Bizkaia Tech

Passing Without Leaving a Trace | Issue 11



CONTENTS

BizkaiaTech Magazine Passing Without Leaving a Trace
Issue 11 - Winter 25

Magazine

When we have answers we must change the questions. Only like this can we innovate disruptively. Change schemes, paradigms and ways of thinking.

BizkaiaTech Magazine is the go-to magazine (filled with art) for inquisitive minds, full of good ideas, great projects and good vibes.

Born to share learning, with a disseminating spirit and the soul of an artist.

With each change of season (winter, spring, summer and autumn) we get inspired, take a deep breath and capture it by launching a new issue.

We want to be the space where anyone, wherever they come from, can find the latest news in technology, great stories, projects that we are doing, projects that are to come and how to get the best out of our land, which belongs to everyone.

And all this, **collaborating with local artists.**

Editor Lantik S.A. (Sabino Arana Etorbidea, 44, 48012 Bilbao, Bizkaia) | **D.L.** LG BI 1460-2023 | **ISSN** 3020-9609

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04	Passing without leaving a trace
08	EIC, the cornerstone of a smart decarbonization strategy
12	The fediverse and the sustainability of life
18	Quantum computing and hydrogen: the entanglement of a new sustainability
24	One click away from your doorstep. The true price of e-commerce
30	Technology for eating well and caring for the planet
34	In the kitchen with BizkaiaTech Magazine
38	Ecological transition: from challenge to opportunity
42	Quantum-inspired tensor networks: a sustainable future for artificial intelligence
46	Microorganisms: our tiny allies in environmental protection
50	The decisions you make today will determine your tomorrow. Choose your own future



PASSING WITHOUT LEAVING A TRACE

BY **BIZKAIATECH EDITORIAL TEAM** / ILLUSTRATION **MAITE GURRUTXAGA**

Technological advancements have transformed the way we live, produce, and consume. But they also bring a major challenge: making it sustainable. Undoubtedly, innovation can drive the ecological transition and improve our relationship with the planet, but it also generates a significant environmental footprint.

This issue is dedicated to exploring how technological tools and the habits that rely on them can be allies in building a sustainable future. In the following pages, we highlight initiatives launched by public and private entities to achieve this goal or simply to raise awareness about it. And, of course, we explain the key concepts you should keep in mind to navigate this green movement with ease.

Pay attention.

The Energy Intelligence Center (EIC) is a project in Biscay that showcases how public-private collaboration can support one of the key pillars of new environmental policies: industrial decarbonization. It is a commitment to innovation in hydrogen technologies and renewable fuels that also fosters education and attracts talent.

The Fediverse presents itself as a fairer and more sustainable digital alternative. This decentralized Internet model not only protects privacy and data sovereignty but also aims to reduce the environmental impact of centralized digital infrastructures, which, as we will see, consume enormous amounts of energy. In other words, it offers a different way to interact in the digital space without compromising the planet's resources.

INNOVATION CAN DRIVE THE ECOLOGICAL TRANSITION AND IMPROVE OUR RELATIONSHIP WITH THE PLANET, BUT IT ALSO GENERATES A SIGNIFICANT ENVIRONMENTAL FOOTPRINT

Food is another key pillar of sustainability that is undergoing a technological revolution. From using artificial intelligence to reduce waste to developing new foods such as lab-grown meat, the food industry is exploring more efficient and environmentally friendly solutions. The circular economy is gaining traction with initiatives that turn waste into useful resources, while automation and digitalization optimize food production and distribution.

Artificial intelligence, with its enormous potential, also raises questions about its environmental impact. Increasingly complex models require a staggering amount of energy. This is where tensor networks inspired by quantum physics can make a difference, offering a more efficient and sustainable alternative for AI development.

The ecological transition, far from being just a challenge, represents an opportunity to generate employment, investment, and the emergence of new technological solutions. Artificial intelligence, blockchain, and renewable energies are driving the creation of innovative materials and traceability systems for more effective waste management. However, to make these initiatives viable, it is crucial to have demonstration spaces, proper funding, and public policies that encourage change.

THE FUTURE DEPENDS ON HOW WE CHOOSE TO USE TECHNOLOGY TODAY



START SMALL, THINK BIG

Technology is not inherently eco-friendly. It is how we use it that truly makes the difference. That's why it's worth reconsidering our habits when making a purchase, for example. Would you know the carbon footprint of a purchase from a major e-commerce platform? Reflecting on the "hidden cost" of digitalization is key to making more responsible consumer choices and demanding greater transparency from companies.

Finally, to wrap up this issue, we encourage you to put on your apron and try out a zero-waste recipe.

Technology and sustainability don't have to be in conflict, but their coexistence requires a conscious and strategic approach. The future depends on how we choose to use technology today.

ENJOY THE READ!

EIC, THE CORNERSTONE OF A SMART DECARBONIZATION STRATEGY

BY **AINARA BASURKO (GOVERNMENT OF BISCAY)** / ILLUSTRATION **JON AMORRORTU**

In Biscay, energy transition is a lever to innovate, grow, and lead. The Energy Intelligence Center (EIC) positions us at the forefront of sustainable industrial solutions, driving high-value technology and global collaboration.

In Biscay, energy transition is not just an environmental challenge. It is a way to build a sustainable future that impacts competitiveness and employment. To position Euskadi and Biscay at the forefront of technological and industrial innovation, the Energy Intelligence Center (EIC) emerges as a strategic hub, a key open innovation environment for our positioning as a reference in energy transition.

Since its creation, the EIC has been conceived as a transformation engine whose goal is to accompany companies in their decarbonization processes. But above all, it is intended to lead the development of pioneering solutions in the field of energy transition to boost the Basque industry in increasingly demanding international sustainability markets.

Located in the Ezkerraldea-Meatzaldea Technology Park, the EIC is a space where public-private collaboration is the axis of an intelligent decarbonization strategy that focuses on the technological industrial value chain related to hydrogen and renewable fuels, both of biological and non-biological origin.

In the building that bears its name, companies with industrial and technological development projects in this field already have private and shared spaces that promote collaboration and synergies. The site includes shared laboratories and a full-scale workshop to optimize analysis processes and experimental tests.

DECARBONIZING AND REINDUSTRIALIZING

By protecting our industry's competitiveness and aligning decarbonization processes with reindustrialization, we will facilitate the energy transition of sectors with greater difficulty in doing so, such as energy- and emission-intensive industries or heavy and long-distance transport.

It is intended to lead the development of pioneering solutions in the field of energy transition



The journey toward this sustainable future has been undertaken by the Basque Energy Agency (EVE), the Basque Hydrogen Corridor (BH2C), the Energy Advanced Engineering Foundation, Nortegas, Petronor, and the Government of Biscay, which presides over the board of the EIC Foundation, the entity responsible for managing this collaborative R&D&I platform. The foundation combines the fight against climate change with industrial and technological development through projects that strengthen the value chains of a decarbonized industry.

THE HEART OF INNOVATION IN BISCAY

Biscay and Euskadi face a unique opportunity to lead this change and build competitive advantages based on our capacities and strengths. We are a territory of high innovation, with a consolidated business fabric and a strong tradition in the energy sector, the ideal place to connect local and global talent.

For this reason, the EIC has been designed as a platform where companies, technology centers, and universities converge, fostering research and development in clean energies such as renewable hydrogen, advanced biofuels, and synthetic fuels.

An example of its impact is the "Hard to Zero" project, an initiative that integrates the production and distribution of renewable hydrogen, oxygen, and synthetic fuels to decarbonize complex industrial sectors. Such projects reduce emissions and decisively contribute to positioning Biscay and Euskadi as an international reference in sustainable technologies.

A MODEL BASED ON COLLABORATION

The key to the EIC lies in its ability to generate synergies. By attracting leading international companies and fostering cooperation with local entities, the center will become a hub of knowledge, talent, and investment. Thus, the renewable fuels development hub that the EIC will host will centralize technological capabilities, facilitating the scaling of innovative solutions.

Training will also play an important role in the EIC's agenda. In collaboration with universities and specialized centers, educational programs will be promoted to prepare youth to lead change. This includes everything from inter-university master's programs in hydrogen technologies to outreach workshops to raise societal awareness of the importance of energy transition. It is essential for institutions, companies, research, and knowledge centers, along with citizens, to actively engage in this transition toward climate neutrality.

