EU CLIMATE PACT AMBASSADORS:

FOR A SUSTAINABLE WORLD

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Various Authors

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EU Climate Pact Ambassadors: For a Sustainable World

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Acknowledgments

This book is the result of a collective effort that would not have been possible without the support and collaboration of many dedicated individuals and institutions committed to sustainability and environmental protection. We extend our deepest gratitude to the Climate Secretariat of the European Union, whose leadership and vision have been instrumental in advancing environmental initiatives across Europe. Their steadfast dedication to addressing the climate crisis has inspired countless individuals and laid the groundwork for this shared endeavor.

Our sincere thanks also go to the European Climate Pact. This initiative has not only provided a powerful platform for climate action but has also brought together individuals from diverse cultures, ages, and disciplines in a common cause. The Climate Pact has demonstrated the power of collaboration and citizen commitment in building a sustainable future, and we are honored to be part of this transformative movement.

To our fellow Climate Ambassadors, to whom this book is dedicated, we express our profound gratitude for your passion, tireless efforts, and determination to create a better world. Each of you has brought a unique and essential perspective to this project, enriching these pages with your knowledge, experience, and commitment. The diversity of voices within this book reflects the vast and complex nature of our shared challenge, as well as the hope we share in overcoming it together.

To all who believed in this mission and contributed in various ways to the creation of this book, we extend our heartfelt thanks. May this effort mark only the beginning of a path of continuous collaboration, innovation, and actionin our pursuit of a more just and healthy planet for all.

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INTRODUCTION

In an era marked by unprecedented environmental challenges, the collective call to action has never been more urgent. "Climate Ambassadors: For a Sustainable World" emerges as a beacon of hope and a manifesto for change, uniting voices from diverse sectors in a shared mission to safeguard our planet for future generations.

This book represents a key initiative by the volunteer organization of the European Climate Pact Ambassadors, aimed at fostering environmental outreach and awareness. By bringing together ambassadors from all regions of Europe, the text celebrates and highlights the diversity and richness of approaches and experiences converging in the Climate Pact, underscoring the significance of this heterogeneity in building a greener and more sustainable Europe and world.

As we navigate the complexities of climate change, biodiversity loss, and environmental degradation, this book serves as a critical platform for knowledge, perspective, and inspiration. Our distinguished ambassadors—leaders, scientists, activists, and visionaries—have come together to illuminate the multifaceted nature of the ecological crisis and chart pathways toward a more sustainable and equitable world.

Each chapter on these pages is a testimony to the depth of understanding, wealth of experience, and fervor of commitment our ambassadors bring to the climate dialogue.

From the severe impacts of environmental pollution on human health to innovative solutions for sustainable living, the breadth of topics addressed offers a comprehensive and nuanced exploration of the global environmental landscape.

This book is not merely a collection of individual perspectives; it is a collaborative symphony of voices advocating for change, a chorus that resonates with the urgency of the present and the hope for the future. It is an invitation to engage, reflect, and act—a call to join hands across disciplines, borders, and ideologies in pursuit of a common goal: a sustainable world where respect for nature, human rights, and future generations prevails.

As you turn these pages, we invite you to embark on a journey with us through the changing realities of our planet, to be moved by stories of struggle and success, and to be empowered with the knowledge and passion shared here. May "Climate Ambassadors: For a Sustainable World" be more than a book; let it be a catalyst for transformation, a guide for action, and a source of hope in our collective quest for a better future.

The future we chart now, the generation of today, will be the people deciding tomorrow. Our example as parents, educators, scientists, leaders, activists, and visionaries now in the present of dissemination, diffusion, and the mission to raise awareness about climate change as ambassadors through these pages will aid in understanding the past and its challenges for the future leaders, teachers, scientists, and activists who will follow us with more innovative actions, more committed and united in one purpose: the preservation of the planet.

Rosmel Rodriguez and Isabel Silva

1. Climate Change, a definition of a tremendous liability for the planet's environment, and so, for our world

Rogério Ivan

Biliškov Nikola

Our planet's environment... this is an incredibly rich vast realm and a complex ecosystem wherein the echoes of climate change do constantly impose their influence. Its main impacts are causing, each day, major and growing concerns all over the world.

We will be embarking on a journey here overviewing its main impacts on and to the environment.

The concept of climate change is now increasingly becoming more familiar to most people worldwide due to media coverage and the growing number of victims experiencing its environmental consequences. Not long ago, those familiar with it were mainly found within scientific communities, among academics, students, or activists.

According to the United Nation's UNFCCC, climate change consists of "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods".

It is correct to say, though, that the phenomenon of

climate change itself is generally a natural occurrence that has always been present on Earth, caused by a nonlinear dynamic, constant adjustment and by the interaction of several uncountable mutually coupled elements on Earth that together contribute for the creation of different climate patterns along the planet in different regions, that are continuously being adapted to every new natural circumstances and natural changes.

Climate patterns play a crucial role in shaping biodiversity. The existence of diverse species of living organisms, both animals and plants, can be attributed to their varied adaptation of capabilities to the local environment. Every local environment, in turn, is intricately shaped by the specific climate of the region, thus creating a harmonious natural cycle.

The global multi-ecosystem, with its perfect balance, operates in a delicate equilibrium. Any slight change within this complex system sets off a chain of events, leading to bio-adjustments and adaptations aimed at restoring the natural balance, a phenomenon commonly referred to as natural evolution.

The current rate of actual changes is causing a rapid loss of biodiversity, and this is consequently leading to extinction thousands of species, also to disruption of natural cycles, degradation of soils, resulting in countless other social and economic consequences.[i]

Nevertheless, the nature of actual climate change cannot be understood without considering the Human's impacts and influences, which became predominant and very intense particularly due to the constant pursuit of the economic growth.

The current economic models are all based on consumerism, which requires extraction of more and more natural reserves and resources, more and more raw materials, and more and more energy, all to process and produce goods, to increase trade and selling, to distribute them to any corner of the world.

For the last 250 years, but impressively over the last 50, the major drive of society and education has been to produce product value and profit, and this has been made by exploiting the environmental and social resources, requiring an increasing number of intensive industries.

Over-exploitation of natural reserves results in an imbalance of environment, by destroying natural ecosystems, biodiversity, microorganisms, soil, and oceans, and therefore by blocking natural cycles like life-supporting water and carbon cycles. Seriously degraded at so fast pace, they do not have time to recover, to bio-adjust, adapt, and rebalance the local climate pattern. Consequently, biological species and other environmental factors are unable to successfully adapt to them.

As a cornerstone of human society, agriculture is facing significant challenges due to climate change. Changes of precipitation patterns, temperature rise, and extreme weather events hinders growth, reduces crop yields, and causes massive losses. This leads to issues such as food insecurity, increased risk of malnutrition, famine and ultimately to conflicts.

The costs associated with the loss of thousands of different species can be scrutinised. A critical example is the decline of populations of pollinators, most prominently of bees[ii] and, coupled with this, loss of pollination, aggravated by climate change in a vicious cycle.

The loss of microorganisms in soils, crucial regulators of soil fertility, must be added to this. This disruption accelerates desertification, enhancing agriculture losses, as well as natural wildlife in life-chains that sustain ecosystems.

Additionally, climate change directly impacts human health. Rising temperatures can exacerbate heat-related diseases, while air pollution can contribute to respiratory problems. Additionally, it increases the risk of vector-borne diseases, such as malaria and dengue fever.

In the oceans, the rising temperature is destroying massive extensions of coral reefs, that are existentially extremely sensitive to minimal variations of sea temperature. Coral reefs hold and support enormous ecosystems. Their biodiversity, consisting of millions of living species, maintain enormous quantities of carbon within its natural cycle and out of the atmosphere.

Additionally, several other consequences resulted from the climate change. During the last years, a continuous significant increase of frequency and intensity of extreme weather events, like unprecedented heat waves, storms, rainfall bursts followed by long and catastrophic droughts, long and devastating intrusions of polar air in winter and spring months are clearly evident on the so-called Global North, which until recently was largely immune to the consequences of climate change. For example, the extreme power and destructiveness of storms that more and more frequently hit countries of the Global North by discharging their destructive energy. In recent years Europe witnessed several tornadoes, which, until recently, were completely unusual in this region. Indeed, it seems that unusual and unpredictable weather is a “new normal” in this age of climate change.

Obviously, these rapidly changing conditions dramatically affect all the entire environmental components. Generally, wildfires are causing more and more destruction throughout the EU, especially in Mediterranean countries, which are particularly affected.[iii] Natura 2000 sites were hit hard, with the total burnt surface in these protected areas reaching the highest amount mapped in the last ten years. As for 2023, the EFFIS portal reports that in this season the wildfires are in some extent connected to the serious drought.[iv]

Globally, the UN estimates that current climate change is causing the displacement of 21 million people per year. In addition, climate change is causing water scarcity and food insecurity. These problems are particularly acute in developing countries of the so-called Global South.

In general terms, due to all the above-mentioned damage, climate change significantly affects the global economy. However, a lot of material damage, but also mental pain cannot be fully expressed in monetary amounts. It includes suffering and grief of communities, which are losing habitats, especially in protected areas, which further worsens the already alarming state of biodiversity.

Due to the large fires that devastated large areas of Portugal in 2017, six young people sued a total of 32 countries (among them all 27 EU member states) to the EU Court of Human Rights for failing to do their part to avert climate catastrophe.[v] They decided to do so because their physical and mental health is already being harmed by the impacts of climate change and unless countries, including European countries, adopt much steeper greenhouse gas emissions reductions urgently, these impacts will worsen dramatically over the course of their lifetimes.

It doesn't require special powers of foresight to foresee an increasing number of similar lawsuits in the near future. Conceptually, these actions call for introduction and implementation of new legal and jurisprudential concepts, such as rights of nature, that describe inherent rights as associated with ecosystems and species, similar to the concept of fundamental human rights, giving nature a status of legal personality.[vi] This concept currently exists in legislation of at least 39 countries of the world, from local to national levels, in the form of constitutional provisions, agreements, statutes, regulations and court decisions. It would be desirable for the EU to consider introducing this into its legislation.

Climate change and its devastating effects on the environment, and the creation of completely new circumstances on a personal level are the cause of incalculable losses that cannot be expressed in numbers but must not be ignored. The environmental damage can be directly anthropogenic, which was done by extractivist projects and by development of the infrastructure for distribution and final use of fossil fuels. Being directly visible, these damages often cause a direct opposition by the people. The other category of damage is the response of the climate and ecological system to new conditions. This category of damage, often vaguely connected with climate change, thus making it a subject to various tendentious relativizations, which are mostly conditioned by profit-driven short-term interests. Exposed to these damages, makes the people feel powerless, and their prevention is the subject of political negotiations at the highest, largely inaccessible international levels, the results of which are mostly disappointing. The consequence is a deep sorrow and pain, each of us experiencing in a personal way. Each of us has our own stories about climate change and the devastation of our own environment, the places where we grew up, the places we care about the most. This deep

pain speaks completely subjectively about the disappearance of singing birds, the loss of habitat, about the environment that we should know very well, but has changed beyond recognition. We must share and exchange these stories. Mutual understanding, stemming from the fact that we all lost a lot, are the seeds of caring for each other and the much-needed solidarity.

It is completely impossible to enumerate all examples of personal losses due to environmental degradation. One of the examples is typhoon Haiyan, one of the strongest cyclones on record, which hit the Philippines in the summer of 2013, leaving a havoc behind. On that occasion, Joanna Sustend was left without her family and closest relatives, pushing her to take action. In a conversation with Canadian author Geoff Dembicki, she precisely addressed her loss to oil companies, which actively spread denial-feeding lies about climate change: “If they acted in a way that’s favorable for the planet, for the people, if they diverted their financial and technological capacity into cleaner sources of energy, we wouldn’t be experiencing climate crisis. And my family would be probably still alive.”[vii]

Imbalance of glaciers is well documented, but for most of us they are very far away, many of us will never even set foot on them. However, they are a crucial source of freshwater, so their retreat entails very significant consequences for all of us. But we also should be aware of communities which are directly affected by their collapse and related consequences. One of the recent examples is the rapidly vanishing glacier Quelccaya in Peruvian Andes. The very survival of communities which live under this glacier depends critically on freshwater from this glacier, and its retreat forces them now to leave their millennial hearths: “Without the ice cap, without water, we cannot live. It will affect, above all, our children, and grandchildren. It is they who will be affected the most by

climate change."[viii]

Rising sea of the oceans now engulfs entire island states, especially in the Pacific. „We are sinking", said Simon Kofe, Tuvalu's foreign minister, who gave a speech to the United Nations climate conference 2022 in Glasgow literally standing knee-deep in seawater to clearly illustrate how his low-lying Pacific island nation is on the frontline of the climate crisis.[ix]

The cruel reality is that the impacts of climate change are not limited to distant regions anymore. However, all those wonders of nature that have disappeared are important to us, our lives are empty without them. Seasons change with a new dynamic, which brings great uncertainty into our lives. The storms of our grandchildren[x] have already caught up with our generation, warning us that the rate of changes is much greater than those predicted by science. We are afraid, because every new, unprecedentedly intense storm screams at us that the window for the necessary climate action is closing faster and faster.

Obviously, stories about destruction are also globally spread. We must hear and understand them. On the other hand, the inherent psychological bias makes us mostly responsive and sensitive to local stories. It is thus of crucial importance to receive and exchange both global and local experience, to gain not only a full insight into the full spread of damage due to climate change, but also to understand the global context of local environmental destruction.

Clearly, global climate-related stories reflect deep environmental grief everywhere. But what do these stories about suffering and loss, deep injustice, environmental racism, and other aspects of climate disaster have to do with us? How are the local examples, connected with global stories? To answer these questions, we all must understand the deep

interconnection of all the elements of the global ecosystem, which is complex. One of the fundamental properties of complex systems is their inherent nonlinearity, reflected through tangled feedback loops of causes and their effects. Thus, events in one part of that system can greatly affect what happens in distant, seemingly unrelated places.

What is happening locally must be read as an echo of all these global changes. However, this global disaster should not be read as the cry of the Earth, because from this side it is only an effort of the ecological and climate system to establish a new balance, to reach a new state of minimal potential energy.

What is really happening is an echo of the suffering of people, who are losing everything they care about. We must learn to listen to these stories. Because they are stories about ourselves.

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2. Climate change and its social, political, and economic effects

Bruno Lisboa Diotallévy

We are all lucky to inhabit a planet full of life and exuberant natural beauty. In the history of Planet Earth, it is nothing new that humans are recent residents, and only for a short time we have been part of this intense journey of transforming airs and landscapes that this planet has always experienced. And it was more than 4 billion years and thousands of transformations in our atmosphere that resulted in the moment that allowed life to flourish and multiply, in a wonderful and inspiring explosion of biodiversity.

Along with the evolution of species, humans developed the ability to study themselves and the nature to which they belong. Science continues to evolve and today we have more information than ever at our disposal about how life, and its balance, works on this small, big planet. This precious balance and the insistent and creative evolution of nature has allowed humans to understand global climate cycles, which has enabled us to carry out agriculture, the domestication of animals, the control of electrical energy, safe transportation and the creation of civilizations and cities around the world. Human intelligence has brought technological marvels and thousands of amenities and comforts, as well as societies richer in arts and cultures, more fun with music, more thought-provoking literature and with the most delicious foods, seasonings, and recipes.

However, our rich powers of analysis and evaluation, fruits of our unique evolution on this planet, are presenting alarming results regarding the consequences of the impact of the transformation and growth of the human presence on Earth. The impact of our creations and current global systems of food, energy, transportation, industrial production and health are causing alarming damage to the complex climate balance that exists within our

atmosphere. The same natural balance that allows us to live, learn, evolve, and contemplate is being seriously threatened by ourselves and our irresponsibility.

In this chapter we will reflect on the consequences of climate change in different global and social aspects and the connection of human action with this situation. And we will realize that the most drastic consequences will be, mainly, the result of the inaction of our nations and communities. The warnings and scientific studies shared for decades are also calls for help regarding the need for structural and behavioral changes that we need to make to avoid the most intense and irreversible outcomes of this planetary climate crisis.

According to the 6th IPCC synthesis report (Intergovernmental Panel on Climate Change) even if all countries in the world implement their climate commitments, this will probably not be enough to keep global warming to 1.5oC above pre-industrial levels, which means we need to seriously assess and understand the consequences of global warming.

Inconsequential consumption and excessive production, in addition to increasing exploitation of natural resources, also cause an increase in atmospheric pollution due to the emission of polluting gasses by industries and transport means, which

disproportionately intensify the greenhouse effect. Greedy and excessive production also accelerated the deforestation of forests, which caused changes in the climate and the absurd loss of nature's biodiversity. Animals and plants of different species are affected by global warming, impacts that will cause changes in their habitat and unfortunately generating the extinction of a significant number of species in our biodiversity. These attitudes linked to carbon dioxide emissions have caused a considerable increase in Earth's temperatures, which, together, cause what we call global warming and climate change.

But, what are the consequences of climate change?

First, we need to understand that climate change has a profound impact on several fundamental aspects of society, from people's health and well-being to economic and political stability. Mitigation and adaptation to climate change have become imperative to face these challenges and minimize their negative impacts in the short and long term.

The social consequences begin with an increase in the risk to human health and safety, extreme weather events such as heat waves, storms and floods, result in direct impacts on the health of vulnerable communities, including obvious risks to life, diseases related to heat and the proliferation of vector-borne pests. Extreme weather events, such as hurricanes, wildfires and droughts, can cause significant damage to infrastructure, agriculture and industry, resulting in substantial economic losses and increasing adaptation and recovery costs for governments and businesses.

An alarming consequence of extreme and unpredictable weather is mass migration and population displacement. Rising sea levels, which occur as a result of melting glaciers, can result in the flooding and submersion of coastal areas,

and as these areas are impacted and scarcity and disputes over drinking water worsen, entire communities will be forced to move to geographically safer areas and more habitable places and regions, thus aggravating the increase in environmental refugees and the possibility of armed conflicts. The warming of ocean temperatures has increased worryingly in recent decades at different depths, and in addition to the melting of polar ice caps, the greater presence of carbon dioxide makes the water more acidic, threatening marine life and coral reefs.

Climate change seriously affects agriculture and global food production chains, leading to shortages and rising product prices, resulting in food insecurity and hunger in many regions. A worrying reality that is strongly connected to global social injustice is environmental racism, a reality that is a reflection of socio-environmental inequality that affects vulnerable segments of marginalized communities, such as black, indigenous and poor people. These communities suffer the negative impacts of climate change and lack of access to natural resources, basic sanitation, housing and health structures, at the same time that privileged percentages of society enjoy greater environmental protection and better living conditions.

Unfortunately, the list of consequences of human negative environmental impact on the Earth's ecosystem is extensive and information about difficult predictions for the future is available to a large part of the population thanks to the internet and informative books like this one. But, despite a world of studies and scientific reports on the topic, we still find a large number of people alienated from the

current climate crisis, whether due to ideological partisan political issues that choose to ignore reality in exchange for a loyal electorate, or due to the force of alienation caused by social networks used to promote shallow entertainment in

search of monetization, or finally, and also the saddest reason, the great lack of democratic information about climate change due to the absurd social inequality that exists in our current civilization, which deprives thousands of people have access to reliable, quality information.

The importance of public opinion

Despite decades of difficulties and delays, the pressure from society and public opinion has led many governments and economic blocs to adopt stricter environmental policies, such as emissions regulations, renewable energy targets and incentives for clean technologies. We are in the age of democratization of information and it is noticeable that we are experiencing a global awakening in relation to the various consequences of climate change and in relation to the need for immediate and real action for climate stability and preservation of the biosphere and biodiversity.

The interest in the topic at various leadership summits around the world is a relief and an awakening of hope, despite political difficulties, selfish interests and excessive bureaucratic systems. Climate literacy grows every day in different ways within our societies, new information shared through communication and learning technologies results in new changes in habits, different visions and ways of consumption more connected with the circular economy, fair trade products, new clean technologies, recyclable products, interest in composting, organic foods and the energy transition.

