impact, inspiring others to take up the baton and explore further AI applications to empower impact.

As you'll know, the world is waking up to today's pressing social and environmental challenges, driving even more interest in the potential of AI to empower smart and impactful solutions. AI technologies have matured to the point where they can be reliably deployed in critical domains like healthcare, education and agriculture.

With greater collaboration between AI researchers, domain experts, policymakers and other key stakeholders, AI has the power to tackle real-world problems with a deeper, systemic understanding.

Open questions

As we've mentioned, AI is not a silver bullet for the world's wicked problems, nor is it a perfect tool. Like other tools, it can be used poorly or responsibly, and demands respect for important ethical and environmental considerations. Here, we recognise the open questions that remain when discussing the potential of AI, and which we must tackle in order to have the impact we want.

Like other tools, it can be used poorly or responsibly

Environmental implications

While sustainably-conscious citizens, organisations and governments continue to work hard to reduce carbon emissions, some major tech companies have dropped their carbon neutrality pledges and even increased emissions in the name of AI development. Although AI may seem intangible, it comes with a very material infrastructure: massive data centres that require materials to build and vast amounts of water and energy to maintain — energy which, more often than not, comes from fossil fuels. It's not an insurmountable challenge but one that is pervasive across industries. It requires a total transformation of our water and energy systems, with commitment and action from stakeholders across the economy.

Responding to ethical concerns

Since AI's early development, several ethical concerns have been raised. AI researchers-turned-ethicists have highlighted the social, political, and cultural implications associated with issues such as privacy, surveillance, misinformation, and copyright violations. Biases in facial recognition and faulty predictive systems are also common pitfalls linked to skewed datasets used in training.

So far, these concerns have not been fully resolved. In some cases, we've even witnessed AI researchers being pushed out of big tech firms after raising ethical and environmental concerns. As we see a growing number of cases of data being scraped without permission, and data workers screening and tagging harmful material under precarious conditions, there is an urgent need to address ethical concerns when working with, and discussing, the potential of AI.

Left in the dark

Since its inception, AI has promised to augment human intellect — though it's unclear whether the technology will be able to actually live up to these promises. Large language models (LLMs) are incredibly good at mimicking human language. However, while they excel at replication, they don't truly understand language or produce original content and it's not always clear how they come to their conclusions. Indeed, OpenAI's CEO Sam Altman admitted that they don't know how their tech works, raising concerns about how much power we lay in the hands of generative AI, in terms of decision-making and other important processes. At the moment, AI training relies on human supervision whereby crowdworkers screen and tag content. However, as models continue to develop and training becomes automated, we should be careful not to be left in the dark.

Open questions

Too much power?

Power over AI and its recent advancements is concentrated in the hands of a few. Racing to develop the next successful model, tech giants like OpenAI/Microsoft and Google are heavily investing in foundation models with the aim of developing Artificial General Intelligence (AGI) — that is, non-specific artificial intelligence, comparable to that of humans. Though AGI may never be fully realised, power still lies with those who can spare the resources to try, fail or succeed.

AI development has become so resource-intensive that major firms are having a heavy advantage, leaving smaller players out of the picture. In this position of power, tech giants are resisting regulation, privately lobbying governments against the same policies they publicly call for, and constructing narratives that warn against AI's "existential threats", while taking attention away from immediate concerns around human right violations and the environmental toll that AI poses today.

Overall, given that corporate interests may not always prioritise sustainable and inclusive innovation, leaving the development of AI to big tech risks not realising AI's full potential for impact. While in the hands of major firms, AI may enhance productivity and improve a company's bottom line, in the hands of all, it could transform whole systems.

If we restructure how data and AI models are owned, enable innovators from diverse backgrounds to enter the field and direct global resources towards building foundation models, we could develop effective tools for solving the social and ecological challenges we face in today's world in crisis.

"What is happening is not just a battle for market control. A small number of tech titans are busy designing our collective future, presenting their societal vision, and specific beliefs about our humanity, as the only possible path. Hiding behind an illusion of natural market forces, they are harnessing their wealth and influence to shape not just productization and implementation of AI technology, but also the research."

— Goodlad and Stone, 2024

75%
of global CEOs believe technology and AI are key to solving their sustainability challenges.

59%
of consumers worldwide believe that generative AI will fundamentally change their interactions with companies in the next two years. Among those with direct AI experience, it rises to 3 out of 4 consumers (75%)



MACROTRENDS

From open questions to making impact work

Navigating AI's development and potential, responsibly is, without a doubt, challenging. We recognise that AI is not just a tech tool, but as the AI researcher and expert Kate Crawford puts it, "an idea, an infrastructure, an industry, a form of exercising power, and a way of seeing; it's also a manifestation of highly organised capital backed by vast systems of extraction and logistics, with supply chains that wrap around the entire planet." While we recognise that there are still open questions about how we can develop AI in a just and equitable way, we see a huge potential to help a growing global population live within our planetary boundaries, while meeting everyone's basic needs. Here, we focus on shining a light on the possibilities of AI in impact entrepreneurship. The catch? We need courage, optimism and collective, responsible action to shape the future we want.

We have uncovered eight AI macro trends in the impact space — and here, we hand them over to you. Take a read, be inspired, and put AI to work!

Call for Impact

Together, we can steer AI to help restore balance in the planet, boost (bio)diversity, and meet human needs — while giving real power back to people, from farmers to marginalised communities. We're excited about the potential for us — that's Impact Hub Berlin, you, our partners and innovators around the world — to create real, systemic change. If used in the right way, AI can enable us to embed core values — like equity, resilience, and regeneration — into technological developments. Hence, not just transforming our digital systems, but our social, ecological, political and even economic systems. When AI is developed by, and for, diverse communities, used in a way that gives back to the people whose data it uses, and is stewarded collectively, it could be a game-changer for impact through inclusive and sustainable climate action.

**USD
40bn**

The Gen-AI market is predicted to grow at a compound annual growth rate of 42% over the next 10 years, reaching USD 1.3 trillion from a market size of USD 40 billion in 2022

100bn

The Large Language Models (LLMs) behind popular chatbots like OpenAI's ChatGPT contain over 100 billion parameters—vastly more information and code than the most advanced AI models had just a few years ago.



ChatGPT query **Google query**
A ChatGPT query needs nearly 10 times as much electricity as a Google search query.

MACROTREND ONE

RESILIENT SUPPLY

#CircularEconomy
#GreenTech
#SustainableFood

Transparent, shock-proof supply chains

Citizens and governments have long called for more resilient global supply chains. Today, AI-powered solutions can help producers make their supply chains less susceptible to disruptions. AI models have the capacity to analyse supply chains, create transparency from origin to final destination, smooth out snags in freight management, enhance efficiency, and cut carbon emissions. This can help companies manage and reduce risks occurring from data gaps, changes in suppliers, and even human rights violations. This not only makes supply chains more resilient, but also builds reputational trust between partners and customers.



Why now?

Global supply chains under stress

Our global supply chains, even for the most common goods, are under constant threat, from political to climate crises. The pandemic and ongoing conflicts revealed just how fragile our supply chains are, especially when they lean too heavily on a single country or region.

While you may find olive oil back on the shelves, prices have skyrocketed. In Germany, raw materials have seen a 40% price-hike since pre-Covid times, shrinking wallets and consumer confidence as inflation soars.

Although it's a necessary step to reach a more sustainable future, the green transition is putting additional pressure on supply chains which are typically powered by fossil fuels. Thankfully, whole supply chains are now starting to shift in support of renewable energy and clean tech. They recognise that they need to remain stable, but flexible enough to prepare for the unknown in order to keep meeting society's basic needs while staying within our planetary boundaries. In short, supply chains will have to become more resilient.

Push for transparency

Companies are feeling the heat from all sides — consumers, NGOs, governments, and the EU Supply Chain Act are pushing companies to disclose their supply chains. Ignoring these calls for transparency might seriously scorch their reputation.

Take the food industry: along the supply chain, it is facing everything from unidentifiable ingredients, to food fraud, animal welfare issues, and cases of child labour. Thanks to new global laws, companies are required to monitor concerns around human rights, conflict minerals, forced labour, modern slavery and food safety in the supply chains — and maintain a high level of overall transparency. Under Switzerland's Responsible Business Initiative, companies will be liable for any illegal dealings by their subsidiaries worldwide — and might even get burned by their business partners' bad behaviour.

If you can't trace your supply chain back to the source, your shipments might be turned away in ports, wreaking havoc on the rest of the supply chain. However, to be able to disclose this information, companies first need to understand exactly what's going on upstream.

In short, supply chains will have to become more resilient.