LOCAL IMPACT, GLOBAL VISION

The EIC is set to transform the local landscape with global ambition. The creation of a competitive intelligence platform will monitor international trends in regulation, technology, and markets, ensuring our territory remains at the forefront of innovation. This comprehensive approach will strengthen the competitiveness of our industry while contributing to the decarbonization of the global economy.

On the path to sustainability, the EIC is a strategic ally. Through disruptive projects, a shared vision, and a determined commitment to innovation, we will demonstrate that the challenge of decarbonization is an opportunity to lead change from our small corner of the world.

We will demonstrate that the challenge of decarbonization is an opportunity to lead change from our small corner of the world





The fediverse and the sustainability of life

BY **DIANA FRANCO EGUREN** / ILLUSTRATION **ADARA SÁNCHEZ**

Technology can be developed in many different ways. In relation to this idea, Donna Haraway says something I like to repeat: “We depend on what we make, and we are what we make.” This phrase suggests that the technology we create is a reflection of our society. Therefore, to stop the ecological catastrophe we humans are causing, we should rethink our relationships with the planet and the species that inhabit it. The fediverse is a practical example of this reconsideration of relationships.

WHAT RELATIONSHIPS DOES THE FEDIVERSE REDEFINE?

The Internet was launched in the 1960s and developed within the framework of economic and political power structures. These structures shaped its evolution, embedding their values into the Internet as we know it today. This is why it is crucial to ask who creates technology and for what purpose. Technology absorbs our character, both its light and dark sides. Ultimately, technology is not neutral. Given this, we must constantly evaluate and rethink the technological models we use.

In today's model, most Internet spaces are owned by a few corporations. The Internet is centralized.

These corporations have designed the infrastructures and business models that dominate the Internet. The expansion of these infrastructures increases their power in society. They compete to maintain and expand this power, driving continuous growth and resource exploitation. However, the world's resources are not unlimited.

The fediverse proposes a decentralized model that, while not requiring major changes for users, challenges corporate business models. These business models rely on exploiting vast amounts of user data by centralizing computational power and turning it into valuable information. To achieve this, they require massive infrastructure (servers, communication networks, device development, software... in other words, clouds). These centralized clouds have negative effects on human life and the environment.

THE ENVIRONMENTAL IMPACT OF THE CURRENT DIGITALIZATION MODEL

In our daily lives, we use the Internet without limits. Every action we take online, sending a message, watching a movie, making a suggestion, has an energy cost. Given that digitalization is constantly growing, the numbers are concerning:

Internet usage in 2023:

- 66% of the world's population had Internet access, a 51% increase compared to 2018.
- The average number of devices per person was 3.6 in 2023.
- 50% of connections were M2M (Machine-to-Machine, or Internet of Things, IoT) devices such as cars and smart appliances that connect automatically.

The fediverse is a practical example of this reconsideration of relationships

The influence of data centers (the cloud) in the centralized digitalization model:

- In 2022, global data centers consumed as much energy as the entire country of France.
- Most of the electricity required to run every day Internet services (social media, email, streaming platforms...) comes from fossil fuels. About 40% of that energy is used just to cool the infrastructure.
- Large amounts of water are needed to cool servers. The activist group "Tu Nube Seca Mi Río" (Your Cloud Dries My River) has reported the environmental damage caused by Facebook's data center, built near a river in Talavera de la Reina, Spain.
- Today, the cloud has a larger carbon footprint than the airline industry. A single data center can consume as much electricity as 50,000 homes.



The growing energy demands of our current digitalization model will not stop until energy resources are depleted or until strict regulations are implemented (Low Tech Magazine).

Now, artificial intelligence is adding to these energy demands:

- AI is already integrated into many platforms and websites, analyzing user behavior and running energy-intensive processes.
- Training Meta's AI model, LLaMA, emits more CO_2 than 2,400 cars per year.
- By 2030, 41% of data center electricity consumption will be used for AI.

How can the fediverse help reduce the environmental impact of digitalization?

The Fediverse alone cannot solve this problem. However, in combination with other efforts, it can play a crucial role in rethinking our digital relationships and their impact on the world.

Therefore, on the path toward a more sustainable life on this planet, the Fediverse generates two types of relationships:

- Those related to the power dynamics that exist in society today: empowering more actors and weakening the power of the tech oligopolies that dominate the Internet.
- Those related to human relationships with the environment: the energy needs of small, decentralized infrastructures can be adapted to local capacities and managed more sustainably.

BUT WHAT IS THE FEDIVERSE?

The fediverse is another way of creating and existing on the Internet. It transforms the way relationships between users and service providers are structured. The fediverse is a technological model based on the values of distributing power, data sovereignty, and privacy protection.

The fediverse contains two words: federated and universe. In Biscay, we are very familiar with the first word, federated, as we have many federations in our region: parent associations, various sports clubs, leisure organizations... These associations unite in pursuit of shared goals, gaining greater strength in both society and institutions.

The second word, universe, signifies that in the infrastructures that make up the fediverse, anyone can be an agent. That is, in this universe, there is no centralized infrastructure as in the current dominant model. Instead, the servers that make up this universe are autonomous. The fediverse operates across all these servers using Free and Open-Source Software (FLOSS) and spreads through the Internet.



Free Software is software that can be copied, analyzed, modified, and distributed. To be considered Free Software, it must meet four freedoms:

- The freedom to run it for any purpose.
- The freedom to examine and modify it.
- The freedom to copy it.
- The freedom to improve it and make those improvements public for the benefit of the community.

THE FEDIVERSE INFRASCRUCTURE

The fediverse is built with software that runs within a network using the same communication protocols among independent servers (also known as instances or nodes). Thanks to this software, instances can connect, creating a universe of federated instances, each with its own identity.

Currently, the most widely used communication protocol is ActivityPub, which is used by the following software:

- **Mastodon** // microblogging // alternative to X and Bluesky
- **Lemmy** // forums // alternative to Reddit
- **Signal** // messaging // alternative to Whatsapp and Facebook Messenger
- **Peertube** // video sharing // alternative to YouTube
- **Pixelfed** // photo sharing // alternative to Instagram
- ...

The Basque fediverse has grown in recent years, creating numerous instances. Informally, euskera has found a thriving space: mastodon.eus, pixelfed.eus, lemmy.eus, peertube.eus...

Furthermore, last January, the Abaraska community, driven by various social groups, launched a worldwide campaign to support individuals and organizations in their transition to the Fediverse.

WHO'S BEHIND THE FEDIVERSE?

A self-organized society. From its inception, the fediverse has been promoted by Free Software communities. These communities organize themselves both formally and informally. Many developments are initiated by individuals or groups, either independently or as part of work and research projects. These projects are enriched by contributions (knowledge, outreach, funding...). There are also organized entities that support, promote, or spread these developments. In this way, ideas and innovations are gradually integrated into different levels of society.

LET'S JOIN THE PATH THEY HAVE STARTED...

As I said earlier, the fediverse alone will not change anything—it simply shows a path. We must work together with other movements to influence the digitalization model we have:



- Develop closed energy cycles in server infrastructures designed for local conditions.
- Continue supporting the development of Free Software.
- Protect digital rights.
- Regulate energy usage.
- Combat planned obsolescence to reduce electronic waste.
- Promote education: expand our knowledge of devices and technology.
- ...

We have a long journey ahead—full of opportunities.

The fediverse is not based on centralized infrastructure; it is a decentralized infrastructure



QUANTUM COMPUTING AND HYDROGEN: THE ENTANGLEMENT OF A NEW SUSTAINABILITY

BY **AITOR MORENO (AYESA)** / ILLUSTRATION **ALEJANDRA SANTAMARÍA**

In recent months, I have participated in two events that I are quite representative of the exciting technological era we are living in. Specifically, I am referring to the exponential advancements that are driving quantum technologies forward every day, particularly quantum computing.



The first event was *Bizkaia-BBVA. Banks in Quantum Days*, organized by the Government of Biscay and BBVA, together with BIQAIN, which showcased the strong integration of quantum solutions in the financial sector. The second was a conference titled *Quantum Computing and Hydrogen: The Future of Green Energy*, organized by the Basque Hydrogen Corridor and Ibermática Fundazioa, where the potential of quantum computing as a tool to advance renewable energy development, specifically in the hydrogen sector, was discussed. At first glance, these two conferences may seem unrelated, but they are intertwined by a key concept: digital sustainability.

