

REVOLVE

QUARTERLY INSIGHTS INTO A CHANGING WORLD

N°51 | Spring 2024



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The health of our ecosystems depends on the decisions we take today. In this issue, we take a closer look at the pressing concerns of environmental degradation and the importance of inclusion when it comes to taking action.

We begin with the Mission Soil by casting a spotlight on a major initiative aimed at protecting and restoring European soils, spearheaded by Kerstin Rosenow, Head of Unit 'Research & Innovation' in DG AGRI, European Commission. Then, to Europe's push towards organic agriculture, unraveling the motivations behind this shift and its implications for sustainable food production. This is followed by a discussion on the intersection of data proliferation and environmental concerns and how this challenges the notion of digital inclusion at the expense of planetary well-being before we shift our focus to farmer protests and the EU's environmental policies.

Our VIEWS section, we spotlight the plight of L'Albufera de Valencia, a vital freshwater lagoon facing numerous threats to its biodiversity and ecological integrity, and we

stay in Spain to explore the search for innovative water solutions in Catalonia. We turn our attention to the alarming decline of our oceans and advocate for a return to a thriving marine ecosystem.

We also shed light on the often overlooked environmental consequences of military activity, emphasizing the urgent need for comprehensive emissions reporting and mitigation strategies. And we conclude our journey with a close examination of marginal land management and how we must tread carefully when it comes to land change.

Join us in championing environmental restoration and justice, as we strive to build a more sustainable and resilient future for generations to come.

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Cover image:
Three young farmers plow the land in a field in Casa do Meio, Santo Antão island, Cape Verde, on 26 February 2024.
Photo: Belén G. Carmona / REVOLVE

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Mission Soil: A Major Initiative To Protect and Restore European Soils

KERSTIN ROSENOW

HEAD OF UNIT 'RESEARCH & INNOVATION', DG AGRI, EUROPEAN COMMISSION

Life on Earth depends on healthy soils, a major challenge that our society faces today

In 2021, the **Directorate General for Agriculture and Rural Development (DG AGRI) of the European Commission** received the rewarding task to manage the newly launched **Horizon Europe Mission 'A Soil Deal for Europe'**. The missions are a novel instrument under the Horizon Europe research and innovation program for the years 2021-2027.

Soil health was considered one of the five major challenges that our society faces today, which deserved a dedicated instrument, high financial commitment, and a new type of action: the **EU Mission Soil**. The EU's past investment in soil research amounts to 1 billion euros over the last 40 years. A comparable amount is planned to be invested in just 7 years of the Mission Soil to enable and accelerate soil health protection and restoration.

Soil is not only the foundation of our food systems, but it provides also clean water and habitats for biodiversity while contributing to climate resilience. It is part of our cultural heritage and landscapes, a key component of our economy and prosperity. At the same time, soil is a fragile resource that needs to be carefully managed and safeguarded for future generations. One centimeter of topsoil can take hundreds of years to form but can be lost in just a single rainstorm or industrial incident.

According to the current evidence, **61% of EU soils are unhealthy**. There are around 2.8 million potentially contaminated sites which poses a serious threat to human health. Costs related to soil degradation are estimated at an incredible 50 billion euros a year. Those alerting figures triggered the launching of the Mission Soil.

But soil health is not only a challenge for Europe, it is a global challenge that requires international cooperation, also in view of the achievement of **the Sustainable Development Goals**.

Our management role in the Mission Soil requires that we develop activities beyond the agricultural, forestry, and rural lands and beyond our usual stakeholders. In fact, the Mission Soil scope is much broader, it covers all types of lands and soil health issues, it also targets urban areas, industrial contamination, and soil sealing and intends to reach out to citizens, schools, municipalities, regions, and businesses, being also active on the international scene. We adapted our way of working to the ambition of the Mission Soil.

Through the first three Horizon Europe work programs (2021 to 2023) around 300 million euros have been already allocated to **R&I projects** addressing a variety of topics related to soil health. 29 projects have already started and 19 more are to be launched soon.

The Mission Soil main instrument is the experimentation and demonstration sites, that target the establishment of 100 living labs and lighthouses across Europe that will lead the transition towards healthy soils by 2030. The living labs are tools for bottom-up research and innovation: in a living lab,

experimentation happens in real-life conditions, operating with end-users.

This is key to closing the knowledge-practice divide and bringing innovation to the ground. Living labs co-develop innovations, use the soil health monitoring framework to assess the impacts of these innovations and of their practices on soil health and ecosystems and contribute to the testing and validation of monitoring techniques and approaches, helping the development of indicators. They will also be ideal places for citizen engagement and soil literacy improvement activities and practices.

We have opened the first application for Living Labs in 2023 and it was a huge success. They will start their activities in 2024: we are excited to receive their first results.

Beside Living Labs and Lighthouses, the Mission Soil has also significantly enlarged the R&I for soil health. The Mission Soil is also active in the development of a harmonized soil monitoring framework at the EU level in collaboration with the **European Commission Joint Research Centre**. In 2023, the **EU Soil Observatory (EUSO) Dashboard** was launched.

The Soil Health Dashboard is an open interactive platform that provides an assessment of the state of soil health in the EU, expressed through 17 key indicators. It is a first step; more indicators will be added and will be regularly updated according to the availability of new data over time. This work is complemented by at least five Mission Soil-funded projects that contribute to the better monitoring of soil health, for example, through the development of new

sets of indicators, the use of artificial intelligence (AI), and new earth observation techniques.

Awareness raising on soil health issues, activation of citizens, territorial actors, businesses, and public authorities for soil health is key to improving soil health. Since its beginning in 2021, Mission Soil has been present in almost 400 events at national, European, and international levels, and in November 2023, the first European Mission Soil Week was organized.

In fact, everyone, being an individual citizen and a legal entity, can voice their support, gain visibility, and access to Mission-led knowledge, and get involved in Mission activities by signing the **Mission Soil Manifesto**, which to date counts with 2.600 signatories, including almost 400 legal entities. We hope that many of you will join the vibrant community that cares for soil health! Anyone can sign the Manifesto.

To gather and make easily accessible all those information, funding opportunities, actions, and projects, in 2023 we have launched the Mission Soil Platform **EU Missions Soil Deal for Europe | Mission Soil Platform**.

We hope that on that platform anyone can find relevant information that will leverage actions for soil health. We count on you! ●



Synthetic vs. Organic Fertilizers

WRITER: SUMMER FELSEN

Europe's transition to organic agriculture
may not be as simple as we think.



2

There is a story of a farmer who woke up every morning to see that more nutrient-rich soil had been deposited on his land during the night. He was baffled by this strange act of benevolence, and he suspected the culprit to be his neighbor. I cannot seem to remember how the rest of the story goes, but I do recall that the plot thickened.

Alas, not many farmers are fortunate enough to receive gratuitous soil deposits on their land, and instead must replenish nutrients to their soil in other ways. The methods of applying fertilizer differ greatly and are affected by numerous factors, including geography, climate, personal preference, and accessibility.

We now pay increased attention as to where our food is grown, who grew it, and whether the product is ‘inorganic’ or ‘organic.’ We compartmentalize the agricultural system into strict categories, where one side is ‘good,’ and the other is ‘bad.’ After all, this dogma is far easier to grasp – as opposed to the reality that the soils in which our food comes

The necessity for fertilizer is simple: when crops are harvested, the soil loses valuable nutrients.

- 1. Farming field. Photo: Tom Fisk / Pixabay
- 2. Farmer Tilling Land. Photo: PublicDomainImages / Pixabay
- 3. Farmer on the field. Photo: Jvalenciaz Jhon / Pexels

from are the most genetically diverse ecosystems on the planet, and where, in one tablespoon of soil, reside billions of microscopic cells containing 10,000 species of bacteria, protozoa, fungi, and viruses that we simply cannot see with our bare eyes. So, we choose to purchase ‘organic’ bananas at the grocery store and yell at people on the internet who do not do the same.

The necessity for fertilizer is simple: when crops are harvested, the soil loses valuable nutrients. Without fertilizer, it can take hundreds of years for topsoil to regain the proper amount of nutrients needed to be productive. However, an oversaturation or improper application of fertilizer can cause soil degradation and serious environmental implications. Whether using organic or conventional methods, it is imperative to thoroughly plan fertilizer application cycles that work with the seasons. Proper planning will allow greater yields, slower release of nutrients, and minimal agricultural runoff.

Why has conventional agriculture been dominant for decades?

Many people have internalized a fear of conventional agriculture, often due to misconstrued vernacular surrounding the health and environmental impacts of inorganic produce. Let us unpack the truth.

Agriculture is about beating the odds. Ever since the first hunter-gatherer scared away a herd of deer that were nibbling on the same plant that they had a hankering for, we were beating the odds. We give desirable plants what they need to thrive while thwarting anything that could take these plants away from us, and modern farmers aim to do this as effectively as possible. Many farmers today perceive synthetic fertilizers as being the best way to beat the odds.

So, when did conventional farming replace organic as the dominant agricultural method?

For thousands of years, our agrarian ancestors fed themselves by working with nature’s nutrient cycles. Through trial and error, they learned the best ways to sustain soil fertility. However, what had been a circular process for centuries became a linear one by the mid-1800s; food transported from farms to cities was reduced into waste and subsequently dumped into rivers and landfills. Rapid urbanization and intensive farming systematically disrupted the previous nutrient patterns, and the combination of sewage accumulation in urban areas and soil exhaustion in farmland produced progressively weaker crops. Thus came the need for synthetic fertilizers.

Synthetic fertilizers are designed to provide crops with the nutrients that they need. They offer readily available nutrients that plants can quickly absorb through their roots, making them more efficient and requiring smaller volumes compared to organic alternatives. As a result, upfront costs for conventional fertilizers are typically lower, and malnourished plants have increased chances for survival.

It is true that, if applied negligently, conventional fertilizers can easily oversaturate soil with nutrients, causing agricultural run-off and groundwater contamination as the plants cannot filter all the nutrients. However, when applied in proper quantities, synthetic nutrients will achieve predictable results and foster strong and vigorous plants.

Crop rotation is an integral component of conventional farming that helps the soil remain healthy and ridden from disease. Different plants uptake different nutrients. Therefore, crop rotation prevents the soil from being depleted of all its nutrients. As a result, conventional farms trump organic farms in terms of

crop diversity and yield because they can supplement their soil with nutrients quicker, thus allowing more freedom for specialization and greater nutrient diversity. Furthermore, synthetics allow for soil to be replenished with specific nutrients if there is a deficiency.

Nevertheless, Europe is experiencing increased restrictions on inorganic farming to drastically reduce the quantity of synthetic fertilizer in our soil.

Why is the European Union pushing for organic practices?

In 2021, the European Commission adopted an action plan to reinforce its target of transforming at least 25% of the European Union’s (EU) agricultural land into organic land, as outlined in the Farm to Fork Strategy within the EU Green Deal (EGD). The EU’s Farm to Fork Strategy ultimately aims to establish a food system that could help mitigate climate change and adapt to its impacts, reverse the loss of biodiversity, ensure food security, and foster competitiveness in the EU supply sector. The EU is pursuing these ambitions by passing numerous legislative acts and providing tools for newly established organic farmers by offering certifications, conversion assistance, expert legal advice, and incentives such as the annual EU Organic Awards.

In Europe, organic farming is regarded as a knowledge-intensive, rather than input-intensive method of agriculture, and the EU uses careful observations and practical data to support their pro-organics policies.

The European Commission acknowledges that when applied in the proper quantity, organic fertilizers ultimately improve soil health by increasing the quantity of microorganisms in the soil. These microorganisms break down the organic nutrients that plants can use,

What Do You Know about Soil?

Fertilizers do not inherently poison the soil when applied at agronomically correct rates, timing, and placement. The important distinction to make is that excessive rates of any fertilizer can cause serious environmental damage.

Approximately 10% of the world's carbon dioxide emissions are stored in topsoil. Soil serves as a filter that prevents atmospheric pollutants from entering groundwater.

Soil is alive!

One gram of soil may harbor up to 10 billion microorganisms of possibly thousands of different species. This is more than the number of humans on the planet!

Soil is a renewable resource; however, it can take up to hundreds of years for soil to replenish and become fertile again.

Many of today's antibiotics have been derived from soil eg. *penicillin*.

Soil is not the same as dirt. Dirt is an inorganic material made from broken down rocks, while soil is comprised of water, air, organic material, and minerals.

1 What is the main component of vermicompost?

- a. Manure
- b. Worms
- c. Plant waste
- d. Nitrogen

2 What is NOT prohibited in organic farming?

- a. Antibiotic use in livestock husbandry
- b. Hormones
- c. Bone Meal
- d. Genetically Modified Organisms

3 The dark, top layer of soil composed of decomposed organic material is known as:

- a. Humus
- b. Dirt
- c. Fertilizer
- d. Sand

Soil Quiz
Do You Really Know How Your Food is Grown?

4 What farming practice is defined by the creation of beneficial ecological outcomes?

- a. Conventional
- b. Regenerative
- c. Organic
- d. Commercial

5 What element is NOT found in fertilizers?

- a. Nitrogen
- b. Phosphorus
- c. Potassium
- d. Iron

6 What fact about earthworms is true?

- a. There are around 6000 species of earthworms in the world.
- b. Productive soil can contain up to 7 million earthworms per hectare.
- c. Earthworms can eat up to a third of their body weight every day.
- d. All of the above

Find the answers

d 9 b 5 a 4 c 3 b 2 1



3

thus improving soil structure, nutrient availability, and microbial activity. Healthier soil allows for greater water-holding capacity and increases the mobility of air and water through the soil, promoting deeper root growth, minimal soil erosion, and positive environmental impacts.