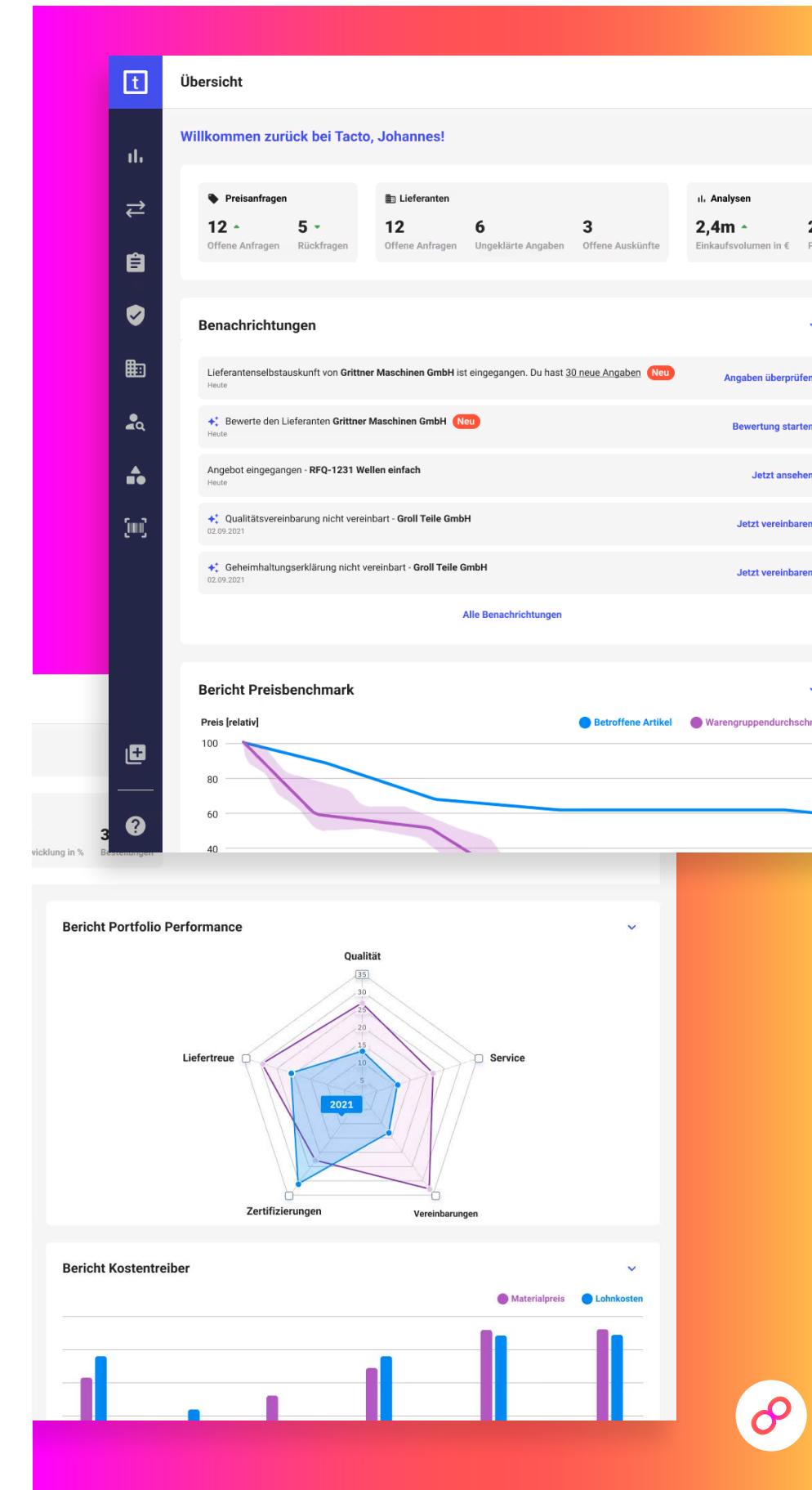
Pioneers' advantage

Supply chains were not designed to be transparent. Companies have long feared that sharing too much information about their supply chains could undermine their competitive advantage or expose them to criticism. Oftentimes, no data was collected, and if it was, it was likely to be full of errors. There was little incentive to invest in transparency as the ROI (return on investment) didn't always satisfy near-term goals. Today, however, shedding light on your suppliers and their suppliers can transform you into a pioneer: Patagonia's Footprint Chronicles maps the raw materials, mills, and factories that make their products and drills down into the details of their suppliers' operations and staff.

Tacto

Combining supply chain tracking with ESG reporting

Tacto utilises AI to gather data from suppliers, calculate CO₂ emissions, and automate sustainability reporting. Hence, allowing companies to effortlessly track their supply chain, while producing ESG reports, which are required for public tenders and a prerequisite for many other calls and financial markets. This need has only grown with the introduction of the Corporate Sustainability Reporting Directive (CSRD) in 2023 and rising consumer pressure. Several German industrial companies are already benefiting from Tacto's automatically generated reports on how they can better measure, balance, and reduce emissions. Now, the only way is up the supply chain!



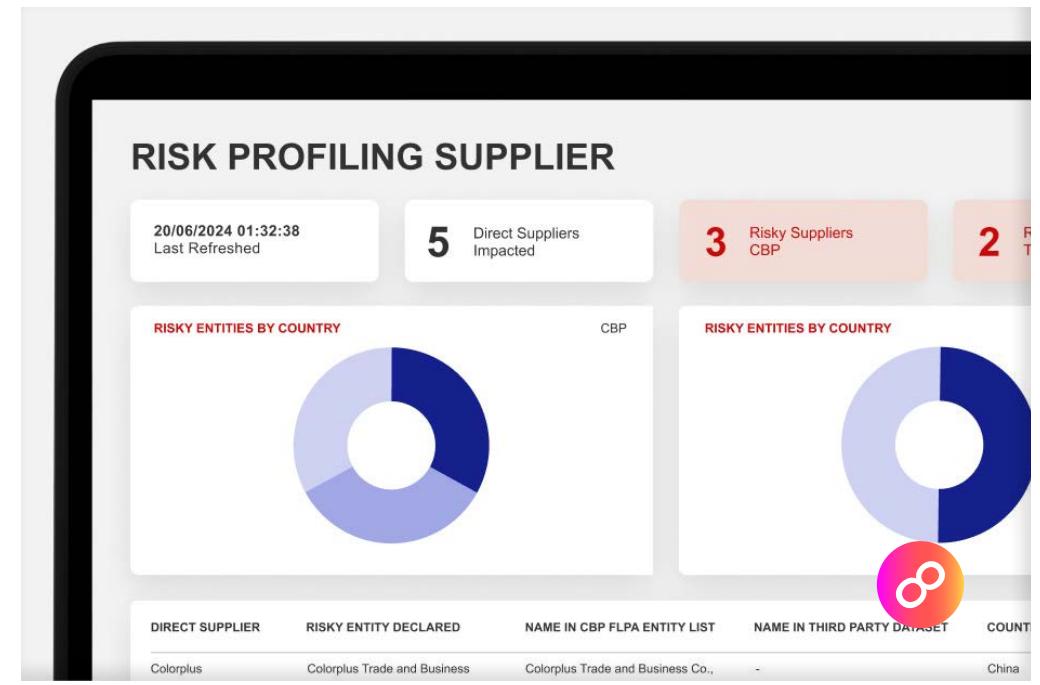
iCOMPLAI



Early warning system for raw material risks in food production

What issues has a supplier faced in the past? How many product recalls might a company have in the next 10 years? Risk assessments for products and supply chains can be complicated, especially without sufficient, reliable data. iComplai is a Munich-based startup that helps companies assess, monitor, and predict product risks for consumer goods, with a focus on food. Their early warning system helps identify and predict raw material risks in the food supply chain by integrating high-dimensional data streams. The AI-based tool monitors your supply chain and alerts you as soon as it identifies risks or issues, allowing companies to react promptly and minimise implications.

TrusTrace



Screening tool for forced labour in fashion

TrusTrace is a software-as-a-service (SaaS) solution for AI-powered Forced Labor Prevention (FLP). The solution helps fashion brands increase transparency and compliance in their supply chain, while also calculating carbon footprint. FLP maps supply chains, screens for risks and gathers compliance evidence from suppliers. TrusTrace can process documents in over 100 languages and automatically screen for risks using the US's Customs and Border Protection database.

Opportunities

Trust, inside & out

Not only does increasing transparency help build consumer trust, brands with high levels of transparency also perform better in terms of employee attraction and retention. Patagonia and Nike, who are both committed to transparency, have high rates of job applications and a very low employee turnover (4% for Patagonia), which can be at least partially attributed to their responsible reputation.



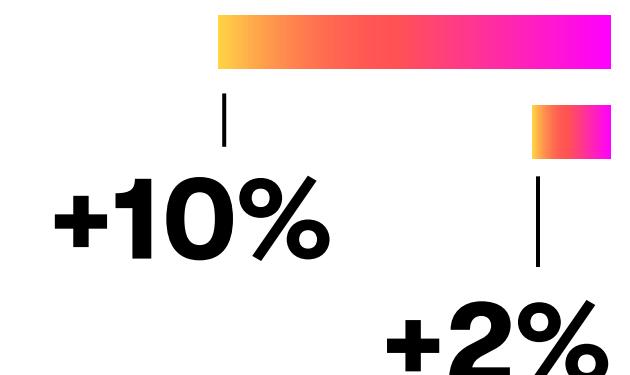
How might companies leverage greater transparency in supply chains to increase their reputation and build trust with employees and consumers?

Building bridges

Digital technologies such as AI, as well as blockchain, have been hailed as the holy grail of supply chain tracking. While they do enable new, improved solutions, they still operate in a tangled web of organisations — and humans. This presents an opportunity to convene internal and external stakeholders, and deploy tech that doesn't just gather data, but translates it into helpful recommendations to support systematic decision making. It is also a chance for companies to build data science know-how, blending human expertise and machine intelligence to tackle current challenges in our supply chains and beyond.



How can human expertise and AI be combined to create a more efficient, collaborative approach to logistics and operational decision making?



Consumers may be willing to pay 2% to 10% more for products from companies that provide greater supply chain transparency.

40%

Brittle supply chains come at a price: raw materials have increased in price by 40% in Germany since pre-Covid times, eroding consumer purchasing power and confidence and contributing to soaring inflation.

— MACROTREND TWO

LOOPS SUPER-CHARGED

Taking the circular economy to the next level

The circular economy has been picking up steam, and AI is here to supercharge it. By facilitating material recovery, boosting circularity, and curbing consumption, AI can disrupt traditionally linear production models and support the transition to a circular economy — the only really viable option in a world with finite resources. Across sectors, researchers and businesses are already flexing their AI muscles, using computer vision, deep learning algorithms, and generative AI to rework complex designs to save resources and repurpose second-hand materials. AI is quickly becoming the go-to tech in everything from solid waste management, to manufacturing, fashion, and more — empowering circular business models. With AI, businesses can push up product utilisation, material efficiency and recovery rates.



AI can enable more circular business models by design for circularity and enhance material recovery.

Why now?

Implementation of the circular economy is bumpy

Despite high levels of interest in the circular economy, circular practices are actually declining. Material circularity dropped from 9% to 7% due to an increase in virgin material extraction and increased material use. In fact, the volume of raw materials extracted between 2018 and 2023 is nearly equivalent to the amount extracted in the entire 20th century. We are unfortunately still trying to fit circular practices onto existing linear processes without substantially changing the techniques and technologies in the industry.

“If recycling works, then nothing needs to change”, is not the answer to keeping within our planetary boundaries. As much as we need recycling and recycled materials, we must go further and transform our industrial processes using new, AI-enabled solutions that harvest different loops within the circular economy — repair, reuse, repurpose. Overall, AI can enable more circular business models, design for circularity, optimise supply chains, and enhance material recovery — hence reversing the declining trend in circularity.

Hiccups with second life materials

In order to support the transition to circular practices, we need to ensure a comparable quality of second life materials. Currently, the availability of quality recovered materials is limited and they can sometimes be more expensive than their virgin counterparts. In fact, the use of circular materials in the construction sector shrunk from 31% to 20% between 2018 and 2023. One of the biggest barriers is labour costs — AI solutions can help the industry overcome this barrier by digitising material management and automating construction processes, hence increasing the availability and affordability of high-quality recycled materials.

Circularity needs sufficiency

While we've seen progress in certain circular economy initiatives, we risk focusing on incremental innovations with little impact when we don't take a systemic approach. In the worst case, initiatives can have negative rebound effects, stimulating demand and overconsumption. Now, we have the opportunity to go beyond existing circularity practices, and transform the economy based on the principle of “make do with less”.