Large and small companies are also revealing their alignment with the trend through innovative actions and with the need to adapt to climate change and greater responsibility with its products or services impact to the planet, creating and adapting new working sectors focused on sustainability and

environmental, social and corporate governance. There is an evident need to share with society as a whole the consequences of ignoring science, as we need everyone to be present in this process of change, which is proving to be the great common challenge of these generations living on planet Earth today.

We need society, governments and companies in coordinated, fair and equal alignment. It is essential for a society to be aware of the situation on our planet in relation to climate change caused and accelerated by our means of production and extraction that disregard the limits of our planet. The need for resources to adapt to the multiple realities of climate change is vital, such as building resilient infrastructure, a just transition to clean energy technologies, and developing sustainable business strategies.

And why do we need everyone on board?

Because we are living and planning a journey of transformation in the way we live today, envisioning tomorrow. A collective global task force is truly needed to ensure a fair and healthy future for the next generations, with the existence of resilient and innovative systems that allow human creativity to work positively with the possibilities that our intrinsic union with nature allows us. It has been millions and millions of years of connection and inspiration with the diversity of life on Earth that have brought us here, a story that deserves an impressive turn of action and purpose for the common good and to the future of this beautiful blue and green planet.

3. Nature-based Solutions for biodiversity and climate resilience

Jesús Iglesias

As a result of human activities, 68% of the world's wildlife populations have vanished in the last 50 years (1). Around 1 million species are in danger of extinction, many within decades, out of the approximately 8.7 million that are thought to live on Earth (2), including more than 40% of amphibians, almost 33% of reef-forming corals, and more than a third of marine mammals. Using the analogy of The Jenga Tower (3), if biodiversity was a tower, taking out 1 in 8 blocks could make it all collapse.

“Only life generates the conditions for life,” as the remarkable biologist Odile Rodríguez de la Fuente elegantly puts it. I grew up listening to her beloved father, Félix Rodríguez de la Fuente, a famous Spanish naturalist, while observing the eagles, herons, roe deer and trout, here in my Ribera del Duero (region of central Spain known for its wines). To protect nature, and hence ourselves, you have to love it first, know it, be in direct and frequent contact. Coexistence teaches us interdependence. Thus, reintroducing nature into cities is a necessary part of the equation, as is rural repopulation, since most of the natural heritage is in the countryside, its forests, rivers and fields. Aside from their inspiring beauty and inherent right to exist, ecosystems provide services that sustain our species on all levels, as well as all life on Earth: clean air and water, healthy food, a stable climate, but also well-being and even culture. In this context, Nature-Based Solutions (NBS) emerge as an effective, inclusive

and adaptive use of ecosystems to address societal challenges. As their name indicates, NBS they seek to work with nature, use it, but without abusing it, regenerating the ecosystem services it provides us to address major societal challenges such as climate change, the degradation of ecosystems and loss of biodiversity, food and water security, human health or socioeconomic development.

A global standard

In 2016, the International Union for the Conservation of Nature (IUCN) defined NBS as "actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature." In order to avoid inappropriate or misleading use of the tool (greenwashing), as well as contribute to a universal application (adapted to the local context) and a comparative analysis of projects, an extensive global consultation process culminated in 2020 with the publication of the IUCN Global Standard for NBS (4). The document establishes a solid framework to design and promote NBS, measure and verify their impact. It focuses on users, is dynamic, and facilitates practical application, learning and continuous improvement.

Given the magnitude of the challenges, solutions must reach a certain spatio-temporal scale. Thus, in the design phase, all dimensions and associated systems of the implementation site/area are considered: geographical, ecological, social, cultural and economic. It is the scale of the landscape, terrestrial or marine. Landscapes like the African Great Green Wall (5), a wall of international cooperation to combat desertification, empowering local communities against poverty and migration. PosbeMED (6), a trans-Mediterranean project, promotes reforestation and participatory management of Posidonia meadows, so as to protect beach-dune systems, absorb up to four times more

CO_2 than their terrestrial equivalents, and expand marine biodiversity. The Mesoamerican Reef Restoration Network (MAR-RRN, 7) foments the exchange of experiences and methodologies for the restoration of reefs and associated ecosystems (seagrasses, mangroves, dune and beach vegetation), among experts, governments and civil society, in the Caribbean. Coral reefs constitute a biodiversity hotspot, a natural barrier against hurricanes and tsunamis, contribute to food security through traditional fishing, and activate ecotourism. All these NBS at the landscape and ecosystem level fix carbon, build resilience against climate impacts, and regenerate the local economy by creating green jobs.

Time is also an essential variable. Just think about the climate crisis and how the period of effective mitigation action corresponds to the current decade (2020-30). This temporal urgency, derived from the exponential speed of our civilization's development, collides with the slow development of natural ecosystems (like the growth of a tree), highlighting the imperative to stop emitting. NBS complement, never replace, the necessary drastic reduction of carbon emissions and pollutants in general. The desired net zero emissions goals by mid-century should not be an excuse to continue burning fossil fuels, but rather a true horizon of opportunity towards a post-carbon world, in which NBS provide their full range of benefits for holistic and planetary well-being.

Biodiversity and resilience

Unlike other failed anthropocentric approaches, NBS result in a net gain or enhancement of biodiversity. The health of ecosystems depends on that of their species, in all their diversity and functional completeness (integrity), but also on the continuity of habitats (connectivity). Biodiversity, moreover, is the bundle of keys that opens adaptation pathways to some impacts of climate change. And I say some, because at the pace they are advancing there will be

no adaptation possible without urgent and drastic mitigation now. In other words, rewilding the world will give us biodiversity back, but it does not replace the change necessary to mitigate the climate crisis.

Resilience is the ability to adapt, but to achieve it you must reduce the threat in the first place. Trees will die if heat waves and droughts multiply, and with them the shade they give us, the water they retain, not to mention the oxygen they produce, the biodiversity they harbor or the carbon they sequester. Same with everything else. The Adaptation Fund (8), the famous positive conclusion of COP27 in Egypt in 2022, is nothing more than a mere mirage without a radical transformation of our collective behavior. Money is useless on a dead planet. While this North African climate summit in late 2022 emphasized the potential of nature itself as a climate resilience mechanism, the equivalent biodiversity summit - COP15 (9)- held in Montreal weeks later, underscored the expansion and reconnection of habitats for the viability of ecosystems, as well as the rights and vital role of indigenous peoples, as custodians of biodiversity throughout human history.

But we now live in the Anthropocene, humans we have affected most ecosystems. Dealing with this reality, the NBS approach proposes, on the one hand, conserving the remaining little-altered natural areas; and on the other, abandoning the current colonizing and extractivist paradigm for one rooted in coexistence and cogeneration of mutual benefits, that is (re)building mutually-reinforcing alliances between humans and other species. Biodiversity corridors that interconnect existing green and blue areas, both in rural and urban areas, illustrate this criterion to perfection. In Spain, this is the case of Vitoria's Green Belt (10), Santander's Green Ring Bay (11), or Barcelona's Green & Living Roofs (12) program.

Economic viability and the local economy

Sustainable human development requires economic systems that provide decent and lasting livelihoods. NBS incorporate this aspect via innovative business models seeking to ensure the project's viability in the long run, covering the total costs incurred. The impact lies in the ability to capture the value created (ecosystem services) through a diversity of revenue streams, with appropriate financing mechanisms, over light cost structures, equitably distributed among key beneficiaries and stakeholders.

A holistic view understands viability from the local economy scale: the business fabric and in particular small businesses, a pillar of employment and equity, under favorable conditions (legislative and fiscal frameworks), are capable of monetizing the benefits of NBS, while contributing to their care and maintenance.

It is an intuitive idea visualized in examples such as the renatured urban rivers emerging across Spain, creating areas of high quality of life around them, where people gather and socialize, thus paving the way for hospitality, sports or wellness businesses to flourish. For instance, the restoration project of the Cádiz marshes aims to capture the so-called blue carbon via business credits, in order to finance projects that stimulate the local economy, and preserve biodiversity and cultural heritage, such as the recovery of old artisanal salt mines, currently under replication throughout the Mediterranean basin via the MEDARTSAL program (13). Equally, the Algarbia in Transition network (14), brings together small agroecological producers and consumers in the Guadalhorce Valley (Málaga), to share and exchange in cheerful farmer markets with the help of a local currency: the Algarbe.

Democracy is experiencing low times, with a clear global

decline in both quality and extension. In its staunch defense let us remember its value for the greater good. In the words of Annie Leonard: “A healthy democracy is a prerequisite for a healthy environment.” Only one approach guarantees the ecological and fair transition of the economy: citizen governance or direct democracy. Let's analyze its implications in the management of the commons (climate, biodiversity, human rights), through Nature-based Solutions, in light of IUCN Global Standard.

Inclusive governance

As in any large initiative, the key success factor of NBS is achieving a high degree of involvement and empowerment of the stakeholders: the local community both as beneficiary and custodian (especially indigenous peoples), civil society organizing for human rights, administrations upholding the public interest, the business community with the key to the local economy, academia with scientific-technical knowledge, or the media with narratives of better futures. Truly transformative NBS, in fact, are undertaken by public-private or even public-civil partnerships.

The level of engagement depends on the degree of openness of the project, which is greater the more options for participation and cocreation among changemakers are made possible, and the sooner they begin along the timeline. Under these premises, added to transparency and inclusion in decision-making, true inclusive governance can take place, allowing for equitable sharing of the benefits. The city of Turin (Italy) constitutes a transformative benchmark in this regard, with its pioneering Regulation on Urban Commons (15).

Balance and tradeoffs

We live in a complex world, full of interdependencies. On many occasions we are forced to make decisions that involve tradeoffs and compensations. Hence, NbS

constantly seek balance between the achievement of their main objectives (addressing major societal challenges such as health or food security), the additional co-benefits they bring forth (wellbeing, equity), as well as their necessary economic viability, and the enhancement of biodiversity. The interrelationships among the different criteria of the IUCN Global Standard are made explicit in the design and especially the implementation phases. To this end, building fair and lasting consensus, based on flexibility and adaptability, remains crucial.

Likewise, the temporal dimension requires balance between short and long-term benefits, or the local and global scale of some NBS that contribute to addressing global challenges such as the climate crisis, but also intervene and generate direct changes at the local level, in which context they must be integrated.

One of my favorite NBS, an example like no other of citizen governance and balance, is the Malaga Urban Forest (BUM in Spanish, 16). A project born in the neighborhood’s social fabric, co-designed with the university, and with the support of the local small business association. It’s conceived to regenerate an old degraded industrial plot, in the heart of one of the most densely populated and with the least green areas districts in Europe; filling it with biodiversity, social life, climate resilience and local economy.

For six years, citizens have been advocating for the BUM project, the standard-bearer of a green and fair Málaga of which they can be proud. The blocking of the project by narrow private interests, highlights the imperative need for democracy, because the city belongs to everyone and not just an elite few. Institutions have to overcome their fear of managing public goods jointly with citizen platforms, especially in these cases where it is already happening, and it would simply suffice to lubricate the process. Just like nature

regenerates itself if given time and space, neighborhoods self-organize if given the opportunity.

NBS work with ecosystems, which are by nature complex, dynamic, interdependent and multi-scale systems. Consequently, the responses of these ecosystems to NBS interventions may be desired or not, planned or unforeseen, and therefore adaptation capacities must be generated from the start, by design. Likewise, throughout the project's life cycle, the evolution of the ecosystems, challenges, needs and levels of participation of the stakeholders involved, entail adaptive management so as to unleash continuous learning and improvement. To this end, SMART indicators together with simple, effective and collaborative impact measurement methodologies are quintessential, allowing us to assess the achievement of objectives, as well as the additional co-benefits generated, and act accordingly. In this sense, the Citizen Drought Observatory in Seville (Spain, 17) stands out in the way it leverages citizen science for a more effective and sustainable management of water resources and drought risk; through active and real public participation, as well as dialogue among science, politics and society.

Scale and networks

The true potential of NBS lies in their scale. To this end, they must be integrated into existing regulatory frameworks and, above all, materialize strategic plans on the ground. Traction starts by inspiration, as they become paradigmatic cases. In this regard, it's worth mentioning Enrique Salvo Tierra's comment on a beautiful photo of the Batán stream that now flows through Vitoria where there was asphalt before: "Paradigm!" The same applies to the renaturing of the Manzanares River (18) in Madrid, a mirror in which citizen-led projects such as Malaga's Guadalmedina River (19) and many others look at themselves in. We are undoubtedly talking about the power of translocal networks for the exchange and

replication of good practices.

Likewise, the road to impact passes by transdisciplinary and open legislative development, which enables the collective adaptation of legal tools to changing biophysical and social realities. The pioneering Popular Legislative Initiative of the Mar Menor (20) comes to mind. This people-led initiative has succeeded in granting full legal rights to this heavily polluted yet immensely valuable coastal saltwater lagoon in the southeastern Mediterranean coast of Spain, so as to ensure its existence and resilience, as a living ecosystem and cultural heritage site.

The IUCN Global Standard is therefore a robust tool, rendering NBS projects sound in terms of scale, impact on social challenges, biodiversity net gain, inclusive governance, economic viability, balance of tradeoffs, adaptive management, and alignment with strategies and regulatory frameworks.

A literary fable, in the form of a Letter to Mother Earth written by a wolf, places NBS in our hearts: "Humans, sisters and brothers, we do not compete, we coexist, as we have done for millennia. You need me, I need you. I control herbivore populations so that they do not decimate your crops or the banks of our rivers. You must protect the wild, our habitat. From mutual respect and understanding, together, we will move forward." That's just what the game-changing reintroduction of wolves in Yellowstone proved. The same happens with big cats, reindeer or bison, all bioindicators (marker species) of the health of their ecosystems, including human populations. Its symbology, embedded in ancestral traditions, makes its conservation a cultural challenge that excites and engages the public, quite like the various projects led by Rewilding Spain aiming at reintroducing large wild herbivores, but also some iconic predators like the majestic Iberian lynx, in the rural areas of the so-called "Empty Spain",

always working hand in hand with local communities and SMEs for their own benefit as well.

To take the leap of the Great Transition, to regenerate the forest and the sea, one with Nature we must be!

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4. Environmental Pollution and its Consequences Transboundary E-Waste, Social, Environmental and Governance Issues

Fadeke Ayoola

The escalating issue of electronic waste (e-waste) a form of environmental pollution with dire consequences has emerged as a pressing global concern. The term e-waste refers to discarded electronic devices and equipment, including computers, smartphones, tablets, and other electronic equipment "Electronic products are characterized by high metal complexity. Meanwhile, recycling industries are not fully aligned with this complexity, leading to losses of unique scarce metal resources" (Andersson et al., 2019, p. 1). "Heavy metals are of great concern due to their toxicity, mobility, and non-biodegradability in environmental media such as soil, water, and air" (Ouabo et al., 2019, p. 2). The annual generation of e-waste exceeds 50 million metric tons (Parajuly et al., 2019). This vast and rapidly accumulating waste stream poses a significant threat to environmental sustainability and human health, particularly in developing nations that often bear the brunt of improper transboundary e-waste management practices (Baldé et al., 2022). “Some of the major responses to the rising generation of e-waste have included the development of producer “take-back” legislation, technological innovations in recycling processes, and the formation of partnerships to facilitate the transfer of e-waste between the informal and formal recycling sectors,” (Lucier & Gareau., 2020, p.1). "Despite previous and ongoing efforts,

waste production, management, and e- waste transboundary movements are predicted to significantly grow with global social, environmental, and economic implications" (Thapa et al., 2022, p. 1).

A substantial portion of e- waste embarks on a perilous journey from developed nations to developing countries, where it frequently encounters environmentally detrimental and unsafe recycling processes (Forti et al. 2020). Baldé et al. (2017) describe these unregulated practices, which often involve rudimentary techniques such as manual dismantling and open-air burning, leading to the release of hazardous pollutants into the environment and posing serious health risks to workers and surrounding communities. Baldé et al. (2015) highlight the grave threat posed by the transboundary movement of toxic e-waste to non-renewable resources, especially precious metals and rare earth elements.

These valuable materials, essential for the production of modern electronic devices, are often lost or irretrievably dispersed during uncontrolled e-waste recycling, depleting finite resources and

undermining the principles of circular design (Lucier & Gareau 2020).

Moreover, improper e-waste management contradicts the core principles of circular design, a sustainable approach advocated by Mínguez et al. (2021) that minimizes waste generation and maximizes resource recovery. However, as a result of improper management, “many scarce metals risk being lost by entering waste incineration or landfills, or dispersed in other recycled materials,” (Andersson et al., 2019, p. 1). Circular design principles advocate for the extension of product lifecycles, the use of environmentally friendly materials, and the efficient recovery and reuse of resources for electronics such as computers, smartphones, tablets, and

other electronic equipment. Over the last decade, many companies in different sectors in Europe have opted for circular models through channels of circularity involving an extension of product use, recovery of resources, and platforms for sharing, Mínguez et al. (2021).

Addressing the e-waste crisis requires a multi-dimensional approach that encompasses international cooperation, enhanced regulations, and sustainable e-waste management practices. Developed nations must take responsibility for the e-waste they generate, ensuring its proper disposal and recycling within their borders. Simultaneously, developing nations require support and capacity building to establish sustainable e-waste management systems that protect human health and the environment while adhering to circular design principles.

2. Research questions

In this chapter, we address the following questions:

I. What conventions are in place to control transboundary e-waste?

II. What are the differences between conventions on transboundary e-waste?

III. What are the hazardous impacts of e-waste pollutants on human health and the environment?

IV. What is the EU's response to addressing transboundary e-waste?

3. Convention to control transboundary e-waste

Table 1: Timeline of Convention to Control Transboundary e-waste

Year	Event
Pre-1989	Unregulated transboundary e-waste from developed countries is shipped to developing countries causing environmental degradation and human suffering.
1989	Basel Convention was adopted to minimize and control the transboundary movement of hazardous e-waste.
1989-1995	Many low-income countries criticized the Basel Convention, arguing that the Basel Convention failed to recognize the plight of toxic dumping in developing countries, particularly African countries as well as the environmental pollution caused by transboundary movements of toxic e- waste.
1995	The Basel Convention was amended ("the Ban Amendment") to prohibit the export of hazardous waste from developed countries (the Organization for Economic Cooperation and Development (OECD), the European Union (EU), and Liechtenstein) to developing countries.
1998	Although the Basel Ban Amendment was adopted it was not yet ratified. Many African governments argued that the Basel Convention was flawed because no part of the treaty addressed trading radioactive waste to low-income countries. Bamako Convention entered into force. It was an extension agreed upon by African countries to officially prevent the importation of all kinds of hazardous and

	radioactive waste to the African continent.
2019	It took twenty-four years for the Ban Amendment, adopted in 1995 to enter into force and become international law on 5th December 2019.

Table 2: Differences between the Basil Convention and the Bamako Convention

	Ratified / entered into force	Membership	Type of waste prohibited	Liability	Criticism
The Basel Convention	1989	All Countries	All hazardous waste	No specific liability for victims of hazardous waste	
					Too weak and requires strengthening
Bamako Convention	1998	African Countries Only	All hazardous waste as well as all radioactive wastes and all forms of ocean disposal.	Requires parties to establish a liability regime to ensure that victims of hazardous waste damage are compensated.	
					Lack of enforcemen

					t and legislation within African Countries on e-waste. Also, not all African states have ratified the Bamako convention
The Basel Convention (Ban Amendment)	2019	All Countries	All hazardous waste	The Basil Protocol on Liability and Compensation regime was adopted in 1999 but has not yet been ratified or enforced	Increases illegal hazardous e-waste trafficking
(UNEP 2018; 2019)					

Table 3: Hazardous impacts of e-waste pollutants on human health and the environment.