Organic farming can also serve as the pathway for a circular economy, an integral component of the EGD. Organic fertilizer products recover wastes that were already created in our food systems, such as animal-based manure and compost from plant sources, and they circulate these wastes to propagate new agricultural growth.

Hasler Iglesias Yanez, Environmental R&D Researcher at CETENMA and partner for the FER-PLAY EU project on soils, indicated that “organic fertilizers and circular wastes should have been the first steps in the transition to

a circular economy.” Yanez maintains that “when designing the food system, we should consider longevity,” and circular fertilization from organic waste is the best way to do so. All living organisms create waste inevitably, and organic farming allows us to harness these wastes to become functional and effective.

A significant advantage of circular fertilizers is that they can be locally sourced. Every region has its own geographic characteristics and different wastes to be utilized, and when soil is not dependent on a foreign fertilizer, farmers can leverage the materials that already exist and thrive in that region.

Agroecology is a circular value that many organic farmers embrace. Alfred Grand, owner of Grand Farms in Austria, is particularly keen on biomimicry, which is the process of mimicking natural processes, systems, and structures

to create sustainable solutions, as well as agroforestry and vermicomposting.

By “using the earth as a role model,” Alfred strives to create organic production systems that are equally environmentally friendly as they are agriculturally prosperous, demonstrating how food production and nature can better align.

Many of the EU’s efforts to support organic agriculture aim to neutralize and improve several of the environmental problems that emerged from conventional practices. When too much chemical fertilizer is applied, the soil is starved of microorganisms, and its capacity to retain water is lost, forcing the soil to become dependent on chemical additives. Many critics of conventional agriculture also argue that synthetic fertilizers abuse the natural nitrogen cycle, thus creating a feedback loop of soil, water, and atmospheric degradation.

A large proportion of nitrogen-based synthetic fertilizers are manufactured by the Haber-Bosch Process, a century-old method that relies on intensive fossil gas for production. Furthermore, the synthetic fertilizer industry is dangerously consolidated and under-regulated, meaning that only a handful of companies control about 75% of the market today. This monopolization results in higher prices for farmers, and exponentially greater revenues for fertilizer suppliers.

Nevertheless, it is important to acknowledge that organic farming also has its imperfections. Instances of lower yields under organic farming could result in the need for greater land mass cultivation, proliferated pesticide and fertilizer application, and increased labor intensity.

How we can make farming more pragmatic and good for the soil

So, is Europe’s gradual transition to organic farming the best way to move forward? The answer is not so simple.

Karen Thorsted Hamann, Managing Director and Senior Researcher at the Institute for Food Studies & Agro Industrial Development (IFAU) and MarginUp! EU project, expressed her concern for the recent rise in strict agricultural regulations. Hamann, with a specialization in Danish agricultural systems, illustrates the complexity of the matter by drawing attention to Denmark’s deteriorating wheat production as a result of government-imposed nitrogen restrictions.

She cautioned that “if synthetic fertilizers were to be eliminated, crop yields would decline dramatically” and the price of food would rise exponentially. As an example supporting Hamann’s alert, it took Sri Lanka, the first country

to nationally ban synthetic fertilizer, only 6 months to reverse this policy in 2021.

Yanez and Hamann, two experts in the field who hold differing opinions on the best fertilization method, both agree that soil health is of utmost importance, and they unanimously concur that fertilizer should be applied on a case-to-case basis. There are explicit contingencies that must be considered when applying fertilizer, and they must reflect the ideals of agroecology and regenerative agriculture. It is imperative to combine ecological concepts with farming principles to mitigate climate change, coexist with wildlife, and adapt agricultural techniques that best suit each local community. “There is no handbook for sustainable agriculture,” says Yanez.

Farming methods should always be evolving to reflect new technology and the needs of our growing population. Combining conventional and organic methods can have positive impacts on soil health and fertility. For instance, cereal crops generally experience an increase in biodiversity but a loss in yield after a switch to organic farming, while non-cereal crops show no significant yield loss after the switch.

With knowledge and data like this, farmers can determine which crops require additional nutrient deposits (to avoid the need for greater land culti-

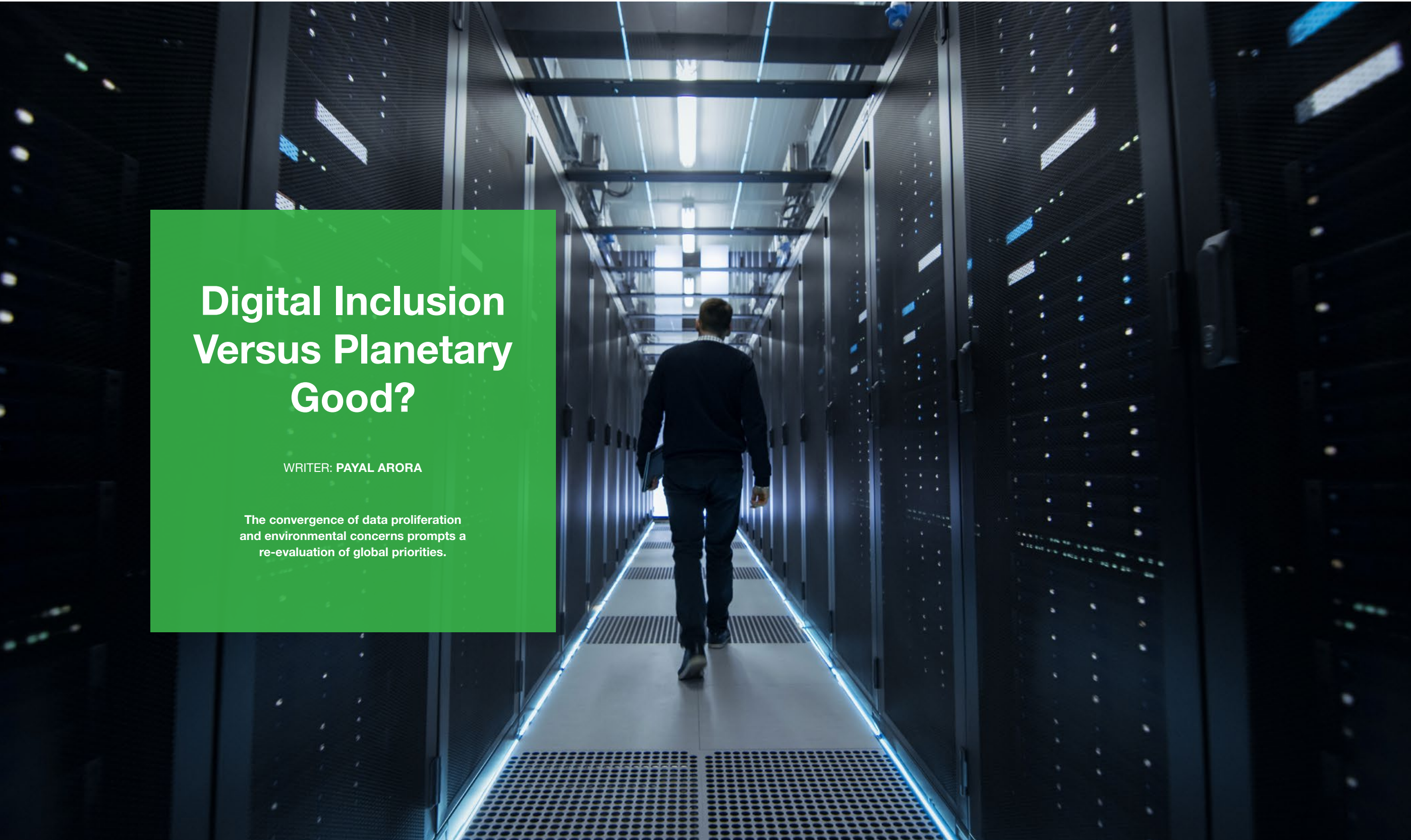
Approximately 10% of the world’s carbon dioxide emissions are stored in soil.

vation) and which crops do not. As a result, biodiversity can increase without sacrificing yields.

Agricultural production affects everybody (if it does not affect you, then maybe you should see a doctor – you might have scurvy). Therefore, it is in all our best interests to improve soil health. Not only does soil health affect the food we eat, but it also affects our planet altogether.

Approximately 10% of the world’s carbon dioxide emissions are stored in topsoil, and soil serves as a filter that prevents atmospheric pollutants from entering groundwater. In addition to properly understanding the different agricultural methods, we can also mitigate soil crises by changing our behavior towards consumption and being more meaningful about what we buy and what we waste.

Above all, we must listen to farmers, respect their expertise, and understand how we can work with nature rather than against it. “Nature has a solution to everything; we only have to find it,” vocalized Grand. ●



Digital Inclusion Versus Planetary Good?

WRITER: PAYAL ARORA

The convergence of data proliferation
and environmental concerns prompts a
re-evaluation of global priorities.



2

Data is critical in the global AI arms race for governments and industries. States are heavily investing in collecting citizen-generated data to optimize the value of public services. Companies compete fiercely for consumer data, viewed as scarce resources. In the last decade, institutional attention has shifted to the Global South where 90 percent of the world’s youths reside.

Data is the ‘new oil:’ Data centers have a bigger carbon footprint than the aviation industry.

Affordable smartphones and data plans have pushed these ‘next billion’ users online for the first time and they have become avid consumers and creators of digital data.

While aid agencies and governments celebrate such growing access as bridging the digital divide, climate activists sound the alarm about what indiscriminate data collection, storage, and use may mean to the fate of our planet.

Data is the ‘new oil’: Data centers have a bigger carbon footprint than the aviation industry. Far from being abstract, invisible, and intangible, data is very much physical and resource-consuming.

AI activists call for ‘data justice,’ the fair and ethical treatment of individuals and communities’ data when it comes to collecting, processing, and use.

Climate meets data Justice

The cloud is grounded by cables and concrete. From sensors to streaming, our everyday digital tools demand a slice of the energy pie. Moreover, the data war is the new water war. Data centers demand enormous amounts of already scarce water to cool their systems, often at the cost of the local communities’ basic need for water to survive.

Pitting digital inclusion against planetary preservation though, is not the answer.

Framing this relationship as oppositional is misleading and unhelpful. It prevents an honest reckoning of the West’s legacy of resource extraction and consumption, and current practices of indiscriminate data harvesting. Climate and data justice need to go hand in hand – both vying for an equitable distribution of value and responsibility between the North and South of our physical and digital resources. We need to invest in innovations for data-lite technologies and renewables, especially for and by the Global South. We should enforce existing data regulations on indiscriminate data collection and embrace an inclusive approach to translate AI-driven precision into prosperity for people and the planet.

Environmental activists especially in the Global South call for ‘climate justice,’ to equitably redistribute the burdens and benefits of addressing climate change, prioritizing communities most vulnerable to its impact. The world’s wealthiest 10 percent produces up to 50 percent of the planet’s consumption-based carbon emissions, while the poorest half of humanity contributes only 10 percent. We have a problem when an American fridge uses more electricity than a typical African person. Western hypocrisy runs deep. Rich countries advocate for clean energy while importing fossil fuels. They can afford to be organic, ‘go local,’ and celebrate their air quality while dumping their e-waste in the Global South.

Aid agencies offer loans at debilitating interest rates for clean energy, often leaving African countries with little choice but to consume coal or look to their Asian neighbors for investment. Blanket treatment of different contexts in the name of sustainable design can exacerbate inequality and entrench poverty. While the rich world is preoccupied with making clean energy, countries in Africa are focused on

- 1. Following Shot of IT Engineer Walking Through Data Center Corridor with Rows of Rack Servers. Photo: Getty Images Pro
- 2. Shacks in the Favellas in Rio De Janeiro. Photo: dndavis
- 3. Illustration by Dariana Guevara / REVOLVE

producing more energy—their pathway out of poverty.

Likewise, AI activists call for ‘data justice,’ the fair and ethical treatment of individuals and communities’ data when it comes to collecting, processing, and use. There is a push to de-bias data that is used to train AI systems to ensure that they work fairly for everyone. While typically the West has been preoccupied by the data deluge and the need to slow down and even turn off the flow, the rest of the world is more focused on the data deficit, the vast black holes of data missing about the Global South.

This invisibility can create further misrepresentation, discrimination, and alienation of those already at the margins from future markets and societal opportunities. For instance, Brazilian tech reformer Ronaldo Lemos explains that by being unmapped, people living in the favelas have limited access to public services: “They don’t have an address, so they don’t get mail at the post office. You don’t get garbage collection, you don’t get electricity. That’s the reality.”

The degrowth movement’s advocacy of ‘voluntary’ downscaling of consump-

tion and production is tone-deaf to the realities of disadvantaged populations living with minimal means of survival. Being frugal as a choice versus as a social condition is contingent on your socioeconomic reality. Moreover, it is false to assume an incompatibility between socioeconomic mobility and environmental care. The degrowth movement fails to take heed of how Indigenous cultures approach dignified living and planetary well-being as symbiotic and fundamental to their place in the world. By extension, we can learn to explore ways in which the digital and planetary can become compatible and mutually reinforcing.