Sufficiency in the circular economy refers to reducing overall resources and waste generation, and promoting more moderate levels of production and consumption. Rather than placing the responsibility on consumers, businesses have the opportunity to pioneer this approach: prioritising quality of life over profit, and leveraging their influence to drive change — take the outdoor company Patagonia as an example. AI can support this economic change by optimising demand forecasting, designing products for longevity, analysing consumption patterns, enabling a sharing economy, optimising repair and maintenance, and educating and engaging consumers.

Gainnext

Easy sorting, even for food-grade plastics

AI is revolutionising how packaging materials, including food-grade plastics, can be recovered and fed back into the value chain to support the circular transition. The deep learning tech, Gainnext, connects to automatic sorting machines, identifying plastics such as PET, PP and HDPE. Gainnext can even detect which materials have come into contact with food. For heavily contaminated plastics, Innosort Flake uses AI to clean and sort flakes by polymer, colour, and transparency. This boosts recyclability and yield from diverse waste streams. The data from sorting helps plant operators minimise downtime, increase output, and plan maintenance, so they can continuously assess the quality of the sorted streams and the loss of recyclables to make informed decisions. Plus, it acts as an automated compliance tool, ensuring adherence to strict food recycling regulations and local legislation.



SXD AI



Zero waste fashion design software

SXD AI is a software that uses AI to redesign clothes in order to generate less pre-consumer waste from production offcuts. It combines sketches with fabric information to produce zero waste patterns that auto-adjust across sizes, fabrics, and styles. The designer behind the software, Shelly Xu, uses the software to create clothes with close to zero waste, compared to the 10-30% of material which is typically wasted during production. In addition, each SXD product “unwastes” material by using leftover fabric that would have otherwise gone to landfill. Unlike other tools such as virtual design tech or digital pattern software, SXD AI eliminates waste across all stages of production, increasing circularity while saving costs — the new designs lower costs by around 55%.

University of Trondheim



Substituting new for old in construction

Reusing building materials could significantly reduce the environmental impact of new construction. However, designing with reused components can be challenging. Researchers at the University of Trondheim developed an AI-enabled tool that can take a design and substitute new materials for reclaimed counterparts within user-defined constraints, simultaneously calculating the emissions saved. If the design changes, the algorithm can be rerun to find the latest, most optimal combination of components. By automating the design process, AI can embed various circularity principles in construction projects and hence, lower carbon emissions.

Opportunities

Increase product utilisation

AI can extend the lifecycle of products by increasing product duration through, for example, automated software updates for smartphones or manufacturing equipment. AI algorithms can adjust settings dynamically based on sensor data and extend the operational life of hardware. Google and DeepMind used such an algorithm to optimise battery life by predicting usage patterns and reducing charging cycles.

AI can also increase product utilisation through circularity: optimising product refurbishment programs and increasing the competitive strength of product-as-a-service, leasing and sharing models. Specifically, the accurate and rapid analysis of data from products and users can enable predictive pricing and demand, maintenance, and smart inventory management.



How might data-driven systems and services keep products in use as long as possible?

Scaling efficiency and smart materials

Breakthroughs in AI are scaling material efficiency and opening up new zero waste opportunities. Through data- and AI-driven production, the material impact of supply chains can be reduced by minimising waste and increasing efficiency. This is particularly important in hard-to-abate industries, which are already showing signs of emerging innovations — for example, more efficient compositions of new metal alloy formulations driven by machine intelligence.

These so-called tough-tech segments can, however, require longer innovation and iteration cycles on the path to scalability. Educating investors on the longer-term financing that's needed now to secure a sustainable future can ensure long-term success of circular innovations . After all, every zero-waste solution that exists in the market is living proof that it is possible to design waste out.



How might we design waste out by using AI to enable smart materials and scale efficiency?

Scaling material recovery and security

On our path to a circular economy, there's a wealth of resources that need to be recovered before they end up in landfill. This is especially true for finite materials and minerals, such as lithium and cobalt. AI can improve material recovery and give resources a second life, through higher sorting accuracy, reduced contamination, process optimization, advanced material identification and automated recovery. Hence, increasing material security in a world of limited resources.



How might AI improve rates of material recovery while reducing costs?



38%

80%

20%

The iPhone is a pioneer in extending product use, keeping an 80% market share in the secondhand smartphone market. The rate of circular materials in construction shrunk from 31% in 2018 to 20% in 2023.

MACROTREND THREE

DESIGNING CARBON OUT

Reducing CO₂ where we can, looping it back into natural systems where we can't

#SustainableFood
#GreenTech

The path to a sustainable, net zero future requires a continuous commitment to reducing carbon emissions. While currently, AI comes with a hefty price tag in terms of environmental impact, it also has the potential to decarbonize the economy. AI-powered solutions can literally design carbon out — from optimising energy use and cutting emissions at the source, to decarbonising supply chains, and enhancing nature-based solutions that put carbon back into nature, with regenerative effects. This trend emphasises proactive carbon management within supply chains and systems — putting integrated, data-driven approaches for reducing CO₂ first. By combining cutting-edge technology with nature-based solutions, AI innovations are paving the way for more effective and measurable climate mitigation strategies.



Why now?

Path to zero

The [European Climate Law](#) officially locks in the [European Green Deal's](#) goal of becoming [climate-neutral by 2050](#), with a mid-term target of cutting greenhouse gas emissions by at least 55% by 2030 (compared to 1990 levels). The aim of the Climate Law is to tackle or at least mitigate global climate impacts such as extreme heat, flooding, rising sea levels, and their longer-term effects for societies and economies. For the first time ever, Germany is, as of 2024, [on track](#) to cut its emissions in line with its climate goals, if it keeps up its efforts across all sectors. So far, energy, industry, agriculture and waste management are leading the way, while the transport and building sectors have some catching up to do to hit their targets.

Social and environmental integrity

Designing carbon out requires a commitment to social and environmental integrity, ensuring that carbon reduction efforts align with broader sustainable development goals. This involves reducing energy demand, cutting CO₂ emissions across supply chains, and practising caution when it comes to atmospheric carbon reduction. Effective carbon management should consider all emission sources, including those traditionally difficult to address, and extend efforts globally. [Scientists](#) emphasise the importance of using carbon dioxide removals judiciously and regulating carbon offsets to prevent misuse. Achieving net zero should be an equitable process, integrating socio-ecological sustainability and fostering economic opportunities to really support net zero.

AI's own climate impact

While AI has the potential to reduce emissions, generative AI models like GPT-4 consume [10 times](#) as much energy per query as traditional search engines. Currently, the infrastructure supporting AI, particularly data centres, has a substantial energy footprint, and it is expected to grow by 160% by 2030. Major tech companies developing AI have seen [increased emissions](#), with [Microsoft \(29% increase\)](#) and [Google \(48% increase\)](#) reporting challenges in reducing their carbon footprint while further integrating AI into their products. While some AI innovations may improve computing efficiency, the widespread adoption of AI is likely to further increase overall power consumption. There is an urgent need to transition to renewables across the grid in order to harvest the benefits of AI without further contributing to global warming.

Effective carbon management should consider all emission sources.

VoltVogel



Optimised charging service saves up to 95% energy

Charging stations for electric vehicles can be expensive to install and are subsequently, often underused. The Berlin-based VoltVogel offers a flexible and scalable EV charging service that brings the charger to you. Their mobile charging station can drive up to parked electric vehicles (EVs) and charge them on the spot. Thanks to AI, they optimise charging times, maximise the use of renewable energy, and ensure the charging points are always in action, cutting down on downtime. By using 100% renewable energy and sustainable batteries, VoltVogel's system can cut CO₂ emissions by 95% compared to standard charging – making charging not just more efficient, but greener too.

Samudra Oceans



Monitoring seaweed for better CO₂ capture

Oceans are a carbon capture powerhouse: seaweed alone captures up to 50 times more carbon than trees on land. Samudra Oceans blends nature-based solutions with AI-powered data analytics and robotics, enabling them to scale seaweed farming a thousandfold. Swarms of robots equipped with sensors and cameras monitor everything from pathogens to nutrients and acidity levels, while tracking biomass growth. These robots cut down the cost and resources used in traditional monitoring, increasing efficiency and reducing emissions. Samudra's goal is to remove 1 gigaton of carbon from the atmosphere by 2033, creating a sustainable, traceable, blue carbon system, with seaweed at the heart.

CinSoil



AI-enabled carbon insetting in our soil

Instead of just offsetting emissions elsewhere, CinSoil helps businesses remove CO₂ directly through carbon insetting. Carbon insetting involves reducing or absorbing greenhouse gases directly in your own supply chain or operations. The Berlin-based startup developed an AI tool that utilises satellite data to accurately monitor soil carbon dynamics and find ways to improve soil health through carbon insetting at the farm level. This way agri-food companies can decarbonise their supply chains, promote regenerative agriculture, restore soil health, biodiversity, and even create a revenue stream through carbon farming.

Opportunities

Building strategic partnerships

Collaborations and strategic partnerships can help companies scale solutions to optimise energy use and CO₂ reductions, building resilience against the impacts of the climate crisis. For example, startup [Green Fusion](#), is cooperating with Viessmann Group to scale their intelligent heating system through cloud technology. Green Fusion's solution can reduce energy use and CO₂ emissions by an average of 20% across heating systems. Through cloud access and remote control of Viessmann Group's API systems, Green Fusion eliminates the need for hardware, enabling them to scale faster and cheaper.



How might strategic partnerships scale carbon saving potential beyond individual AI-driven solutions?

Purposeful AI

How do we balance the growing energy demands of a digital economy with the urgent need to cut greenhouse gas emissions? Constraints can in fact be a catalyst for innovation. Today, we have an opportunity to develop AI solutions with intention – focusing on those that help reduce emissions, and scaling back those that don't. As responsible consumers and businesses we should also hold our partners to account and show the courage to demand more. In one extreme example of impact, [Futureproof Clare](#), the Irish grassroots environmental group, took legal action against a €450 million plan for a data centre which would rely on fossil fuels.