E-Waste Pollutant (Heavy Metals)	Source/Route of Exposure	Hazardous Impacts on Human Health	Hazardous Impacts on the Environment
Mercury (Hg)	Ingestion, inhalation, and dermal contact	Stunted foetus growth; contaminant	Contaminates air, dust, soil, plants, and surface

		s are absorbed in the mother's milk. Upsets the kidneys, immune system, and central nervous system. Mercury can contaminate the human food chain through, soil, ground, and surface water. Harms the reproductive organs, central nervous system, and respiratory system and damages the kidneys and lungs.	and groundwater.
Lead (Pb)	Ingestion, inhalation, and dermal contact	Can have adverse impacts on the development of the brains	Contaminates air and dust; causes soil acidification; and leaches

		of children; damage the circulatory system; and hinder the performance of enzymes in the human body.	into ground and surface water.
Cadmium (Cd)	Inhalation and ingestion	Causes irreparable toxic effects on human health; can accumulate in the kidneys and liver and leads to neural damage; causes cancer, the softness of the bones, and severe pain in the spine and joints.	Contaminates air, dust, water, soil, and plants (particularly rice and vegetables).
Arsenic (As)	Ingestion, inhalation, and dermal contact	Extended exposure to arsenic causes skin diseases,	Contaminates air, soil, water, and plants.

		lung cancer, and damage to the nervous system. Also causes skin alterations and leads to an increased risk of diabetes.	
Zinc (Zn)	Ingestion and inhalation	Leads to cramps in the stomach, skin irritations, nausea, and anaemia, and can severely damage the pancreas.	Contaminates air, dust, soil, and surface and groundwater
Lithium (Li)	Ingestion, inhalation, and dermal contact	Causes kidney disease, coughing, and burning sensation; Difficulty breathing, shortness of breath, sore throat,	Contaminates air, dust, water, soil, and plants

		redness of the skin, skin	
		burns, pain, blisters, and redness in the eyes.	
Beryllium (Be)	Ingestion and inhalation	Causes lung cancer, which can destroy other organs, including the heart. Also causes pneumonia.	Contaminates air, soil, water, and plants
Chromium (Cr)	Ingestion and inhalation	Leads to asthmatic bronchitis and liver and kidney disease and can cause lung cancer.	Contaminates air, soil, water, and plants
Nickel (Ni)	Ingestion, inhalation, and dermal contact	Causes carcinogenic lung embolism, respiratory failure, birth	Contaminates air, soil, water, and plants

		defects, asthma, and chronic bronchitis Also leads to skin allergies.	
Barium (Ba)	Ingestion, inhalation, and dermal contact	Causes elevated blood pressure, stomach irritation, changes in heart rhythm, weakness of the muscles, nerve reflex changes, and swelling in the brain, liver, and kidney.	Contamina tes air, dust, and water
Aluminum (Al)	Ingestion, inhalation, and dermal contact	Causes poor metabolism and has impacts on the nervous system and foetal development .	Contamina tes air, dust, and water
Cobalt (Co)	Ingestion,	Causes	Contamina

	inhalation, and dermal contact	vomiting and nausea, asthma and pneumonia, vision problems, heart issues, thyroid damage, and hair loss.	tes air, dust, water, soil, and plants
Bismuth (Bi)	Ingestion, inhalation, and dermal contact	Damages kidneys and causes severe ulcerative stomatitis, feelings of bodily discomfort, excessive secretion of albumin and other protein substances in the urine, diarrhea, skin irritation, and serious exodermatiti s.	Contamina tes air, dust, water, and soil
Antimony (Sb)	Ingestion, inhalation, and	Exposure can cause	Contamina tes air,

	dermal contact	damage to the lungs, heart, liver, and kidneys. Also causes eye irritation and hair loss.	dust, water, and soil
Gallium (Ga)	Ingestion, inhalation, and dermal contact	Prolonged exposure to gallium chloride can lead to throat	Contamina tes air and water and
		inflammatio n, breathing difficulties, and chest pain.	produces toxic fumes
Indium (In)	Ingestion, inhalation, and dermal contact	Damages the heart, liver, and kidneys and can lead to cancer.	Contamina tes air, dust, water, and soil
Copper (Cu)	Ingestion, inhalation, and dermal contact	Irritates the eyes, nose, mouth, and throat. It also leads to severe dizziness, headaches,	Contamina tes air, dust, water, and soil

		migraines, stomach aches, vomiting, and diarrhea.	
Germanium (Ge)	Ingestion, inhalation, and dermal contact	Causes severe cough, abdominal cramps, burning sensations, redness of the eyes and skin, and body pain.	Contamina tes air and dust
Selenium (Se)	Ingestion, inhalation, and dermal contact	Causes hair loss and nail brittleness. It also causes cardiovascul ar, renal, and neurological abnormalitie s.	Contamina tes air, dust, water, and soil
Iron (Fe)	Ingestion, inhalation, and dermal contact	Excess exposure or ingestion can damage the liver	Contamina tes air, dust, water, and soil
Molybdenu m (Mo)	Ingestion, inhalation, and	Exposure can cause	Contamina tes air,

	dermal contact	liver dysfunction pain and swelling in the joint areas.	dust, water, and soil
Tin (Sn)	Ingestion, inhalation, and dermal contact	Causes severe headaches, eye and skin irritations, dizziness, stomach aches, severe internal sweating, shortness of breath, and frequent urination.	Contamina tes air, dust, water, and soil
Dioxins Polyaromat ic Hydrocarbo ns (PAHs)	Ingestion, inhalation, and dermal contact	Exposure causes cancer. Mutagenicit y and teratogenicit y can also occur.	Are often released as combustio n by-products into the air, dust, soil, and plants
Brominated flame retardants (BFRs)	Ingestion, inhalation, and dermal contact	Affects thyroid function and causes cancer in humans.	BFRs in landfills. Organic pollutants in the air and

		Also affects the reproductive and immune systems and disrupts functions of the endocrine system.	sources of dioxins in the environme nt
(Andeobu et al., 2023, pp. 11-12)			

1. Environmental pollution and consequences of exporting e-waste pollution.

Based on evidence from Tables 1, 2, and 3, the illegal dumping and mishandling of e-waste is a global scourge, poisoning the environment and endangering human health. From Africa's sprawling dumps to developing nations in Asia and Latin America, even parts of Europe, children and adults are forced to work in hazardous conditions, scavenging for precious metals like gold and copper amidst toxic fumes and chemicals.

E-waste harbours a deadly cocktail of toxins like lead, mercury, and flame retardants. Improper disposal through landfills or incineration unleashes these poisons into the air, soil, and water, contaminating ecosystems and food chains. Contaminated water and crops pose serious health risks to local communities, while valuable resources are tragically lost.

The consequences are dire toxic chemicals leaching into soil and water, poisoning ecosystems, and threatening human health. Workers and communities are exposed to hazardous materials, leading to respiratory problems, cancers, and birth

defects. Valuable metals like gold and copper are wasted when e-waste isn't recycled properly. Toxic chemicals enter the food chain, posing risks to consumers.

National, regional, and international governments need to Implement and enforce laws against illegal e-waste dumping and promote responsible recycling practices, particularly in developing countries and developed countries need to assist them in strengthening their e-waste management. Encourage proper e-waste disposal channels and invest in safe and sustainable recycling facilities.

Educate communities about the dangers of e-waste and empower them to make informed choices.

2. EU Case Study

2.1 The new EU Rules on E-Waste Shipments

Obsolete regulations and lenient enforcement contribute to the inundation of developing countries with e-waste, causing harm to both their environment and population. The European Union, a

significant exporter, is intensifying its control through more stringent regulations and the implementation of a dedicated enforcement initiative known as SWEAP.

The problem:

· The European Union is a major player in the growing global e-waste trade.

· Old, inadequate regulations leave destination countries vulnerable

· Environmental and public health risks abound The

solution:

· Revised regulations on waste shipments within the EU: Restricted to sustainable destinations exclusively.

· The SWEAP project: Training inspectors, boosting cooperation, stopping illegal dumping Progress so far:

· Conducted more than 11,800 waste inspections across 28 EU countries (2018-2020).

· 2,586 violations were uncovered, mostly paperwork errors, regulation breaches, and illegal exports.

3. Conclusion

The new EU Rules on E-Waste Shipments represent a crucial step towards addressing the pressing issues associated with outdated regulations and lax enforcement in the e-waste trade. Recognizing the European Union's significant role in this global trade, the implementation of more stringent regulations and the initiation of the SWEAP project demonstrates a commitment to curbing the adverse impacts on both the environment and the population of developing countries. These new stringent regulations on e-waste could guide other regions of the world on how to update outdated regulations and lax enforcement in the e-waste trade.

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5. Every drop counts: RAISING-AWARENESS ON WATER THROUGH education at different levels, the SDGs and eu commission recent policies

Juan Luis Muñoz Arbona

José Segarra Murría

Under the above-mentioned title, United Nations launched its “Water Action Decade 2018-2028” report, following some recommendations and outcomes from previous meetings at the highest international level to deal with a sustainable management of water. According to the UN World Water Development Report, back in 2022, groundwater was “central to the fight against poverty, to food and water security, to the creation of decent jobs, to socio-economic development, and to the resilience of societies and economies to climate change”. In what concerns Europe, according to the EU’s environmental programme Copernicus, European summer of 2022 was considered the hottest on record, with a drought that has been recorded as the “worst in 500 years”, in what scientists have considered as a “soil moisture deficit”.

Some key objectives of the mentioned ten-year resolution call for:

- the sustainable development and integrated management of water resources for achievement of social, economic and environmental objectives;
- the implementation and promotion of related programmes and projects; and the furtherance

of cooperation and partnerships at all levels to achieve internationally agreed water-related goals and targets, including those in the 2030 Agenda for Sustainable Development.

As we can see, Agenda 2030 has been somehow configured as a landmark in what regards a future sustainable management of water, as World Water Day future 2028 edition, on March the 22nd will show us (or not) progress on this issue that, back in 2016, prior to the 2018-2028 declaration, was considered for 3 years in a row, as the top 3 of global risks. Failing to respond effectively to these challenges will have devastating global effects.

On the other hand, global warming seems not only to be targeting drought in terrestrial ecosystems, but also in what concerns our oceans and sea management. Instead, it is plausible to highlight the UNFCCC Partnership on Water-Resilient Food Systems to support countries and non-state actors to integrate water and food systems management ahead of COP30 and to present the partnership's objectives over the next two years, although some critics remain on the SIDS states emergency. Small Island Developing States have been raising their voices, especially in the last COP28, as sea-level rise is affecting them in high numbers, threatening their livelihoods.

So, the water element is a two-sided coin, as it deals not only with life on land, but also with life below water. Agenda 2030 calls for a partnership for the goals in its Goal number 17, in close relation with others as Climate Action (SDG 13), Life Below Water (SDG 14) or Life on Land (SDG 15), among others. This represents an excellent opportunity to create accurate partnerships beyond scientific data. This paper aims to offer some insights of how to integrate water management in schools and in international programmes. The goal is the same as stated in the previous lines, to raise awareness on this key

issue, somehow underrated by the international community but whose data is alarming.

SDGs are really gaining traction in the educational field, where many organizations like Teach SDGs, based in Florida (USA), which has a partnership with United Nations, are spreading the 17 goals into education, mainly thanks to the voluntary initiatives from many teachers-Ambassadors working together within this organization all over the globe. "*There is no higher curriculum than The Global Goals: Working on real-world problems is beyond engaging. The sustainable development goals (SDGs) are global goals that allow us to student-centered approaches and curricular development*" said Juan Luis Muñoz Arbona, First Cohort Spanish Ambassador of the TeachSDGs +45k global movement of teachers and educators and EU Climate Pact Ambassador.

Besides, at other educational levels, as higher education, while attending the Implementation Plan of the Ocean and Water Restoration Mission of the European Commission, the degradation of aquatic ecosystems in Europe is a bad sign for the future of water management in this continent, primarily driven by three interconnected factors:

1.- Unsustainable Exploitation of Marine and Freshwater Resources:

Over 65% of protected marine habitats exhibit an unfavorable conservation status, and 79% of coastal seabeds are considered physically disturbed, mainly due to bottom trawling. Approximately 19% of the EU coastline is affected by permanent physical alterations in seabed habitats due to urbanization, port facilities, navigation, flood protection infrastructure, and land reclamation. Additionally, about 25% of the coastal zone experiences habitat loss due to the construction of wind farms, oil and gas facilities, ports, as well as the exploitation of fish, seafood, and minerals.

Dams and barriers disrupt the natural flow of rivers, posing significant pressure on about 20% of surface water bodies in Europe. According to the 2020 EU State of Nature report, the proportion of wild bird species with a poor or bad status increased to 39% between 2013 and 2018, with 63% of non-avian species showing a poor or bad status, of which 35% are further deteriorating, and only 15% of habitat assessments indicate a good state.

2.- Pollution Affecting the Aquatic System:

Pollution, including plastics and microplastics, nutrients, chemicals, and underwater noise, impacts the aquatic system from the source to the sea. Plastic pollution has multiplied tenfold since 1980, with 4.8 to 12.7 million tons ending up in the ocean each year, posing an increasing risk. Inadequate treatment of urban waste and sewage, along with stormwater overflows, is a major driver of point-source pollution. Agriculture is the main contributor to diffuse pollution, with significant nutrient and organic matter inputs into aquatic environments. Only 38% of Europe's surface water bodies achieve good chemical status, with mercury, PBDEs, and PAHs responsible for most failures. Marine biodiversity is also affected by air and water pollution from naval sources. Underwater noise, mainly from maritime traffic and impulsive sources, adversely affects the health of marine species and biological productivity.

3.- Human-induced Climate Change:

Climate change resulting from human activity is altering the physical and biological state of oceans, seas, and waters, disrupting their ecosystems. Increased carbon dioxide emissions and subsequent absorption by oceans lead to changes in water temperature, ocean acidification, and deoxygenation, affecting circulation, ocean chemistry, sea level rise, storm intensification, floods, and alterations in

the diversity, distribution, and abundance of marine species. Since the Industrial Revolution, ocean acidity has increased by 30%. Ocean acidification reduces plankton weight, dissolves calcareous shells, and harms corals. Both acidification and warming affect the availability and toxicity of various chemicals, generating cumulative effects of multiple stressors on organisms and ecosystems. River and lake temperatures rise, rendering them inhospitable for cold-water fish, leading to the formation of dead zones. Changes in ocean temperatures and currents caused by climate change disrupt climate patterns in Europe and globally, affecting living ecosystems, altering migration patterns, and causing habitat loss. Longer drought periods and more frequent intense rainfall events, as experienced in recent years, pose new challenges for freshwater management, with increased competition for available water resources. Climate change weakens the ability of the ocean and coasts to provide critical ecosystem services such as food, carbon storage, oxygen generation, and support for nature-based solutions for climate change adaptation, while changes in water bodies cause them to emit more methane. Additionally, damage to seabeds and the destruction of important marine habitats release more carbon into the atmosphere, accelerating climate change.

To restore the health of the hydrosphere and its essential functions and services, it is necessary to reverse its degradation. Achieving this requires a systemic approach to address all interconnected drivers, such as unsustainable exploitation, pollution, and climate change, as well as lack of citizen participation and insufficient knowledge, throughout the entire water system. These drivers and the solutions to address them are inseparably linked.

Therefore, education is and will be an essential part of the hydrosphere restoration process to improve knowledge and encourage active citizen participation. Here are exposed some

case studies showing how to address the above-mentioned causes and issues relating to water management. The first one relates to raising-awareness on the liquid element, through different workshops and initiatives in a VET Centre in Ceuta (Spain). The second one deals with an Erasmus+ initiative, addressing good governance and practices for students of all levels (including higher education) and water-related issues professionals.

Case study 1

The Vocational Education and Training Centre number 1 from Ceuta (Spain), under the coordination of the above-mentioned teacher, organized last March 2023 the "1st Sustainable Development Fair of Ceuta". This initiative aimed to implement sustainability at a school level by leveraging some of the different vocational training curriculums with the SDGs and the European Green Competences Framework, as through new European Union financing figures as the "Next Generation" financing instrument, the EU is making Europe healthier, greener, and more digital.

The mentioned fair consisted of several roundtables and talks on sustainable development through sustainable energy, fashion, and transport, the three main issues that were dealt in 2022 by the European Commission with the introduction of the "Peer Parliaments" initiative. Moreover, a demonstration on the 50th death anniversary of Picasso was shown by relating their life and work with the 17 SDGs through negative facts that still affect equality worldwide.

"Picasso and Agenda 2030" demonstration showed itself effective to raise awareness on the referred unequal happenings around the world, but with special attention to SDG number 6 "Water and Sanitation", as much of Picasso's work is connected somehow to water and the sea. Some students even reproduced copies of some of his most

important paintings related to the sea in our particular" Water's Corner".

Besides, this was connected to the last UN Water Conference and New York Water Week, that also took place last March. Both organizations' websites displayed a reference to the "Picasso and Agenda 2030" demonstration.

Later, in June, we were invited to expose this case study in front of educational representatives from different EU member states in Madrid, in a working group (Sub-group on Education for Environmental Sustainability) on “Sustainable Infrastructures and Learning Environments” (Madrid, June 2023)

Case study 2

The significance and connection between WATER and

EDUCATION are crucial, and the European Commission is promoting this relationship through European programs, especially Erasmus+. Over the recent years, more than 500 EU-funded projects have included WATER as a concept in educational initiatives across various fields, including VET Education, Secondary Schools, and Higher Education.

The Dashboard illustrates the distribution of EU-funded projects focusing on WATER as a relevant Green Deal target. These projects align with the objectives of Climate Change and a just transition, covering various European countries.

One such project is the L&T's RIVER initiative: The river as a space for learning and teaching. L&T'S River, an Erasmus+ project, aims to facilitate the transition of primary education students to secondary education by emphasizing the significance of the river and water.

To achieve this, an innovative methodology has been implemented: the river as a space for learning. Involving secondary education students in activities around the river helps connect general knowledge from history, natural sciences, mathematics, or languages, always focusing on the river and the importance of water in all aspects.

The project has engaged schools and organizations from three European countries: Portugal, Italy, and Spain. In Spain, specifically, the educational institution IES Botanic Cavanilles and the Low Carbon Economy Foundation have participated. They have highlighted the project's importance in raising awareness and interest among young people aged between 10 and 14 years.

In conclusion, the urgent need for sustainable water management is evident as the world faces unprecedented challenges related to climate change, pollution, and unsustainable exploitation of marine and freshwater resources. The United Nations' Water Action Decade and the

European Commission's initiatives underscore the gravity of the situation and call for integrated efforts to address these issues.

The interconnected nature of water-related challenges requires a comprehensive approach, emphasizing education at various levels. The Sustainable Development Goals (SDGs) play a crucial role in shaping educational initiatives, with organizations like Teach SDGs actively promoting the integration of these goals into curricula worldwide. Education is identified as a fundamental component in the restoration of the hydrosphere, fostering knowledge and encouraging active citizen participation.

Two case studies presented in this article highlight successful efforts to raise awareness and integrate water-related issues into education. The "1st Sustainable Development Fair of Ceuta" demonstrated the effectiveness of connecting sustainable development with vocational training curriculums, utilizing the European Green Competences Framework and EU financing instruments. The "L&T's RIVER initiative" exemplifies the impact of Erasmus+ projects in promoting the significance of rivers and water in education, engaging students across multiple European countries.

As we approach the World Water Day in 2028, the progress in addressing these water-related challenges will be a testament to the success of global initiatives and collaborative efforts. It is imperative that nations, organizations, and individuals actively participate in achieving the water-related goals outlined in Agenda 2030 to secure a sustainable future for our planet. The education sector, as demonstrated by the presented case studies, remains a powerful ally in this collective endeavor, shaping informed and responsible citizens committed to preserving our precious water resources.

But before that date arrives, we can look forward to the next

World Water Day 2024 (22nd March) and the accompanying UN World Water Development Report 2024 to be released on the same day. Conflicts can be ignited or resolved by water. Tensions between communities and nations can arise when water is scarce, contaminated, or unavailable to some people. Water that flows over national boundaries is essential to over 3 billion people globally. However, agreements for collaboration covering all shared water are only in place for 24 countries.