Indigenous design

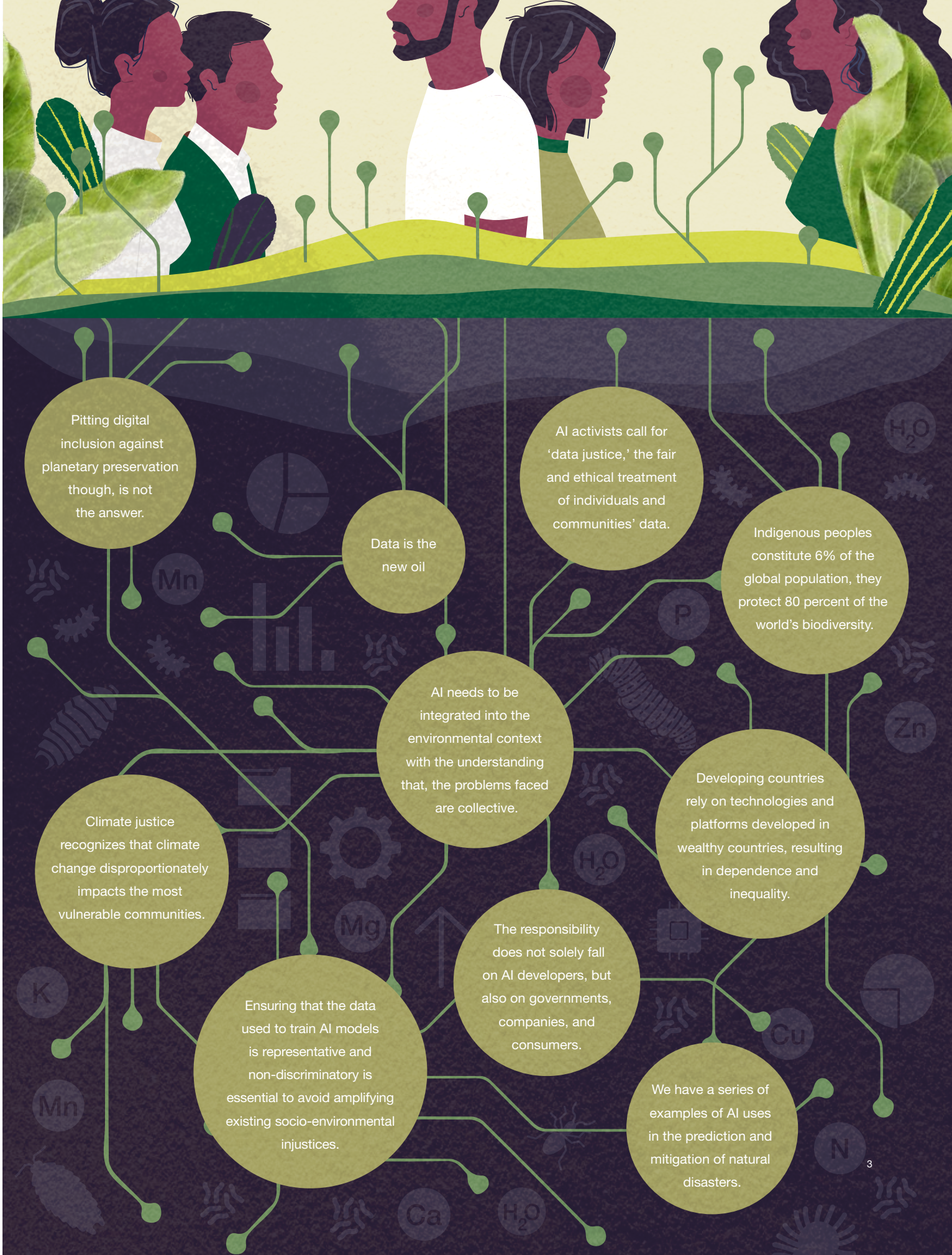
We need to think and do differently if we are to address the formidable challenges of social and planetary wellbeing. We can learn from care practices among Indigenous communities in the Global South. Striding forward does not always mean leaving the past behind. There is value in culture for computing a future. We need to dive deep into diverse cultural contexts to avoid reinventing the wheel.

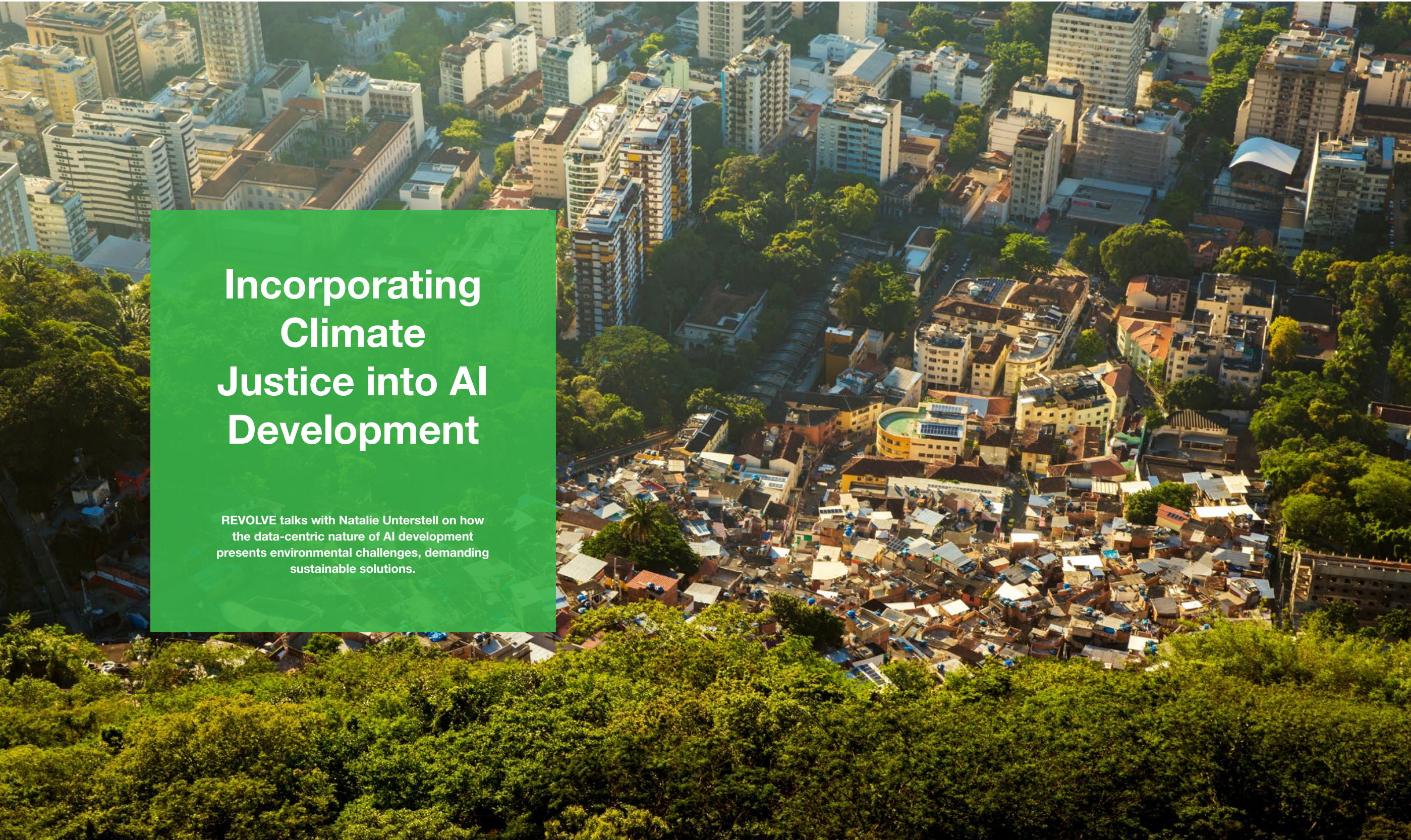
While Indigenous peoples constitute 6 percent of the global population, they protect 80 percent of the world’s biodiversity. The Sámi people living in the Arctic, for instance, can teach us coexistence through their core principle of *eennâm lli eellim* (land is life), which shapes their everyday behavior with nature. Many Indigenous communities across the world share similar world-views in which nature enables their culture’s existence. This stands in contrast to Western extractive perspectives that commodify nature to serve their people.

Indigenous communities are not ‘too poor to be green.’ Greening is not something their people ‘do,’ but is essentially how they live. Time to acknowledge that sustainability is indigeneity writ large.

Note: This essay is built on ideas from the upcoming book by the author with MIT Press/Harper Collins India – “From pessimism to promise: Lessons from the Global South on designing inclusive tech.” This section was written as a Rockefeller Bellagio Resident in 2023. ●

Indigenous communities are not ‘too poor to be green.’ Greening is not something their people ‘do,’ but is essentially how they live. Time to acknowledge that sustainability is indigeneity writ large.





Incorporating Climate Justice into AI Development

REVOLVE talks with Natalie Unterstell on how the data-centric nature of AI development presents environmental challenges, demanding sustainable solutions.



2

In the realm of environmental stewardship, the integration of artificial intelligence (AI) holds immense promise for addressing pressing challenges, particularly in underserved communities of the Global South. However, this potential comes with ethical considerations that must not be overlooked. As we navigate the complex intersection of AI technology and environmental concerns, it becomes increasingly evi-

dent that a collaborative and inclusive approach is essential. Successful solutions require active community participation, transparent governance, and equitable distribution of resources and to understand all of these issues, their interconnectedness and possible solutions, Raphael Tsavkko Garcia, from REVOLVE, spoke with Natalie Unterstell, president of the Talanoa think tank.

The ethical approach to addressing environmental challenges in ‘marginalized’ communities requires the collaborative and inclusive application of AI technologies.

1. How can AI be used ethically to address environmental challenges in underserved communities in the Global South?

AI needs to be integrated into the environmental context with the understanding that, in this field, the problems faced are collective, such as deforestation, climate change, and air pollution. They are called ‘tragedies of the commons’ precisely because they are not restricted to a single individual or group but affect everyone who depends on nature’s production for their well-being. Moreover, they often transcend the local – they are regional, global, cross-border issues. And not all of them are ‘visible’ or immediately perceived by the communities.

Elinor Ostrom, in her seminal work that earned her the Nobel Prize in Economics, highlighted the necessary conditions

for communities to effectively address the tragedy of the commons. Among these conditions are the clarity of property rights over the resource, active user participation in decision-making, monitoring, and enforcement capacity, as well as effective conflict resolution mechanisms.

By bringing these principles into the realm of artificial intelligence, I understand that the ethical approach to addressing environmental challenges in ‘marginalized’ communities requires the collaborative and inclusive application of AI technologies. This means involving local communities from the outset, ensuring that their voices are truly heard and that they actively participate in defining goals and solutions.

Furthermore, it is essential to establish transparent and accountable governance systems that allow for the continuous monitoring and evaluation of the impacts of AI technologies on the environment and local communities. This includes clearly defining property rights over the data and resources used by AI, as well as effective mechanisms for accountability and conflict resolution.

This not only ensures the relevance and effectiveness of solutions but also strengthens the capacity of communities to become protagonists. Without this, there is no way to evolve AI as a solution to ‘tragedies of the commons’ that makes sense for collectives. In summary, the ethical use of AI to address socio-environmental challenges requires an approach based on collaboration, participation, and shared responsibility.

2. How does the data-centric nature of AI development contribute to environmental concerns, especially in terms of carbon footprint and resource consumption?

On the one hand, the evolution of AI offers the opportunity to ‘dematerialize’ the economy, therefore, I believe AI is indispensable for solving contemporary environmental problems. On the other hand, while it can contribute to the solution, it also contributes to the problem.

For example, the data centers that power AI systems have been called energy ‘devourers’ as they consume an absurd amount of electricity, often from non-renewable sources. This obviously contributes to greenhouse gas emissions and strains energy systems. We know that this consumption is only expected to increase because AI is still expected to grow significantly: there are estimates showing that AI will require between four and ten times more energy than the current demand of global servers in the coming years.

Therefore, it is essential that AI development be adapted to contribute to and accelerate the transition to zero emissions, rather than being a barrier to it. This includes optimizing AI algorithms and architectures to reduce the demand for computational resources, as well as investing in renewable energy sources to power data centers. Additionally, recycling, and reusing computing hardware can reduce waste and minimize the environmental impact of the technology industry.

The responsibility does not solely fall on AI developers, but also on governments, companies, and consumers. Stricter environmental policies and regulations are needed to incentivize the adoption of sustainable practices in the technology industry, while awareness

- 1. Contrast between Poor and Rich People. Photo: Mikolaj Niemczewski
- 2. 4G and 5G cellular telecommunication towers. Photo: Getty Images
- 3. Data center cloud computing. Photo: Getty Images

AI will require between four and ten times more energy than the current demand of global servers in the coming years.

and public education can promote more responsible consumption choices. In developing countries, we need innovations in the industry and infrastructure for AI focused on the transition to zero emissions.

3. What are the implications of the digital divide/digital colonialism, especially in the Global South?

Today, developing countries rely on technologies and platforms developed in wealthy countries, resulting in a relationship of dependence and inequality in access to digital resources and knowledge. Technology companies often have control over digital infrastructure in developing countries, such as social networks, cloud services, and e-commerce platforms. This limits the ability of developing countries to regulate and protect their own digital data and resources, putting their citizens at risk.