THE NEW STAPLER IN THE OFFICE

The enormous importance of AI in accelerating productivity and knowledge is undeniable. The AI systems we knew 20 years ago are now becoming obsolete. A decade ago, a company could differentiate itself from the competition by implementing AI systems. Today, that opportunity no longer exists: having a generative AI system is as essential as having email or PowerPoint. The reason is clear: AI has become an indispensable technology, just as steam engines were during the Industrial Revolution.

At the same time, as customers and citizens, we demand that our companies, financial institutions, and governments uphold reasonable environmental, social, and governance (ESG) responsibilities. However, with the current graphic processor-based AI systems, some Sustainable Development Goals (SDGs) (such as climate action and responsible production and consumption) are completely at odds with these technologies.

PROBLEM OR SOLUTION?

Ironically, AI can be a key tool for achieving the United Nations' Sustainable Development Goals (SDGs). Through automation and big data analysis, AI can contribute to climate action by optimizing resource use and improving energy efficiency across industries. However, the energy consumption required by today's large foundational AI models has a significant, if not dramatic, environmental impact.

AI HAS BECOME AN INDISPENSABLE TECHNOLOGY, JUST AS STEAM ENGINES WERE DURING THE INDUSTRIAL REVOLUTION

For example, it is estimated that the training of current ChatGPT models consumes as much energy as the annual consumption of 40 households. Generating a 100-word text in ChatGPT consumes, on average, 519 milliliters of water, equivalent to a standard water bottle, per query. The reason such high energy is needed is simple: we must model knowledge from a chaotic data environment with the least possible uncertainty, and in information theory, this means "cooling" complex data environments filled with high entropy (in computing jargon) or "very high temperatures" in a physical analogy. The higher the temperature, the greater the disorder, which translates to extracting less information. Current classical computing systems are not efficient in this task; they require many bits and millions of parameters to mitigate uncertainty and select the correct response among billions of possibilities. And this is computationally very expensive.

In this process, another major issue is the energy supply to these analytical systems. Data centers, where the servers operating AI models are housed, are responsible for nearly 1% of global electricity consumption, according to the International Energy Agency (IEA). The expansion of AI and other digital services contributes to the growing problem, although companies like Google and Microsoft have managed to power their data centers with 100% renewable energy. However, new energy sources like solar and wind are not always available, which has led to the consideration of modular nuclear reactors for power supply, ultimately creating yet another challenge to solve.

0S AND 1S ARE FALLING BEHIND

Regarding computational complexity, if a technology capable of evaluating all possible states of a system (the answers to a complex problem) in parallel and within just a few computing cycles existed, computational complexity would radically decrease. As a result, uncertainty would be resolved more efficiently, essentially "cooling down" the system better. And this property is precisely what quantum systems offer us. This hardware, based on the exponential growth of quantum storage capacity and the advantages of quantum parallelism (where we can apply a function to all states in a single cycle), results in computationally more efficient systems that, consequently, demand less energy. Theoretically, many quantum functions are even reversible, maintaining the quantum "coherence" of information. Since this information is not lost, entropy does not change, meaning energy would not be consumed; although, in contrast, cooling these systems, error control, and measurements do require energy.

On the other hand, energy supply to data centers also requires new technology. And this is where hydrogen comes into play. Hydrogen is considered one of the key solutions for renewable energy storage and can play a crucial role in the transition to a cleaner and more sustainable energy system. On one hand, it acts as an energy reservoir for electricity generated by intermittent renewable sources such as solar or wind power, allowing excess energy to be converted into hydrogen via electrolysis and stored for use when renewable generation is low, thus providing flexibility to the energy system. On the other hand, hydrogen is a key alternative for sectors that are difficult to electrify, such as heavy transport and industry, where it can replace fossil fuels and contribute to decarbonization (especially in steel production, chemical industries, and refineries) helping to reduce emissions and meet global climate goals.

WE NEED TO MOVE FORWARD WITH OTHER PARADIGMS AND UNDOUBTEDLY DIRECT OUR EFFORTS TOWARD QUANTUM AI

However, hydrogen presents several challenges, such as its production through electrolysis using renewable energy, which requires large amounts of energy and has suboptimal efficiency compared to other, cheaper forms of hydrogen. Its storage and transportation are also problematic, as they require high pressure or extremely low temperatures—processes that are energy-intensive and costly, as well as posing safety risks due to hydrogen's high flammability. Finally, the overall efficiency of the hydrogen life cycle is low, as energy losses occur at each stage (production, storage, and reconversion), making it less efficient than other storage technologies, such as batteries based on alternative molecular components.

In this context, we face a new computational challenge: we need an efficient, comprehensive, and sustainable computing system that facilitates the simulation and design of more efficient materials for the electrolysis process, a highly complex problem for current computational systems. For example, optimizing chemical processes and helping to find more efficient methods for hydrogen production using less energy requires simulations of multi-physical systems, which today take months to run on classical computing systems, even on current supercomputers. The development of new materials to improve hydrogen storage optimization, as well as designing more efficient compression and liquefaction systems, would reduce energy consumption in these processes.

All these problems stem from the difficulty of modeling analog systems of particles, waves, and fluids, which, in reality, are nothing more than quantum systems. And as Poplavsky famously stated: "Classical computers cannot efficiently simulate quantum systems," to which Feynman responded, however, that "since quantum computers are quantum systems, they can (by definition) simulate quantum systems. Therefore, quantum advantage exists." Clear as day. Quantum computers are also analog systems.

THE NEW ERA OF AI

Quantum computing is an area experiencing rapid progress, completely transforming how we understand computing and problem-solving in optimization. Chemical, fluid, and gas simulations (in short, particles and waves) related to the generation, improvement, storage, and processing of hydrogen are extremely difficult. Advancing in the simulation of chemical and physical systems based on quantum computing models is necessary to deepen our understanding of interactions between complex molecules and their implications in the development of new products, processes, and materials.

If we want a sustainable computational technology, we need to move forward with other paradigms, such as quantum computing or neuromorphic computing, and undoubtedly direct our efforts toward quantum AI. The key is to develop quantum AI technologies that are more efficient than current classical AI systems while simultaneously hybridizing the use of renewable energy with new technologies like hydrogen. This approach will help promote responsible governance, supporting the evolution of these two interlinked technologies, which complement each other and are essential for a sustainable future for our country.



ONE CLICK AWAY FROM YOUR DOORSTEP

THE TRUE PRICE OF E-COMMERCE

BY **BIZKAIATECH EDITORIAL TEAM** / ILLUSTRATION **NEREA RUIZ PICHEL (MARRUBI)**

Pizza Hut claims that the first online purchase was one of their pizzas. There's also a story about a grandmother who used her TV remote to order eggs, butter, and flour. But in reality, the first true online purchase was made by Dan Kohn, an American teenager who had a friend nearly 500 km away and wanted to sell him Sting's *Ten Summoner's Tales* album. And he did! It wasn't easy, but with his knowledge and a bit of help from his startup, Phil Brandenburger managed to get the website to accept his VISA card, successfully purchasing the CD for $12.48.

The year was 1994. *Pulp Fiction* had just premiered, Brazil had won its fourth World Cup, and the Bilbao Metro was still under construction. Thirty-one years have passed since then, and now *Pulp Fiction* is a cult classic, Brazil has five World Cups, and the Bilbao Metro has three lines.

"ON DEMAND", BUT FOR REAL

Everyone shops online. It only takes two steps: add to cart and check out. The next day, the book your favorite BookToker recommended is already at your door. The possibilities of e-commerce are immense, and after the COVID-19 pandemic, when it shifted from being a common practice to an everyday necessity, even more so. In fact, projections indicate that by 2025, this sector will reach $7.4 trillion in global sales, a staggering figure that shows no signs of declining in the coming years.



Having everything at your fingertips is great, fantastic, even. But for the environment? Not so much. The rise of online shopping brings a series of environmental costs: increased carbon emissions, the electricity needed to keep servers running, and the use of fossil fuels, among others, all of which severely impact our planet's health.