As the effects of climate change worsen and the world's population rises, it is imperative that nations come together to safeguard and conserve this most valuable resource.

A healthy and fairly managed water cycle is essential for public health and prosperity, food and energy systems, economic productivity, and environmental integrity.

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6. Deforestation and degradation of forest ecosystems. Data-Driven Traceability: The Key to Deforestation-Free Commodities

Fadeke Ayoola

In an era of growing environmental consciousness, consumers are increasingly demanding products that do not contribute to deforestation or forest degradation noted Behnke and Janssen (2020).

Deforestation and forest degradation have become major threats to the environment (Duguma et al., 2019; Pacheco et al., 2021; Shapiro et al., 2023). Deforestation is the permanent removal of trees from a forested area, transforming the forest into a different land use such as pasture or cropland (Souza et al., 2023). "A degraded forest is one whose structure, function, species composition, or productivity has been severely modified or permanently lost as a result of damaging human activities" (Vásquez-Grandón et al., 2018, p. 1). The expansion of agricultural activities, often driven by the demand for commodities such as soy, palm oil, and beef, is a major driver of deforestation (Goldman et al. 2020). Smallholder farmers play a pivotal role in the production of numerous forest-risk commodities, including cocoa, coffee, palm oil, and rubber. Their contributions form the backbone of supply chains for many companies that deal in these commodities, as observed by Haryono et al. (2023). These farmers may clear forests to make way for crop cultivation or pasture, contributing to the loss of valuable forest ecosystems. International markets,

with their voracious appetite for agricultural products, play a significant role in driving local farmers in developing countries to engage in deforestation, as observed by Walker (2022). The demand for commodities in global supply chains can create economic pressures on local communities to expand their agricultural activities, often at the expense of forests, resulting in economic incentives driven by the desire for profit and competitiveness in the global market observed D'Odorico et al. (2018), Goldman et al. (2020), Saberi et al. (2018). Global supply chains for agricultural commodities can be intricate and involve multiple stakeholders which can result in inequality within and between countries and between individual actors globally noted Campling and Quentin (2021). The complexity of these supply chains can make it challenging to trace the origins of products, as different actors are averse to sharing traceability information due to a lack of trust between actors,

creating difficulties in enforcing sustainability and responsible practices (Behnke & Janssen, 2020; Saberi et al., 2018).

2. The consequences of inaction on deforestation and forest degradation.

Planting new forests and protecting existing forests play a significant role in limiting global warming to within the 2-degree Celsius threshold that will ultimately determine the fate of the planet noted Kauppi et al. (2022). The 2-degree Celsius threshold is not merely an environmental target; it is a long-term goal to safeguard the planet for countless future generations. In just a decade, 420 million hectares of irreplaceable rainforest, teeming with biodiversity and crucial for climate regulation, were observed to be sacrificed to deforestation (Ameray et al., 2021; Shono, 2021). The loss of 420 million hectares (ha) of forest, equivalent to an

area the size of France, Spain, and Portugal combined, is a staggering figure that highlights the urgent need to address deforestation.

To achieve the ambitious objective of 2 degrees Celsius, it is imperative to embark on a comprehensive strategy that encompasses land-based mitigation and sustainable land-use practices, as noted by Domínguez et al., 2022; Estrada et al., 2023; Muller et al., 2020; Sboui et al., 2023). This includes measures such as planting new forests, protecting existing forests, and utilizing bioenergy with carbon capture and storage, as observed by the publication Environment (2018).

A landmark day for global forests occurred when the EU's groundbreaking Deforestation-Free (EUDR) legislation came into effect on June 29th, marking a significant step forward in the EU's efforts to address global deforestation and forest degradation observed by Köthke et al. (2023).

The EUDR is the first of its kind to establish legally binding due diligence requirements for a wide range of products linked to deforestation. Dissimilar to voluntary guidelines or non-binding initiatives, the EUDR is legally binding observed by Berning and Sotirov (2023). This regulation has set a global benchmark for addressing deforestation risk commodities for governments around the world to understand and inform their policy formation on the issue of deforestation. Companies operating within the EU are obligated by law to ensure all products made available on the EU market or exported must be deforestation-free, produced under relevant legislation of the country of production, and covered by a due diligence statement, Berning and Sotirov (2023).

The Regulation employs a three-tier risk assessment system to categorize countries based on their deforestation and forest degradation risks associated with agricultural production. Countries deemed to pose high deforestation

risks due to deforestation rates, agricultural land expansion, and commodity production trends are classified as high-risk countries. In contrast, low-risk countries are characterized by robust compliance practices and a low likelihood of deforestation associated with agricultural activities. Countries not readily classified as either high- or low-risk are categorized as standard-risk countries observed by Berning and Sotirov (2023).

3. Research questions

Tracing deforestation-free products throughout complex supply chains requires granular data at each stage of production and distribution as well as transparency (Ermgassen et al., 2020; Gardner et al., 2019; Pendrill et al., 2019). In this chapter, we address the following questions:

I. How can data analytics effectively track deforestation-risk commodities throughout complex supply chains that span multiple countries and jurisdictions?

II. What are the data challenges and what methodologies are currently used to assess deforestation risk, and what are their limitations?

III. What are the current big data issues that need to be addressed to comply with EUDR?

IV. How do we address the lack of standardization in the traceability of deforestation-free commodities?

4. Potential Benefits and Challenges of the EUDR

The implementation of the EUDR holds the potential to increase investment in traceability and certification systems, which could generate substantial benefits for producers

enhancing their market access observed by Berning and Sotirov (2023). However, not all producers will obtain the investment in traceability and certification systems to enhance their market access. Inequality within and between countries could increase particularly between developed and developing nations noted

Campling and Quentin (2021). In addition to this, the global recognition and prestige attached to voluntary standards and certifications drive the operation of traceability systems (Razak et al., 2021). To this extent, sustainability considerations and certifications are becoming critical for modern supply chains observed by Saberi et al. (2018).

Due to the recent development in machine learning and computing infrastructure, big data analytics in supply chain management is evolving rapidly (Lee & Mangalaraj, 2022, p. 1). Big data analytics can enable compliance with the EUDR. Companies who gain access to the investment in robust traceability systems can effectively track the origin of commodities throughout their supply chains. However, despite progress in computing, the current data processing methods, such as databases and warehouses, are drowning in the sheer volume of big data noted Sivarajah et al. (2017). The vast amount and demand for data storage requirements is outstripping the capacity of databases and data warehouses. Another challenge is the lack of a unified traceability standard, this obstructs the effectiveness of traceability since the various systems have different data manipulation attributes, creating compatibility problems (Razak et al., 2021).

5. Track deforestation-risk commodities

“Combining conventional supply chain processes with sustainability practices is not an easy process” Saberi et

al. (2018, p. 2125). Tracking deforestation-risk commodities throughout complex supply chains poses a significant challenge due to the intricate nature of global trade networks and the involvement of multiple actors across various stages of production and distribution Renier et al. (2023). There is also the challenge of big data issues. Tracking deforestation risk commodities through complex supply chains may result in merging data from various sources making it difficult to integrate due to format and content differences resulting in heterogeneity noted Kumar et al., (2021), Valdemar et al., (2021), Vanani and Majidian (2020). Due to the complexity of traceability, issues such as inherent uncertainty to data integrity, measurement errors, sampling bias, subjectivity, and human bias can result in data quality issues Christiaanse (2022) and Yang et al. (2023).

Table 1: Big Data issues

Data issue	**Challenges and issues**	**Examples of Reference**
Heterogeneity	Merging data from various sources becomes difficult due to format and content differences	Kumar et al. (2021); Valdemar et al. (2021); and Vanani and Majidian (2020)
Data Silos	Lack of data governance and negative impact on decision-making	Kumar (2023); Patel (2019)

Real-time data	Data streams can be inaccurate, difficult, or maybe impossible to measure	Abdelmajied (2022); and Etxegarai et al. (2023)
Data quality	Inherent uncertainty to data integrity. Measurement errors, sampling bias, subjectivity, and human bias	Christiaanse (2022); and Yang et al. (2023)
Data Validation	Extensive experimental validation, Accuracy, precision, uncertainty	Etxegarai et al. (2023); Moosavi and Ghassabian (2018)
Scalability costs	Infrastructure limitations, data management complexity, cost management, hardware and software expenses, human resource costs	Fan and Zhang (2016); and Tang and Liao (2021)
Infrastructure costs	Capacity and performance, cost management, computational	Hussein et al. (2023)

	challenges	
Security concerns	Targeted attacks, cyber-security, network security, privacy	Charan et al. (2022); and Showail (2021)
Legislation	Current laws, regulatory challenges	Murillo (2023); and Talimonchik (2019)
Privacy Concerns	Security and privacy are two big concerns when it comes to the future of the Internet of Things	Murillo (2023); and Showail (2021)
Trust	Relationships based on the trust model	Steedman et al. (2020); and Tang and Liao (2021)
Expertise, skills	Strengthen digital, technical, and analytical skills, hard and soft skills	Petrillo et al. (2018); Waller and Fawcett (2013)
Collaboration	Appropriate teaching strategies in collaborative learning are required.	Tsujioka (2020)

Table 2: Current data methodologies and limitations

Method	**Purpose**	**Limitations**	**Examples of reference**
Remote Sensing	Detecting and quantifying, deforestation, identifying deforestation drivers, monitoring forest health, and mapping deforestation hotspots and trends.	Data, availability, sensor resolution, atmospheric interference, land cover heterogeneity, temporal resolution, **c**alibration, and validation.	Cabrera et al. (2020); Duguma et al. (2023); Gao et al. (2020); Hoang et al. (2021; Lechner et al. (2020); Mitchell et al. (2017); Romero-Sanchez et al. (2016).
GIS	Tracking deforestation in early stages, linking deforestation to commodity trade.	Data Consistency and Integration, Integration with Remote Sensing Data	Gabriele et al. (2022); Voss (2021); Kallimani et al. (2014); Kumar (2011); and Monjardin-Armenta et al. (2020).
Expert interviews & Participatory mapping	Providing a comprehensive understanding of deforestation	Subjectivity and bias of expert Opinions, difficulty in	Beaudoin et al. (2016); Bos et al.

	issues from different perspectives and identifying key areas for intervention.	Quantifying Expert Knowledge	(2020); Fagerholm et al. (2021); and Reed et al. (2016).
Agent-based modelling	Understanding the decision-making processes of actors involved in deforestation. Exploring the impacts of different conservation policies.	Very complex as they attempt to model the interactions of many different agents and factors. Simplification of reality.	Beaudoin et al. (2016); Bos et al. (2020); Fagerholm et al. (2021); and Reed et al. (2016).
Machine learning	Detecting and monitoring deforestation, predicting deforestation risk, and understanding the drivers of deforestation.	Data dependence, Overfitting, and Underfitting, Interpretability, Explainability	Domíngue z et al. (2022); Estrada et al. (2023); Muller et al. (2020); and Sboui et al. (2023).
Statistical analysis	Monitoring deforestation trends, Identifying, deforestation drivers, Informing Policy Decisions	Heavily reliant on data availability and quality, model assumptions, Contextuality, and Causation. Integration with other	Moradi and Tabrizi 2023; and Vieilledent 2021.

		approaches	
Participatory scenario planning	Engaging and Empowering Stakeholders. Building Consensus and Collaboration. Inform Decision-making.	Time-consuming, resource-intensive process, with significant investments in engagement, data collection, and facilitation.	Fagerholm et al. (2021); and Oteros-Rozas et al. (2015).

"Traceability is the ability to capture and describe the processes related to a specific product" stated Gartner et al. (2021, p. 1). Traceability of deforestation free commodities involves tracing the product from the origin, using a variety of different methods to capture data that confirms no harm to forest, in consultation with farmers and agricultural land managers, through to the traders,

brokers, suppliers and manufacturers, exchanging information in different formats, through diverse stakeholders to the marketplace that involves legislation, compliance and due diligence.

There are a variety of different ways data analytics can effectively track deforestation-risk commodities (Taylor et al. (2020).

Table 3: Examples of Data-Captured for Deforestation-Free Supply Chain

Forests	Indigenous People	Supplier	Manufacturer	Consumer

Satellite Imagery	Healthcare access	Permits	Labour Conditions	Product Labels
Ground Sensors	Land management	Certifications	Social	Ratings
Drones	Culture	Regulations	Responsibility	Certifications
Machine Learning	Human Rights	Sustainability	Environmental	Standards
Spatial Analysis		Standards	Compliance	Supplier Practice
			Supplier Monitor	

"Big data analytics offers solutions through real-time data integration, predictive analytics, and enhanced visibility to address issues such as limited visibility, inaccurate demand forecasts, inefficient inventory management, and disconnected collaboration between stakeholders," (Agarwal et al., 2023, p.220). This allows for the tracking of deforestation-risk commodities across different

countries, jurisdictions, and trade routes noted by Gorelick et al. (2017). However, the different methodologies and criteria used to assess deforestation risk, makes it difficult to compare genuine deforestation-free products. The deforestation-free market does not have a single universally

recognized traceability standard or framework for deforestation-free commodities. These differences in methodology and criteria to track and trace deforestation-free commodities are a hindrance to achieving the global goal of halting and reversing deforestation and protecting the world's forests.

There are many established organizations and stakeholders who have existing traceability standards.

1. Conclusion

The EU's groundbreaking Deforestation-Free (EUDR) legislation is a significant step in addressing global deforestation and forest degradation. To comply with the EUDR producer countries, traders, and brokers will be required to trace deforestation-free products throughout complex supply chains that require granular data at each stage of production and distribution.

The multitude of existing traceability standards creates confusion and fragmentation within the deforestation-free commodities market. Stakeholders might be unsure which standard to adopt, hindering widespread adoption and interoperability. Integrating various traceability standards into a single framework presents technical challenges due to differences in data formats, communication protocols, and application needs.

Established organizations and stakeholders might be reluctant to abandon their existing traceability standards, fearing disruption and cost burden associated with the adoption of a new framework.

The key lies in collaborative efforts between all stakeholders, including standard-setting bodies, industry representatives, technology providers, and government agencies. Instead of creating a single universal standard, efforts could focus on harmonizing existing standards, identifying common ground, and establishing bridges for data exchange.

Further research into a universal framework specifically for the deforestation-free market is essential to halt and reverse deforestation and forest degradation for current

and future generations. The universal framework should be flexible enough to accommodate the diverse needs of different industries and regions while ensuring core data attributes are standardized for interoperability.

A gradual approach could be implemented, starting with harmonizing key data elements and communication protocols, followed by building a more comprehensive framework over time. Encouraging adoption through incentives such as regulatory recognition, financial support, and technical assistance could be crucial for widespread acceptance.

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7. Oceanic Crisis: Climate change, pollution, loss of biodiversity, and ocean governance

María Gálvez Del Castillo Luna.

"Without the ocean, there is no life. Without blue, there is no green" Sylvia A. Earle

Most of the planet is covered by water, and most of this water is in the form of seas and oceans. As eloquently expressed by oceanographer Sylvia A. Earle, "Without the ocean, there is no life. Without blue, there is no green." This statement resonates with the magnitude of the importance that seas and oceans have for our existence. The marine environment, which covers 70% of the Earth's surface and houses 97% of the planet's water, is fundamental for the life of the planet and plays a crucial role in meeting our most basic needs.

For the first time in the history of our planet, the global mass created by humans - anthropeias - exceeds all living beings on Earth - biomass. This phenomenon is related to the exceeding of six of the nine planetary boundaries that regulate the stability and habitability of the Earth. Among these are climate change, the integrity of the biosphere, changes in fresh water, and the presence of artificial chemical entities in the environment. In addition, ocean acidification, a consequence of increased CO2 in the atmosphere, is dangerously close to its limit. Meanwhile, at the same time, billions of people around the world still cannot meet their most basic needs.

In this context, the marine environment plays a vital role. It is the main regulator of the climate, sustains more than 80%

of life on the planet, generates more than half of the oxygen we breathe, provides us with nutritious food, and a wide variety of ecosystem services. However, coastal areas and seas also face major challenges and pressures related mainly to climate change, loss of biodiversity, overexploitation of resources, pollution, and inadequate management.

Despite this, the Sustainable Development Goal dedicated to life below water (SDG 14) is the least funded of all goals. From 2013 to 2018, only 1.6% of the total Official Development Assistance was allocated to SDG 14. This figure is well below what is needed to address the ocean crisis. Recent estimates indicate that more than 175 billion dollars a year are needed to achieve this goal by 2030. It is also calculated that an investment of 2.8 trillion dollars today in four sustainable ocean solutions – the conservation and restoration of marine and coastal ecosystems, the decarbonization of international maritime transport, sustainable food production based on the oceans, and offshore wind production – would yield net benefits of 15.5 trillion dollars by 2050.

Likewise, according to estimates by the high-level panel for the sustainable ocean economy (Ocean Panel), investing 2 trillion dollars in ocean-based climate solutions between 2030 and 2050 would favor climate change mitigation, helping to reduce the "emissions gap" by 35% with the goal of 1.5 °C and up to 47% in the goal of 2°C.

Greenhouse gas emissions that are raising the global temperature of the planet and affecting the chemical composition of the ocean, causing ocean acidification, have serious consequences for biodiversity and coastal ecosystems. At the same time, global warming is raising ocean temperatures to unprecedented levels. In 2023, the North Atlantic experienced extremely warm temperatures,

surpassing any record of the last 40 years. Since 2016, the Atlantic has warmed faster than other ocean basins in the first 100 meters, probably related to record levels of sea ice melt in Antarctica. The decrease in the extent of Antarctic Sea ice in 2023, reaching historically low levels, is in turn altering ocean currents, essential for the distribution of heat, oxygen, carbon, and nutrients on the planet. These currents, which represent 40% of the total volume of the deep oceans, are losing speed due to climate change. The slowdown of this abyssal machinery could have consequences, in turn, on the global climate and marine resources, putting at risk the oceanic biodiversity and food security of numerous living beings, including humans.

On the other hand, marine pollution, especially plastic, is also reaching alarming levels. Every year, millions of tons of garbage end up in the ocean. Specifically, in 2021, 17 million metric tons. This figure is projected to double or triple by 2040, representing a serious threat to the health of the oceans. If no action is taken, by 2050 there could be more plastics than fish in the sea.

The ocean, the lung of our planet, is directly threatened, as we are seeing, by a series of threats that negatively impact the health of our planet. At the same time, the commitments of the Paris Agreement cannot be achieved without a healthy ocean. To achieve the goal of limiting global warming to 1.5 °C, a radical shift towards ocean-based solutions, innovation, and the development of a truly sustainable and socially responsible blue economy is necessary.

This scenario presents new challenges for global ocean governance and its sustainability. Despite historical efforts in this direction, current governance mechanisms are revealed to be insufficient, fragmented, and disconnected from the climate and ocean regime. It is imperative to effectively

integrate traditional geopolitics with ocean and climate governance to address global risks.

The ocean crisis represents an urgent call to action, but at the same time, the ocean is presented as a fundamental part of the solutions to climate change and global food security. To ensure a sustainable future, it is crucial to adopt blue solutions that effectively address the climate and ocean crisis. This involves increasing funding for research and the implementation of initiatives and solutions aligned with the Kunming-Montreal Global Biodiversity Framework and the Paris Agreement. It is essential to intensify efforts for ecosystem recovery and conservation, as well as to urgently change the course of climate change to preserve the health of our seas and oceans. In this way, we can build a healthy, sustainable, and prosperous future for our planet and our species. Without healthy seas and oceans, there is no life. Without the blue of the water, the green is not possible.

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8. Human Rights and Climate Change, an Interlinked Issue

Alexandra Politaki

Setting the democratic principle that States have the obligation to respect, protect, fulfill, and promote all human rights for all persons without discrimination as a cornerstone of modern States, leads to the conclusion that governments have the same obligation regarding the human rights harms caused by climate change. And, indeed, the relevance of human rights to climate change is now universally recognized. This is because it has long been recognized -after decades of discussions- that a clean, healthy, and functional environment is integral to the enjoyment of human rights, such as the rights to life, health, food, housing, water, sanitation and an adequate standard of living.