In particular, the gap between those who have access to and skills to use digital technologies and those who do not in these countries is already quite large. And it is often accentuated by income disparities, limited infrastructure, and lack of access to quality education. This has profound implications for addressing environmental problems, as the affected communities are generally those 'on the other side of the digital

fence.' Nowadays, they are connected, but are still paying a high price for this access and not benefiting fully.

Furthermore, the production of technological resources itself has generated concern in developing countries. Especially, the race for critical minerals for digital transformation has involved environmental degradation and economic inequality among countries. The extraction of rare minerals and metals, such as cobalt and lithium, necessary for the manufacture of many devices, often occurs under precarious working conditions and significant environmental impacts. This implies deforestation, water and soil pollution, and loss of biodiversity, harming local communities and exacerbating economic inequality between producing countries and technology consumers.

4. How can principles of climate justice be integrated into discussions about AI development and data collection to ensure equitable distribution of environmental burdens and benefits?

Climate justice recognizes that climate change disproportionately impacts the most vulnerable communities, who have contributed less to carbon emissions but suffer the most severe consequences.

Prioritizing that AI solutions be developed with a community-centered approach, involving community members from conception to project implementation is the right way to go.

Furthermore, it is crucial to consider the social and environmental impacts of AI technologies when designing and implementing solutions to address climate challenges. This includes carefully assessing how AI solutions may affect different groups of people and communities, avoiding the amplification of existing inequalities.

It is also important to prioritize equitable access to information and resources needed to address climate change, ensuring that the most vulnerable communities have access to the technologies and data needed to adapt and mitigate the impacts of climate change. We are far from this in countries like Brazil.

5. In what ways can AI and data collection exacerbate existing inequalities, especially in marginalized communities, and what measures can be taken to address this problem?

Ensuring that the data used to train AI models is representative and non-discriminatory is essential to avoid amplifying existing socio-environmental injustices. Additionally, rigorous data protection policies and transparent governance are necessary to ensure the trust of local communities in the use of AI to address local and especially global environmental challenges.

Furthermore, marginalized communities often have less access to the resources and skills necessary to benefit from AI technologies, creating a digital divide that increases their exclusion and marginalization. This can lead to greater



3

disparity in access to educational, economic, and health opportunities, further exacerbating social inequalities.

6. How can indigenous/traditional/peripheral knowledge inform more sustainable approaches to AI development and data collection, especially in terms of respecting nature and promoting coexistence?

We already have a series of examples of AI uses in the prediction and mitigation of natural disasters, such as droughts, floods, and hurricanes, providing early warnings and facilitating evacuation and rapid response, which rely on inputs from communities and peoples. Also, in the sustainable management of natural resources, such as water and forests, through real-time monitoring and analysis of usage patterns.

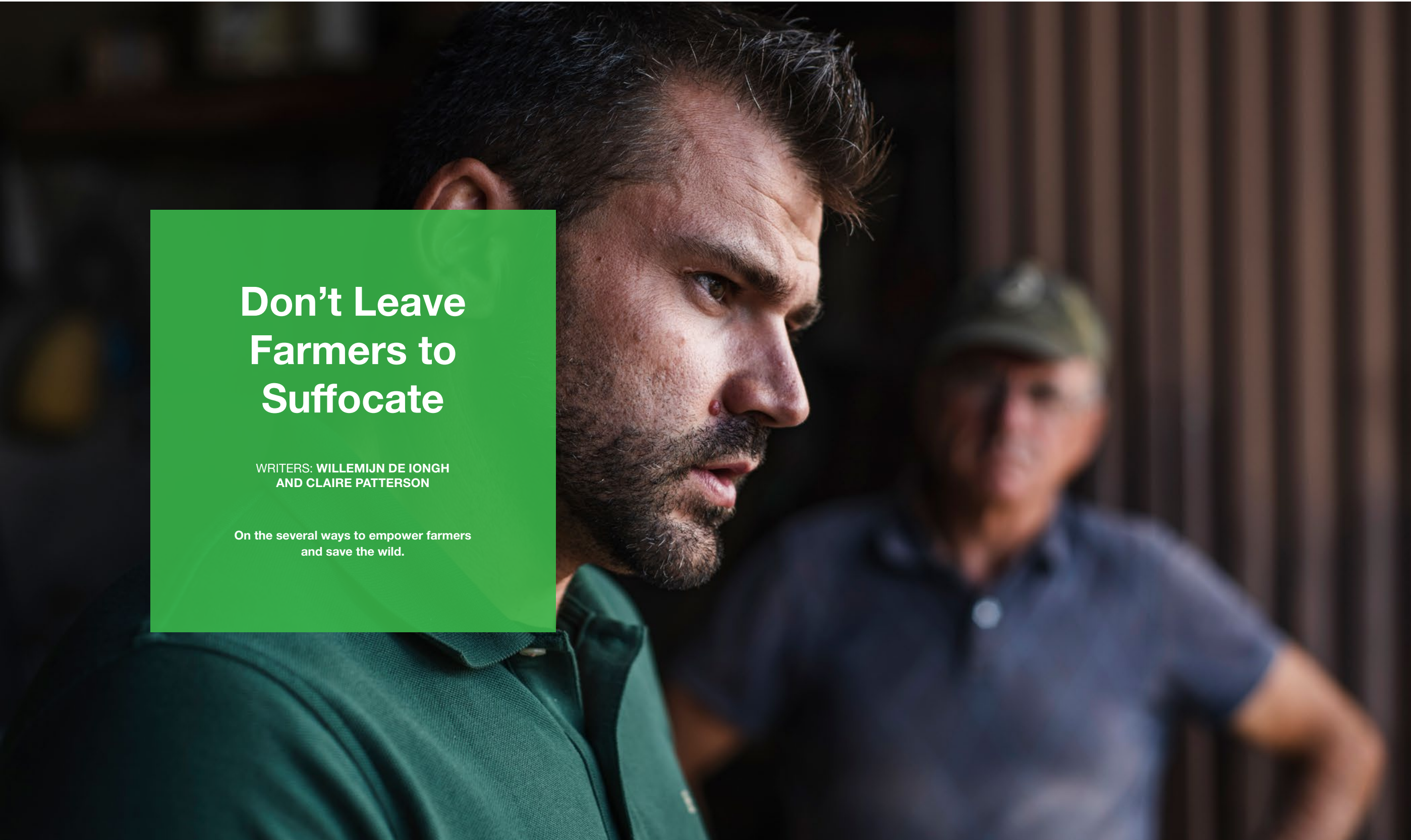
For example, AI algorithms already analyze satellite data to identify areas of illegal deforestation and mining activities

on indigenous lands in Brazil, supporting indigenous territorial surveillance systems. These are examples of using AI in the service of communities. But we still have much to advance in AI development approaches.

For example, traditional resource management practices can inspire innovative approaches to biodiversity conservation and sustainable use of natural resources, while indigenous knowledge systems can offer valuable insights into designing and adapting AI technologies to the needs and values of local communities.

Additionally, it is important to recognize and respect the rights of indigenous peoples and local communities over their traditional knowledge and natural resources, ensuring that they are properly consulted and involved in the development of technologies that affect their lives and territories. ●

Indigenous knowledge systems can offer valuable insights into designing and adapting AI technologies to the needs and values of local communities.



Don't Leave Farmers to Suffocate

WRITERS: WILLEMIJN DE IONGH
AND CLAIRE PATTERSON

On the several ways to empower farmers
and save the wild.



2

“The guys producing our food are getting f**ked at every turn,” says George Lamb, co-founder of Wildfarmed, an organization that connects regenerative farmers to food suppliers in the UK and France. Lamb’s blunt assessment echoes the frustrations of farmers. Caught between pressure from cheap imports and environmental measures exacerbating their financial struggles, Europe’s farmers feel deserted. Research underscores their plight, revealing staggering unmet financing needs of €62 billion in 2023 alone.

Since the introduction of the Nature Restoration Law to the European Commission in June 2022, media coverage of farmer protests has surged

across Europe. However, it’s important to note that these protests aren’t solely about the law itself. Rather, they stem from long-standing grievances that have reached a boiling point coinciding with the passage of the law. Issues such as bureaucratic obstacles, trade agreements, economic policies, income disparities within the sector, and the broader call for societal recognition are all driving farmers to protest.

However, the exact mix of reasons as to why farmers are taking to the streets varies significantly across regions, adding layers of complexity to the discussion about what it will take to foster a sustainable food system.

Despite the challenges of transitioning, agriculture stands out as an industry most in need of nature restoration. Given that climate change and biodiversity loss disproportionately affect the agricultural sector, the imperative for farmers to transition to sustainable practices cannot be overstated. To do this they need our help.

Commission President Ursula von der Leyen has said that the green transition is a symbol of polarization. The failure to heed farmers’ requests for support only perpetuates this polarization, impeding the cooperation necessary to address complex environmental challenges like ecosystem restoration—a roadblock

we simply cannot afford in the face of the climate crisis.

The remedy to polarization lies in society’s commitment to supporting farmers. By first supporting farmers, they are then, and only then, capable of supporting nature. Across the globe, organizations are already engaged in the crucial work of equipping farmers with resources.

A safety net for a messy transition

Transitioning to regenerative agriculture is a significant endeavor for farmers, requiring not only dedication, but also access to essential resources like training and investment. “Farmers have no external incentive to make the transition to regenerative agriculture,” states Philippe Birker, co-founder of Climate Farmers. “What I would love to see,” continues Philippe, “is corporations or society taking the risk away from them. We do know that they will have fewer yields for the first 3–5 years, and right now that risk is on them.”

To mitigate this risk, AIVelAI, a prominent farmer cooperative in Spain, provides financial assistance and training to farmers transitioning to regenerative farming. These incentives help offset the initial costs and challenges associated with implementing new techniques.

One great example of reducing the risk burden is AIVelAI’s shared machinery bank. Launched in 2023, the bank is a cost-effective innovation that facilitates the sharing of machinery amongst farmers while applying new regenerative farming techniques such as no-tilling, clearing of green cover, shredding of pruning waste, and organic matter input.

Elvira Marin, former AIVelAI director and now director of Aland, an organization extending regenerative agriculture’s success across the Iberian

Peninsula, emphasizes the importance of mobilizing communities. The key to this mobilization is the inclusion of key stakeholders such as farmers, researchers, and future generations in the restoration process. “The dream of the AIVelAI team is to create a big movement of people. AIVelAI itself cannot restore 1,000,000 hectares but the people who live there can restore the landscape,” says Marin.

Fostering dialogue across battle lines

Wij Land, a 150-person strong farming network in the Netherlands is another initiative providing resources to farmers to drive a local regeneration revolution. Through an initiative called the Peat Meadow fund, Wij Land gives farmers, citizens, or entrepreneurs the financing needed to make regenerative agriculture projects a reality. This fund is all about tearing down barriers and speeding up the transition to a revitalized landscape.

Through a learning network facilitated by Wij Land, the organization provides a space where everyone can swap stories and share their wins and losses. “It is really underestimated how many ideas farmers have, and how willing they actually are for change,” states Rosa Vendel, Project Manager at Wij Land.

She goes on to explain that farmers are used to changing and working with nature to some extent already. When these farmers are brought together in networks to connect, you can see that the power to change is not top-down, but bottom-up.

The article continues on page 50.

- 1. Miguel Angel Gomez and his father, Miguel senior at their regenerative farm in Southern Spain. Photo: Gabrielle Hengeveld / Commonland
- 2. Farmer measures plant growth in Baviaanskloof, South Africa. Photo: Living Lands
- 3. Wij Land festival, families exploring the landscape. Photo: Wij Land, 2020
- 4. A Farmer talks about the land. Photo: Alvara Martínez Raya



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VIEWS

The Albufera

PHOTOGRAPHY: JUAN SOLBES
TEXT: MARTA CASTILLO

The Albufera wetlands include a freshwater lagoon and estuary on the Gulf of Valencia. The lake covers 3,000 hectares (15% of the Albufera surface), making it Spain's largest freshwater lake. The Albufera is facing the threats of water pollution, disrupted flow, marsh silting, and urbanization. Its proximity to Valencia has intensified pressures from infrastructure development, tourism, and recreational activities. Adjacent to the Gulf of Valencia on the Mediterranean coast of Eastern Spain, the Albufera wetlands remain however a hotspot for biodiversity and provide crucial resources for local communities.

Fishing has been an integral part of human history in the Albufera lake. Three fishing communities (Catarroja, Silla, and El Palmar) continue this tradition, though the declining water quality has diminished the variety and abundance of prized species. The marshlands, once part of the lake, now serve as expansive areas dedicated to rice cultivation, a cornerstone of the local human and natural ecosystem. The agricultural field covers almost three-quarters of the Albufera surface and we can still find traditional rice cultivation techniques – like 'fangueo' – in this area.

The Albufera gained global recognition in 1989 when it was added to the List of Wetlands of International Importance under the Ramsar Convention. Spain ranks 5th globally with 76 Ramsar-listed wetlands, but 85% suffer alarming conservation issues. This photo essay by Juan Solbes emanates from his book with boatman Vicente M. Muñoz Gras *La Albufera de Valencia. DESDE DENTRO* (2022) that transmits a harmonious blend of nature, agriculture, and cultural heritage.

Golden and quiet afternoons in the Albufera, when birds enjoy the quiet wetland.



Left: The lake is connected to the sea with canals like this one. Only fresh water flows through the canals. The difference in level prevents salt water from entering the lagoon, as well as the existing artificial floodgates. This is fundamental since the Albufera is responsible for filtering and accumulating all the sediments before the water reaches the sea.
Above: A farmer uses a horse to plow his rice field. **Below:** Rice in the bush. The rice as it is collected in its ears. With its husk and its protections to offer us the best of the fruits.