THE VIRTUAL SHOPPING MALL

By now, we all know that the Internet isn't just "sparks in the air." Every website from your favorite online stores needs a place to be hosted: a physical location. That place is data centers, where the servers that house every corner of the Internet are stored. Data centers were already a widespread phenomenon, but with the rise of artificial intelligence, the need for more and more of them has skyrocketed.

According to the IEA, major companies have taken advantage of this boom by investing heavily in data centers: "In 2023, the total capital investment of Google, Microsoft, and Amazon, the industry leaders in AI adoption and data center deployment, was greater than that of the entire U.S. oil and gas industry, amounting to about 0.5% of U.S. GDP."

And how do data centers impact the environment? More than you might think. To function (24/7, all year round, with no days off), they obviously need electricity. Additionally, vast amounts of water are required to cool the servers and prevent them from overheating, just like your desktop computer when you have 45 tabs open.

That being said, it's important to clarify that data centers don't exclusively serve e-commerce websites. However, given the sheer number of data centers owned by major e-commerce players like Amazon (which operates over 100 data centers worldwide, each housing around 50,000 servers), it's clear that e-commerce plays a massive role in internet infrastructure. On the bright side, thanks to advances in renewable energy, data centers today consume only about 1–1.5% of the world's total electricity. Not bad.

FROM THE DELIVERY VAN TO THE BIN

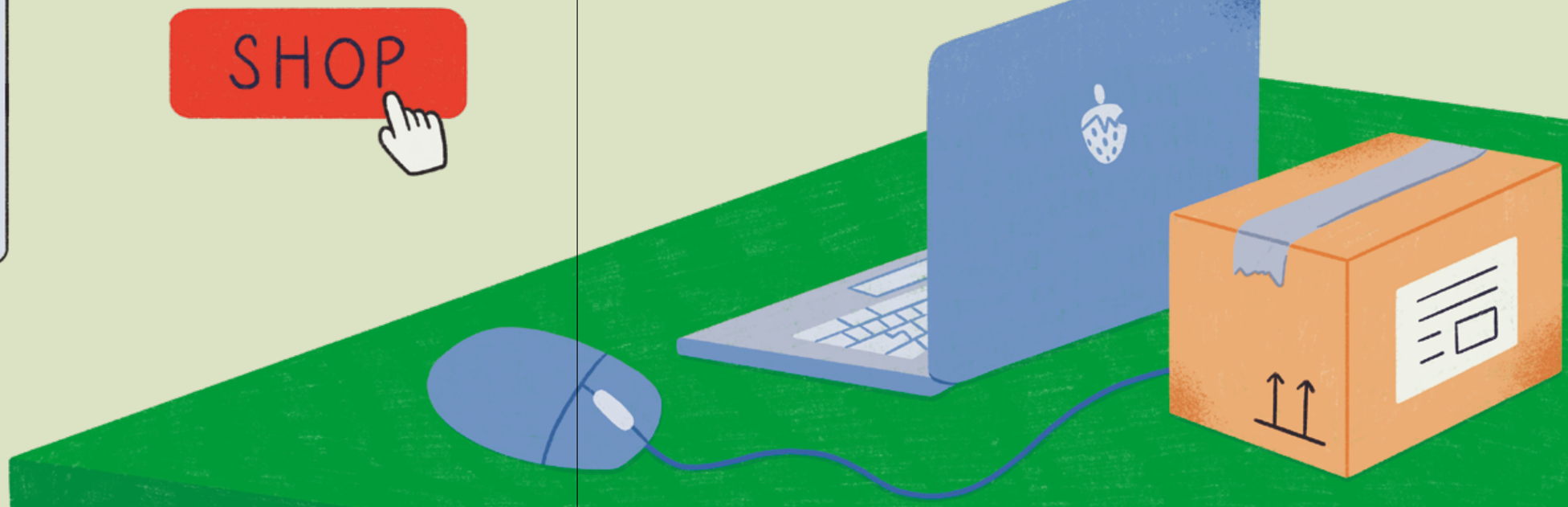
Data centers aren't the only environmental concern. When you buy something online, it's usually because you want to receive a physical item at home (unless you're a crypto bro, enjoy buying clothes in Roblox, or read e-books). And that item has to make its way to your house, which comes at a significant cost to the planet.

First, let's talk about packaging: countless cardboard boxes, plastic wrap, and several meters of bubble wrap to ensure your order arrives intact. The numbers confirm the environmental impact: The European Commission states that 40% of plastics used in the EU come from packaging, and half of the pollution in waterways also originates from this source.

While the packaging industry is becoming more aware of these issues and trends suggest we're moving toward recycled materials, there's still a long way to go. Even consumer attitudes have shifted: A Shopify study found that 73% of shoppers would be willing to pay more for sustainable packaging and products.

But the package doesn't magically teleport to your doorstep. If it's coming from abroad, it probably travels by ship. While the European Commission recognizes that maritime transport is the most energy-efficient mode of shipping, it remains a growing emitter of greenhouse gases.

And even once the package is in your city, someone has to deliver it. And that someone is unlikely to walk. They need a vehicle, which won't be public transport, unless you live in Madrid, where a new initiative is using the Metro to bypass traffic and reduce pollution. Parcel and Postal Technology International states: "E-commerce parcel delivery could contribute up to 5.5 million metric tons of CO_2 by 2032, highlighting the urgent need for drastic action in the logistics sector."



PUTTING ON A GOOD FACE

Supposedly, major companies are tackling these issues. Amazon claims it will reach net-zero carbon emissions by 2040 and promises to eliminate unnecessary packaging. Google, for its part, says it is developing AI responsibly, despite the environmental impact. These are just two examples of what big corporations are pledging to an increasingly eco-conscious public.

But are they actually keeping these promises? In Amazon's case, data shows that since 2019, its carbon emissions have not only increased but have risen by 40%. Google's emissions have also surged by nearly 50%, partly due to the data centers needed for AI development. So, why make these claims? National Geographic quotes Miguel Ángel Soto, spokesperson for Greenpeace Spain: "Looking green is trendy, and if you're not green, you're out of the market." And if there's one thing big companies don't want, it's to be left out of the market.



This is, essentially, greenwashing: a marketing strategy where companies publicize sustainable practices while their actual operations harm the environment. The danger is that consumers are misled into thinking they're making eco-friendly choices when, in reality, they're not. And that, of course, is deception, plain and simple. To combat greenwashing, in February 2024, the European Union proposed Directive 2024/825, which aims to empower consumers in the green transition by providing better protection against misleading claims and clearer information. Step by step...





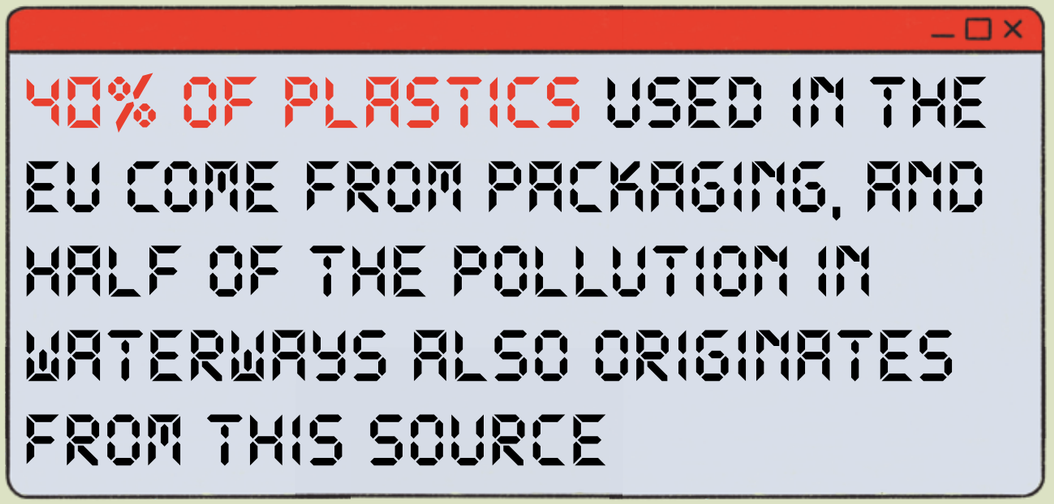
SO, WHAT CAN I DO?