To put this thought more broadly, the human rights norms relating to the enjoyment of a safe, clean, healthy, and sustainable environment, have been clarified under the recognition that climate change impacts all areas of the natural environment as ecosystems, natural resources, freshwater resources, ocean systems, coastal and low-lying ocean systems, but also across the entire range of human life and activity: production system and food security, physical infrastructure and human settlements -both in urban and rural areas-, livelihoods, poverty, health, education, and security. Following these steps is easy enough for anyone to recognize the interplay between climate change and human rights.

Even further, is, however, commonly recognized that climate change impacts affect the most vulnerable populations and communities, groups (like women, children, elderly, migrants, people with disabilities, indigenous, the marginalized) and individuals, and is an important driving factor for the increase of the already existing inequalities. But another challenging observation is that the possible lack of adequate, effective, non-discriminatory, and otherwise compliant human rights obligations measures in the entire climate change context not only exacerbates the existence of vulnerability but creates new ones by dragging non-vulnerable populations, groups and individuals into vulnerable contexts and categories.

Furthermore, the interactions between the changing climate patterns and human society form the basis of emerging risks that constantly increase the number of another crucial category of those exposed[1] at higher risk.[2] Since climate change is contributing to humanitarian crises where climate hazards interact with high vulnerability, a dual need is emerging in climate mitigation and adaptation frameworks: to readdress the current harm and prevent human beings from any further harm to their rights because of climate change, while ensuring that all rights-holders have the necessary capacity to adapt to the climate crisis and prevent it from creating new kinds and forms of vulnerability.

Supporting all the above, *Climate Justice* requires that climate action is consistent with existing human rights agreements, obligations, standards, and principles. Access to justice enables the protection of environmental law and human rights and promotes accountability in public institutions.[3] The latest report (2023, July) that was launched in conjunction with the anniversary of the United Nations General Assembly's recognition of the human right to a

clean, healthy and sustainable environment (A/RES/76/300), and the majority of cases brought before the courts all demonstrate the concrete links between human rights and climate change.

Considering this frame, climate change has been recognized as a major threat to human rights in the international debate. In light of this, integrating human rights into climate action at all levels is not an option but where the heart of climate action beats or, at least, should be beating.

Integrating Human Rights into Climate Action

Despite decades of debate surrounding the relationship between human rights and the environment, it is acknowledged by the EU, United Nations, and the national governments that climate change and its responses are intricately linked with human rights. However, there remains a notable disparity in reaching an agreement on the corresponding obligations of States, governments, and private actors to address the issue.

Open Letters from civic society organizations, reports from Special Rapporteurs, Joint Statements, and numerous discussions and negotiations between UN bodies and governments all underscore the complexity of integrating Human Rights into Climate Action. This challenge appears contradictory in the face of the widespread impact of climate change on human life and the evident linkages between climate change and human rights. As these efforts persist, it is crucial to highlight a few of the latest major milestones along this path.

The United Nations Human Rights Council (HRC) recognized in 2008 that "*the world's poor are especially vulnerable to the effects of climate change.*"[4] A year later underlined that "*the impacts of increased temperatures and sea level rise affect most*

acutely those segments of the population who are already in vulnerable situations owing to factors such as geography, poverty, gender, age, indigenous or minority status and disability."[5]

The initial direct mention of human rights within UNFCCC context occurred in decision 1/CP.16 (Cancun Agreements, 2010), where reference was made to HRC resolution 10/4. This decision acknowledges the adverse effects of climate change on the effective enjoyment of human rights, stating that "*climate change has a range of direct and indirect implications for the effective enjoyment of human rights.*" Moreover, it urged States to ensure respect for human rights in their climate actions, emphasizing that "*Parties should, in all climate change related actions, fully respect human rights.*"[6]

The Preamble to the Paris Agreement on the UNFCCC (1/CP.21) further amplifies the incorporation of human rights language. It calls on States, when undertaking actions to address climate change, to "*respect, promote and consider their respective obligations on human rights.*" Notably, the Paris Agreement stands as the first international Environmental Treaty to explicitly reference human rights. It enumerates specific rights, including "*the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity*".[7]

During COP 24 and the UN Climate Change Conference in Poland, anticipating the 70th anniversary of the Universal Declaration of Human Rights (10 December 2018), a collective of thirty-four UN human rights experts, covering diverse issues such as business, development, and environment, appealed to States to pursue human rights-based climate action aligned with the 1.5C temperature target in the Paris Agreement. They urged the prompt adoption of a

"*comprehensive set of guidelines and modalities that ensures the effective implementation of the Paris Agreement. These should reflect States' obligations under international human rights law, as acknowledged in the Paris Agreement, in particular the need for rights-based, participatory and gender-responsive climate action that promotes a just transition and food security for all.*"[8]

The COP26 and COP27 (Glasgow, UK, 2021 and Sharm el-Sheikh, Egypt, 2022) decision to establish a *Loss and Damage Fund* also spring from the same spirit of a human rights-based approach. This move is seen as a significant first step towards Climate Justice, representing a major win for climate-vulnerable countries and civil society that long advocated for such fund while suffering because of a crisis they had no role in creating. Even further, the issue of the Loss *and Damages Fund* was raised as a matter of legal obligation and effective policy and not as a mechanism for the debt crisis, marking a critical point for future discussions. For this reason The First Meeting of the Loss and Damage Transitional Committee: Emerging Trends & Challenges Ahead emphasizes that "*The fund must address a wide range of harms*" and "*These losses can be economic, such as the loss of livelihoods or the destruction of infrastructure, but often cannot be counted or easily given a value, such as when lives are lost, cultural heritage is in danger, or the recovery from a series of extreme events has an impact on people's mental health.*"

The Office of the High Commissioner for Human Rights (OHRC) consistently highlights the importance of addressing human rights in the context of ongoing discussions related to the United Nations Framework Convention on Climate Change (UNFCCC) and the 2030 Agenda for Sustainable Development.

During COP28 in Dubai (November-December 2023), the High Commissioner issued an Open Letter to all Permanent Missions in New York and Geneva,[9] calling for the centralization of human rights in all climate decision-

making processes at COP28 and beyond. In the Letter, the High Commissioner urges commitments at COP28 on the "*protection of civic space, ensuring human rights guardrails for climate action, prioritization of adaptive measures for the people most affected by climate change, ensuring accountability and access to effective remedy for climate-related harms*, as well as *mobilization of resources for a rapid and just transition centered on human rights.*".

An Optimistic Standpoint in Future Discussion

The purpose of the ongoing general discussion in civic society regarding the interlink between human rights and climate change is not necessarily to describe the legal dimension in detail (such as the Universal Declaration of Human Rights/UDHR, the International Covenant on Civil and Political Rights/ICCPR and the International Covenant on Economic, Social and Cultural Rights/ICESCR, and other treaty obligations and national laws). This task is challenging, as the Climate Change legal environment is highly dynamic. Nevertheless, it is both useful and necessary to keep in mind a few baselines to actively participate and contribute to the decision-making process as rights-holders, shaping in creating rights-based climate policies at both national and European levels. This ensures that climate change action aligns with human rights obligations and includes appropriates assurances in these considerations.

The Nature and Universal Dimension of Human Rights. Human rights are universal; inalienable; indivisible; interdependent and interrelated. They are universal because everyone is born with and possesses the same rights, regardless of where they live, their gender, race, religious, cultural, or ethnic background. Inalienable, as these rights can never be taken away. Indivisible and interdependent because political, civil, social, cultural and economic rights are equally importance

and none can be fully enjoyed without the others. They apply to all equally, and all have the right to participate in decisions that affect their lives. They are upheld by the rule of law and strengthened through legitimate claims for duty-bearers to be accountable to international standards.

Enriching Climate Change Policies. The Human Rights approach addresses cross-cutting social, cultural, political and economic challenges while empowering individuals, groups and communities, especially those in vulnerable situations. This can make considerable contributions to climate change policies, making them more responsive, sensitive, and collaborative and societies vice-versa.

The Growing Consensus. The interaction between Climate Change and Human Rights is highly dynamic, allowing us to focus more on the growing consensus rather than misleading voices. In addition, the interdisciplinary approach has much to offer.

Anthropocentric and Anthropogenic. Human Rights approaches are anthropocentric in both their object and origin. At first, they place the human being at the centre of moral and legal consideration and justify duties based on human interests and rights. And second, ethical and legal practices that concern human rights are always human practices. Climate Change is also anthropogenic. These facts provide an unlimited field of action, both for correcting existing distortions and for drawing up new policies.

On debates about Climate Change, I always keep in mind a Percy Shelley line "*Fear not for the future, weep not for the past".*

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[1] Although Vulnerability and Exposure are dynamic, varying across temporal and spatial scales factors, consider "expose at risk" as the likelihood of a threat or vulnerability occurring.

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9. Sustainable Use of Natural Resources, Respect for the Planets Biophysical Limits: A Holistic Approach

João Graça Gome

Thaddeus Anim-Somuah

The surge in greenhouse gas (GHG) emissions from human activities, primarily carbon dioxide (CO_2), over the past two centuries, has induced profound shifts in the global climate [1]. This emergent climate crisis has morphed into a formidable threat, exacting a heavy toll on the environment, global development, and geopolitical equilibrium, thereby exerting pressure on socio-economic endeavours. To mitigate the repercussions of this climate challenge, global economies have directed their focus towards sustainable resource use, and respect for the planetary boundaries, aligning their industrial and trade policies with the United Nations' Sustainable Development Goals (SDGs). This multifaceted approach is a dynamic synthesis that weaves together the principles of circular economy, the preservation of natural capital, the enhancement of societal well-being, the momentum generated by grassroots movements, and an array of other interconnected elements.

In this sense, the present chapter aims to summarize the intricated web of connections that bind together the diverse aspects of sustainable resource management, aiming to illuminate the path towards a more harmonious coexistence with our planet. The chapter succinctly outlines how the promotion of resource use can be achieved through the lenses

of circular economy, natural capital preservation, grassroots movements, stakeholder collaboration, societal well-being enhancement, and the widespread adoption of low-carbon energy sources.

Circular Economy principles form the bedrock of a sustainable and regenerative economic model and share a symbiotic relationship with the energy transition. Conceptualizing and designing products with circularity in mind challenges industries to question the necessity of certain materials, prioritizes sustainable alternatives, and reduces the energy-intensive demands of constant production. This conservation of resources aligns with the goals of the energy transition, emphasizing a shift to renewable sources. Embracing reusable and recyclable materials becomes integral, fostering a paradigm shift away from the linear "take-make-dispose" model [2]. This approach not only diminishes the environmental footprint across the entire life cycle of a product but also catalyzes innovation that aligns with principles of reuse and regeneration. This is particularly crucial in the domain of equipment necessitating materials, like lithium and rare-earth elements, which pose environmental challenges in natural extraction. In Fig. 1, a schematic synthesizing the key components of the circular economy framework is shown.

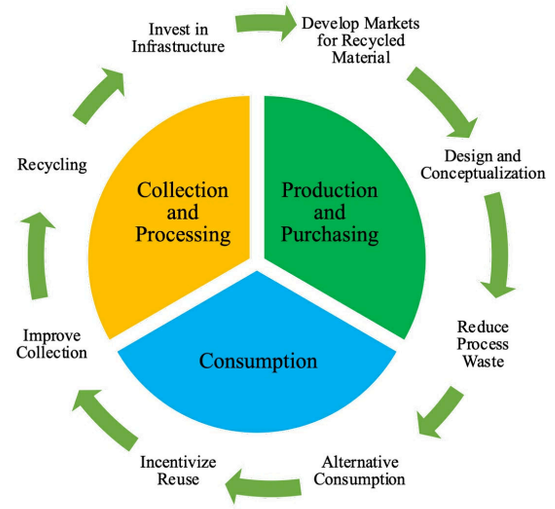


Fig. 1: Circular Economy Framework. Adapted from: [3]

In addition, integrating circular principles accelerates the transition to cleaner energy systems, creating a holistic approach that addresses both resource management and energy sustainability for a more resilient and environmentally conscious future. Nevertheless, the shift towards a circular economy requires substantial societal transformations and an elevated sense of responsibility in how we consume. It entails a fundamental change in individual behaviours, with a focus on prioritizing durability over disposability and moving away from a throwaway culture. Education emerges as a key player in this transition, serving to raise awareness about sustainable choices and the environmental repercussions of consumption. Cultivating a mindset that esteems quality, longevity, and conscious consumption becomes integral to fostering a collective shift towards sustainability. By embracing this ethos, individuals can actively contribute to the global transition to a circular economy, thereby championing a more responsible and resilient future.

Natural capital forms one of the foundational principles

for achieving sustainable use of materials. Preserving natural capital, which includes ecosystems, biodiversity, and natural resources, is fundamental to sustainable resource use. Natural capital accounting quantifies nature's contributions, emphasizing its economic value and societal benefits, providing a framework to understand the environmental impact of resource extraction and consumption (fig. 2). This accounting framework offers insights into the environmental impact of resource extraction and consumption, guiding efforts to align economic activities with the finite capacity of ecosystems and ensuring the well-being of future generations.

Fig. 2: Natural Capital Framework. Source: [4]

The Amazonia Forest in South America stands as a quintessential example of natural capital. Without the lens of natural capital accounting, the true significance of this region

might be overlooked. Its rivers play a pivotal role in supplying water to nine countries. Simultaneously, its forests act as a crucial environmental player, absorbing carbon dioxide and releasing oxygen and moisture into the atmosphere. This process contributes significantly to the creation of rainfall, impacting weather patterns far beyond its borders [5]. The Amazon area is also characterized by unparalleled biodiversity, housing thousands of unique animal and plant species. The profound richness of the Amazonian ecosystem underscores the critical importance of preserving natural capital. Recognizing and valuing the intricate contributions of this region, from its environmental functions to its wealth of biodiversity, becomes paramount for the benefit of both present and future generations. It serves as a poignant reminder of how natural capital when properly understood and accounted for, reinforces the interconnectedness between the environment and human well-being.

Grassroots movements, citizen action, and NGOs play pivotal roles that demand careful examination when contemplating the shift towards a global economy grounded in a sustainable resource-use paradigm. Local initiatives, driven by the tangible repercussions of unsustainable practices, exemplify the viability and advantages of embracing sustainable living and may contribute to the educational transformation required for the mainstream implementation of a circular economy. Notably, movements such as the European Climate Pact Ambassadors serve as outstanding illustrations. These endeavours actively contribute to enhancing consumer literacy across a spectrum of issues, ranging from energy dynamics to informed user choices. They achieve this through various channels, including organizing informative sessions featuring experts, publishing technical and opinion articles, and engaging in activism by hosting events that underscore the critical significance of climate

change mitigation and drive positive change. Moreover, grassroots movements serve as a channel for amplifying the diverse voices of the general public. By incorporating individuals with distinct visions and concerns into their ranks, these movements become a robust platform for evaluating public sentiment. Within the realm of informed consumer choices, grassroots campaigns wield influence that resonates in the market, fostering a demand for eco-friendly products. This influence compels businesses to adopt responsible resource management strategies.

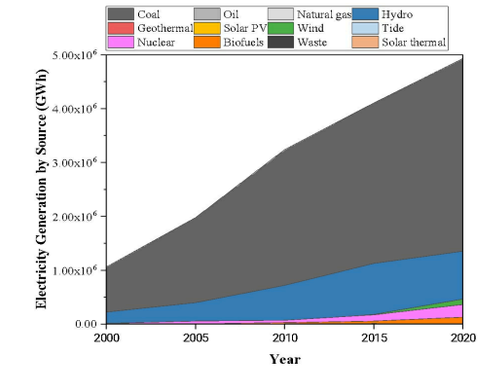
A concrete example of this influence is evident in the advocacy for eco-labelling, a system to identify the energy efficiency, resource conservation, waste reduction, and overall environmental impact of a product. Informed consumers, empowered by eco-labelling initiatives, actively stimulate demand for goods sourced and produced sustainably. This dynamic interaction creates a positive feedback loop, incentivizing businesses to prioritize sustainability in response to consumer preferences. In the European Union, eco-labelling is facilitated through the EU Ecolabel, which is a voluntary certification scheme designed to promote products and services with a reduced environmental impact throughout their lifecycle[6].

Stakeholder collaboration is paramount in achieving sustainable resource use. By fostering collaboration across diverse sectors, industries, supply chains, as well as forging partnerships between governments and businesses, a holistic approach emerges to grapple with the intricacies of resource management. A compelling example lies in the synergy between government and business entities, instrumental in shaping policies and regulations essential for fostering sustainable resource practices. This collaboration leverages regulatory authority alongside private sector innovation, harmonizing policy frameworks with sustainable business

practices to chart a course towards a balanced future. Moreover, inter-industry collaboration assumes a pivotal role, particularly in originating innovative solutions for challenges such as waste management and the integration of low-carbon energy within the energy sector. Collaborative initiatives also extend their impact to infrastructure development, where sustainability takes centre stage. Sustainable infrastructure endeavours to curtail resource depletion, minimize energy consumption, and incorporate eco-friendly materials. Notably, resilient infrastructure, designed to adapt to environmental changes, diminishes the necessity for frequent repairs or reconstruction, thereby mitigating resource consumption. The adoption of sustainable and resilient design principles positions infrastructure as a significant contributor to a harmonious coexistence within planetary boundaries. The imperative for stakeholder collaboration is equally pronounced at the international government level, where concerted efforts are required to facilitate agreements pivotal for advancing sustainable resource use on a global scale. The Paris Agreement, the global plan to tackle climate change and restrict global warming, serves as a compelling example of establishing targets and commitments for sustainable practices. Stakeholder collaboration becomes indispensable in collectively addressing environmental challenges and fostering the exchange of knowledge, best practices, and technological innovations. This cooperative spirit ensures a cohesive and unified global response to the multifaceted challenges associated with resource management.

Societal well-being and resource use have a complex relationship and are deeply rooted in economic history. Societal well-being represents another pillar that should be studied in the context of the planet's biophysical limits. Throughout history, heightened consumption of resources and energy has been a driving force behind technological

progress and economic prosperity. As example, Fig. 3 highlights the evolution of the Chinese GDP and the country´s electrical consumption in the last two decades, showing a clear correlation between these two factors.



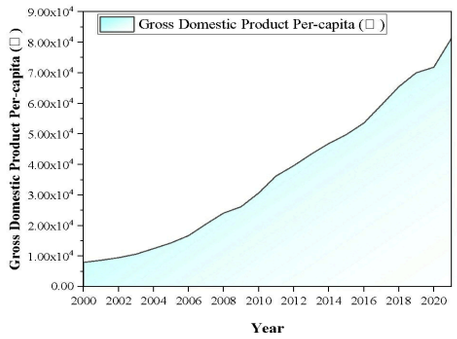


Fig. 3: China, 2000 to 2021 a) Electricity Generation

b) Gross Domestic Product Per-Capita [7].

However, unchecked consumption has also given rise to ecological threats that jeopardize the well-being of our ecosystems. Addressing this complex relationship requires a concerted effort to decouple economic growth from resource depletion and carbon emissions. Key to this endeavour is striking a delicate balance between energy security, resource equity, and environmental conservation.

An example of the impact of resource use on societal well-being is found in the issue of energy poverty. In Portugal, for instance, approximately 20% of households face challenges in adequately heating their homes. To solve this solution, Portugal has funded household insulation, the installation of solar thermal and solar PV in households, and a reduced energy tax for low-income households [8]. This highlights the urgent need to find a harmonious coexistence, between well-being and resource use. This demands a thoughtful and strategic approach, integrating solutions that uplift the quality of life for communities while preserving the integrity of our shared environment.