'Ullals' are underground water springs that create small lagoons and drains isolated from the rest of the wetlands. Due to their special characteristics, 'ullals' often constitute true refuges of biodiversity.



Left: A view of the 'fangueo', from inside one of the tractors. **Above:** An osprey spies its next prey. This raptor, strictly tied to aquatic environments and exclusively piscivorous in its feeding habits, is one of the rarest birds of prey, having been on the brink of extinction in the second half of the 20th century. In the Albufera, it is typically found during winter as part of migratory passages. **Below:** A typical dwelling in the region.





Sunset over the lagoon of Albufera seen from a traditional Albufera boat with a Latin sail.



Above: Tancats purify water naturally. **Below:** This heron descends at full speed from above, with astonishing aerodynamics, to secure the prey it needs to survive. **Right:** A farmer sows seeds on his flooded rice field. The seeds will begin to sprout within a couple of days.





Left: The rice fields are flooded during autumn and winter. **Above:** 'Ullals' have been recovered slowly and are now water springs that fill the whole Albufera with life. **Below:** Rice fields in July and August.



A fisherman at dawn casts his nets into the water to gather the fruits of his labor.



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The remedy to polarization lies in society's commitment to supporting farmers. By first supporting farmers, they are then, and only then, capable of supporting nature.

In 2023, Wij Land brought together decision-makers and farmers to align on perspectives of how government policy is embedded in the reality of farming. One of the farmers at the event remarked that it “sounds like it is also a hassle to work at the ministry. I thought it was easy work.” Fostering understanding between parties and increasing dialogue is an important element of these learning networks, driving change by creating connections and offering space for mutual learning across siloed sectors.

Try, try, try again...

“There is no one-size-fits-all solution,” states Matt Stephon from Living Lands, a non-profit organization based in South Africa that focuses on promoting regenerative agriculture that “encompasses a whole host of techniques, practices, and concepts. In the absence of a close working network or existing guidelines for any given farming sector, options must be narrowed down from a large suit. This can often seem daunting, and without a clear playbook can be intimidating to new farmers.”

In South Africa, farmers from Living Lands aiming to rejuvenate the Baviaanskloof region opted for aromatic crops like lavender as part of their approach. Initially, this choice seemed straightforward and promising, offering numerous benefits to both the landscape and the farmers’ finances. However, in an attempt to expedite progress, they embarked on the ambitious task of planting 100 hectares at once—a decision that proved to be a significant gamble. After 2–3 years of replanting the crops and trying everything they could to save the fields, the farmers were forced to write them all off as unusable.

When facing significant challenges like land degradation and biodiversity loss, there is often a temptation to implement sweeping changes hastily. However, the realm of regenerative agriculture is rife with uncertainties. Because of this, farmers need safe spaces for experimentation when moving toward a regenerative agricultural model.

The comfort of a shared struggle across borders and generations

“It is very comforting and useful to know that I am part of a learning network of people struggling with the same challenges,” says Gabriela Poiană, Program

Coordinator at Asociația Kogayon, adding, “It is way easier to act in a network than by yourself.”

She is reflecting on the power of cross-continental learning networks for all those who work to restore landscapes. This includes farmers who are looking to transition from business-as-usual practices that are degrading ecosystems towards a more regenerative model, as well as landscape practitioners who advocate for this work on a systems level.

An example of such a network is the Bioregional Weaving Labs Collective – a European initiative bringing together changemakers leading the charge when it comes to landscape restoration to facilitate peer-to-peer learning across borders. Their goal? To mobilize one million change-makers across one million hectares of Europe’s land and seas.

Joseph Gridley, CEO of Soil Association Exchange in the UK, highlights that the significance of collective action in landscape restoration should not be underestimated. “Finding ways to join farmers up to do [landscape restoration] *en masse* is fundamental.”

Learning networks can also help with bringing the next generation of farmers into the regenerative transition. Geert van de Veer, co-founder of Herenboeren, an agricultural cooperative in



We need the youth to be inspired to farm – and to do so regeneratively.

Dialogue is the only way to foster understanding of how to navigate the complexities of creating a more sustainable food system that works for all parties.

The Netherlands, highlights the impending retirement of a generation of farmers, which poses both challenges and opportunities for the regenerative transition. He asks, “What kind of system can we build so that we can produce livelihoods in landscapes that are becoming deserted?”

As more and more youth are leaving rural areas for urban areas, inspiring the next generation of farmers is a vital purpose of these collaborative learning networks. We need the youth to be inspired to farm – and to do so regeneratively. This is the only way to ensure livelihoods for their children and all generations to come.



4

It’s going to take time

It has taken decades of time, investment, and innovation to get to the current model of intensive agriculture that we are ‘stuck’ in. We cannot expect a change in agriculture overnight. While the passage of the Nature Restoration Law marks a significant step forward for environmental protection, the ongoing legitimate frustration from farmers will hinder its implementation unless they’re given more support in this transition. Without adequate support, we leave farmers grappling with debt, lack of skills, and uncertainty – despite farmers being key stakeholders in our food systems.

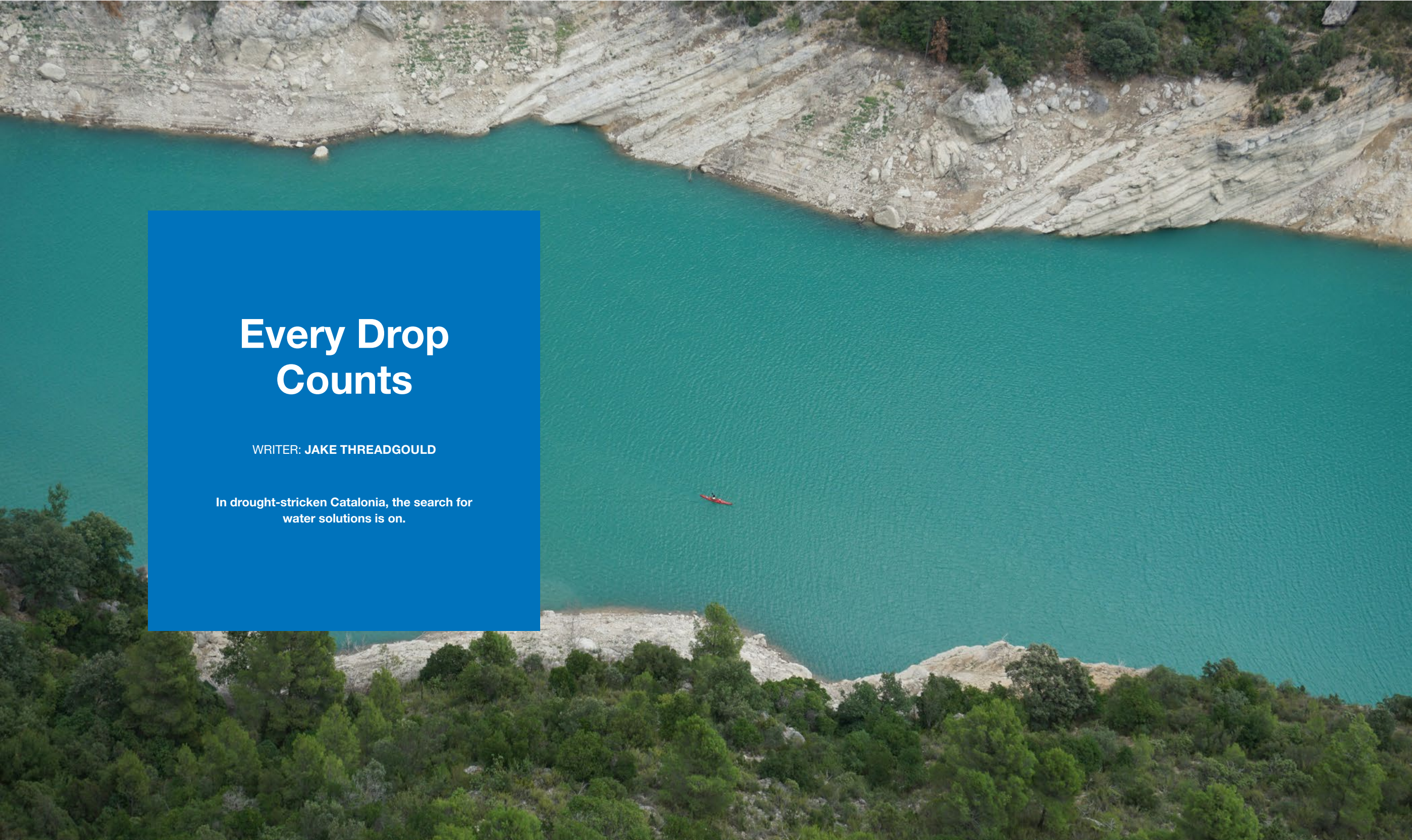
The Nature Restoration Law marks the starting point of collaborative action to address the gaps in between environmental legislation and agricultural livelihoods. In the coming months, member states will develop national restoration plans, and European Union policy-makers will vote on a whole host of agri-food and carbon farming measures. Tangible support to farmers across policy levels – through investment, training, and learning networks – must be top of the agenda.

Dialogue across societal sectors will be key here – both with farmers and broader society. We all have a stake in the food system, after all. Dialogue is the only way to foster understanding of how to navigate the complexities of creating a more sustainable food system that works for all parties – up and down the value chain.

By giving farmers the right kind of support and recognizing their pivotal role in achieving environmental goals, we can pave the way to a more sustainable and inclusive future. ●



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Every Drop Counts

WRITER: JAKE THREADGOULD

In drought-stricken Catalonia, the search for water solutions is on.



2

“We have biogas for energy exploitation, water for different reuses, and then the recovery of nutrients for use in agriculture.”

– Teresa de la Torre, Sorigué Department of Innovation.

- 1. A large body of water surrounded by trees in Catalonia. Photo: Andrii Chuzhynov / Unsplash.
- 2. A view of the WATER-MINING Case Study 5 site in La Llagosta, Spain. Photo: Emin Yigit Koyuncuoglu / REVOLVE
- 3. Water faucet in Barcelona. Photo: Pixabay

Some of the wastewater that has been flushed or drained away from the town of La Llagosta, a 20-minute train ride north of Barcelona, ends up churning and bubbling through a lattice of grey pipes and containers under the scrutiny of a small team of researchers who view this material as a golden opportunity.

This team has several goals. One of those is to show that water purification does not have to be a linear process — wastewater in, freshwater out — but that along the way we can recover some marketable resources. Another is that it could be possible to power the process with the gas it produces. All this of course without wasting a drop

of precious water, which is especially important given the location.

From their pop-up laboratories, these researchers run experiments using wastewater syphoned off from the much larger facilities at La Llagosta’s Wastewater Treatment Plant (WWTP) operated by the local water institution, *Consorci del Besòs Tordera*, which has provided the space for the pilot.

The study led by Sorigué, a group of companies in the technology and water engineering, services, construction and materials sectors, as part the WATER-MINING project, adds extra circular steps to a linear purification process

to obtain nitrogen, phosphates, biogas and, ultimately, high quality freshwater for potential agricultural, urban, leisure, environmental and industrial reuse.

“What we are doing here is a water treatment process that allows us to maximize the recovery of resources from the wastewater. We have biogas for energy exploitation, water for different reuses, and then the recovery of nutrients for use in agriculture,” Teresa de la Torre, from Sorigué’s department of innovation, says during a visit to the study in Catalonia, northeast Spain.

A series of circular events

Speaking to REVOLVE from the project site, Teresa de la Torre explains that these valuable products are extracted through a series of different processes and reactions that can be used as needed.

One option at the pilot site is to take the wastewater as a base for biogas production, which is done by passing it through a unit filled with granular bacteria that can remove the organic material and convert it into the gas. In theory, this biogas could fuel the very

wastewater treatment process from which it is extracted. De la Torre says the tests at the site suggest the repurposing of biogas in this way could help slash the energy required to power the treatment process by a quarter.

Another option being examined at the pilot is the extraction of nitrogen through a process that uses partial nitrification and bacteria to remove nitrogen gas without the need for energy-consuming aeration.

A third option is to obtain phosphate using innovative crystalizing technologies that in this case are being applied by the European center of excellence for

sustainable water technology (Wetsus). Removing phosphates from the water presents an opportunity to recover a finite resource and avoids the introduction of phosphorus into natural bodies of water, which in abundance can induce eutrophication. Phosphates and nitrogen are both immediately marketable commodities that can be used in agricultural fertilizers and reduce the farming sector’s reliance on imports.

Finally, a reverse osmosis unit at the end of the process can produce high-quality freshwater that can be reused in many different sectors and industries. These experiments are already bearing fruit, says Teresa.

“The process we are studying here will allow us to reduce the energy consumption required for the water purification treatment by approximately 25% as well as recover almost 100% of water for agricultural, urban, environmental, and industrial reuse,” she says.

A race against climate change

These preliminary results from the case study could not be timelier.

In early February 2024, the Catalan regional government extended a state

of emergency to over 200 towns and cities, including the capital Barcelona, amid the region’s worst drought since records began in 1916. This measure means that six million people, or 80% of Catalonia’s population, are facing tighter water restrictions including consumption caps for households and businesses, strict limitations for swimming pools, and a ban on using ornamental water features.