We're not here to tell you to stop shopping in Shein. Wanting to help and make a difference should come from within, and blaming individuals for buying a $4 bikini won't change anything. However, we can offer some tips to make your shopping habits a bit more sustainable:

- Look for alternatives in local businesses, artisan products, and second-hand items.
- Try to buy only one of each item you like, ideally, without returning anything.
- Opt for pickup points for online orders, as they generate 86% fewer CO_2 emissions than home delivery.
- Bundle your purchases as much as possible.
- Look for certifications or indicators that the company behind your order is actively fighting climate change.
- Recycle the packaging, duh.

With these small changes, we hope online shopping becomes more planet-friendly, hopefully long before Bilbao's Metro gets its fourth line.







TECHNOLOGY FOR EATING WELL AND CARING FOR THE PLANET

BY **SERGIO FABREGAT (FOOD4FUTURE)** / ILLUSTRATION **PAULA PÁEZ**

The way we produce and consume food is changing. Technology has entered the food industry as an ally to make it more efficient and sustainable. But do you really know how innovation can help us care for the planet without giving up the pleasure of eating?

The aroma of freshly baked bread, the freshness of seasonal fruit, or the unmistakable taste of a good coffee may seem like simple pleasures. However, behind every bite lies a transforming industry seeking to balance the joy of eating with the urgent need to protect the planet and promote sustainability across the entire value chain. Food is more than just taste, it reflects how we manage resources, produce food, and make the most of every ingredient. And in this landscape, technology is undeniably playing a key role.

In recent years, the food industry has accelerated its commitment to sustainability because the challenge is anything but small. According to data from the Food and Agriculture Organization (FAO), this sector is responsible for a third of global greenhouse gas emissions. For this reason, the urgency to find solutions has led to exploring new approaches that inevitably involve innovation and efficiency. This will once again be highlighted at the upcoming Food 4 Future – Expo Foodtech, taking place at the BEC in Bilbao from May 13 to 15, where discussions will focus on how technology can contribute to a more sustainable and responsible industry.

The great challenge is to feed a growing population without depleting the planet's resources, involving the entire value chain





A TECHNOLOGICAL REVOLUTION TRANSFORMING THE INDUSTRY

In a world where climate change and resource scarcity have become top concerns, the food industry has found an indispensable ally in technology. Artificial intelligence (AI) and big data are optimizing production and reducing waste. This was demonstrated by companies like Pepsico and Danone at last year's event: both of which have started using AI algorithms to adjust their water and energy consumption, reducing their environmental footprint without compromising product quality. A McKinsey study estimates that applying AI in the food industry could reduce waste by 40%, a significant figure in a world where more than one billion meals are wasted daily, according to the United Nations (UN).

RETHINKING THE MODEL: CIRCULAR ECONOMY AND NEW FOODS

However, sustainability isn't just about producing better; it's also about maximizing resources. The circular economy has gained momentum in the food industry, with innovative projects turning waste into new products. At the 2024 Food 4 Future event, for instance, Mahou San Miguel showcased how barley waste from beer production is being repurposed into animal feed and even edible cutlery. Meanwhile, in the fishing industry, companies like Nauterra are working to minimize waste and promote sustainable fishing practices.

But if there's one area where technology is making a major impact, it's in the development of new protein sources. Lab-grown meat, edible insects, and proteins derived from microalgae are no longer futuristic concepts but a growing reality. These innovations are paving the way for sustainable alternatives without sacrificing taste.

AUTOMATION AND LOGISTICS: THE KEY LINK

Resource optimization is another crucial step toward greater sustainability. Robotics and automation are enabling more efficient production, while real-time monitoring systems and predictive maintenance powered by AI help detect production failures before they occur, reducing waste and improving operational efficiency.



Additionally, logistics plays a crucial role. The digitalization of supply chains is improving food traceability and reducing the environmental impact of transportation. The implementation of blockchain, for example, is helping ensure food safety and prevent fraud regarding product origins.

THE FUTURE OF FOOD IS ALREADY HERE

All of this demonstrates that the food sector is undergoing a profound transformation, and technology has become the key to progressing toward a more sustainable model where innovation is redefining how we produce and consume food.

Events like Food 4 Future – Expo Foodtech not only reflect these changes but also drive new ideas and collaborations to continue advancing. In a world where food is a fundamental pillar of society, committing to sustainability is not an option, it's a shared responsibility. The great challenge is to feed a growing population without depleting the planet's resources, involving the entire value chain, from producers and distributors to businesses and consumers.

Food is more than just taste, it reflects how we manage resources, produce food, and make the most of every ingredient

In the kitchen with BizkaiaTech Magazine



BY **BIZKAIATECH EDITORIAL TEAM** / ILLUSTRATION **EURIE CIERBIDE**

Sustainability in the kitchen is in style, and it's wonderful. Organic food, vegetarian and vegan diets, local produce, seasonal consumption, home gardens... Who wouldn't love to have fresh tomatoes on their balcony?

In the previous article, we looked at how technology can help us achieve a much more sustainable food industry. But you don't need a degree in computing, programming, engineering, or biotechnology to do your part in making the culinary world greener. That's exactly what the zero waste movement is about. You've probably heard of it, right? But do you really know what it means?

Zero waste is a term coined in the 1970s when single-use plastics and mass consumerism started to become a problem for humanity. It's a movement aimed at minimizing individual waste, consuming only what is necessary, and properly disposing of the waste that is inevitably generated. This lifestyle can be applied to any area, and the kitchen is no exception. In fact, as stated by the European Commission, more than 59 million tons of food (132 kg per person) are wasted annually in the European Union, accounting for 16% of greenhouse gas emissions. That's an outrageous amount.

TIE YOUR APRON TIGHT

To start leading this great change from the comfort of your own kitchen, we bring you a few recipes that will help you make use of food leftovers and reduce that "132 kg of waste per person", an amount so high it would keep even a koala up at night. Grab your trusty pot and your grandma's fine china, because things are about to get interesting! (Now's the part where you say, "Yes, Chef!")

HOMEMADE VEGETABLE STOCK CUBES

INGREDIENTS

- 1 kg of vegetable scraps: you can use stems, peels, or leftover bits from any vegetables you like
- Aromatic herbs to taste
- 4 garlic cloves
- 1 onion
- Two tablespoons of olive oil
- A pinch of salt
- Water

PREPARATION

- Sauté the garlic and onion over medium heat until golden brown, then add the vegetable scraps and cook for a few minutes.
- Add salt and herbs.
- Pour in enough water to fully cover the vegetables and let it simmer for an hour to develop flavor.
- After an hour, turn the heat up to high so the water evaporates completely, leaving a concentrated vegetable mixture.
- Once fully reduced, remove from heat and blend until you get a smooth paste. Let it cool.
- Once cooled, pour the mixture into ice cube trays or any mold you have at home.
- Freeze the mixture, and they'll be ready to use in any stew or broth!



More than 59 million tons of food (132 kg per person) are wasted annually



HOMEMADE BREADCRUMBS

INGREDIENTS

- Leftover bread (stale bread)

PREPARATION

- Cut the bread into small pieces.
- Blend the bread in a food processor or with a blender until it reaches a slightly coarser texture than flour.
- Spread the breadcrumbs onto a baking tray and bake at 150°C for 15 minutes.
- Let it cool and use it to coat your favorite foods.

BANANA BREAD

INGREDIENTS

- 4 very ripe bananas (peel included)
- 75 g of butter at room temperature
- 60g of brown sugar
- 50g of white sugar
- 2 eggs
- 225g of wheat flour
- 15g of baking powder

PREPARATION

- Preheat the oven to 180°C.
- Grease a baking pan with a bit of butter.
- Peel the bananas and separate the fruit from the skin.
- Mash the banana flesh with a fork.
- Cut the banana peels into small pieces and boil them for 5 minutes.
- After 5 minutes, drain the water and rinse the peels with cold water. Let them rest for a bit, then blend them into a puree.
- Meanwhile, mix the butter with both types of sugar.
- Once well mixed, add the eggs and both the mashed banana flesh and blended peels.
- Stir until all ingredients are well combined.
- Next, add the flour and baking powder.
- Once you have a smooth, lump-free batter, pour it into the mold and bake for 40 minutes.
- Enjoy! (But be careful: it's hot!).