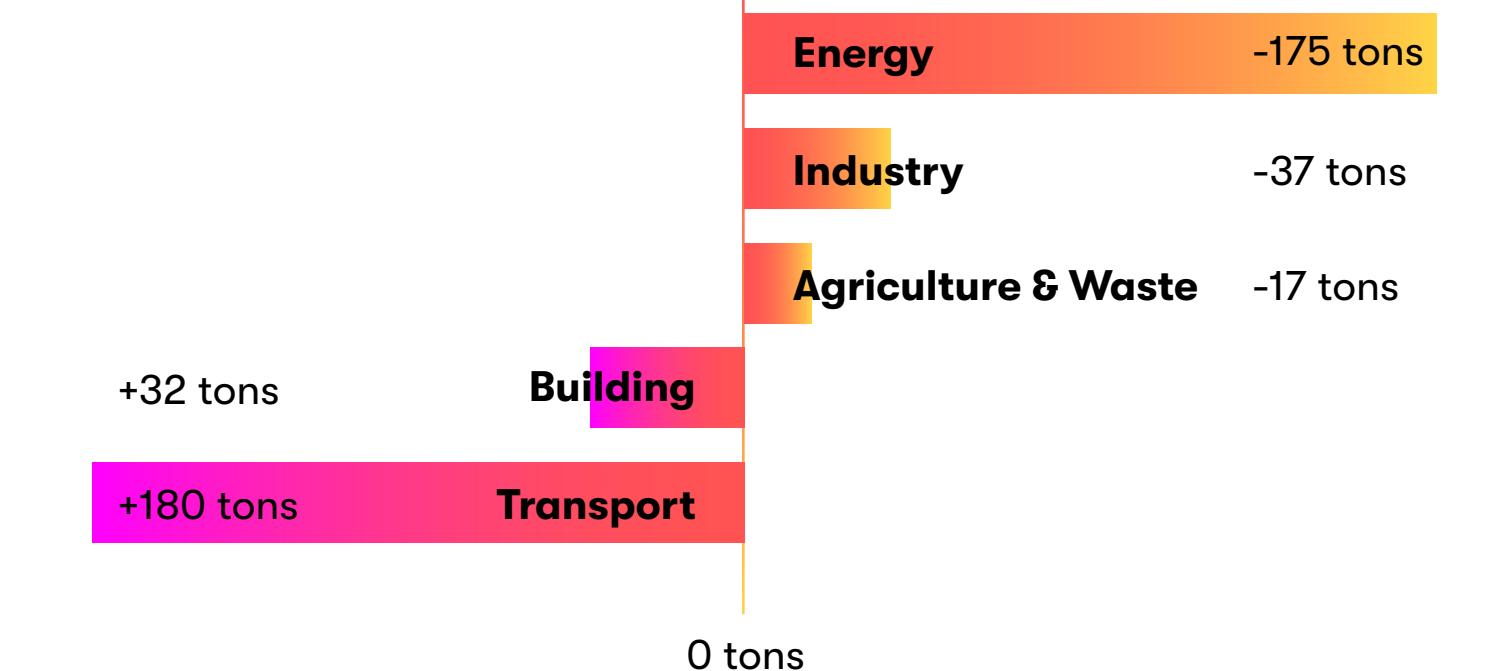
How might we steer AI development to help industries meet their emission reduction targets, instead of adding to the problem?

64%

Germany is on track to reduce emissions by [64%](#) by 2030 (compared to 1990 levels).

Behind Schedule

Reduction gap, aka the need to reduce emissions further in tonnes of CO₂ equivalents



Racing ahead

Exceeding its cumulative emissions target in tonnes of CO₂ equivalents in relation to the 2030 goal

— MACROTREND FOUR

CLIMATE CLARITY

#GreenTech

Rendering climate risks visible and supporting decision making

Increasingly, AI is making climate risks more understandable, visible, and actionable — from more accurate climate simulations, to advanced detection of extreme weather events, climate scenario visualisations and fostering emotional connections to climate change. AI has the power to transform how we understand, prepare for, and communicate climate change. It's enabling more accurate predictions, faster responses to climate-related events, and more effective public engagement with climate risks.



Creative approaches are becoming essential to communicate these risks effectively.

Why now?

Advanced pattern recognition

Climate data is inherently incomplete and fraught with uncertainty, rendering it difficult to translate into actionable decisions. AI is capable of processing vast amounts of complex, multidimensional data — more than we've even been able to before, hence enhancing predictive and microclimate modelling and uncovering subtle patterns that might otherwise have remained undetected. In this way, AI quantifies the uncertainties inherent to climate change and provides clearer projections — bringing the rapid changes in our climate to light and empowering decision-makers to better anticipate and adapt to numerous climate-related challenges.

Data-to-feeling gap

The impacts of climate change are hard to grasp due to their complexity and systemic, wide-ranging effects. Beyond temperature changes, climate change triggers extreme weather, mass migration, and conflicts — disrupting social, economic, and political systems. To understand how these impacts might reshape our world, we need to imagine a future that feels far removed from today's reality.

Creative approaches are becoming essential to communicate these risks effectively. In response, there has been a growing movement of speculative climate fiction, such as Solarpunk. AI-based storytelling can help fill the data-to-feeling gap. It blends scientific facts with human experiences to support the design and creation of literature, visual art and theatre. These forms turn complex data into relatable stories, connecting global climate issues to people's local realities. Climate impacts suddenly become real and, most importantly, personal, which inspires meaningful action.

Pressures for “glocal” climate regulations

To take effective climate action, decision-makers at every level — from global committees to city councils — need to implement climate regulations that make sense globally and locally. After all, what's relevant in Europe (for example, migration) may not be the most pressing issue in South America (say, pressure on local resources), especially when competing with broader local policy goals. Everyone, from governments to hospitals and schools, needs access to robust data and solid short, medium and long-term plans to mitigate and adapt to climate change.

In a world that's getting more unpredictable by the day, AI can swoop in with localised data and tools to help decision-makers cut through the noise and make plans for climate action that work at every level.



OroraTech x Greek Ministry of Digital Governance

AI-powered satellite system for wildfire detection

Greece experiences some of the worst extreme heat and droughts in Europe, and with it, a high risk for wildfires. Unsurprisingly then, it is also the first country to build a National Wildfire System. The Greek Ministry of Digital Governance invested €20 million in developing a satellite-based wildfire defence system in partnership with the Munich startup OroraTech. The system consists of four thermal imaging satellites dedicated to monitoring the country for wildfires — with the goal to scale up to 100 satellites by 2026 — as well as ground systems and processing services. The AI solution enables continuous situational awareness, predictive insights and real-time detection — all of which helps Greece keep wildfires under control. Here, AI is making a meaningful difference to people and our planet by monitoring climate impacts that threaten human lives, natural systems, and the economy.

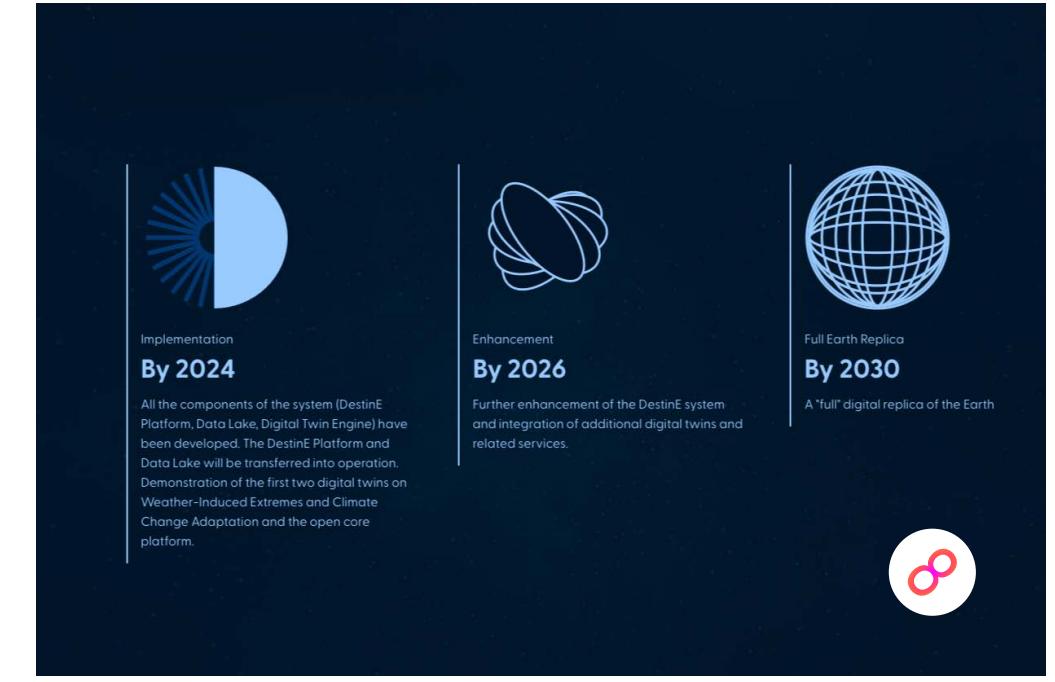
ClimateGPT



AI platform for Climate Research

ClimateGPT is an open source AI platform, designed for researchers, policy makers, and business leaders, which addresses the impacts of climate change. With over 300 billion climate-focused tokens (climate data that is encoded) in its training data, it summarises scientific findings, identifies breakthrough technologies, and tests resource allocation scenarios. The platform is built on renewable energy and uses blockchain for data transparency and integrity. It combats climate misinformation by providing reliable, science-backed information. Altogether, by synthesising climate research across all sciences, ClimateGPT breaks down silos and offers fact-based, actionable insights to support informed decision-making, innovation, and collaboration to drive sustainable change.

Destination Earth



Digital twin of the Earth to monitor climate change

Over 100 partners from across Europe developed a digital twin of the Earth to accurately simulate climate and weather scenarios.

Destination Earth (DestinE), launched by the European Commission, leverages machine learning (ML) to provide uncertainty qualifications for modelled scenario simulations, as well as developing workflows towards a foundation model of Earth's system, which could serve multiple use cases. Having a working digital twin of our planet is a groundbreaking initiative for understanding climate impacts. It gives us the possibility to digitally visualise climate change and environmental challenges, as well as anticipate future scenarios, such as extreme weather events, like never before.

Opportunities

Filling knowledge gaps

Even though AI does not truly understand language, its ability to generate human-like responses may be sufficient to give users personalised information about climate change. AI chatbots, when designed and implemented responsibly, can provide reliable, tailored answers to specific climate-related questions. As a result, they could be used to reduce misinformation and fill individual knowledge gaps. For example, the Washington Post's [Climate Answers bot](#) draws from the publication's own content to offer accurate, source-backed responses — similar to [ClimateGPT](#). These tools demonstrate how AI can make climate information both more accessible and more personal. This could significantly improve public understanding and engagement with complex climate issues.

 **How might we leverage chatbots to provide personalised climate information while making source choices transparent?**

Creative campaigns to make climate impacts visible

Translating abstract climate data into visual representations of real-world locations can make climate impacts relatable and create an emotional connection to an otherwise intangible issue. Generative AI offers the opportunity to alter any existing location to highlight predicted climate impacts (think: dried-up lakes, melted glaciers and lower snow caps). This is a big win for visual learners, and opens doors for creative campaigners. The Austrian collective [Letzte Generation](#) ('Last Generation'), for example, hijacked Google Maps, superimposing AI-generated images of popular Austrian tourist spots as modelled by climate scenarios. By doing so, they caught people with the reality of climate change right when they were thinking about their holiday.