These steps came as reservoir levels in Catalonia’s internal basins, known as the *Conques internes de Catalunya*, shrunk to lows of around 15%. The internal basins, which drain into the

Mediterranean and are managed by the Catalan Water Agency (ACA), account for 52% of the region’s total area but are home to 92% of its population. They cover major settlements like Barcelona and Girona. The WWTP at La Llagosta falls within the affected area. Catalonia’s Ebro basins were not in drought conditions as of March 2024.

The drought, which has been in force for three years and counting, is prompting Catalonia to rethink its models of water management. Empty swimming pools are not likely to be a big draw for tourists, who like in the rest of Spain help to prop up the local economy.

Households, farms, and industry, which account for 44%, 36% and 20% of water consumption in the internal basin areas, are also feeling the pinch of water scarcity. As of February, households and businesses face a government-enforced consumption cap of 200 liters of water per day, which could yet be tightened if the drought worsens.

According to the Catalan government, residents of the region consume 117 liters per day on average, which is above the recommended minimum of 100 per individual per day set by the World Health Organization.

An unreliable sky

With the rain in Spain seemingly falling anywhere but Catalonia for the moment, authorities have launched a campaign to reduce water consumption with a campaign entitled ‘L’Aigua no cau del cel’ (‘The water does not fall from the sky,’ in English). This slogan conveniently sums up the regional government’s wider policy of pivoting to alternative water sources like desalination. When announcing the state of emergency measures on 1 February 2024, Pere Aragonès, the regional president of Catalonia, said that reclaimed water accounted for 55% of all the water reaching homes in the region.

This push for more desalination and purification is encapsulated by the plans from the central Spanish and Catalan regional governments to expand the Tordera and Foix desalination plants at a cost of 287 million and 180 million euros respectively. Desalination plants might offer a quick fix to drought conditions, but some critics of the strategy, including environmental groups, highlight the long-term economic, environmental, and energy costs and advocate instead

for more nature-based solutions and a deeper reflection on how we manage the systems we have.

Close collaboration

When it comes to wastewater treatment in times of drought, the case study in La Llagosta demonstrates a feasible and valuable approach to the process, according to Teresa, from Sorigüé. “In this drought context, we cannot afford to lose any water source that is available. The solutions being tested in the case study allow to reuse the water in an efficient way. They are technologies designed for the WWTP of the present, where every drop counts.”

“In the new era of circular economy, WWTPs must be converted into biorefineries, where resources are recovered and sold as products. It is not easy to transform a conventional WWTP into a biorefinery and it entails costs, which is the main limitation here. However, it is a must, and contexts like the emergency that we are now suffering in Catalonia due to the drought will boost this kind of concept,” she says.



Six million people, or around 80% of Catalonia's population, are facing tighter water restrictions because of the drought.

Teresa adds that the key to success in replicating this system is being flexible so that it can be applied in different ways depending on whether it is to be integrated into a new construction or retrofitted into an already existing plant.

Another crucial element is the engagement with local stakeholders, which is done through the creation of Communities of Practice. These stakeholders involve the likes of water authorities, universities, farmers, centers of technology, and industries. Together, they can outline and tackle market barriers while pushing for policies to boost wastewater treatment acceptance, de la Torre adds.

María Jose Muñoz, innovation technician at *Consorci del Besòs Tordera*, adds in an interview with REVOLVE that “the implementation of the pilot in the La Llagosta WWTP allows the technology to be validated in a real environment.”

“The collaboration with different stakeholders at a local level allows us to learn their real needs and how they can be responded to. This project has allowed us to learn about different water generation and waste recovery technologies. It allowed us to advance in the integration of treatment plants into the circular economy by building systems that generate resources,” she concludes.

In the face of Catalonia’s enduring drought crisis, the quest for water sustainability has unveiled promising innovations in wastewater treatment. Beyond water recovery, these advances offer a beacon of hope for energy conservation. This dual focus on water and energy underscores the urgent need for holistic solutions to climate challenges. As Catalonia navigates this race against climate change, embracing such integrated approaches can help to build a resilient and more sustainable future, where every drop truly counts. ●

“The solutions being tested in the case study allow to reuse the water in an efficient way. They are technologies designed for the WWTPs of the present, where every drop counts.”

– Teresa de la Torre, Sorigué department of innovation.



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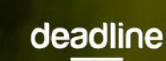
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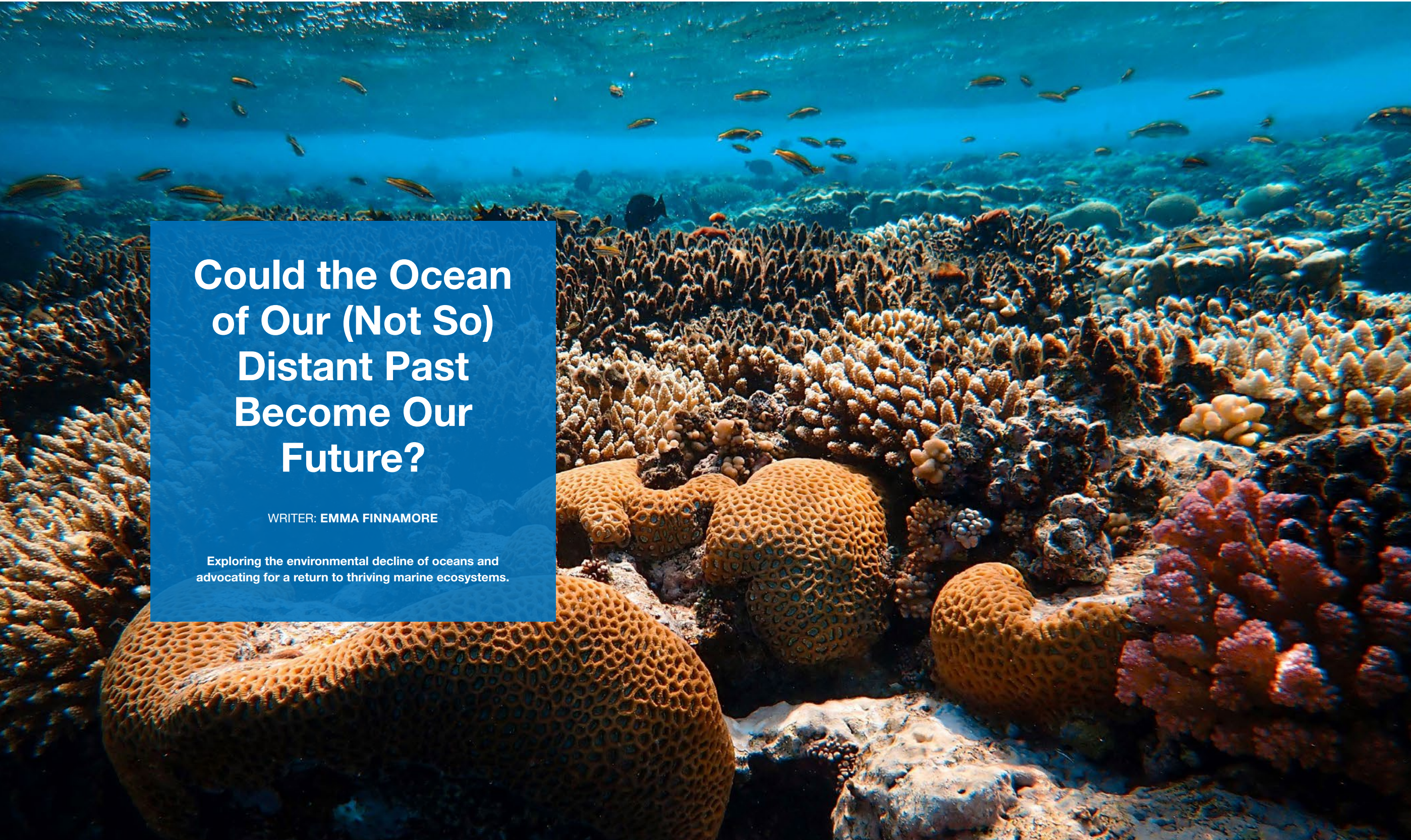


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**Could the Ocean
of Our (Not So)
Distant Past
Become Our
Future?**

WRITER: EMMA FINNAMORE

Exploring the environmental decline of oceans and
advocating for a return to thriving marine ecosystems.



Conservation experts argue that as people, we all have some connection to the ocean, no matter how far inland from the shore.

2

- 1. Coral reefs. Photo: Francesco Ungaro / Unsplash.
- 2. Oysters and clams underwater. Photo: Studio Philippines / Canva
- 3. Wild oysters. Photo: Getty Images

Beneath the surface, aquatic ecosystems are facing a steep decline. The seas are emptying, the coral and oyster reefs are in critical condition, and aged fisheries are collapsing. Unrestrained human activity in pursuit of financial gain is the main culprit of this environmental decay, and in the European Union (EU), policy-makers, researchers, and academics alike make the case for a nature-led return to what once was: a thriving ocean full of wildlife.

Gradual, slow violence such as biodiversity loss is hard to recognize from a

human point of view. Harder still when the ecosystems affected are out of sight – underwater – and out of mind – only met when consumed on a plate. The ‘shifting baseline,’ first described by fisheries scientist Dr. Daniel Pauly in 1995, is the failure to process a change as the reference points continue to shift, themselves obscuring the original state of being.

There are many issues concerning the assessment of what remains in our oceans. Sir Dr. Poul Holm, Professor of

Environmental History and Director of the Trinity Centre for Environmental Humanities at Trinity College Dublin, elaborates further: “Fish stocks are monitored and managed by a short-sighted system that operates on the basis of very short baselines. When we look at the longer time frame, say since 1950, it is obvious that we have fished down the ecosystem and are nowhere near rebuilding valuable stocks. Single-stock management has left us with ecosystems that are out of balance.”

Many cannot fathom what is being lost as they do not know what was once there in the first place. Hauntingly, journalist Nathan J. Robinson writes in *Current Affairs* that “the next generation of children, who will never remember [what] once existed in the wild, will not hear anything eerie in the silence. Once a mass murder is complete, its victims tell no tales. When nobody is left alive who remembers...the loss is not felt.”

Lack of awareness is not a good alibi.

The citizens of the EU have a particular duty to the world’s ocean life. The Commission reports that the EU is the world’s biggest market for seafood, where each citizen consumes on average 24,4 kg of seafood a year. The structure of the Union itself could potentially act as a formidable tool in conservation policy, as it is in a more capable position to oversee its safeguarding in comparison to its member states whose policy-makers are inclined to prioritize their economic growth over sustainable ocean management. Regarding mobili-

zation for action, conservation experts argue that as people, we all have some connection to the ocean, no matter how far inland from the shore.

According to Dr. Aleksandre Gogaladze, Ocean Policy Officer at the World Wildlife Fund’s (WWF) EU office, “sustainable ocean management, broadly speaking, means balanced and responsible use of the ocean, to make sure that we reserve basically the rights of future generations to have access to the same resources that we have today. What we

“What we have today is what our ancestors saved for us. And we have a moral obligation to do the same for future generations.”

– Dr Aleksandre Gogaladze, Ocean Policy Officer at the World Wildlife Fund’s (WWF) EU office

have today is what our ancestors saved for us. And we have a moral obligation to do the same for future generations.”

The current framework outlines the Marine Protected Areas (MPAs), which operate on a spectrum of strictness of human intervention. Dr. Gogaladze explains, “12% of EU seas are designated MPAs currently. The goal by 2030 is to have 30% covered, so an increase of 18% in six years. But it cannot just be designated without any guidance or change in human behavior.” Alluding to a ‘paper park,’ a term coined by the WWF meaning a region legally assigned as protected, but in practice, ineffective, Dr. Gogaladze advocates for better protected, stricter zones with less human interference.

Holm feels similarly, arguing that “MPAs are likely a very efficient way to rebuild ecosystems if they are large enough and effectively policed *and* commercial fisheries limited or prohibited. The reality is that MPAs are often introduced in areas of low productivity or come with such a light touch that they do not fulfill their purpose.”

In making a case for restoration and expertise to go beyond the hard sciences and receive multidisciplinary support, he added, “We also need to rebuild

reef habitats that have been effectively ruined by trawling and stone-fishing for decades. Historical maps of lost habitats are much needed to inform management.”

Conservation efforts regarding European reefs are already coming to fruition. Oyster reefs are the temperate equivalent of tropical coral reefs. Oysters themselves are a keystone species, filtering water and acting as a buffer against ocean acidification, like makeshift kidneys along the coast. They can also act as natural barriers preventing erosion, a nature-based climate adaptation that will mitigate the surges of sea level rise to come.

The decimation of 99% of oyster reefs globally in the last 150 years is a result of fishing pressure, overharvesting, pollution, and disease imported through increasingly global trade, contributing to the steady degradation of native habitat.

The Native Oyster Reef Restoration Ireland (NORRI) project, led by Steven Kavanagh, CEO of Marine Health Foods, and Dr. Anamarija Frankić, professor of ecology and biomimicry at the University of Zadar, works from an ecosystem-based perspective. Kavanagh assures that “the tide must lift all boats. We must all be involved for this to work properly.”

With the improvement of environmental health, such as the growth of kelp forests, NORRI speculates that Ireland could sequester up to 2,6 million tons of CO₂ a year.