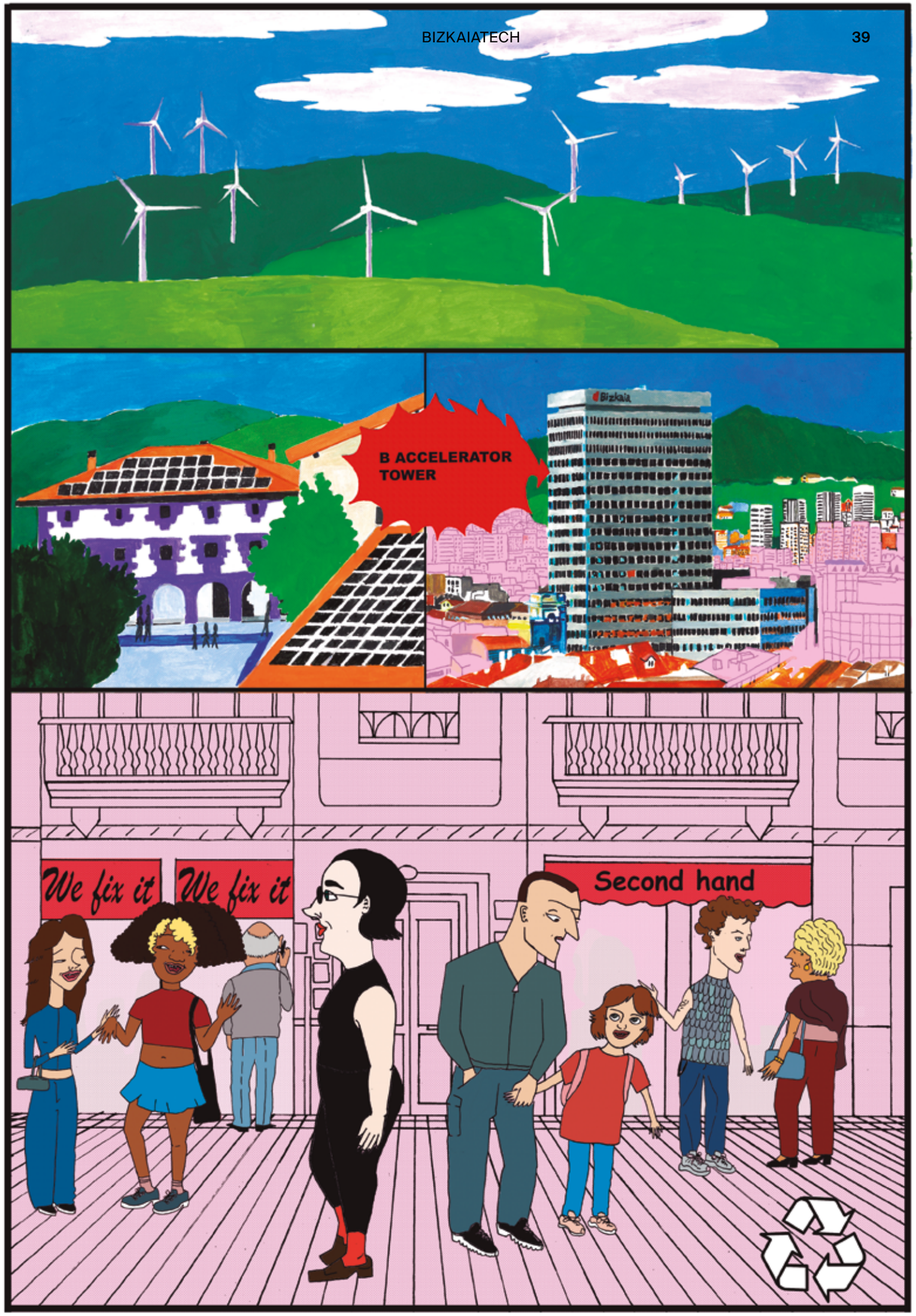


ECOLOGICAL TRANSITION

– from challenge to opportunity –

BY **BIZKAIATECH EDITORIAL TEAM** / ILLUSTRATION **AINIZE SARASOLA**

A tree needs 80 years to offset one ton of CO^2. And a cement plant generates approximately 400,000 tons of CO^2 in a year. There isn't even enough land in the world to plant that many trees. How are we supposed to eliminate polluting emissions under these circumstances? The first step is to take an optimistic approach: stop talking about a challenge and start talking about an opportunity.





"Opportunity" is probably the most frequently heard word in the Green Tech sector: the sphere in which companies develop technological solutions and services for the ecological transition. And let us warn you: opportunity will also be the most repeated word in this article.

When we talk about the environment or climate action, the word opportunity is used because these areas require investment and the creation of new businesses. Opportunity because Europe, and consequently Biscay, remain firmly committed to achieving the main goal of the Green Deal: reaching climate neutrality or net-zero emissions by 2050. In other words, by then, we must be able to emit only as many greenhouse gases as nature (forests, oceans, and soil) can absorb.

It is a massive challenge that, according to experts, requires the combination of technology, demonstration spaces, and investment.

GREEN TECH

Creating technology-based companies dedicated to this cause is essential for many reasons. The most obvious is that the emergence of a new sector specializing in environmental solutions generates numerous job opportunities. Another crucial reason is that the more entrepreneurship there is, the more competitive the region becomes.

And we're talking about a competition at the highest level.

Europe needs renewable energy because it needs energy self-sufficiency. Beyond environmental concerns, this is a matter of geopolitical strategy. Only in this way can we reduce our dependence on major fossil fuel-exporting countries.

Technology is (surprise!) our greatest ally in strengthening this sector. Companies are already incorporating artificial intelligence into the development of new materials. Sensors and blockchain are also being used to track and manage waste life cycles.

And this represents a huge opportunity. For instance, only 12% of waste generated nationally is reused or recycled. This means there's a 90% window of opportunity to boost circular economy initiatives focused on waste.

Technology is (surprise!) our greatest ally in strengthening this sector

Recently, Biscay's Department of Economic Promotion has launched Smart Grids Academy, an international platform aimed at training professionals in smart electrical grids, another area where technology plays a key role in fostering ecological transition.

In Biscay, the B Accelerator Tower serves as the main hub for startups in the region. It's a kind of flagship for entrepreneurship, offering valuable local and international networking opportunities. Green Tech entrepreneurs also have a place there.

THE IMPORTANCE OF DEMONSTRATION SPACES

One of the biggest challenges, according to experts, is the lack of patents. "We conduct a lot of research, but we're not translating it into practical applications; we need to be able to scale real projects to an industrial level," says Olga Martín, General Director of Aclima, at the IV Basque GreenTech & Green Ups event.

Among the key drivers (understood as opportunities) are the end of internal combustion engines, the goal of reaching 40% renewable energy use by 2030 (currently at 20%), the need to retrofit buildings to achieve zero emissions, the Carbon Border Adjustment Mechanism (which sets a fair price on emitted carbon to promote cleaner industrial production), the need to provide transparency in supply chains for consumers, and the potential of eco-design in products and services.

And that's not all. There are also opportunities in the circular economy regulations for plastics, land-use changes and forestry for CO^2 absorption, biodiversity restoration, and integrating nature into urban environments.

On this last point, a clarification: integrating nature into cities isn't just about making them greener, though that would be beautiful. Imagine twelve-story buildings covered in cascading greenery, in true Singaporean style.

When we talk about integrating nature into cities, we mean harnessing rainwater, offsetting unavoidable CO^2 emissions, and much more.

Beyond environmental concerns, this is a matter of geopolitical strategy

Because let's not forget: clean air is a fundamental right recognized by the United Nations.

GREEN, LIKE MONEY

It's clear that bringing technology-driven proposals to life and turning them into real industrial solutions requires money. A lot of it.

In this regard, public policies, particularly grants and subsidies, play a crucial role. In Biscay, several public programs are already in place, ranging from environmental tax incentives (deductions for investments and expenses related to environmental projects) and green investment grants to projects aimed at improving the region's forests, the true lungs of our home.

Of course, public institutions cannot take on this challenge alone. Private companies and every individual on this planet must also do their part. Let's start with a collective reflection. And speaking of opportunities: this could also be a great chance to create a more conscious and collaborative society.





QUANTUM-INSPIRED TENSOR NETWORKS:

A SUSTAINABLE FUTURE FOR ARTIFICIAL INTELLIGENCE

BY **GUILLERMO VALVERDE GARCÍA (VICOMTECH)** / ILLUSTRATION **HOPPER INK**

Is it possible to revolutionize artificial intelligence through quantum inspiration?