 **How might we use the visual potential of generative AI to help people understand the climate crisis in their local surroundings?**

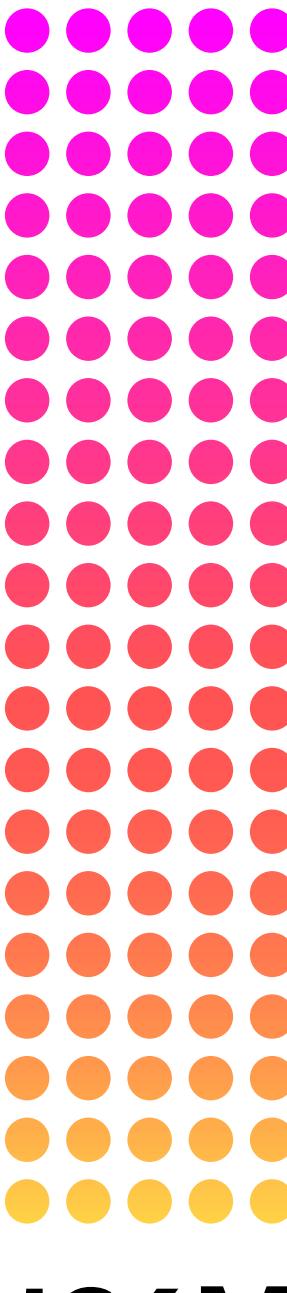
Updates to global policy

Current global climate policy relies on climate predictions and mathematical models that could soon be replaced by AI algorithms. These algorithms could pick up new data patterns, hence outputting more accurate predictions, while requiring less time and energy. By utilising AI, therefore, decision-makers can develop more informed policies in a less carbon-intensive way, ultimately mitigating climate impacts on multiple dimensions.

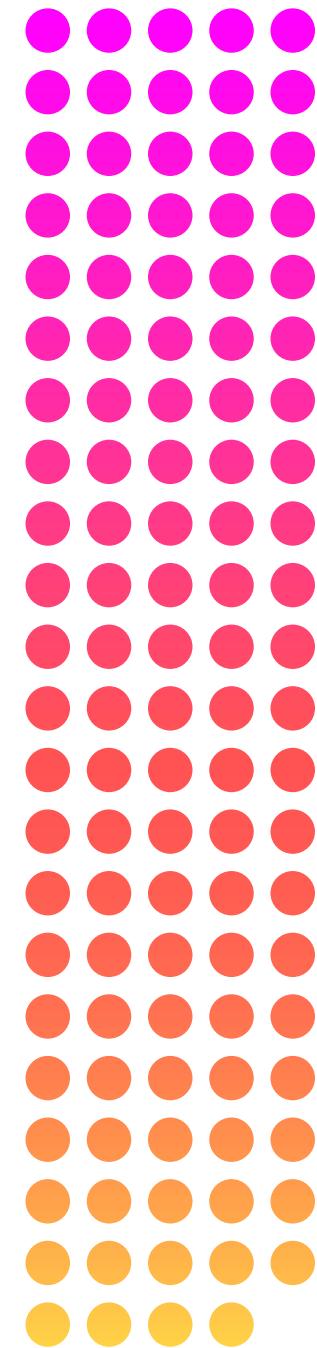
 **How might advanced AI applications support policy makers in understanding and drafting equitable, anticipatory climate policies?**

130.8 M people will be forcibly displaced and stateless in 2024, up from 126 million in 2023. (The global refugee count is surging to unprecedented levels due to conflicts and severe climate events.)

2023



2024



126M

130M

MACROTREND FIVE

RESOURCE PROTECTOR

#GreenTech
#CircularEconomy

Using AI to stay within Earth's natural limits

AI is playing a transformative role in protecting natural resources. Sensors and AI-powered data analytics in imaging and disease management tools help foresters and farmers protect soil and insects, crops and animals, and avoid unnecessary chemicals. AI can also enable other players in the food system to avoid wasting food and other natural resources along the supply chain. These applications open up new business streams, making businesses more resilient, as well as enhancing resource efficiency and sustainability in agriculture and food production, protecting and preserving nature and keeping our planet healthy.



Why now?

Limited resources

We are burning through natural resources faster than the Earth can keep up. From water and biomass to clean air and energy, the demand for these resources is rising rapidly, alongside the growing population and technological developments. In the past 50 years, natural resource extraction has tripled, with wealthy nations consuming six times more resources and causing 10 times the climate damage than lower income countries. Earth Overshoot Day — which marks the point at which humanity's demand for resources exceeds that which the planet can regenerate — hit globally on 1st August 2024 (and between 7th April and 27th May in the DACH region — ouch!). Before we completely run out of nature's precious creations, it's time to swap the “move fast, break things” mentality for sustainable resource management and radical lifestyle changes.

Advanced sensing

The integration of sensor technology marks a notable shift towards data-enhanced nature-based solutions. A wide array of sensors are now being employed to monitor various environmental conditions, all of which can be used to help protect and care for natural resources. In forestry and agriculture, these include sensors for measuring soil moisture, air temperature, humidity, and even detecting specific gases that may indicate plant stress or disease. Advanced technologies like deep MRI (magnetic resonance imaging) scans are being used to analyse soil composition, root development and more. Farm-based weather stations can provide precise data on rainfall, while leaf wetness sensors help predict disease risk. This wealth of real-time data allows farmers to make more informed decisions, optimising resource use and potentially increasing yields while reducing environmental impact.

Waste crisis

Food waste still presents a significant challenge along the supply chain. In Germany alone, an estimated 11 million tons of food are wasted annually. On farms, imperfect produce often goes unharvested due to aesthetic standards set by retailers. Inefficient production lines and strict quality control measures at food-processing facilities lead to further waste. Supermarkets then discard large quantities of food due to overstocking and approaching sell-by dates. The hospitality sector, including hotels and restaurants, also struggle to predict demand, resulting in overproduction and even more waste. Efforts are being made to address this issue through improved logistics, consumer education, and innovative technologies for food preservation and redistribution — AI has a role to play in all of these areas.

Before we completely run out of nature's precious creations, it's time to swap the “move fast, break things” mentality for sustainable resource management and radical lifestyle changes.

Databaum

Anticipating disease spread and precision pesticides

When winegrowers understand the health of their fields, they can avoid spraying unnecessary pesticides. The Swiss startup [Databaum](#) offers farmers an AI-powered disease management tool for healthy farming. Successful production depends mostly on crop health: currently, disease is responsible for 10% of yield loss — a significant amount of produce and revenue, which can be mitigated. Farmers can use sensors in the ground, air, and on leaves to monitor health, predict disease spread, and dose pesticides precisely. This way, farmers can reduce their workload and pesticide costs, while increasing their yield. This avoids the use of unnecessary chemicals on food and our planet, protecting crops, soil, waterways, and even [bees](#).



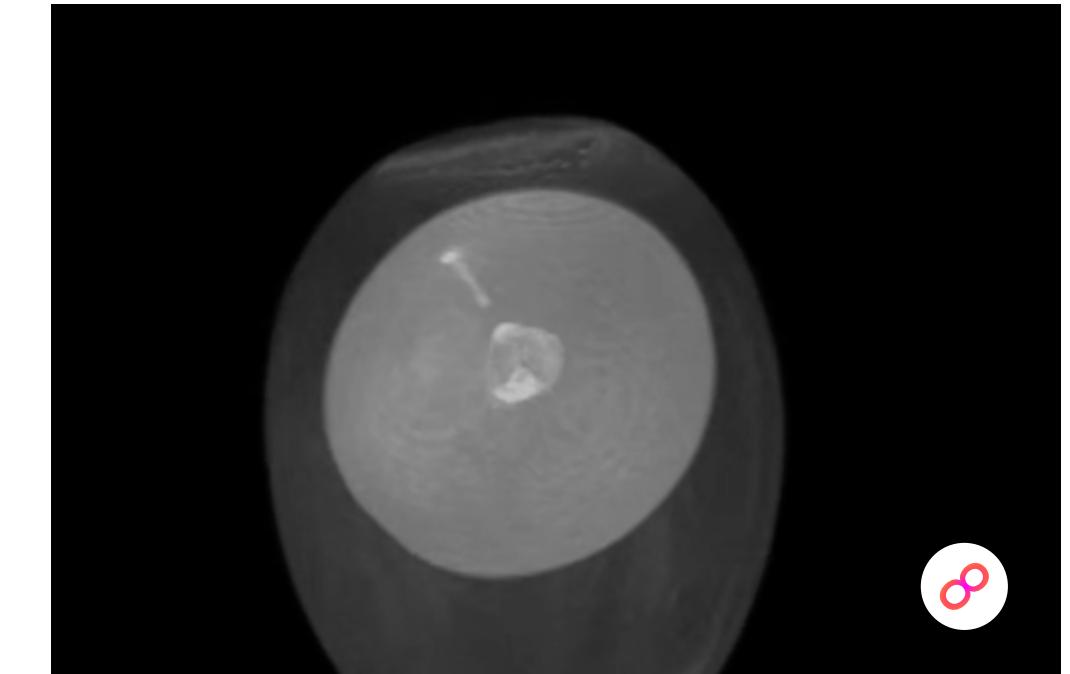
Skonelabs



Sensors detect food quality changes and anticipate spoilage

[Skonelabs](#) are reducing food waste by employing AI to detect changes in food quality and identify spoilage before it occurs. Skonelabs combines the Octagon, a smart device which monitors produce through temperature, air humidity and gas sensors, with AI, which predicts the life expectancy, ripening and spoilage of produce. The device can be used by stakeholders along the supply chain — from farms to storage facilities, supermarkets, and hotels. At every stage, Skonelabs can help reduce food waste, monitor supplies, check product compliance, manage inventories, estimate CO₂ emissions, and conduct ESG monitoring.

ORBEM



AI-imaging to determine egg fertilisation

Billions of unfertilized eggs are wasted every year during incubation because their fertilisation status is unknown. The Munich-based startup [Orbem](#) offers an AI-powered MRI scan to classify eggs in a non-invasive way, and detect the fertilisation status of eggs pre-incubation. This helps poultry producers sell unfertilized eggs as table eggs, potentially generating new revenue streams, and increasing their production capacity by freeing up space in incubators. Ultimately the solution reduces resources and the footprint of poultry and egg production, accelerating the transition to a green economy.