“No species wants to live alone. They work with each other, they collaborate with each other to survive. If we restore one of those species, it’s not going to work as well as if we did all of them together in the habitat,” says Dr. Frankić. “Everybody’s asking me, you need to prove that...but isn’t that obvious? Why do we need to prove something that

nature has already proved, for millions of years?” The group has secured a site and, in collaboration with a hatchery, will continue building an integrated restorative sanctuary for oysters, fostering coastal biodiversity.

Overfishing, albeit the current global norm, will end, either by regulation or fishery collapse. While the reality of marine ecosystems is dire, change will come, and the future is as open and endless as the ocean itself. For aquatic life, experts in conservation

agree that the best thing would be to leave the fish alone.

“There is no sustainable fishing industry, at all,” Dr. Frankić reasons. “We need to start thinking about the fishing industry and seafood like our ancestors did.” Anything with the prefix “over” is not the answer – instead, let nature take the lead and show its resilience, inspired by the possibilities of the past, before trawlers and overexploitation robbed the water of life.

Conservation and restoration go hand-in-hand in the seas, allowing them to self-rejuvenate and increase their biodiversity. Scientists and researchers aim to build the conditions for species to balance themselves out within thriving ecosystems. The creation of strictly protected areas, with minimal to no human economic activity, requires cohesion at many levels (local, regional, EU), along with supplementary policies such as reducing pollution and eliminating bycatch, for robust success.



Overfishing, albeit the current global norm, will end, either by regulation or fishery collapse.

True sustainable ocean management will be developed through the restoration of marine ecosystems. In this way, the coastal communities that take care of them have a special role in the future of our aquatic life. Seas are a communal resource, a shared heritage, and should be treated as such going forward into the deep blue unknown. ●

The 1993 collapse of the cod fishery off the coast of Newfoundland, Canada, acted as the canary in the coal mine for the commercial fishing industry. A trade that shaped the societies of North American settler colonies for over 500 years shuttered overnight. In the early colonial era, European seafarers wrote of the Atlantic as so rich with sea life that they could reach into the glittering water and pull out fish without a net.

In the 20th century, the cod population had been decimated, falling to about 1 % of these original historical levels, owing largely to the introduction of trawlers and other harmful mass extraction techniques. When a moratorium on cod fishing was publicly announced, fishermen who simultaneously lost their jobs and way of life stormed the press room, devastated. Cod is not the only victim. The Food and Agricultural Organization of the UN estimates that 85% of commercial marine fish stocks are overfished or exploited. Overfishing and bycatch are pushing a myriad of species to the brink of extinction.

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The Hidden Costs of Military Expansion on Climate

WRITER: ARETI VLACHODIMOU

Military activity is increasing emissions and funding with dire and unfair consequences for people and the environment.



2

Five months have already passed since the onset of Israel’s war in Gaza and the death toll is higher than any other conflict of the 21st century. The devastation is unprecedented. People risk their lives even to get some flour for their families, and the means used for this social and environmental degradation lead to greater food and infrastructural insecurity, and climate impacts – and unveil consequences of military activity beyond the local.

The destruction of infrastructure and loss of human lives are worrisome, but the movement of troops – from training, transportation, and deployment – already has dire consequences for the environment.

On top of that, military institutions have today the privilege to intensify greenhouse gas (GHG) emissions without accounting for them to the United Nations’ climate body, UN Framework Convention on Climate Change (UNFCCC).

Knowledge gap in emissions reporting

It all began with the 1997 Kyoto Protocol negotiations. During this time, the US government successfully lobbied for an exemption for its military-industrial complex from any emissions-cutting obligations. This exemption remained in effect until the 2015 Paris Agree-

ment, which addressed and eliminated this unjust policy. However, to this day, countries are still only required to voluntarily report their national military emissions.

The result is that the biggest investor in the military, the US, is not obliged to do a full emissions reporting, causing a very significant data gap. However, even if military emissions reporting becomes obligatory, it will be applied to only 43 Annex I countries, excluding nations with high military activity, such as Israel, Saudi Arabia, and China. These states are not obliged to report any of their national emissions to the UNFCCC. On the other hand, nations that report their military emissions, such

as aircraft and land vehicles, can still leave out emissions that greatly contribute to the climate crisis, including military equipment procurement and other supply chains.

Skyrocketing military emissions

In 2022, the military’s global GHG emissions were estimated to surpass the national carbon footprint of Russia, which is a major petrostate. Specifically, the total carbon footprint was estimated to be around 5.5% of global emissions. This exceeds the global aviation and shipping emissions combined. With the provided data, if we assume that the

In 2022, the total global military expenditure surged by 3.7% - an increasing trend for the eighth consecutive year.

global military was a country, it would be the fourth with the highest national carbon footprint!

The research excluded warfighting emissions, such as infrastructural damage, ecosystem degradation, fire, healthcare for survivors, and post-conflict reconstruction. Also, non-CO₂ heating effects from contrail creation were excluded by the methodology used.

In the ongoing devastating wars in Gaza and Ukraine, these climate impacts are expected to be even greater. For instance, research showed that the first 60 days of the Israel-Gaza war contributed to emissions exceeding the total annual emissions of 20 individual countries and territories.

On top of that, NATO targets to increase financing of the military, while failing to reduce emissions in any of their operations. In 2023, the military carbon footprint of NATO was 30 million more tons of CO₂ than in 2021, which is equivalent to putting over 8 million extra cars on the road.

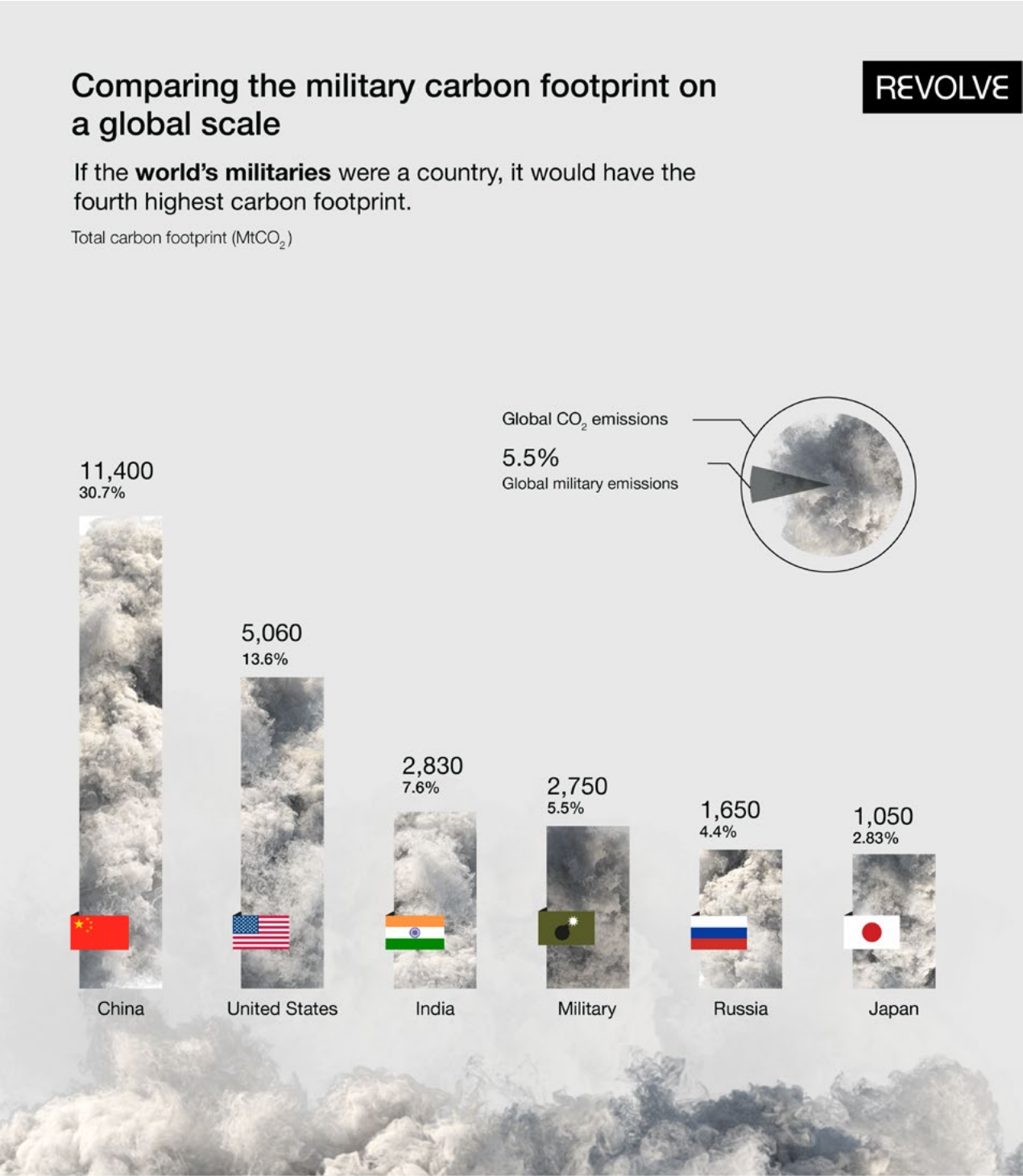
There is, however, some good news. Based on Neta Crawford, a professor of international relations at Oxford University, there is some progress in fuel reduction from the US Department of

Defense (DOD). The scientist has mentioned that more fuel-efficient vehicles, the employment of renewable energy, fewer and smaller military exercises, as well as US troop withdrawal from Afghanistan and Iraq, have contributed to fuel use decline.

The reduction of polluting fuels can also decrease climate change threats to national security, such as conflicts over basic resources like food and water. Yet, Crawford highlights that DOD is still a significant consumer of fossil fuel energy, being the largest institution in petroleum use and GHG production worldwide.

In 2022, the total global military expenditure surged by 3.7 percent - an increasing trend for the eighth consecutive year. For Europe, it was the steepest year-on-year increase in at least 30 years, due to the war in Ukraine. “The continuous rise in global military expenditure in recent years is a sign that we are living in an increasingly insecure world,” says Dr Nan Tian, Senior Researcher with SIPRI’s Military Expenditure and Arms Production Program.

NATO has announced a new target to increase enormously the military budget in the forthcoming four years. Already, research shows that more than half of



1. A person carries a banner against the war in Gaza. Photo: Sophie Popplewell / Unsplash

2. Military aircrafts flying in the skies. Photo: Craig Manners / Unsplash

the global military costs were spent by NATO members, reaching globally a record high of €2.05 trillion in 2022. Despite the climate and social impacts of the military expansion, a minimum of 2% of the NATO state's Gross Domestic Product (GDP) is expected to be used for the military, and the related target of at least 20% of expenditure on equipment.

It is estimated that if all 31 countries reach their 2% target by 2028, this would amount to an additional cost of €2.35 trillion. This enormous amount could cover the climate adaptation costs for low- and middle-income countries for seven years. Otherwise, zooming in on the European Union, it is estimated that the €1 trillion extra spending needed to achieve the 2% of GDP target for military expenditure of the European NATO members equals the total financing for the European Green Deal. NATO has therefore starkly ignored the IPCC recommendation of a 43% decline in GHG emissions by 2030 to keep global average temperature increases below 1.5°C.

A promising step on hold

If we consider that current methodologies for calculating military emissions have their imperfections, lacking data makes relevant assumptions even less accurate. Hence, it is crucial that transparent reporting is happening. Precise data can help scientists to make more accurate calculations about the global GHG emissions and member states can record their progress for national net zero targets.

We urgently need to escape the vicious cycle between wars and climate change, as one feeds the other. Research from the Nature Journal showed that intensifying climate change is estimated to increase future risks of conflict and increased military activity leads to

greater emissions and uncertainty at many levels. And like the environmental policy officer Linsey Cottrell said, “a failure to act on military emissions poses a far greater risk to our security than reporting them will ever do.”

A promising step was the resolution that the European Parliament passed ahead of COP28, which called for a transparent accounting of military emissions to the UNFCCC. One of the amendments was proposed by Swedish MEP Pär Holmgren (Greens/European Free Alliance) and it calls for “the Member States to ensure that military GHG emissions are included in domestic net-zero targets to accelerate the development of decarbonization technologies and strategies.”

The other amendment, proposed by MEPs from the Left, stressed that “all sectors must contribute to the reduction of emissions, including the defense sector while maintaining operational effectiveness, and that the development of decarbonization technologies and strategies in the defense sector should be accelerated.” Both amendments

were faced with backlashes from the far-right Identity and Democracy Group. In 2023, researchers and civil society organizations made a joint submission to the UNFCCC where they wrote: “Our climate emergency can no longer afford to permit the ‘business as usual’ omission of military and conflict-related emissions within the UNFCCC process.”

Despite these efforts, real action is yet to be taken. The forthcoming EU elections in June 2024 might be an opportunity to take responsibility, as it is crucial to impose military emission accounting to improve the European Green Deal and reduce potential conflicts and climate risks.

In the end, it is about applying the European Climate Law that mentions “Improving climate resilience and adaptive capacities to climate change requires shared efforts by all sectors of the economy and society.” ●

The €1 trillion extra spending needed to achieve the 2% of GDP target for military expenditure of the European NATO members equals the total financing for the European Green Deal.

Marginal Lands: Avoiding the Mistakes of the Past

WRITER: BELÉN G. CARMONA

The development potential of our marginal
lands must consider climate consequences.



2

“During the last decades in Europe, croplands have been reduced due to abandonment and policy changes.”

– Karina Winkler, postdoctoral researcher in the Land Use Change & Climate Research Group at the Karlsruhe Institute of Technology.