The rise of artificial intelligence (AI) has brought extraordinary advances, but it has also posed significant challenges, particularly regarding sustainability. In this context, tensor networks, a tool born in the quantum world, might make a crucial difference. What if the solutions to AI's most complex challenges didn't lie in more resources but rather in innovative and sustainable techniques?



AI is here to stay, and ChatGPT is a clear example. Whether you need help with a university assignment, writing a letter to Olentzero, or something else entirely, it's got you covered. Washing your car? Not yet, but give it time! AI, particularly generative models, can handle almost anything. What began as fairly simplistic models have evolved into systems capable of solving a multitude of problems. By leveraging increased computational resources and extensive, costly training, these models improve daily. But how much of this is truly positive? Do we really need to book a stadium like San Mamés to celebrate a birthday?

In AI, progress has been swift. Companies like Google, Microsoft, and OpenAI compete for dominance by developing increasingly complex models and using more powerful computers to accelerate tasks. However, this progress comes with a high energy cost, consuming growing amounts of resources like water and electricity and raising concerns about sustainability. Faced with this clear limitation, a key question emerges: instead of seeking more resources, what if we explored new ways to tackle these problems?

THE CROSSROADS OF AI: PROGRESS AND HIDDEN COSTS

Given the current challenges of AI, such as the complexity of models and their energy demands, it may be time to look to other fields for inspiration. Think of it like preparing dinner at a txoko: you may be an expert at making cod, but listening to others might teach you a new trick for improving your marmitako. In condensed matter physics, for example, scientists have long grappled with similar issues when attempting to simplify quantum systems.

To understand this better, imagine trying to simulate how particles interact in a quantum world. Everything seems fine until you add another particle, and suddenly, the required calculations double. It's like organizing a party: every additional guest not only increases the fun but also the chaos and the number of pizzas you need to order. In the quantum world, this happens because particles are interconnected in incredibly intricate ways (thanks to phenomena like superposition and entanglement), making the system unmanageable faster than your post-vacation to-do list.

> INSTEAD OF SEEKING MORE RESOURCES, WHAT IF WE EXPLORED NEW WAYS TO TACKLE THESE PROBLEMS?

However, the scientific community discovered a clever trick. This runaway need for resources mostly occurs when particles are extremely entangled, making the system too complex to handle classically. But if the entanglement is more "local", where each particle only interacts closely with its neighbors, special mathematical tools can simplify the system without overloading your computer. It's like the earlier party, but instead of everyone shouting, they play a quantum version of "telephone." Best of all, many natural systems work this way, making this approach incredibly useful.

TENSOR NETWORKS: QUANTUM INSPIRATION TO SIMPLIFY COMPLEXITY

These tools are called tensor networks. Essentially, they're a smart shortcut for breaking down complex quantum systems into something more manageable. For decades, tensor networks have been vital in advancing fields like condensed matter physics and quantum chemistry.

But what does one thing have to do with the other? Much more than you might think. Tensor network techniques can decompose quantum systems by capturing how one particle is entangled with the rest of the system. This

> IT'S LIKE ORGANIZING A PARTY: EVERY ADDITIONAL GUEST NOT ONLY INCREASES THE FUN BUT ALSO THE CHAOS AND THE NUMBER OF PIZZAS YOU NEED TO ORDER

concept has quickly found parallels in AI models, which also involve correlations between different nodes.

As a result, tensor networks can simplify highly complex models by breaking them into manageable parts or combining simple models to represent intricate systems. A useful analogy is DNA analysis: while a person may have thousands of unique characteristics (such as hair color, eye color, or height) their DNA condenses this information into a compact sequence. This compact representation can even enable precise reconstructions, as seen with Dolly the sheep. Similarly, tensor networks unravel complicated structures, transforming them into more comprehensible and efficient representations.

A SUSTAINABLE FUTURE: INNOVATION AND EFFICIENCY IN AI DEVELOPMENT

These quantum-inspired techniques, originally created to understand complex quantum systems, are now emerging as an exciting alternative for designing AI models. They function much like lateral thinking:

> WITH THE PLANET'S RESOURCES LIMITED, CREATING MORE EFFICIENT AND SUSTAINABLE MODELS ISN'T JUST AN OPTION, IT'S A RESPONSIBILITY

instead of following the conventional path, they find creative, unconventional solutions that might otherwise go unnoticed.

In a world where AI development consumes ever-increasing resources, these strategies offer a more efficient and sustainable option. It's like viewing a problem from a completely different angle, uncovering smart shortcuts that make the process faster and less costly.

With the planet's resources limited, creating more efficient and sustainable models isn't just an option, it's a responsibility. Quantum-inspired techniques like tensor networks represent an alternative for making AI more powerful while respecting the environment. This becomes especially relevant as the energy demands of large language models (LLMs) rise, prompting some tech companies to consider buying and reopening power plants or even building new ones to meet the energy needs of training these models. By adopting innovative approaches that optimize resource use, we can solve complex problems while ensuring that technological progress aligns with preserving the planet for future generations.





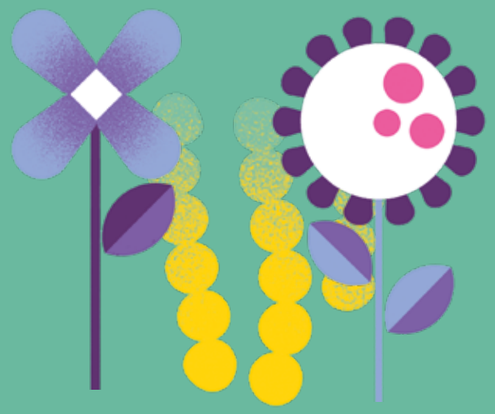
MICROORGANISMS: OUR TINY ALLIES IN ENVIRONMENTAL PROTECTION

BY **JOSU BERGANZA (GAIKER)** / ILLUSTRATION **HIGINIA GARAY**

WHAT ARE MICROORGANISMS?

Microorganisms are living organisms, generally unicellular, so small that they can only be observed through a microscope. This vast group encompasses an incredible diversity of life forms, including bacteria, fungi, yeasts, algae, protozoa, and viruses, among others.

Throughout history, microorganisms have been primarily known for their role as agents of severe diseases in humans, animals, and plants. Everyone remembers the recent COVID-19 pandemic, caused by SARS-CoV-2, a novel virus pathogenic to humans that led to millions of deaths worldwide. However, most microorganisms are not harmful to humanity; on the contrary, they play a fundamental role in maintaining ecosystem balance.



Almost 4 billion years ago, the first living beings to inhabit our planet were microorganisms, in a vastly different Earth from the one we know today. The first microorganism to populate the Earth's surface is known as LUCA, an acronym for Last Universal Common Ancestor. When the first photosynthetic organisms, cyanobacteria, emerged, they generated large amounts of oxygen, radically transforming the Earth's primitive atmosphere, which previously contained little to no free oxygen. This phenomenon, known as the Great Oxidation Event, marked a planetary-scale change, though that is another story.



THE EXTRAORDINARY ADAPTABILITY OF MICROORGANISMS

These tiny life forms can survive in extreme environments such as the Mariana Trench, the deepest known point in the world's oceans, nearly 11,000 meters below the surface, where pressure is 1,000 times greater than at sea level. There are also microorganisms, known as hyperthermophiles, that thrive in volcanic hot springs at temperatures near boiling point. Others survive in polar ice caps at -20°C, well below freezing. True survivors!

A single bacterium can multiply billions of times within just 24 hours under optimal conditions. From a single individual, billions can arise in a single day. Furthermore, microorganisms possess an incredible adaptability thanks to their metabolic diversity, allowing them to use a wide variety of nutrients to survive. A few years ago, it would have been difficult to imagine that a microorganism could use plastic as a source of carbon and energy. However, more species with this ability are being discovered, opening the possibility of a future where microorganisms play a key role in reducing plastic pollution.

ANCIENT ALLIES IN OUR DAILY LIVES

For thousands of years, humanity has had a close and long-standing relationship with microorganisms, making them valuable allies in everyday life. They have played a fundamental role in fermentation, aiding in the production of bread, beer, wine, yogurt, cheese, and other foods. The ancient Egyptians were already using yeast to ferment bread and beer thousands of years ago.