Opportunities

New business streams

By leveraging AI technologies, agricultural businesses can improve operational efficiency, reduce costs, and offer innovative products and services to address the challenges faced by modern farmers, therefore opening up new revenue streams. For example, AI enables a new range of data-driven agricultural services, such as precision agriculture services, predictive yield forecasting, smart irrigation management, automated grading and quality control of agricultural products, robotic farm equipment, and even alternative credit scoring, where AI-powered financial services use machine learning to generate credit scores for farmers who lack traditional credit histories. In addition, by improving our understanding and management of processes along the supply chain, AI can facilitate the reallocation of produce that would have otherwise been wasted, giving it second life and generating revenue.

 **How might agricultural businesses use their new insight to create new revenue streams and increase resilience?**

Protecting nature as a whole

AI has the potential to protect more than what ends up on our plates. It can protect endangered species across our natural systems. For example, AI-powered systems can identify and protect salmon populations from invasive species with over 99% accuracy. In the renewable energy sector, AI helps prevent bird collisions with wind turbines by predicting flight patterns. AI also aids in biodiversity conservation by analysing complex data, assists in water management to reduce waste, and supports climate modelling for better environmental policies. By enhancing efficiency and providing data-driven insights, AI empowers conservationists and policymakers to make informed decisions for nature protection.

 **How might we extend AI applications to regenerate nature beyond food systems for human consumption?**

Harnessing nature intelligence

What if, instead of using AI to outsmart nature, we team up with it, and harness a form of “natural intelligence”? AI can analyse complex data sets to understand and optimise natural resources in agriculture, forestry, and fisheries, while machine learning algorithms can help fine-tune sustainable harvesting practices that keep biodiversity intact and systems healthy. Imagine a world in which AI helps farmers conserve water and soil, and cut pollution, while letting nature do its thing and promote ecological health. The Nature Futures Framework, developed by the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: similar to IPCC for climate) imagines relationships between humans and nature which aren’t based on rivalry or competition, but respect and mutual reciprocity.

 **How might AI support the shift to lifestyles in which humans and other parts of nature are not separate from each other, but one?**

11 m tons

In Germany, around 11 million tonnes of food waste is thrown away every year.

40%

40% of the 11 million tons of food waste are thrown away along the food production chains before it even reaches our kitchens at home.



MACROTREND SIX

FAIRER A(I)CCESS

#DEI
#GreenTech

Democratising access to fairer social services

AI is transforming access to essential services by breaking down barriers for under-served communities. By leveraging data analytics and machine learning, AI helps governments and providers target remote or discriminated groups, enhancing access to energy, health-care, and social services. It can identify needs, monitor discrimination, and automate processes, making resource distribution more equitable. We're already seeing applications for fair-rent claims, legal services and clinical trials, ultimately promoting inclusivity and improving living standards for marginalised populations worldwide.



Why now?

Privileged representation

Globally, many services are biased towards a privileged group that is white, middle-class men in the Global North. This is visible in, for example, clinical drug trials, which have historically been conducted predominantly with white male participants, leading to a lack of data on how women and minority groups respond to treatments. Similarly, access to quality education, healthcare, and financial services often favours those in more affluent or majority demographics, perpetuating systemic inequities. There is a need for more inclusive policies and practices to ensure universal access to essential services, regardless of dimensions of diversity and identity.

Untapped data

Satellite imagery and digital technologies, including AI, have revolutionised access to previously inaccessible or unmanageable data. Together, these systems can capture and analyse vast amounts of satellite data, identifying changes and patterns beyond human capability. This enables real-time monitoring of urban growth and climate-related changes. For example, multispectral imaging reveals hidden impacts such as pollution, which affects the health of billions of people around the world. Additionally, automating the analysis of historical data can uncover long-term trends and predict future changes. Altogether, these technologies offer unprecedented insights for climate science, urban planning, and careful resource management.

Scaling reach

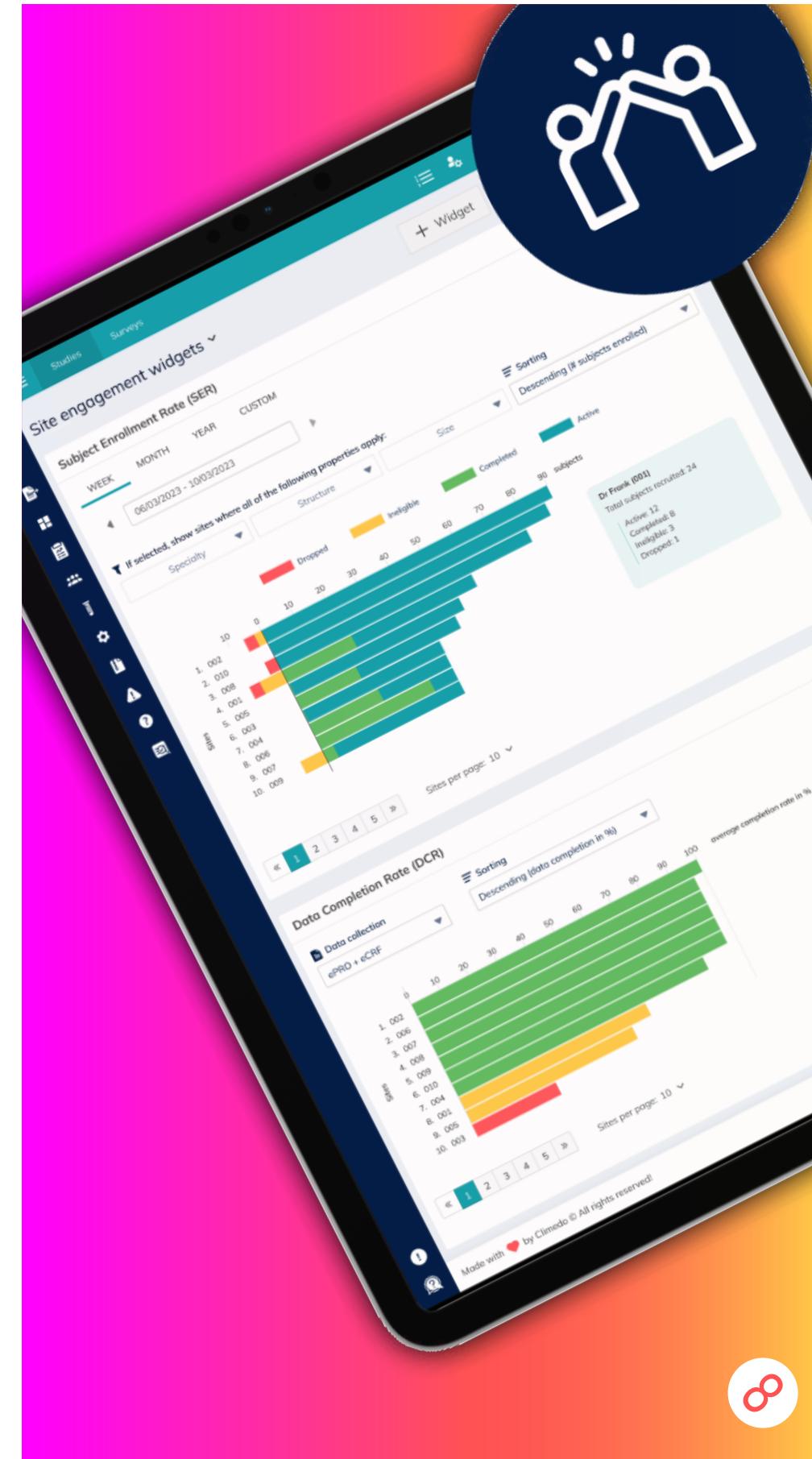
The potential of AI to revolutionise access to basic services lies largely in its ability to scale and democratise delivery. Through automation and intelligent data processing, AI is significantly reducing costs and increasing efficiency in healthcare, education, financial, and legal services. AI can also break down geographical, economic, and social barriers, hence increasing the reach of essential services and promoting equity and inclusion on a global scale.

Automating the analysis of historical data can uncover long-term trends and predict future changes.

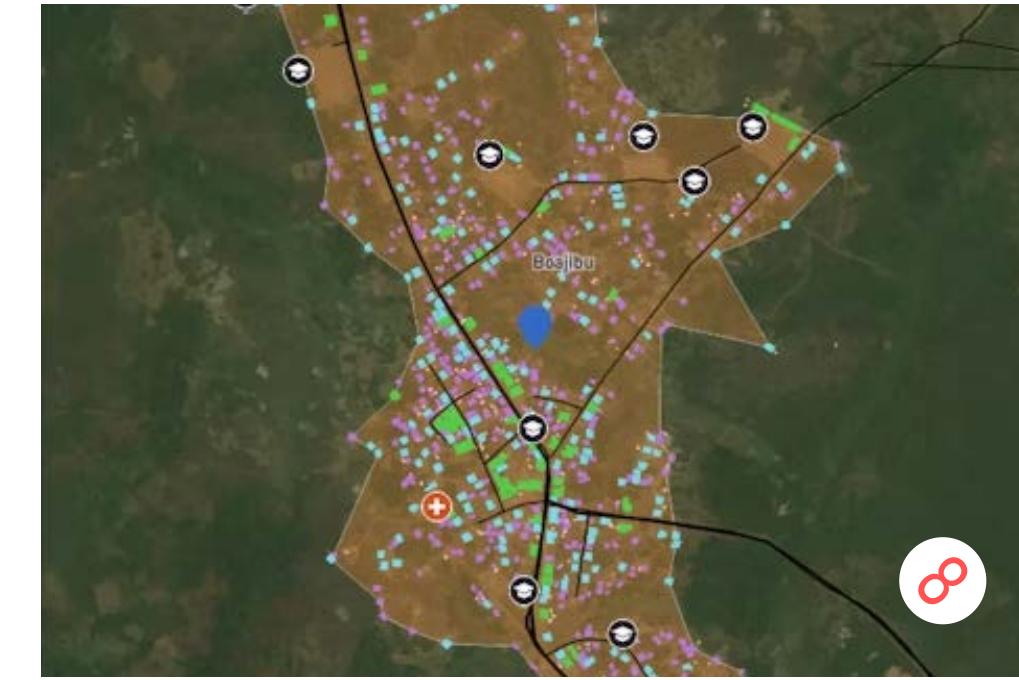
Climedeo

Democratising clinical trials

Drug discovery and testing is far from inclusive: women and people of colour are underrepresented in clinical trials and their symptoms are taken less seriously. Climedeo leverages AI to enhance efficiency and inclusivity. Their analytics model processes real-time data from electronic Case Report Forms and Patient-Reported Outcomes to produce faster insights and more adaptive trial designs which can help tackle health disparities and inequities. The Munich startup is also exploring how generative AI could be used to summarise data and create reports. Their patient-centric and decentralised approach has the potential to reduce participation barriers and improve the applicability of results across diverse populations, hence, improving global health outcomes and accelerating the development of treatments for rare diseases.