Low-carbon energy, comprising renewables and nuclear sources, is intricately linked with resource utilization. In the realm of renewable energy, which derives power from easily replenished natural sources, there is a notable absence of direct impact on resource depletion. Nuclear energy, while not renewable, distinguishes itself by generating electricity without carbon emissions, and uranium, a crucial element for this type of electricity generation, is anticipated to have natural reserves lasting thousands of years. By contrast, fossil fuels rely on non-renewable resources, and recent years have highlighted the increasing complexity of exploring economically viable coal, natural gas, and oil reserves. The exploration of new fossil fuel sources is starting to extend into unique ecosystems, such as the Arctic region, posing formidable challenges in resource management, and leading to new geopolitical issues. Therefore, it is crucial to minimize as soon as possible the use of these energetic sources in the global power system.

Yet, even within the low-carbon energy group, there exists a critical reliance on resources. The development of wind farms, solar panels, and associated infrastructure, including transmission lines and electrical batteries, necessitates rare

minerals. Therefore, adopting a comprehensive perspective, underscored by life cycle assessments (LCAs), is indispensable. Life cycle assessments serve as pivotal tools for comprehending and mitigating the environmental impact of low-carbon energy products. Offering a systematic approach to evaluating the ecological footprint, LCAs guide decisions that optimize resources, curtail waste, and champion eco-friendly alternatives. Recognizing the role of transparency and accountability, industries striving for sustainability find enhanced guidance through the insights derived from life cycle assessments. In the realm of low-carbon energy, the European Union is a pioneer in significantly increasing the proportion of renewable sources in the electricity system (fig. 4). However, it is crucial to strike a delicate balance by thoroughly assessing the comprehensive environmental impacts of these technologies on the ecosystem.

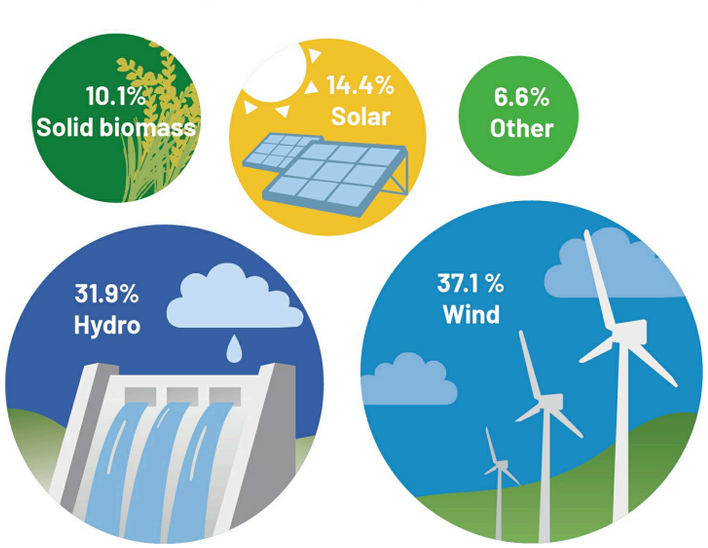


Fig. 4: Renewable Electricity in the EU, 2021 (in % of total electricity from renewable sources) Adapted from: [9]. **Elaborated by:** [10]

Innovation stands as a cornerstone in the pursuit of sustainable resource use, offering creative solutions to overcome challenges associated with resource depletion and environmental degradation. Technological innovation introduces advancements that enable more efficient resource utilization, from renewable energy technologies to sustainable materials and circular economy practices. Innovations in business models, consumption patterns, and societal paradigms drive the transition toward a future where resource use aligns harmoniously with planetary boundaries. Within the European Union, innovation takes centre stage in the European climate policy, with more than 35% of the economic bloc's major research program —Horizon Europe—dedicated to addressing climate change. This extensive research initiative, spanning from 2021 to 2027 with a budget of €95.5 billion, is equipped with powerful instruments and innovative governance designed to instigate systemic changes. Its overarching goal is to achieve climate neutrality and facilitate an inclusive ecological and economic transition. Simultaneously, it strengthens the EU's position in science and industrial innovation, ensuring that emerging technologies, sustainable solutions, and disruptive innovations evolve into viable products with commercial potential [11]. This dual role underscores the deep connection between innovation, resource use, stakeholder involvement, and societal well-being. On a global scale, the correlation between innovation investment and GDP evolution is evident. The Global Innovation Index of 2023 reveals that the top three countries in terms of research and development investment - Switzerland, Sweden, and the United States of America - also rank highly in GDP per capita (fig. 5) [12]. This alignment underscores the economic impact of fostering innovation, illustrating how nations investing in research and development tend to experience robust economic growth.

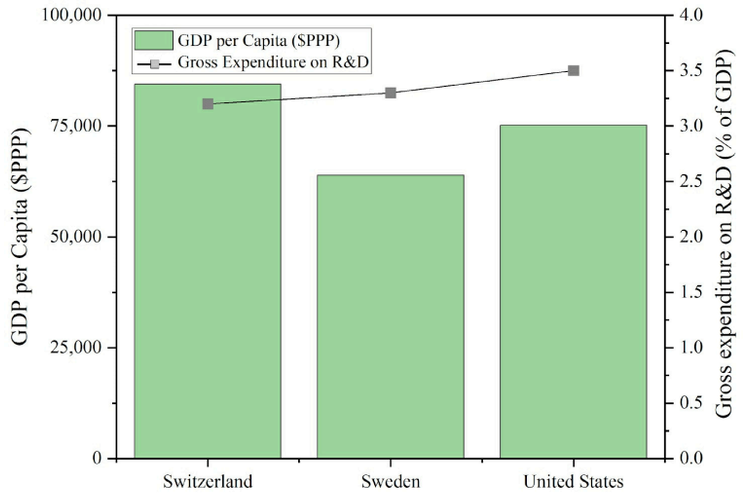


Fig. 5: Top 3 Investors in Innovation, The Global Innovation Index 2023. Source: [12]

Agriculture has been a major turning point in human existence, shaping the course of our development, influencing societal well-being, and catalyzing the progress of civilization. Yet, the very methods we employ to produce, cultivate, and grow our food contribute significantly to global GHG emissions, with agriculture land use, crops, and livestock accounting for nearly 20% of the total. Recognizing this environmental challenge, there is an imperative to transition toward more sustainable farming practices. This imperative becomes even more critical when we consider the current growing global populations and accelerating the material transition from fossil fuel-based products to renewable biobased products. Key solutions include bolstering support for local agriculture, fostering farm-to-table practices, and implementing more efficient distribution systems. A striking example of this transformative approach emerges from the Netherlands. Despite its modest size, the country holds the

remarkable status of being the second-largest global exporter of agricultural products and the largest meat exporter in Europe, playing a pivotal role in shaping global agricultural landscapes. Notably, the Dutch have been pioneering groundbreaking advancements in areas such as cell-cultured meat, vertical farming, innovative seed technologies, and robotics for milking and harvesting. The Netherlands has developed a Regenerative Agriculture initiative aimed at developing and showcasing how farming can simultaneously generate agricultural produce and restore nature; creating healthy ecosystems.

Beyond these notable achievements, numerous cases highlight the Netherlands' commitment to embracing precision farming techniques. This includes harnessing geothermal energy to heat greenhouses and adopting hydroponic systems, showcasing a concerted effort to optimize water usage in plant growth [13]. These innovations, designed not only to increase efficiency but also to address environmental concerns, specifically target reducing water consumption, carbon emissions, and methane emissions. The endeavours undertaken by Dutch producers serve as a beacon of inspiration, demonstrating how a nation, regardless of its size, can lead the charge in fostering agricultural practices that harmonize with both ecological sustainability and global food security.

Conclusion

The journey toward sustainable resource use and planetary boundary respect encompasses interconnected principles and collaborative efforts. Governments must enact robust environmental policies, businesses need to develop sustainable production, and individuals play a vital role through informed choices for sustainable products or practices. Resource use is critical to achieving societal well-

being; thus an inclusive approach that seeks to bridge global inequalities is essential to success. The transition should be underpinned by changes in energy and agriculture ecosystems to enable sustainability across all sectors. The interconnected principles of circular economy, natural capital, informed consumer choices and international cooperation contribute to a holistic solution. Embracing innovation, collaboration, and active involvement from all stakeholders is crucial for fostering a resilient, environmentally conscious global ecosystem and respecting planetary boundaries. This narrative underscores the shared responsibility of preserving the planet's resources for current and future generations.

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10. Development of sustainable urban space

Anna Staszewska

Yu Shan Chen's

Urban space is the is a dynamic system influenced by many factors. It refers to the physical environment of a city, including its streets, squares, parks, and other public areas. The formation of the transport structure in the city determines the type of planning structure that forms the spatial framework, and then the functional organization of the territories is determined . Urban space is a place where speech becomes writing, and where speech can become "savage" and inscribe itself on walls . Public space is a vital part of urban life, including paths, parks, squares, and meeting points, where people socialize and interact with the city and its people . Urban open spaces, such as squares, are important "public spaces" that are used for cultural, social, commercial, or political purposes and contribute to the life of the city. Urban public space is an essential element of the urban environment that contributes to the quality of urban life, providing places of meeting, use, conviviality, and social cohesion (Urban space).

Cities provide an immense variety of cultural and recreational facilities, such as concert halls, museums, sport stadiums, educational facilities and all types of restaurants. Cities can pull people apart or bring them together, yield opportunities or constraint people's behavior. The term urban public space implies public spaces in cities. A public space is a social space such as a public park, garden, town square,

etc., that is open and accessible to all, regardless of gender, race, ethnicity, age or socio-economic level. Public space is commonly shared and created for open usage throughout the community (Urban space 1, 2017).

Urban space is also influent by the urbanization. Urbanization is the defining trend of the 21st century; by 2030, 75 percent of the world's 9 billion people will be living in cities. And urbanization is occurring most rapidly in places with the greatest lack of planning for urbanization." Streets, squares, and parks, especially in this city, often have chaotic, poorly planned and maintained, so the public spaces will face multiple challenges presented. Attention to the quality of urban spaces is essential to improving the quality of life of citizens, and these cities have higher levels of prosperity; they are also likely to find themselves more advanced in terms of sustainability. Cities that reevaluate the concept of "public places" and thus provide space in the streets, green areas, parks, recreational facilities and other public places, and preserve them to promote community cohesion and civic identity, making this city an attractive place to live and work (EL-Hamied N.A., Al-Sayyad M, 2017).

Sustainable development – the background

Sustainable development theory first appeared in biology and ecology studies, making reference to the use of resources that allow for the reproduction of ecosystems. The theory includes concepts like the "triple bottom line," "three E," "three-legged stool," or "Venn diagrams" with the environmental dimension described in relation to the economic and social ones. When applied to urban areas, sustainability is frequently seen as the challenge of cities to remain at levels below the carrying capacity of their surrounding ecosystems, while ensuring sustainable social practices and levels of the quality of life for its

present and future members. Cities are socio-ecological systems of interacting components representing five domains: sociodemographic, economic, technological, environmental, and governance (SETEG). In this way, when managing the connect to the SETEG domains, including ethical principles like, for example, equity in resource distribution. The adaptive and transformative capacity of cities becomes then central in this framework, highlighting the interaction between the urban sustainable dimension and the concept of place resilience (Jimenez-Medina P., et all 2021).

The main objects of sustainable development are the elimination of poverty, changing imperfect models of production and consumption, rational use and protection of the natural resource base of economic and social development. Achieving the goals is possible by means of international cooperation directed at integrating of three complementary components of sustainable development: economic development, social progress and environmental protection. The basic document which disclosed the essence, objectives and means of implementing of sustainable development is “Program of action. Agenda for the XXI Century”.

The concept of sustainable development is the result of over 50 years of comprehensive research of anthropogenic changes in the biosphere, performed by the International Biological Program, UNESCO “Man and Biosphere”, “World Commission on Environment and Development” led by Brundtland (1984-1986) and others. The final definition of development was formed in 1992 in Rio de Janeiro at the UN conference on environment and development (Malska et all, 2017).

Even if each city is unique, they all crystallize a certain number of great modem-day worries and they share a great number of common expectations. Research works of the European Union shed light on the challenges cities have to meet in order to improve their environment and reverse the

effects of social exclusion and segregation of certain segments of the population The European Union urban system has been extended and enriched since January 1 , 1 995. The cities of the new member states offer new models of culture and new patterns of population density and environmental performance. The reports issued before the integration of the new member states suggest that the European urban system is now more balanced in terms of growth. None of the 20 world mega metropolises will be in Europe in the year 2000. New migration waves appear however on the horizon. Large cities cannot grow anymore because of their environmental problems and the social shockwaves they cannot absorb any more. Cities will be affected by the development of new physical linkages, mainly the highspeed rail network. Increasing potentialities appear for inter- mediate cities, the "small large" cities which combine ad- vantages of small and large cities and offer citizens more harmonious environments (Mega V, 1996).

Leave no one behind. That defining principle of the 2030 Agenda for Sustainable Development is a shared promise by every country to work together to secure the rights and well-being of everyone on a healthy, thriving planet.

According to the Sustainable Development Goals Report 2023 where was pointed six goals according to the right development. First, Heads of State and Government should recommit to seven years of accelerated, sustained and transformative action, both nationally and internationally, to deliver on the promise of the Sustainable Development Goals.

Second, Governments should advance concrete, integrated and targeted policies and actions to eradicate poverty, reduce inequality and end the war on nature, with a focus on advancing the rights of women and girls and empowering the most vulnerable.

Third, Governments should strengthen national and subnational capacity, accountability and public institutions to deliver accelerated progress towards achieving the Sustainable Development Goals.

Fourth, to ensure that developing countries can deliver in these areas, the international community should recommit at the SDG Summit to deliver on the Addis Ababa Action Agenda and to mobilize the resources and investment needed for developing countries to achieve the Sustainable Development Goals, particularly those in special situations and experiencing acute vulnerability.

Finally, Member States should facilitate the continued strengthening of the United Nations development system and boost the capacity of the multilateral system to tackle emerging challenges and address Sustainable Development Goals-related gaps and weaknesses in the international architecture that have emerged since 2015 (ed. Ross J., 2023).

So if we take all the point we can focus on sustainable urban development which involves creating cities that strike a delicate balance between economic growth, environmental protection, and social equity. This approach acknowledges that a city is an intricate system with interdependent elements, and progress in one area should not come at the expense of others. By embracing sustainability, cities aim to minimize their ecological footprint, ensure equitable access to resources and opportunities, and enhance the quality of life for all residents.

Sustainable urban development is not just about protecting the environment; it also encompasses social and economic aspects. It recognizes that cities are dynamic and constantly evolving, and therefore, it is essential to plan for the long term and consider the needs of future generations.

One of the key principles of sustainable urban development

is the concept of resilience. Sustainable cities are designed to withstand and adapt to various challenges, such as natural disasters and climate change. By incorporating resilience into their planning processes, cities can ensure the safety and well-being of their residents even in the face of adversity (Defining Sustainable Urban Development).

Key Elements and Principles of Sustainable Cities (based on Definig Sustainable Urban Development):

- Urban planning and smart city solutions play a pivotal role in guiding the development process. By adopting innovative design strategies, cities can optimize resource use, reduce pollution, and enhance overall environmental sustainability.
- Cities must integrate green spaces, walkable neighborhoods, and reliable public transportation systems, fostering a sense of community and promoting health and well-being among residents.
- Successful sustainable cities are those that prioritize the efficient management of resources, such as energy and water, while also embracing renewable energy sources. By investing in renewable energy infrastructure and implementing energy-efficient technologies, cities can reduce their carbon emissions and mitigate the impact of climate change.
- Sustainable cities prioritize social equity, ensuring that all residents have access to affordable housing, healthcare, education, and employment opportunities. By addressing socioeconomic disparities within urban settings, these cities aim to create inclusive communities where everyone can thrive.

How to engage citizens to change their behaviours to be sustainable?

Engagement with citizens for their behavioral change is not easy because the general public is not homogeneous group and therefore to understand the drivers and barriers of their behaviors is the first step to implement the inclusive engagement initiatives. According to Veselitskaya, Karasev, and Beloshitskiy (2019b), one of the barriers of the development of smart city in Barcelona is the "inconsistency between the interests of citizens", yet the 1992 Olympics Games in Barcelona became the "starting point" of the city development. Take France for example, Paris 2024, the upcoming Olympics Games to be held in the summer 2024, has implemented an initiative called "Génération 2024", aiming to turn sports into a catalyst to make a school's nearby community more inclusive towards sustainable behavior change through sport education.

Schools can play like a conduit which connects community players together and the Génération 2024 is therefore a label invented for schools to obtain if they fulfill the following four criteria to promote the awareness of health and inclusiveness in the local community through sport education (The legacy and Sustainability, 2021):

- Develop structural projects with local sports clubs;
- Take part in Olympic and Paralympic events;
- Work with or accept elite athletes;
- Make school sports facilities available to local sports clubs to encourage involvement in sport.

Among the forementioned criteria, the first and the last one instead serve as a driver to facilitate the sustainable behavioral change of the citizen engagement because it encourages the citizen to get involved in the sports when school facility is accessible to the public. According to Lawson (2010), there is a positive relationship between people empowerment and community's sustainable development in five aspects, such as citizen health enhancement and increased well-being in

a lifetime; offset the impacts caused by the results of social marginalization; the increased human power cultivation, the young generation in particular; fostered community identify; strengthen people's willingness to volunteer for social development. The forementioned five benefits reflect the Generation 2024 is paving the way for realizing the goal of SDG 3 (Sustainable Development Goals) — *to ensure healthy lives and promote well-being for all at all ages* — by reducing the risk of public health at national level. Since seeking for health is the common interest for everyone, the barrier of being unmotivated for exercise turned into the driver for sustainable behavioral change in the pursuit of health when the sports facility becomes accessible to the public.

A goal-setting is a prerequisite for a successful education program to be implemented as a driver for behavioral change because people can be guided about how to change. The Generation 2024, for example, has a goal to certify 20% of schools to win the label and, therefore, the "Olympic and Paralympic Week (OPW)" was created and held in January 2017 for the first time in France to raise the awareness of importance of sport and also to set an example in the school for the community residents to engage in sport as well. As of 2020, there were more than 450, 000 students took part in the Olympic and Paralympic Week (The legacy and Sustainability plan). Moreover, in the 2012 London Olympic Games, it had demonstrated the positive effect that the Olympic Games can serve as an educational tool to advocate for the exercise importance beyond school in the urban space. According to Kokolakakis and Lera-Lopez (2020), it suggested the positive connection between the 2012 London Olympic Games and its residents' exercise habits by the observation of two-year study of three groups of sports — Combat Olympic sports, Team Olympic sports, Water-based Olympic sport — after the Games. The results were as followings:

- There were 336,000 people increased their frequency of participation in the above three forementioned types of sports;
- The combat Olympic sport increased 8.23%, which was nearly 21,000 new participants in this type of sport;
- For swimming sport, there were 122,000 new joiners to swim at least once in a week.
- With the latest precedent of Olympic Games in Europe, the 2012 London.

Olympics has undoubtedly lighted up the hope for French government's resolution to make "Paris 2024 a new global sustainability benchmark for sporting events" come into reality to change people's behavior by regenerating the urban space development.

Besides, the method of sustainable behavior change in urban space is not limited to education. The Olympic Games is a perfect opportunity for the athlete stars to advocate for the elimination of single-use plastics if they could lead by example. Michie, M van Stralen, and West (2011)'s Behavior Change Wheel mentioned the nine "intervention functions" of behavior change — education, training, persuasion, incentives, coercion, restriction, modeling, enablement, environmental restructuring — in which it clearly stated that they not only acknowledged the importance of education, but also that of the "modelling" when it comes to behavior change, meaning showing an example for people to imitate or learn from. Therefore, the effectiveness of the modelling should, in my opinion, demonstrate the behavior change not only from the athlete stars but also from other stakeholders, such as organizers, spectators, partner marketing managers, etc. In other words, the demonstration in the context of the Olympic Games should be executed in a comprehensive ecosystem of urban space to bring every player in the Games to raise

the public awareness on the banning of single-use plastics if it aims to be effective. The Paris 2024, for example, is in partnership with WWF (World Wildlife Fund) to help French government for the environmental transition to achieve the vision of circular economy, which is a good example of engaging with external partners to advocate for the green actions.