It is essential to recognize the vital role that microorganisms, our ancient allies, play in building a sustainable future

In agriculture, for centuries, some microbes (such as nitrogen-fixing bacteria) have been essential for improving soil fertility and increasing crop yields. They have also played a crucial role in organic waste decomposition, enabling nutrient recycling in natural environments. Almost any soil or body of water harbors a microscopic ecosystem of bacteria, fungi, algae, and viruses, as complex as the ecosystem of higher organisms in the Amazon rainforest.

GAIKER'S ROLE IN BIOREMEDIATION STRATEGIES FOR A SUSTAINABLE ENVIRONMENT

Now, microorganisms are once again proving to be valuable allies in restoring an environment altered by human activity. They can break down pollutants released into nature by industrial activities, transforming them into harmless compounds and helping damaged ecosystems recover. This is particularly useful for cleaning up oil spills, toxic chemicals, and heavy metals, using bacteria, fungi, and other microorganisms capable of "eating" these contaminants present in soil, water, or air.

In biotechnology, the scientific discipline dedicated to studying how microorganisms can be used to clean contaminated ecosystems is called bioremediation. This method allows for the recovery of polluted areas without the need for costly or environmentally damaging interventions.

At the GAIKER technology center, we have been studying microbiological bioremediation technologies for years, developing effective alternatives to environmental pollution issues. We participate in research projects in collaboration with other centers, institutions, and companies to find innovative solutions, leveraging the extraordinary abilities of microorganisms.

Microorganisms naturally act in contaminated sites without human intervention, using those pollutants as sources of energy and carbon. As they multiply, they simultaneously eliminate toxic compounds. GAIKER's work includes determining the best microbiological bioremediation strategy for each contamination issue and location. In simpler terms, we develop technical approaches to remove contaminants using the natural microbial populations present in affected sites. Our goal is to boost these "cleaning" microorganisms, providing them with the necessary conditions and nutrients to perform their task more efficiently and quickly.

It is essential to recognize the vital role that microorganisms, our ancient allies, play in building a sustainable future.





THE DECISIONS YOU MAKE TODAY WILL DETERMINE YOUR TOMORROW

CHOOSE YOUR OWN FUTURE



BY **PILAR ARNAITZ** / ILLUSTRATION **IVAN MIGUEL**



APRIL 25, 2073

Today is my birthday. I wake up with a pleasant tingling sensation all over my body. It has been two years since I started using the exomuscular suit even while sleeping. It is a suit made of a fabric interwoven with nanoscopic intelligent fibers that provide mobility to my deteriorated century-old body. I know this decision undermined my intention to maintain my muscle mass, but other people my age started doing it long ago, and despite everything, they have retained their autonomy. Even so, I still don't like the idea of depending on it to live.

Although my exomuscular suit allows me to move with the agility of a 20-year-old, I have it set to extreme energy-saving mode, so my movements are somewhat clumsier. I can't afford more.

I check the production of my small personal energy farm. I am an elderly person and must be careful with my consumption since I can barely produce energy through my own physical effort. Fortunately, my daughters and granddaughters donate part of their production to me. Without them, I would have to use a bulkier public exoskeleton, probably one of those that must be removed for sleep.

When I was young, energy was cheaper, practically free. We almost never stopped to think about whether using it was justified or not. And although many years have passed, I still vividly remember the global crisis when energy became more valuable than money. That was the choice: either that or losing access to much of the information and services we used on the Internet. At least, that was the reason they gave us.

Those were tough times because, in just a few months, nearly all international currencies devalued, and the kilowatt became the most stable unit of exchange. And although the situation has stabilized, personal energy production remains a source of either wealth or survival, as in my case.

So, anything that can generate energy does. Bilbao, like practically every inhabited area on the planet, changed abruptly. Almost all the buildings in the city are covered from top to bottom with solar panels, turning it into a kind of giant labyrinth of mirrors. Thousands of wind turbines of various sizes rise everywhere. Even the surrounding hills are dotted with solar parks and forests of windmills. The rivers and sewage systems also generate energy. Paradoxically, only the buildings belonging to banks and large corporations can afford the luxury of not producing energy. It is a symbol of power.

I miss the multicolored city, rich with trees and surrounded by green mountains, but I understand that we had no other choice, or at least, that's what they made us believe, and that we must do it for the common good. There is no alternative.

In any case, today I turn a century old, so I will allow myself a little energy indulgence. I will organize a virtual party with my family, friends, and digital companions. Tomorrow will be another day.

My exomuscular suit has already finished its diagnostics and has sent the breakfast order to the domestic gastronomy system. Exceptionally, it allows me to have an extra slice of bread; after all, it is my birthday.

The automated public health system allows me fewer and fewer dietary indulgences, and I cannot afford to buy healthier and tastier products, but I know it is for my own good. The system reminds me of this frequently.

I am still licking the synthetic strawberry jam off my lips when I decide to go for a walk. I put on my VR visors, and before me opens the world I would like to live in. I have been designing it over the years.

Today is my birthday. A faint ray of sunlight filtering through the window wakes me up. I hear my grandchildren, they've come early to have breakfast with me and celebrate my birthday. But first, my granddaughter helps me get up and get ready. Like every morning, one of my grandsons has special permission from work, thanks to the Automated Work Overtime Law, to come give me a massage and assist me throughout the day. It is a privilege my parents and grandparents never had. I am 100 years old, but I can still perform my morning tai chi exercises with ease, and I greatly enjoy sharing that moment with whichever grandchild has come to take care of me that day.

We all sit at the table, and a smile spreads across my face as I take in the scene. I am surrounded by my loved ones, and the table is full of healthy food. There is not as much variety as in other times of my life. Most of it consists of local and seasonal products. We have a good life.

I remember the day the *Lehendakari* announced the strategy that would turn Euskadi into "the world's repair workshop," as they put it. At the time, the words sounded strange, and many critics predicted economic disaster. It seemed as if we were going to become the planet's junkyard.

However, that shift in the country's productive economy became the foundation of the well-being we enjoy today.

Although the early days were shaky, today our industry is dedicated to manufacturing spare parts and components, repairing, and extending the lifespan of a vast range of goods and tools. We are one of Europe's leading forces in the sector because we understood that a circular economy had to be based on standardization and reuse.

I know some people think we live in worse times because energy consumption rationalization has slowed down technological innovation. But since the great energy crisis, those tough times, questioning whether a particular consumption is necessary has become a social responsibility. I remember when we used to waste energy just to watch funny cat videos. What a waste. It took us a while to realize that the key was not to produce more energy, even from clean sources, but to consume only what was necessary.

Today, energy is consumed rationally. It is not an ideal world, but directing energy toward task automation allows our loved ones to take care of us, the elderly. Of course, we also live in a society where child-rearing by parents is a right. We have replaced digital entertainment with board games and frequent social interactions. Medical science says this is healthier, and to be honest, as someone who has lived a century, I don't know how to thank this society enough for granting my close relatives days off so they can come care for me, their children, or participate in social activities. It is a good agreement.

As we finish breakfast, I look out the window to see the day. It is not the Bilbao I knew in my youth. The city now optimizes resources to obtain water and energy in a rational way, always striving to preserve the beauty of the landscape as much as possible. Having a beautiful environment is one of our social values. And our mountains have once again become lands for agriculture and livestock, nestled between forests and wind turbines. It has been a long time since I last ate a mango, but the grapes from Artxanda are a delight.

After breakfast, my entire family, who have the day off for my birthday, suggests we go for a walk in Iturritxualde. As they help me get dressed... I begin to feel a vibration throughout my body.

An overlay message in my virtual world notifies me that I have exceeded my energy consumption limit for the day. Excess time is over.

That family breakfast, even if it was virtual, was nice. How wonderful it is to imagine better worlds... even when they are not possible.

I will spend the rest of the morning sitting on the couch, saving energy so I can walk in the afternoon. I will turn on the old television and let time pass so as not to waste energy.

It is not the future I dreamed of, but it is the best possible one. Undoubtedly. Or at least, that is what they made us believe.



THERE'S NO ART

ARTISTS OF ILLUSTRATION



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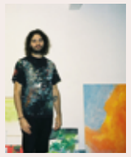
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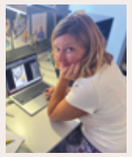
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