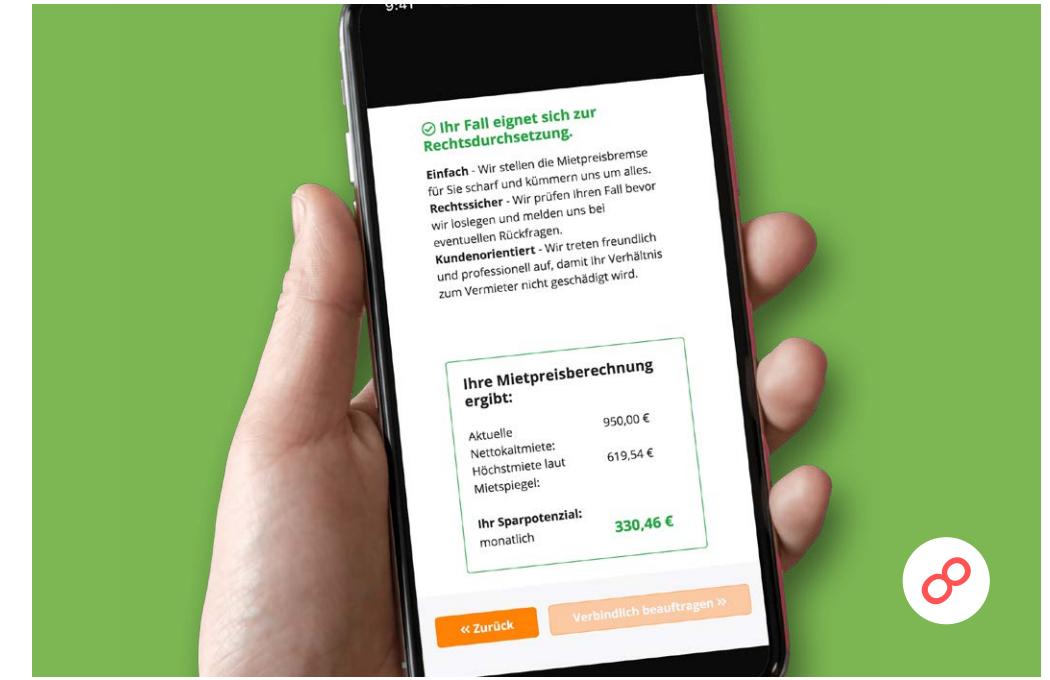
VIDA



Identifying opportunities for electrification and healthcare in remote areas

Many remote areas are not connected to the energy grid or healthcare services, leaving them more vulnerable to climate impacts. However, identifying these opportunities for development finance is challenging. The Munich-based startup VIDA offers a map-based tool which monitors satellite imagery to assess environmental changes (for example, agricultural fields, droughts, water levels in rivers), infrastructure risks, and gaps in essential services. Anticipating the needs of communities in remote areas and globalising access to healthcare and electricity can greatly improve education, living standards, and our life expectancy.

CONNY



Help with housing contracts and rent reduction claims

The Berlin-based startup CONNY uses machine learning to identify problematic or unusual clauses in rental agreements and highlight these to users. Renters can upload contracts onto the CONNY platform, which are then reviewed by an AI algorithm to assess for unlawful agreements. The platform also offers legal services to enforce tenants' rights, such as claiming reductions of overpriced rents (according to rent control or Mietpreisbremse). CONNY makes it easier for renters with limited legal knowledge or financial resources to defend their rights, manage disputes and reduce their cost of living — ultimately making the housing market more equitable.

Opportunities

Building value-aligned systems

When using AI to build digital representations of complex ecological and social systems, we need to consider how we align these models with impact-oriented values. Through responsible development, AI could help democratise these systems by putting the affected communities and their data at the centre of the algorithm. For example, a “Democratic AI” would be developed according to an economic system which aims to reduce pre-existing disparities. Such a tool might, for example, model the redistribution systems of mutual aid and community organisations that have, in fact, existed in our societies for millenia.

 **How might AI model social, economic and political systems based on human values?**

Sensitivity and anonymity

If the concerns raised in the Open questions section of this report are addressed, AI could support rather than discriminate against vulnerable groups — enabling greater access to social services through tailored assistance and anonymity. For instance, AI could provide domestic abuse survivors, for example, with crucial information and access to the services they need to find safety without risking further abuse. The TikTok campaign Face of Courage used generative AI to narrate personal experiences of abuse survivors, share their stories anonymously, and connect survivors to a directory of support services. Such initiatives can empower more vulnerable groups to seek help and shatter the culture of silence around taboo topics.

 **How might we leverage the distance provided by AI-generated content to address issues that require special sensitivity?**

Advocating for rights at scale

AI has tremendous potential to empower individuals by helping them tackle challenges that once seemed insurmountable. From legal rights with landlords to specialised healthcare, AI can increase access to information, automate documents, and streamline processes that help democratise our systems. People can make straightforward requests without the need for specialised knowledge or jargon, and avoid incurring hefty fees associated with experts such as attorneys. By making assistance more accessible, AI empowers citizens to advocate for themselves, harnessing collective strength and bridging the “justice gap” for underrepresented communities.



Though the number of people without access to electricity worldwide has dropped by more than half between 2000 and 2023, 746 million people globally had no access to electricity in 2023.



Clinical trials are supposed to represent the population according to the incidence of the disease. While in some studies the ratio of male to female study participants corresponds to the gender prevalence, in others women are underrepresented 2 to 3-fold.

— MACROTREND SEVEN

POWER TO THE “BAUER”

#SustainableFood
#ClimateAction
#DEI

Empowering farmers for long term benefits

The EU relies heavily on food imports from the Global South, but farmers around the world are grappling with climate chaos and global shifts. AI and big data could offer farmers a treasure trove of knowledge to tackle these challenges. However, while AI can be a gamechanger, its adoption also poses risks for farmers. For example, farmers could become overly dependent on big tech, putting their independence and resilience under further strain. In response, a new trend is cropping up — one that champions equitable AI and data practices, designed by, and for, farmers. Innovations in this area focus on global fairness and business models that put the wellbeing and autonomy of farmers at the centre, ensuring AI benefits are harvested by everyone, not just the tech giants.



Why now?

Evolving farming practices

While, in 1990, one farmer produced enough food for around 4 people in Germany; today, one farm produces food for 139 people – and that number continues to rise. It was tech-based innovations that enabled this increase in productivity. Now, it seems like AI-powered precision agriculture, predictive analytics, and crop monitoring will be the key to feeding tomorrow's population. These solutions offer significant long-term benefits: optimised resource usage, improved yields, and early detection of disease or pests. That said, solutions must prioritise ecological integrity alongside productivity to avoid further biodiversity loss or pollution, and ensure that small-scale farmers can also reap the benefits of progress.

Data for equity

Data is emerging as a key driver for equity in agriculture. For example, data and AI could be leveraged to give farmers equitable access to information about new fertile locations. However, in order to ensure that data is used for good, it's important to consider the inclusivity, discoverability and accessibility of the data, as well as how it's owned and governed. When these considerations are taken into account, data has the potential to enhance collective knowledge, help farmers adapt to global shifts, and create win-win situations for farmers, their partners, and the communities they serve.

Data and AI-driven solutions won't just change farming practices, but power dynamics. They can give small-scale farmers greater control over their practices and operations, as well as enabling them to make more informed choices and regain power over their livelihoods in a complex agricultural landscape.

Data and AI-driven solutions won't just change farming practices, but power dynamics.

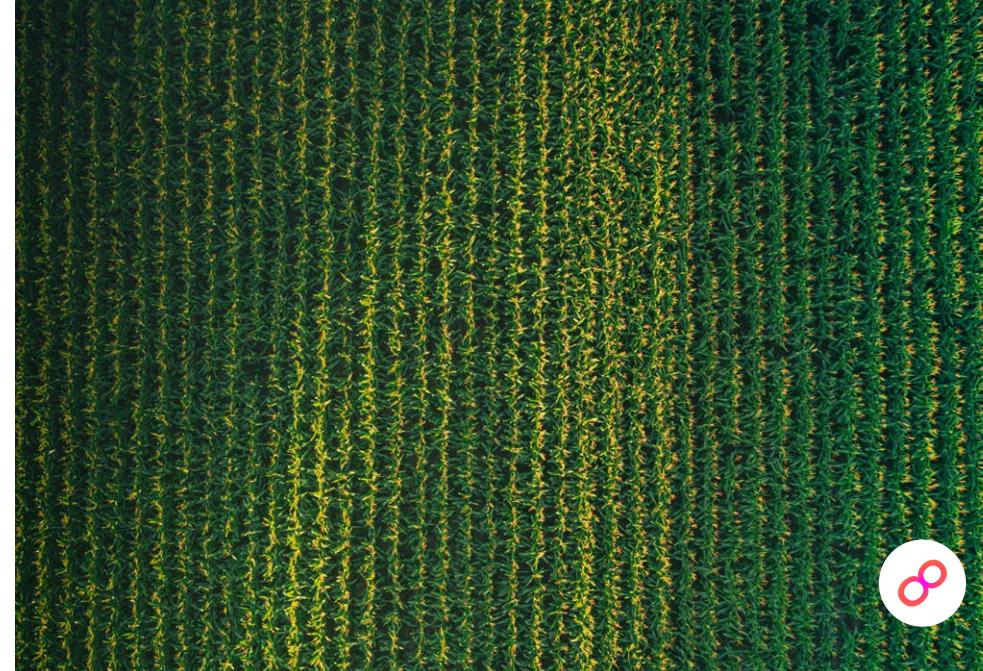
Space Big Data Rice



Rice grown in AI-identified locations

Approximately 95% of the rice on our plates comes from Southeast Asia. Many rice varieties require specific soil and climate conditions which are perfect in this region. However, with the impacts of climate change, farmers may no longer be able to reliably cultivate rice in the same areas. The Japanese startup Tenchijin, a spinoff from the Japan Aerospace Exploration Agency, developed Space Big Data Rice, which leverages satellite imagery and AI-powered data analysis data to identify suitable plots for growing and assist farmers in planning their seasonal operations to adapt to changing environmental conditions.

Agcurate



Agricultural intelligence to reduce economic uncertainty

AgCurate provides accurate and rich agricultural intelligence to organisations for contract farming, whereby farmers sign agreements with buyers before even planting the seeds. As this can increase the risk for buyers, farmers and their partners use AgCurate to monitor their ROI and provide actionable insights based on satellite imagery and AI. Buyers reduce their risk, while farmers benefit from a stable income, can plan better and invest wisely, and avoid the uncertainties of an unpredictable market.