However, the collective efforts calling for waste reduction have been in place long before Paris 2024 throughout the history of the Olympics. The 2000 Sydney Olympic Games was also one of examples that engagement of all stakeholders to lead by example for a thorough solution of waste management. The Sydney Organizing Committee for the Olympic Games (SOCOG) launched the "Sydney 2000 Olympic Games Integrated Waste Management Solution", in which it invited various players in the Games — manufacturers, caterers, as well as the public — literally everyone to be involved in the waste reduction. The most prominent strategy was the so-called "Twelve, Six, and Eight — 12 separate waste-generating areas, 6 waste-generating activities, and 8 waste streams "to advocate altogether that the waste should be treated as resource…rather than materials to be discarded."

<u>Will a sustainable city eventually lead to a resilient city if the aforementioned is all achieved?</u>

According to Rahim, Roshani , Hassani , and Hossienpour (2012), the 11 principles of new urbanism in designing the sustainable urban spaces are as followings — walk ability, connectivity, mixed use & diversity, mixed housing, quality architecture and urban design, traditional neighborhood structure, transect planning, increased density, smart transportation, sustainability, and quality of life, which is in accordance with the concept presented by UNESCO's

"*Education for urban development: alliance for a sustainable future*" issued back in 2004 for the decade's planning from 2005 to 2014, saying that urban sustainability also relies on the city residents' "*quality of life, equity for all and poverty reduction*". In other words, if the citizens can be nurtured with informative education to act collectively to achieve the sustainable quality of life, a sustainable urban space can be possible. To achieve this, Skinner and H. Zakus (208 C.E.) cited Australia as example which is combined with both sport education and various stakeholders' engagement, such as the sport sector, community-based organizations, as well as the local government to work together to achieve social development. Moreover, they stated that even the sport sector, the sport managers for example, should also be educated to correctly apply their knowledge of sport to the community development based on the accurate assessment of the community demand for development. Therefore, based on the literatures reviewed, it is acknowledged that education indeed can be a driver for the sustainable urban development if it can be deployed into sport management and stakeholder engagement for the sustainable urban space governance.

According to ICLEI's (1990) "Launch of Making Cities Resilient 2030" (Launch of Making), the majority of the world's population will reside in the cities by 2050. Therefore, the continuous education of sustainable behavior change for the residents would be one of the best ways to lead a community to a resilient city because cities is the "frontline to avoid the creation of new risk, reduce existing risk and strengthen resilience, including risks from health emergencies", which is especially important during the post-pandemic era and required for all the stakeholders to realize the vision.

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11. Sustainable Consumption and Production: The Imperative of a Circular Economy

Marc Escribà-Gelonch

We only have one Earth, but in 2050 our global consumption will be the equivalent of three planets. The growth trends announce the consumption of materials such as biomass, fossil fuels, metals and minerals will double in the next forty years and the annual generation of waste will increase by 70% between now and 2050. Sustainable development has become consequently an indispensable goal for humans as we grapple with the challenges posed by climate change, resource depletion, and environmental degradation. As a critical point, the traditional linear economic model based on *"take, make, and dispose"* have led to the massive depletion of natural resources and the accumulation of waste. The linear model also exacerbates the problem of waste management, with landfills overflowing and oceans becoming dumping grounds for discarded goods. The mounting volumes of waste contribute to pollution, pose health hazards, and strain ecosystems. As consumerism continues to rise globally, addressing the waste crisis becomes paramount.

In response to these challenges, the concept of a Circular Economy has gained prominence as a holistic and sustainable alternative to achieve a climate-neutral economy by 2050 as stated in the European Green Deal. To this aim, EU must accelerate the transition towards a restorative and regenerative model keeping its resource consumption within

the limits that the planet encloses and strive to reduce its consumption footprint and double its circular material utilization rate in the next decade. Implementing circular models to both industry but also in society would enable savings in the order of USD 630 billion just in the EU region besides obvious environmental benefits , increasing EU GDP by an additional 0.5 % by 2030 and create around 700,000 new jobs. Since EU manufacturing companies spend an average of 40 % on materials, closed-loop models would increase their profitability while protecting them from fluctuations in product prices.

In a social perspective, sustainable consumption involves making choices that minimize the environmental impact of goods and services throughout their life cycle. This encompasses product design, manufacturing processes, distribution, and end-of-life disposal. Consumers play a pivotal role in driving demand for sustainable products, influencing businesses to adopt eco-friendly practices. Educating consumers about the environmental consequences of their choices empowers them to make informed decisions. This could involve considering factors such as a product's carbon footprint, energy efficiency, and recyclability. Through conscious choices, consumers can influence markets and incentivize businesses to adopt more sustainable practices, requiring a holistic circularity of processes from the very early stages.

1. Circularity-by-design

Circular Economy is deliberately restorative and regenerative by concept. In this framework, the recovery of materials and products is not only directed at the end-of-use, but is enabled in the design phase (i.e. materials choice or assembly design). The synergistic interconnection between companies and sectors makes waste industry to be the raw material for another increasing the utility and lifetime

of materials, while increasing the intensity of use. In a circular economy, closed-loop systems prioritize recycling and reusing materials rather than discarding them. This approach promotes resource efficiency, reduces waste generation, and minimizes the environmental impact associated with the extraction and production of raw materials. As materials flow needs to be stated from the very beginning, companies need to develop core competencies in circular design to facilitate reuse, recycling and cascading of products. Products must be designed to last longer and, at the end-of-life, they must be suitable to be fully dismantled and their materials easily sorted and separated to be reused or recycled. Reusing and recycling are two different concepts usually confused. While reuse of materials refers to their employment as such, recycling requires a secondary process previous reutilization, which at the same time might deliver secondary wastes.

2. Recycling while consuming: The inverse cycle of materials

Embracing sustainable consumption involves making responsible choices as consumers, considering the environmental impact of products, and demanding transparency from businesses. On the production side, adopting eco-friendly technologies, embracing corporate responsibility, and integrating circular design principles are essential steps toward sustainable production.

Reverse logistics, encompassing the collection and return of materials at the end-of-life to preserve their value, are pyramidal in the transition to a circular economy. This action allows those materials to be returned to the market as such or as a part of another goods. Reverse logistic chains optimization includes sorting, warehousing, risk management, energy generation and even molecular biology and polymer chemistry. By these cost-effective collection and treatment of end-of-life products, material loses are

reduced boosting the economics of circular design because of a reduction on virgin material loadings, achieved through proper facilities and infrastructures. Collection systems should ease collecting operation, being located in accessible areas for users and recovering services, always preserving the value of the material. Main actions to ensure a proper inverse cycle of materials should include:

- Funding: All actions need tools and R&D which must be eased through proper funding. Governments must support these actions as a proof of commitment towards the transition to a circular economy and as a motivation for investors. Governments can stimulate this transition by covering some of the risk capital.

- Regulatory: The absence of comprehensive policies and regulatory frameworks poses a significant barrier to the widespread adoption of circular economy practices. Governments play a crucial role in creating an enabling environment through legislation, incentives, and partnerships with the private sector.

- Education: One of the primary challenges in transitioning to a circular economy is the resistance to change both from citizens and businesses used to the linear model, not only promoting highly skilled professionals on the topic properly trained in circular materials flow, but also promoting and integrating the social culture of recycling to the end-users. Overcoming this resistance requires concerted efforts in raising awareness, providing incentives, and implementing supportive policies. Governments should impose the integration of the circular economy and systems thinking into school and university curricula.

- Collaborative platforms. Effective collaboration between chains and between sectors is essential for the

large-scale establishment of a fully restorative system. Joint product development, IT-enabled transparency and information sharing, joint collection systems, sectoral standards, harmonization of incentives and intermediation mechanisms could be implemented with the establishment of collaborative platforms, in which different sectors or between companies and policy makers.

- Circularity metrics framework. The need of measuring the transition performance towards circular economy requires the development of a systematic procedure framework to evaluate the mass flows of materials[4]. Using these tools different scenarios and processes can be benchmarked in terms of circular flow of materials, detecting hotspots of material loses. The central metric is the material circularity indicator (MCI) which measures from 0 (linear) to 1 (circular) the degree of circularity of the materials. These results can define business strategies not only in an environmental point of view, but also in terms of material savings and recycling loops.

3. Sustainable production: Rethinking of manufacturing processes

Shifting towards sustainable production involves adopting cleaner technologies and innovative manufacturing processes. This includes the use of renewable energy, eco-friendly materials, and the implementation of circular design principles. Embracing technological advancements can enhance efficiency while minimizing environmental impact. Businesses, as key players in the production cycle, bear the responsibility of adopting sustainable practices. Corporate social responsibility initiatives, such as reducing waste generation, minimizing water usage, and investing in renewable energy sources, contribute to sustainable production. Regulations and incentives can further encourage

businesses to integrate environmentally friendly practices into their operations. The imperative for sustainable consumption and production has never been more pressing. The linear model, with its adverse environmental impacts and resource depletion, is unsustainable in the long run. The transition to a circular economy offers a holistic solution, redefining the way we produce and consume goods and services. Despite considering that each production process and each industry might have individual constraints, key aspects for a sustainable production are disclosed in this section.

3.1 Materials selection

Materials selection plays a pivotal role in sustainable production. Manufacturers are increasingly opting for eco-friendly materials that have a lower environmental footprint, such as recycled plastics, biodegradable polymers, and sustainable wood. Additionally, advancements in materials science have led to the development of innovative alternatives that reduce reliance on traditional, resource-intensive materials, while reducing waste generation and maximizing the lifetime of products by emphasizing reuse, recycling, and sustainability. When selecting materials for circular manufacturing, several factors need to be considered to align with the principles of circular economy. Here are key considerations:

- Materials lifetime: It is necessary to choose materials that are durable and have a long lifespan to extend the use phase of the product without significant degradation. Every time that a material is reused it double its value as it can be sold twice. This approach is not linear for recycled materials, as recycling process involves additional costs. Lifetime together with use intensity is an essential parameter to determine the utility factor, and therefore the mass circularity indicator for measuring circularity. Optimally, materials must be reused up to exhaustion,

including secondary uses when they lose the primary utility.

- Recyclability: Recycling is a process, and as such it can generate secondary environmental impacts and carbon footprint. This is the reason because recycling process has to be simple and sustainable, to avoid secondary impacts to be higher than e new manufacturing from virgin materials.

- Biodegradability: Even reusing or recycling, materials come to the end-of-life in some point. Instead of going to the landfill and cumulating there, the best option is an own degradation to be returned to the biosphere to ensure minimal environmental impact. In some cases, the compatibility with existing composting systems must be ensure.

- Availability and Sustainability: The proper materials to be chosen are the ones renewable and available with minimal environmental impact during extraction and production. The use of local material sources reduces transportation-related environmental impacts and support local economies. Especially preferred are renewable resources or recycled materials which reduce the reliance on finite resources. Most of minerals and lithosphere resources are not included here, as they are non-renewable. Actually, some of the most precious metals are increasingly scarce, and they will be exhausted in the next centuries. Recycling operations are here of an extraordinary importance to prevent their dissemination in landfills. Construction, electronic, agriculture and automobile industries (especially because of batteries) are the most contributive to mineral dissemination due to inefficient recycling processes.

- Non-Toxicity: Safety is very important in all life aspects. The use of materials environmentally compatible must not neglect the human safety both during the manufacturing process and along the material use stage. Hazardous substances that can harm the environment or human health must be avoided as much as possible, including the final disposal at the end-of-life.

- Easy disassembly, modularity and repairability: The products design must include the possibility of an easy disassemble in mind to facilitate the separation of components and materials for recycling or reuse. As a design option, the standardization of connections and fasteners may ease the modularity and repairability.

- Energy and water efficiency: Materials with lower environmental impact in terms of energy and water use should be prioritized, evaluating in all cases the energy and water consumption associated with the extraction, production, and recycling processes of chosen materials. Water is scarce and the electricity demand will significantly increase in the near future due to the conversion of fossil-based devices into electric, so energy optimization is also pyramidal in process design and consumption patterns.

3.2 Energy efficiency

Energy efficiency is another critical consideration in sustainable manufacturing. Companies are investing in technologies that minimize energy consumption during production, such as high-efficiency machinery, smart automation, and the integration of renewable energy sources. By reducing energy usage, manufacturers not only decrease their carbon footprint but also benefit from long-term cost savings. Electrification of traditional fossil-based industrial processes, including manufacturing, transportation, and

heating will demand a huge energy generation. This shift, driven by the imperative to reduce greenhouse gas emissions, is undeniably a crucial step in the right direction. However, it brings with it a new set of challenges, chief among them being the significant surge in energy demand. This is a double-edged sword, because while the electrification of processes promises a cleaner and more sustainable future, electric power is also not produced without its own environmental footprint. The global demand for electricity will exceed the current generation capacity, so new sustainable technologies or sources will need to be explored.

3.3 Digitalization and automation

Digitalization and Industry 4.0 technologies are transforming manufacturing processes by enhancing efficiency and sustainability. Smart manufacturing systems enable real-time monitoring and optimization of production lines, leading to reduced waste, improved resource utilization, and lower emissions. This digital revolution also facilitates the implementation of predictive maintenance, ensuring equipment operates at peak efficiency, minimizing downtime, and extending the lifespan of machinery. The integration of digital technologies and data-driven approaches enhances efficiency, reduces resource consumption, and fosters eco-friendly practices. Digital technologies ease the development of smart energy management, optimizing the energy distribution, while reducing waste and enhancing overall efficiency. In some sectors such as agriculture, digitalization for precision farming enable farmers to optimize the use of water, fertilizers, and pesticides, leading to increased crop yields and reduced environmental impact. Yet, again digitalization is a double-edged sword, because of the environmental risks of these devices at the end-of-life (e-waste). E-waste management crucial practices include proper recycling and disposal methods, by the implementation of

efficient and environmentally friendly recycling technologies, previous establishing proper e-waste collection systems, to avoid the release of toxic substances into the soil, air, and water, as many electronic devices contain hazardous materials such as lead, mercury, cadmium, and brominated flame retardants. When these materials are not properly managed during disposal or recycling, they can leach into the environment, contaminating ecosystems and posing threats to human health.

3.4 Synergistic collaborative connections between industries

Collaborative efforts across the supply chain are essential for achieving sustainable production. Manufacturers are working closely with suppliers to ensure that raw materials are sourced responsibly, with a focus on ethical and sustainable practices. This involves transparency in the supply chain, certification of materials, and adherence to fair labor practices. Industries can collaborate to create closed-loop systems, sharing materials and waste streams to promote sustainability. By this strategy, materials considered as waste for one industry can be used by another as raw material. For example, animal dejections can be used by fertilizers industry, or pruning biomass can be used for green hydrogen production.

3.4 Customers awareness

Consumer awareness and demand for sustainable products are driving manufacturers to rethink their approach. As customers become more environmentally conscious, companies are under increasing pressure to adopt sustainable production practices. Businesses that prioritize sustainability not only contribute to a healthier planet but also gain a competitive edge in the market by appealing to environmentally conscious consumers. It's important to note that awareness alone may not be sufficient; there must also be convenient and accessible infrastructure for recycling, clear

guidelines, and consistent efforts to address challenges in the recycling process. Overall, ongoing efforts from various stakeholders are crucial to maintaining and increasing customer awareness on sustainability.

The adoption of circular economy principles seeks to decouple economic growth from resource depletion and environmental degradation, fostering a regenerative system that minimizes waste and maximizes the longevity of products and materials. One key aspect of the circular economy is the promotion of sustainable consumption patterns by encouraging consumers to prioritize products with longer lifespans, easy recyclability, and minimal environmental impact. One main target of circular economy is the reduction of the overall demand for finite resources and mitigate the environmental footprint associated with production and disposal. From a production perspective, embracing circular economy principles involves rethinking traditional linear manufacturing processes. The shift towards closed-loop systems, where materials are continually reused, remanufactured, and recycled, is paradigmatic to achieving sustainability goals. This can be evaluated using prominent circular metrics tools as a proper framework for a quantitative evaluation of circularity. This not only reduces the extraction of raw materials but also minimizes waste generation, contributing to a more efficient and environmentally friendly production cycle. The circular economy promotes the concept of a "circular supply chain," emphasizing collaboration among stakeholders, including manufacturers, consumers, and policymakers, to create a closed-loop system.

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12. Climate refugees and vulnerable communities

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1 The Concept of Climate Refugees

The term "climate refugees" encapsulates an emerging reality in the era of climate change, defining those forced to leave their homes and communities due to adverse environmental impacts. These include a range of phenomena, from extreme events like hurricanes, floods, and droughts, to progressive environmental transformations such as rising sea levels and desertification, undermining habitability and food security.

The complexity of "climate refugees" lies not only in their tangible reality but also in its multidimensional nature. These displacements are not always cross-border; many occur within national borders, creating vast populations of internally displaced people. Furthermore, climate change often acts as a threat multiplier, exacerbating situations of vulnerability and pre-existing conflicts, making it even more challenging to isolate climate change as the sole cause of displacement.

Despite the urgency and magnitude of the issue, the current international legal framework does not provide a specific definition or protection for climate refugees. Existing conventions, focused mainly on persecution and conflict, do not encompass the complex realities of climate-induced displacement. This has led to a protection and

legal recognition gap for millions affected, who often find themselves in limbo, without access to basic rights and support granted to traditional refugees.

The Internal Displacement Monitoring Centre highlights this growing crisis, documenting millions of annual displacements attributed to disasters and climatic events. These figures not only reflect the scale of the problem but also underscore the critical need for a coordinated global response. The international community, therefore, faces the urgent challenge of updating and expanding legal and policy frameworks to adequately address the reality of climate refugees, acknowledging their unique situation and providing clear pathways for their protection and support.

The United Nations High Commissioner for Refugees (UNHCR) predicts that climate change "will become the biggest driver of population displacements, estimating the figure could reach 200 million by 2050, i.e., in less than 30 years." However, other estimates come from different sources. A recent World Bank statement estimates the figure could reach 1.2 billion.

Therefore, the introduction to the concept of climate refugees aims not only to define a term but also to highlight a call to action. It is essential that legal definitions and policies evolve to reflect the new realities of the 21st century, recognizing that climate change is a powerful force reshaping demographic patterns, undermining security, and demanding a compassionate and effective global response.

2 Origins and Destinations: The Global Map of Climate Displacement

The climate crisis manifests through a variety of extreme environmental phenomena and progressive changes exerting pressure on various world regions. The global rise in temperatures and sea level is indicative of long-term climate

change, while extreme events like droughts, floods, storms, and hurricanes represent immediate and often devastating impacts.

- **Increase in Temperatures and Sea Level Rise**

Global warming has led to an increase in average temperatures, which in turn has triggered chain reactions like polar ice melting and sea level rise. Coastal regions and archipelagos such as Bangladesh, the Maldives, and certain Pacific areas face an existential threat, with entire communities at risk of being permanently submerged. These changes force populations to relocate, often without hope of returning to their ancestral homes.

- **Droughts and Floods**

Prolonged droughts and catastrophic floods are increasingly common and severe, affecting vast regions with direct repercussions on food security and water access. Areas like the Horn of Africa, including Somalia, and regions like the Sahel in Africa have experienced devastating droughts leading to famines, resource conflicts, and large population displacements. Conversely, countries like Mozambique have endured floods and intense cyclones, causing massive displacements and seemingly endless reconstruction.

- **Displacement Trajectories**

Climate displacement patterns are complex and multifactorial. In many cases, displacements are internal, with populations moving from rural to urban areas or from more vulnerable regions to safer ones within the same country. However, there are also significant cross-border flows, where people cross borders seeking refuge in neighboring countries or even continents. These movements pose particular challenges in terms of border management, asylum, and integration into new communities.