- 1. Marginal land in Mérida, Spain.
Photo: Belén G. Carmona / REVOLVE
- 2. Soybean plantation.
Photo: James Baltz / Unsplash
- 3. Tree cover lost in the Gran Chaco Forest between 2000 and 2019. Photo: NASA

From former lignite mines to degraded peatlands and monoculture areas in progressive depopulation, almost 30% of the European Union and the United Kingdom’s agricultural area is classified as marginal.

Marginal lands – also known as unproductive, abandoned, or idle lands – are lands with little agricultural or industrial value. They usually suffer from poor climate conditions and soil quality, as well as water scarcity. But converting them to forest, grassland or cropland is not necessarily a sustainable solution either.

Land-use change entails many negative environmental effects including increased CO₂ emissions as carbon sinks stored in plants and trees are removed from the environment. The Global Carbon Budget 2023 shows that land-use, land-use change, and forestry accounted for an average of

1.3 gigatons of carbon emissions in the period between 2013-2022. Deforestation was the main driver of these emissions, followed by other land-use transitions, peat drainage, and fire.

Land-use change has adverse effects on above-ground biodiversity and fauna due to the fragmentation of habitats and landscape alteration. Below-ground biodiversity and soil properties are especially affected when changing from grassland or forest to cropland, for example, as the carbon in the soil decreases. Soil health is also damaged due to erosion, desertification, and other factors.

There is an additional sustainability aspect to be considered when it comes to land-use change for bio-based feedstock. This can be seen in Brazil, where huge areas of rainforest have been cleared to promote cropland and livestock breeding.

“During the last decades in Europe, croplands have been reduced due to abandonment and policy changes. At first sight, this is a positive land-use change, we want to have more rewilded areas and forests, but at the same time, agricultural goods are coming from somewhere else,” argues Karina Winkler, a postdoctoral researcher in the Land Use Change & Climate Research Group at the Karlsruhe Institute of Technology.

Marginal lands have been identified as a potential economic development solution and used for biobased feedstock cultivation with yields in mind. But this process has often gone ahead without due consideration for all the environmental implications of land-use change in marginal lands, such as soil loss through degradation processes like erosion or pollution caused by intensification and abandonment.

Lessons from Intensive Soybean Cultivation in Argentina

Soybean plantations were introduced in Argentina’s north-west La Pampa region in the 1970s. A decade later, the country had become the world’s top soy oil exporter and one of the biggest exporters of soymeal (oilcake and other solid residues from the extraction of soy oil). Nevertheless, yields remained low compared to countries such as the United States and Brazil.

In response, Argentina pushed for agronomic reforms and introduced genetically modified crops like the transgenic Roundup Ready (RR) soybean, which has an increased ability to withstand herbicides. The country also increased national fertilizer production for more intensive cultivation. In the 1990s, zero-till farming technologies were introduced

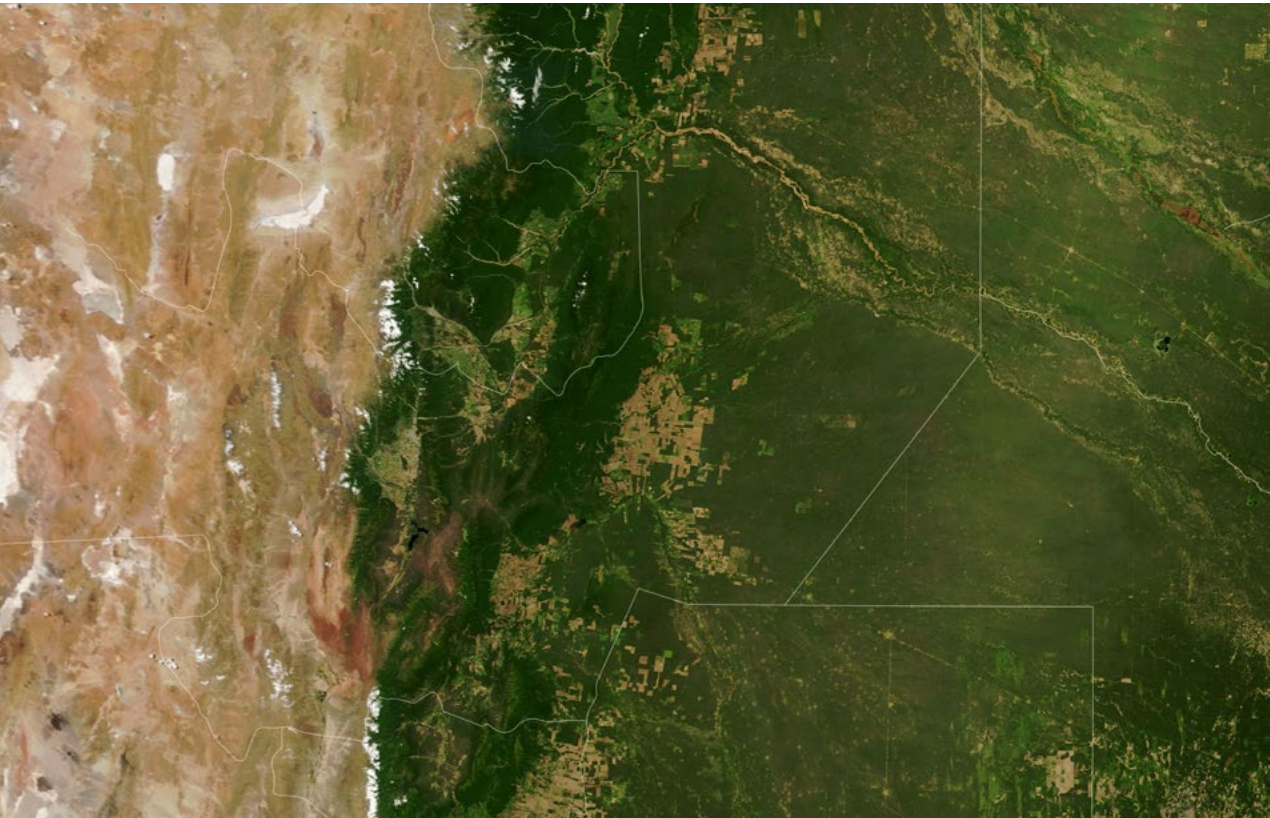
to extend the cultivable land to areas previously considered marginal land.

However, genetically modified soybean production and zero-till techniques carry many negative environmental effects as they depend on herbicides.

The use of pesticides like Endosulfan and herbicides like glyphosate poses a threat not only to human health but also to soil quality as they increase desertification and degradation. Intensive large-scale soybean monoculture also causes extreme soil exhaustion, affecting the overall soil health and requiring increased fertilizer use. In the case of Argentina, data shows that the nitrogen balance has been highly affected by the use of synthetic fertilizers, with most areas under soybean cultivation going through a substantive net loss of nitrogen, which gets into seed exports and leaches into the soil.

The introduction of soy crops and the agricultural expansion in Argentina were done at the expense of clearing large areas of flat and semi-arid forest land in the Dry Chaco eco-region. It resulted in soil degradation in the cultivated area. Between 1972 and 2011, it is estimated that 2.7 million hectares (ha) of the Dry Chaco Forest were converted to crops or grazing land. This is the largest source of carbon emissions from land-use change in the extra-tropical southern hemisphere.

Argentina is highly dependent on its agriculture sector and moving away from soy production and exporting is a considerable challenge. As of 2022, Argentina was the 4th largest producer and exporter of soybeans in the world and the top exporter (\$8.63B) of soymeal.



Gran Chaco Forest 2000



Gran Chaco Forest 2019

Biomass for Energy Production in Lithuania

Another example of mass land-use change took place in Lithuania, where rural depopulation accelerated following its independence during the collapse of the Soviet Union. This resulted in land abandonment, especially in areas with low agricultural yields and productivity.

Between 2000-15, bioenergy feed-stock extraction in the Baltic country almost doubled, with demand mainly coming from the industry and energy sectors. Lithuania clears huge amounts of forest ha destined for biomass for energy production, which translates into enhanced carbon emissions, and many other ecosystem damages amid a wider national strategy to move away from its dependence on natural gas imports from Russia.

Some studies suggest that the removal of plant nutrients through intensive harvesting of forest biomass could be compensated by recycling forest biomass ash to the forest. However, the rest of the benefits of having trees, in terms of habitat, wind breaks and other resistance mechanisms to extreme weather events factors, and the effects on soil, would never be compensated. Burning biomass to produce energy is not an efficient process and it results in CO₂ and N₂O emissions.

Biomass is often touted as a renewable energy source, yet its sustainability hinges on proper management. Improperly managed biomass, particularly from wood, can release significant carbon emissions – up to four times more than gas and one and a half times more than coal. In a worst-case scenario, biomass production involves undocumented plantations with unsuitable tree species, leading to unmeasurable carbon sequestration. Harvested wood may be burned inefficiently and exported, exacerbating environmental impact.

Conversely, an ideal scenario entails sustainable timber plantations on re-purposed land, employing the biomass cascade concept to ensure carbon remains sequestered in primary uses, with only by-products utilized for local energy production. This approach represents a truly sustainable and renewable energy solution.

“An intensive bioenergy production cannot be sold as renewable; it is a lot of money-making for the industry as well. That is what happened in the Baltic countries. It is an easy and known solution to contribute to new policy goals, but we should focus on other renewable energy sources,” explains Winkler, lead author of a 2023 report published by Nature.

Besides Brazil, Indonesia, Malaysia, Argentina and Lithuania, there is no shortage of global and European examples of how marginal lands have been misused in the past and present, but do we have any positive references?

New Farming Schemes and Land Management Practices

When it comes to forests, solutions include reforestation, afforestation, altered forest management practices (fire and pest management), and altered consumption patterns.

“We need to manage our forests better; we need to plant now the trees that will withstand climate change in the next 50 years. We know temperatures will change, we will have more forest fires, droughts, etc., and most of the forests that we have now are used to a different climate. There are very important management decisions coming up,” states Christian Holzleitner, Head of Unit of Land Economy and Carbon Removals, at the EC Directorate-General for Climate Action (DG CLIMA).

Forests sit on both parts of the equation. They are part of the problem, as deforestation releases large amounts of CO₂ that had been absorbed and stored over time, and they are part of the solution, as terrestrial ecosystems absorb nearly 1/3 of the total anthropogenic emissions.

To combat land degradation and promote carbon storage in agriculture, practices like converting cropland to fallow, using catch crops and conservation tillage, and adopting precision, regenerative, and organic farming methods are crucial. However, incentivizing farmers to transition to these approaches is paramount.

Preserving peat-forming wetlands is also essential, as they serve as significant carbon sinks, but transitioning these areas to new regional economies presents challenges, particularly in fertile soil regions reliant on intensive agriculture.

Biomass cascade concept

Biomass cascade is defined as a resource-efficient and circular use of biomass. It involves using biomass for the higher added value first, for example, bio-products like furniture or construction materials, and only using the resulting powder or pellets for energy production.

“We need to plant now the trees that will withstand climate change in the next 50 years.”

– Christian Holzleitner, Head of Unit of Land Economy and Carbon Removals, at the EC Directorate-General for Climate Action (DG CLIMA)

Encouraging mixed land uses like agro-forestry and Agri-PV systems, and avoiding intensive forest exploitation can support biodiversity, bioenergy, and food production. Some of these initiatives are gaining traction in Europe at national and local levels. Spain set up the first national registry of carbon footprint, offsetting and CO₂ removal, through which private biomass companies officially certify the additional carbon they store, so other companies can buy it, and they can mobilize investments. In France they created the so-called Label bas-carbon, that presents several soil management methodologies.

The EU strategy is looking to scale up these initiatives and make them attractive for farmers and land managers. The revised Land use, land use change and forestry (LULUCF) Regulation, presented in April 2023, puts forward two phases. From 2021 to 2025, the EC proposes to compensate land-use emissions by at least an equivalent amount of accounted removals. In a second phase from 2026 to 2030, it sets a target of 310 million tons of CO₂ equivalent removed by 2030 through binding net removal national targets for Member States, which would represent a 15% increase in removals compared to today.

“It is a very ambitious, but realistic target. We need to see more measures by member states through public and private money,” emphasizes Holzleitner. “We do not do this only for the public climate interest, but it is really for the sustainability of our whole bioeconomy.”

The EU also encourages the cascading use of biomass in its Forest Strategy for 2030, adopted in July 2021 as part of the EU Green Deal. It aims to improve monitoring and decision-making around forests and provide better advice and financial incentives for forest managers to adopt more sustainable pathways.

“Using wood instead of fossil fuels could be seen as a mitigation option, but care must be paid not to over-harvest because this would negatively affect the forest sink. Or, if you afforest millions of ha, even marginal lands, for biofuel production or even to restore the CO₂ sink, then attention must be paid to avoid displacing emissions and moving the problem somewhere else, creating an indirect land-use change because these lands were previously used for food or feed,” concludes Giacomo Grassi, Senior Scientific Researcher at the Joint Research Centre (JRC) of the European Commission (EC). ●



Raising Bio-Based Industrial Feedstock in Marginal Lands

MarginUp! is developing sustainable and circular value chains to produce bioproducts and biofuels from natural raw materials grown on marginal lands. By introducing climate resilient and biodiversity-friendly non-food crops on marginal and low-productivity lands, MarginUp! will increase farming system resilience, enhance biodiversity, and promote stakeholder participation.

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