Gramhal

Chatbots for adjustable and fair pricing

Many farmers lack access to credible, contextual and actionable information on pricing. Often they rely on their peer network, which greatly hinders their negotiating ability. The nonprofit Gramhal crowdsources and contextualises data in user-friendly solutions which use colloquial language and include built-in feedback loops for farmers. Their solutions include Bolbhav and Matar. Bolbhav is a WhatsApp chatbot owned and governed by Indian farmers, which provides real-time market data, helping them price crops fairly and boost negotiating power. On average, Bolbhav leads to an 81% rise in income. Matar, meanwhile, is an AI-powered voice recognition chatbot which allows mushroom farmers to ask specific queries.

Opportunities

Reducing risks associated with large scale models

Early testing of AI models for agriculture, for example, through digital sandboxes and low-risk hybrid cyber-physical spaces, offers a crucial opportunity to mitigate potential risks before large-scale deployment. These controlled environments engage multiple stakeholders and allow for rapid prototyping and supervised testing of ML (machine learning) techniques. Projects like the [AI Lab at Makerere University](#) in Uganda and the [Hands Free Hectare](#) at Harper Adams University in the UK demonstrate how AI models can be safely validated in context-specific settings. This approach, similar to biosafety protocols in biotechnology, helps identify and address potential issues early on, reducing the risk of errors that could threaten large areas of farmland. By prioritising such testing methods, we can ensure more responsible and effective integration of AI in agriculture.

 **How might we test and validate AI models in safe environments before deploying them on the fields?**

Cooperative data ownership and inclusive input

Collective ownership of agricultural data could empower farmers by enabling a transparent and democratic governance approach. By adhering to open data principles and utilising standards repositories, farmers can ensure their data is accessible and trustworthy. Data stewardship tools can help farmers achieve this: facilitating the development of data lakes, protecting farmers' proprietary rights, ensuring compliance, and enabling effective data mining. Initiatives like the data pool by the grower-owned data cooperative [Grower Information Services Cooperative](#) (GiSC) and the data sharing standard [FarmStack](#) by DigitalGreen in India exemplify this. The initiative facilitates collaborative data stewardship, allowing farmers to control their data, manage access, and benefit from shared resources.

 **How might inclusively gathered, collectively-owned, and accessible data empower farmers?**

Equitable business models that benefit farmers

Democratising access can come into tension with monetising data to create equitable business models that benefit more vulnerable groups. While this is true for AI in general, small-scale farmers are especially susceptible to power imbalances, despite being the one feeding the algorithms (and literally the world). Farmers should be fairly compensated for their data — especially when the big tech companies behind the algorithms profit from it. This would not only incentivise farmers to share high-quality, structured data, but also make datasets more diverse and inclusive. Different licensing structures can help distinguish between commercial and non-commercial data use, while data cooperatives can facilitate sharing among smallholders, ensuring mutual benefits. Initiatives like the [CGIAR's](#) platform for big data in agriculture promote "FAIR" principles — findable, accessible, interoperable, and reusable — and enable farmers to collaborate and negotiate data-sharing agreements that align with their best interests, and enhance agricultural sustainability.

 **How might farmers get a fair share in the profits from AI that wouldn't be possible without them?**

83%

of farms globally are particularly at risk to be excluded from AI benefits due to marginalisation, poor internet connection and the digital divide, which might further widen divides between commercial and subsistence farmers.

15,7%

Climate impacts are estimated to have decreased farmer incomes by an average of 15.7% between 2021-2023.

73%

of farmers have experienced increasing pest and disease pressure due to changing climate conditions.

MACROTREND EIGHT

QUEERING AI

Transforming AI development for the needs of marginalised communities

Marginalised groups are increasingly taking AI development into their own hands, creating datasets and applications that serve their communities and can respond to their needs, perspectives, and lived experiences. They are challenging traditional AI frameworks that often imposed binaries, ableist, and otherwise discriminatory assumptions. This shift is empowering communities to transform oppressive practices into practices of liberation, fostering inclusivity and equity. As they redefine these technological developments from the ground up, marginalised groups are not only addressing their own needs but reshaping the entire field, promoting a more just and representative digital future, by queering AI.

#DEI



Computing and AI were pioneered by the queer inventor Alan Turing and women like Grace Hopper.

Why now?

Diversity crisis

Computing and AI were pioneered by the queer inventor Alan Turing and women like Grace Hopper, but today there is a lack of diverse representation in the field. This has resulted in AI systems that can perpetuate biases and exclusion. Marginalised groups, including LGBTQIA+ individuals, face significant challenges entering the tech industry and often experience unfair treatment at work, with 42% reporting discrimination. Despite these issues, so far the sector has done little to promote diversity or tackle the challenges faced by marginalised communities.

Depicting otherness

AI struggles to represent and understand diversity, especially regarding people with disabilities. There's a disconnect between how AI is described — often using ableist language — and the lived experiences of those with disabilities. For instance, researchers have labelled AI agents as "autistic" when they excel at specific tasks and "non-autistic" when they appear attractive, which is a misguided comparison. This narrative is extremely problematic as it overlooks the identities of people with disabilities and tries to "fix" them rather than creating systems that accommodate their differences.

Canary in a coal mine

Ironically but unsurprisingly, women of colour, who were the pioneers of research into the potential social and ecological fallout of AI, have suffered the most by their concerns being overlooked. Researchers have been sounding the alarm on the potentially disastrous effects of AI for years. Their concerns range from magnifying biases to erasing contexts, antidemocratic algorithmic decision-making, search engine prioritisation of popularity over legitimacy, and intersectional discrimination in facial recognition systems, particularly against women of colour. Issues such as racial biases, energy costs of training LLMs, and automated systems replacing professional expertise, also pose significant risks to our social and ecological fabric. Altogether, these concerns demand urgent attention in the further development of AI.

Paravan Space Drive

AI-based digital steering systems in cars

Many people with disabilities are already driving AI-enabled cars. The [Paravan Space Drive](#) is a digital driving and steering system that connects to, controls and monitors the car through a user-friendly joystick interface that can be linked to assistance sensors that further enable (semi-)autonomous driving. The joystick can be used to accelerate, brake and steer the car. One person who experienced the system said, “[the situation in the car is the only one in my life where I’m treated just like everyone else.](#)” And when they misbehave in their BMW, they will be approached like any other “macking, car-driving asshole”. This queer-crip AI not only normalised the disability, but responded to their longing for mobility and self-determined navigation through their environment.



AI comes out of the closet



Aims to address discrimination at work

The [AI-based simulator](#) aims to foster empathy, understanding, and advocacy skills for LGBT-QIA+ issues. The LLM-based simulator uses dialogue and virtual characters to stage complex social situations. In a safe and controlled online environment, participants are guided through a series of interactions and scenarios which portray the real-life social and emotional complexities of coming out. Exploring how AI can contribute to human flourishing, the researchers and developers, D.Pilis and Pat Pataranutaporn from MIT Media Lab, see AI not as a tool to make people more effective or more efficient, but one which can support multi-dimensional aspects of human growth and further development.

All.txt



Text editor that suggests gender-neutral language

German is a deeply gendered language. The web-extension, [all.txt](#), automatically corrects text in line with gender-inclusive language. Founders, [Nora Mathelemuse](#) and [So Jin Park](#), see the role of AI not just to improve accuracy and efficiency, but also to educate users. Hence, all.txt provides users with explanations alongside the corrected text to support further learning and more consistent use of gender-inclusive language. By building an innovative data structure and platform, the founding team have been able to queer AI and address assumed gender binaries.

Opportunities

Making AI intersectional

Innovators have the opportunity to question existing understandings of race, ability, gender, sex, and binaries, and avoid mutually exclusive categorisations such as male/female when structuring AI models. In future developments, we need to extend this approach to intersectionality. Now, queer AI has the potential to subvert the historic, repressive and discriminatory structures that it has previously enabled and more authentically serve people and their diverse communities.



How might we make AI development more intersectional to truly serve diverse communities?

Voices from the margins

People with experiences of marginalisation understand the realities of their communities like only people from within those communities could. These nuances often get lost when solutions are developed for someone else rather than by them. Involving people with varied lived experiences in AI development and decision-making will support the creation of a diverse AI landscape that can better meet the needs of different communities rather than following suit with conventional technologies.



How might we include people who understand nuanced, diverse perspectives into AI development?

Acknowledging AI politics

No one can fully embody the ideals of non-disability throughout their entire life — eventually, everyone falls short of society's standards for fitness, performance, and health. By embracing diversity and different lived experiences when using AI as a tool for impact, we can challenge these ideals and make our work political. As pioneers of not just technology but DEI, we can bring our values into AI development, repurposing models for non-normative goals, and striving for equal rights.

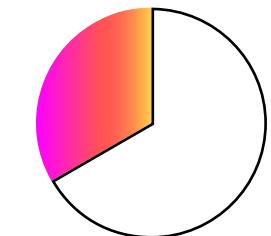


How might we use our own deviations from “the norm” to create more inclusive solutions?

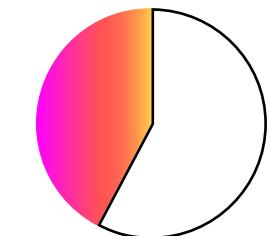
In the UK, the number of people identifying as transgender increased sixfold between 2000 and 2018.

6x

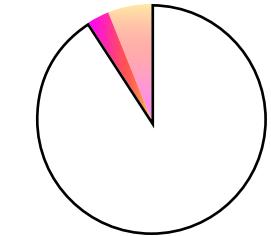
30%
of AI talent were women in 2022 — an increase by only 4% since 2016.



42%
of LGBTQ-workers have experienced non-inclusive behaviours at work.



3%
of respondents from 30 countries identified as transgender, non-binary/non-conforming/gender-fluid, or another gender identity. In Switzerland, it's double the average at 6%.



This trend report is a showcase of collaboration to make impact work. Thank you to all the human contributors and to AI as co-creator of the illustrations:

Concept, Content & Coordination

Impact Hub Berlin
Lead: Stephanie Ries

Research & Content

Juli Sikorska

Copyediting

Impact Hub Berlin
Lead: Ellie May Leopold

Design & Illustration

K-Tiv.com
Lead: Michael Berger
and Pauline De Langre



Together let's make AI work for impact through inclusive climate action!

Get in touch to find out how we can make impact work together — inclusively and sustainably! Details here or reach us [via mail](#).

berlin.impacthub.net