• **Socioeconomic and Political Implications**

Climate displacements have profound socioeconomic and political implications. Economically, the loss of homes, land, and livelihoods can plunge individuals into poverty, exacerbating pre-existing inequalities and creating new challenges for assistance and development. Politically, migratory flows can generate tensions between communities and nations, challenging social cohesion and stability. Furthermore, the governance of climate displacements requires international cooperation and inclusive policies that recognize the dignity and rights of the displaced.

In this context, exploring the origins and destinations of climate displacement reveals a complex and urgently challenging global landscape. It requires a holistic understanding and coordinated responses that encompass climate change mitigation and adaptation, as well as the protection and support of affected communities.

3 International Legal Protection: A Concerning Void

The growing issue of climate-induced displacements clashes with the current structure of international law, which does not provide adequate recognition or protection for so-called climate refugees. This section delves into the legal gaps and challenges faced by these displaced individuals in the international context.

• **The 1951 Refugee Convention**

The 1951 Refugee Convention, along with its 1967 Protocol, establishes the fundamental legal framework for refugee protection. A refugee, according to this Convention, is someone who "owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the

country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country."

• **Inadequacy of the Current Definition**

The prevailing refugee definition, focused on persecution and conflict, does not adequately encompass the phenomenon of forced displacements induced by environmental disasters or climate change. This restrictive approach excludes so-called climate refugees, whose reasons for displacement, though critical and often vital, are not recognized within the established criteria of persecution or armed conflict. Consequently, millions affected by climate change are left without the protections and rights associated with refugee status.

This limitation manifests in two fundamental problems:

• Basis of Persecution: The refugee condition, as defined, requires the individual to have experienced or have a well-founded fear of persecution for specific reasons. However, the adversity caused by climate change, although it can be extreme and have severe consequences for people's lives and safety, is not traditionally framed within these persecution criteria. The effects of climate change, like natural disasters or sustained environmental degradation, are not considered per se acts of persecution, leaving those affected by such circumstances without the protection afforded to conventional refugees.

• Crossing International Borders: The current refugee definition also imposes the condition of having crossed an international border, a requirement that does not align with the reality of many climate displacements. Often, these are internal movements within a country, where people move from areas more affected by climate change to less vulnerable ones, without crossing state borders. This dynamic excludes most climate-displaced individuals

from the recognition and protection that refugee status provides, limiting their access to international assistance and legal protection frameworks.

The inadequacy of the current definition, therefore, not only implies a legal protection void for those affected by climate change but also signals the need for a review and update of the international legal framework to incorporate and address the complex realities of climate displacement.

Challenges of Internal Displacements

Moreover, the Convention is limited to those crossing international borders, leaving out internally displaced persons who constitute the majority of those affected by climate change. These individuals face challenges often invisible in the international refugee discourse, despite their equally pressing protection and assistance needs.

- **Regional Initiatives and Limitations**

While pioneering regional initiatives like the Kampala Convention on Internally Displaced Persons in Africa have extended protection to individuals impacted by natural disasters and climate change, such measures remain more exceptional than normative. These regional initiatives represent a beacon of hope, illustrating possibilities for expanded protection; however, their impact is constrained by insufficient adherence and support at the international level.

On the other hand, regional refugee protection frameworks like the 1984 Cartagena Declaration and the 1969 Organization of African Unity Convention provide a broader coverage spectrum for those escaping circumstances that significantly alter public order. Although these provisions were established long before climate change was globally recognized as an impending crisis, their fundamental purpose

was clear: to secure the essential human rights of individuals confronted with adverse and uncontrollable situations endangering their livelihoods.

These regional instruments, despite being conceived without explicit consideration of climate change, offer a valuable framework that could be adapted to respond to contemporary challenges of environmental displacement. Their existence demonstrates the legal systems' capacity to evolve and encompass new forms of vulnerability, although they require recognition and reinforcement in the context of more inclusive and climate-aware global governance.

- **Need for a New Legal Framework**

The discussion on the protection of climate refugees highlights the urgent need to expand the international legal framework to include people displaced by climatic reasons. This would involve not only recognizing the existence of climate refugees but also establishing legal and operational mechanisms for their protection and assistance. Adopting a more inclusive approach, attuned to the realities of the 21st century, would bridge the current gap and provide robust legal backing for millions of vulnerable individuals.

International legal protection for climate refugees represents a critical challenge and a moral imperative in a world increasingly impacted by climate change. The international community must commit to reviewing and updating its legal frameworks to reflect this new reality, ensuring protection and rights for all displaced individuals, regardless of the causes of their migration.

4 Proposed Solutions: Towards an Inclusive Legal Framework

Addressing the challenge of providing protection and assistance to climate refugees requires a significant and

expansive revision of the international legal framework. The following are concrete proposals to advance towards a more inclusive system that recognizes and addresses the needs of those displaced by climate change:

• **Expansion of the Refugee Convention**

A fundamental solution would be to amend the 1951 Refugee Convention to explicitly include those displaced for environmental and climatic reasons. This expansion would require recognizing that climate change can cause forms of harm comparable to traditional persecution, albeit through different mechanisms. The new definition should consider both cross-border and internal displacements, providing a legal framework for the protection and rights of all individuals affected by environmental disasters and climate change.

• **Integration of Human Rights and Non-refoulement Norms**

Ensuring fundamental human rights are the cornerstone of any renewed approach toward climate refugees is crucial. This includes upholding the principle of non-refoulement, which prohibits returning individuals to countries where their life or freedom would be at risk. For climate refugees, this would mean not being returned to areas where their well-being or survival is threatened by adverse environmental conditions.

• **Regional and National Legal Frameworks**

Given that international action can be slow and meet resistance, countries and regions should start developing their legal frameworks for climate refugees. These frameworks could serve as models for international legislation and provide immediate protections for affected individuals. Countries could, for instance, grant temporary residence permits or protection status to individuals and communities displaced for environmental reasons.

• **International Cooperation and Shared Responsibility**

The response to climate displacement must be global, involving international cooperation and solidarity. This entails sharing the responsibility of hosting and supporting climate refugees among all nations, especially those less directly affected by climate change. A global financing mechanism could support the most affected countries and those receiving large numbers of displaced individuals.

• **Proactive Approach and Preventive Measures**

Adopting a proactive approach that addresses not only the consequences of climate displacement but also seeks to prevent it is essential. This includes policies to combat and adapt to climate change, as well as sustainable development strategies that enhance the resilience of vulnerable communities. Advance planning for the relocation of at-risk populations and investing in climate-resilient infrastructure can reduce the need for future displacements.

5 The Path Forward: Urgent Policies and Actions

Reflecting on the future and considering the path forward in managing the humanitarian crisis of climate refugees, the need for a global, collaborative, and multifaceted approach that addresses both the roots and ramifications of this phenomenon is evident. The international community, together with national governments and local authorities, must unite in a concerted effort to recognize and respond to the unique vulnerability of those displaced by climate change.

The formal recognition of climate refugees in international law is a fundamental step toward legitimizing their situation and ensuring their protection. This recognition should translate into the expansion of legal frameworks and the adoption of definitions that encompass the complexity of climate displacement, ensuring that migration and

climate policies are interwoven in ways that reinforce and complement each other.

Policy implementation must be comprehensive, ranging from climate adaptation planning to ensuring safe migration routes, and flexible enough to adapt to diverse and changing climatic contexts. Moreover, it is imperative that local and national efforts focus on providing tangible support to the displaced, facilitating their access to essential services, employment, and education, and fostering their social and economic integration into new communities.

The effectiveness of these policies largely depends on the availability of adequate financial resources. Thus, a robust and sustained financial commitment is required to support both immediate assistance and long-term research, enabling a deeper understanding of climate displacements and continuous improvement of response strategies.

The international collaboration emerges as a key pillar in managing this crisis. Cross-border cooperation and the exchange of knowledge and best practices are essential for building a cohesive global response. International solidarity, coupled with effective coordination among all relevant stakeholders, can amplify collective capacities to confront and mitigate the challenges associated with climate displacement.

Ultimately, reflecting on climate refugees invites us to envisage a future where solidarity, collective action, and respect for human dignity are at the heart of our responses to crises. In this future, policies and actions will not only address urgent needs but also anticipate and adapt to emerging challenges, ensuring the protection and well-being of all humans in a constantly changing world.

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13. Environmental Justice and Climate Justice

Laure Pichon Carnahan

Since the mid-20th century, human activities have heavily contributed to global warming. 2023 is the warmest year on record. Worldwide, the effects of climate change and biodiversity loss are evident. Severe weather events, unprecedented in number and size, are occurring with relentless frequency.

Our world is suffering from the consequences of the Anthropocene Epoch, a geological period of Earth's history when human activities have started to impact our ecosystems and climate. The climate crisis results from a chain reaction that began when the human lifestyle transformed from a traditional, rural, and agrarian society to a more secular, urban, and industrial one. This new economic system allowed for critical milestones, scientific discoveries, and technical innovations. The human population increased rapidly. Humans extracted more, deforested more, and manufactured more. With ever-growing consumption came ever-growing greenhouse gas emissions, habitat loss, and pollution. The warming stripes of Ed Hawkins, chronologically ordered to portray long-term temperatures, show an annual global average temperature increase since 1850. During that time, most countries experienced economic growth and increased general welfare. Consequently, the fragile equilibrium of our environment started to show destabilization of ecosystems and quick deterioration of six of the nine Earth's vital signs. These vital signs, including temperature, air quality, and

productive oceans, measure Earth's capacity to support human life.

In a world with finite resources, many communities with the least resources are experiencing the worst impacts of the climate crisis. Environmental Justice means sharing the benefits and burdens of our environment fairly. Environmental Justice was born from studying social injustices and is rooted in the 20th-century American Civil Rights Movement. Sociologist Robert Bullard has spent 40 years studying the ecological harms that disproportionately affected communities of color and those with the lowest incomes. Bullard's research highlighted that the population receiving the most from the environmental benefits usually bears the least burden linked to extraction, transformation, industrial wastes, and other harmful infrastructures.

Historically, Europe is responsible for a disproportionate share of global environmental destruction. Even today, Europe uses vast amounts of water, land, and resources from other countries and continents. Europe still participates in soil erosion and degradation through its addiction to pesticides and fertilizers and its ever-increasing emissions through its imports. Discussions to link social inequalities, racism, climate change, and the responsibility for environmental injustices continue.

The Europeanization of environmental Justice evolved in 1998 when 47 nations signed the Aarhus Convention, which linked environmental justice to human rights. The Aarhus Convention allows the public to be informed, to participate, and to have a voice in the decision-making process of any matters related to the environment. The policies to protect our life-support system, Earth, must be acceptable to our population. Communities whom society's systems have historically underserved must have a place at the table and a voice in the discussion. The burdens of the transition needs

be shared decently, evenly, and fairly across all socioeconomic and cultural layers of society.

Research on environmental Justice shows that policies aiming to tame climate change tend to contribute to social inequalities. The higher income group can access environmental benefits when subsidies are used as incentives. The lower income group gives away a higher percentage of their income when taxation is used as a deterrent. Fortunately, the European Union has realized that fighting the climate crisis should not create a social crisis. Preventively, the EU established "The Just Transition Fund" to protect vulnerable communities while taking the necessary steps towards a green transition. The Just Transition Fund and the Aarhus convention helped build an ambitious Green New Deal (GND) while shielding the most vulnerable. It gives people a voice and helps to absorb some of the costs of the transition. Unfortunately, the fund cannot support a fast-paced, drastic transition.

At COP27 in 2022, the Loss and Damage Fund, aiming to help the poorest countries that have participated the least in causing climate change, was discussed. A blueprint of the financial mechanisms, specific functionalities, and parameters was designed, and the fund was formally adopted at COP28. Al Jaber called this decision historic and said this fund would support billions of people. For the Loss and Damage Fund to meet the needs and expectations developed, countries are urged to participate in the fund. Other private and public financial sources are also welcome. At this point, the first round garnered $700 million of pledges, covering less than 0.2% of the 400 billion needed. The Loss and Damage fund is essential to fill the gap for cross-generational justice and enable sustainable development.

Climate Justice aims at the root causes of the climate crisis through a set of principles: respect and protection of human

rights, support for a right to development, equitable sharing of benefits and burdens, transparent and accountable decisions for all, gender equality, education, and an effective global partnership.

Human rights are universal, inalienable, indivisible, interdependent, equal, and non-discriminatory. Most countries have ratified this set of values. They are rights for each of us, and all countries must protect them. Human rights have the best legal framework and moral foundation to act on and deliver climate justice. Human rights, including people's right to health, are interlinked and interdependent with a clean, healthy, and sustainable environment. Over 160 countries have recognized the right to a healthy environment through constitutions, legislation, and regional treaties. In July 2022, the UN recognized the human right to a clean, healthy, and sustainable environment in resolution 76/300.

The climate inaction of governments and the inertia in declaring a worldwide state of emergency with the global deployment of scientific solutions backed by the IPCC has left the people no other choice but to sue their states and delinquent corporations. For instance, in 2015, the court required the Dutch government to reduce emissions by 25%. In 2018, France had an unprecedented civil mobilization, gathering 2.3 million signatures, leading to the condemnation of the French government for failing to reduce its greenhouse emissions. The French government was also found responsible for ecological damage due to deficient environmental politics. In 2019, Total, the French oil company, was sued by NGOs for downplaying the climate risks associated with its activities and lessening their impact on the environment. In 2024, in Strasbourg, the ECtHR (European Court of the Human Rights) must rule on a historical climate justice matter, the Duarte Agostinho case. Six children are suing 33 European states for climate inaction, accusing them of jeopardizing their human

rights and right to life. Ultimately, this case is about the ECtHR and its ability to realize it is a living instrument that needs to interpret its decision in the light of present-day conditions.

European banks, even though some have signed the Glasgow Financial Alliance for Net Zero (GFANZ), still financed climate bombs. Deutsche Bank, HSBC, Barclays, Crédit Agricole, and BNP Paribas are the most prominent European investors and climate "arsonists" jeopardizing the lives of 3.5 billion people. Friends of the Earth France, Notre Affaire à Tous and Oxfam France in October 2022 sued BNP Paribas so the court order the bank to stop financing additional decade of fossil fuels. In Europe, 15 cities and 6 NGOs attempted to sue Total Energies. Their lawsuit was denied on November 10th, 2023, revealing a void leading to the interpretation of the duty of vigilance and provisions relating to ecological damage. Considering the lack of regulations, legislation, or sanctions, it is evident that countries have lost their moral compass leading to climate justice. Climate inaction has been the global norm for policymakers and short-sighted leaders. In contrast, climate action is the new imperative, and to be environmentally just, it must include leadership and wisdom of all frontline communities and institutions. It is very unfortunate that the European Convention on Human Rights does not stipulate a right to a healthy environment.

The Council of Europe seeks to safeguard human rights and promote European unity. Based on the role held by the Council of Europe in the area of human rights, and in this unique context of climate emergency and ecological breakdown, adopting a binding legal instrument recognizing the right to a healthy environment is essential. A protocol for the ECtHR would be the best catalyst to take practical, accountable actions for the much-needed, rapid, systemic, and transformative changes necessary to protect a habitable and sustainable environment. It would also lead to stronger

environmental laws, better protection of the people, and more robust ecological performance. The Council of Europe would be the beacon for countries to work together. The Council of Europe must quickly develop a protocol to protect the people and be able to answer the climate injustices in the 21st century.

In addition to the human right to a healthy and sustainable environment, the idea of giving Nature a right is growing. In 1970, for the first time, the term ecocide designated the deliberate destruction of the environment. Arthur Galston from Yale University suggested creating an international legal agreement to forbid ecocide. Since then, environmental activists, legal experts, and some politicians have worked toward adding a right against ecocide in international legislation. The Geneva Convention of 1979 addressed air pollution, and the World Charter for Nature in 1982 encouraged countries to protect their biodiversity. The Montreal Protocol protected the Ozone Layer in 1987, and the Rio de Janeiro Conference brought recognition to protect the environment legally. The Kyoto Protocol proposed some constraining goals against greenhouse gases in 1997. Countries, despite political divergence, have been able to sit around the table to make safe decisions for the future of humanity. Some countries have also integrated a right for Nature into their legislation: France developed the Environment Regulation in 1995. Vietnam was the first country to recognize the crime of ecocide in 1998. Ecuador included a right for Nature in its constitution in 2008. Some countries recognize land, rivers, and other elements of Nature as legal entities. Lastly, the European Commission included ecocide in the EU law in November 2023, ending impunity for environmental crimes. Currently, to protect the climate system for present and future generations, the International Court of Justice (ICJ) is consulting the states to determine their obligations and the legal consequences. A request for advisory

opinion is open until January 2024, and hopefully, the EU will hand in a progressive submission to the ICJ.

The changes necessary to reverse climate change are difficult to grasp and accept. Politicians, media, and corporations have sent many contradictory messages charged with climatosceptiscism and greenwashing. These biased statements, pronounced as facts, profoundly obscure our understanding of the climate crisis and countries' progress toward a safer habitat. The climate crisis impacts us all on many aspects of our lives, especially the most essential ones, such as our health, access to fresh water, clean air, and food supply. It is essential for all people and all countries, regardless of their worth or vulnerability, to have access to reliable information to develop a voice in the decision-making process and the implementation of policies. The Aarhus Convention provides the right to be adequately educated and thus have access to environmental and climate Justice. The GND supports educators and learners with recommendations on learning about the green transition and sustainable development to truly prepare our youth. Knowing the truth about climate challenges and solutions, as inconvenient as this one may be, is a prerequisite to adopting and transforming our society successfully. Many organizations, such as QuotaClimat, denounced the dissonance between the urgency of the global environmental challenges and the quality and quantity of climate-related content in the media. The GND also proposed in March 2023 a new law on green claims along with an ecolabel to inform on products' environmental excellence. The dilution of climate facts through greenwashing is still too prominent with the imminent danger of brainwashing.

Gender equality is another significant principle of climate justice. The impact of the climate crisis is not shared equally between women and men due to current inequalities in accessing education and employment opportunities, the

prevalence of violence, and all gender-based discrimination. In the design of policies, the GND offers a structure to integrate and strengthen gender perspectives. The GND also sets measures to challenge gender stereotypes and economic empowerment for all genders in all their diversity.

The climate crisis is simple: our consumerist lifestyle fuels an economy of production that is not sustainable for our earth to be habitable. Humanity must shift from an egocentric mindset to ecocentrism to exist and thrive in the 21st century. To do so, the framework for balancing human needs and planetary boundaries needs profound change. Preparing and renovating, transitioning to sustainable food production, and shifting to a zero-carbon emission society come at substantial cost. Delaying the transition has an even greater cost. The doughnut economics offer a social foundation but also an ecological ceiling. Twelve social stands make a social foundation: access to water, food, health, education, networks, energy, housing, gender equality, social equity, political voice, peace and justice, income, and work. The ecological ceiling shows the nine planetary boundaries essential to sustain civilization and prevent reaching the tipping points in the Earth System. It comprises climate change, ocean acidification, chemical pollution, ozone layer depletion, biodiversity loss, air pollution, freshwater withdrawals, land conversion, and nitrogen and phosphorus loading. Doughnut Economics, an economic model introduced by economist Kate Raworth, recognizes growth yet introduces a new way of thinking beyond the mirage of endless growth. The economy, therefore, can be distributive and regenerative, nurture human nature to care for the team's well-being, and balance openness with integrity. The challenge is to create local and global economies where everyone can access life's essentials while preserving our habitat.

In 2021, the EU committed to being a climate-neutral

continent through the Climate Law. All economic key sectors are now legally bound by climate targets. The goal is for the EU economy to reduce emissions by 55% by 2030. EU net emissions are steadily decreasing, but the pace must accelerate to triple the average annual reduction achieved during the last ten years. The EU has developed a Green Industrial Plan with the Net-zero Industry Act to accomplish this decarbonization, enabling 40% of new manufacturing through the clean energy transition. The EU looks at strengthening European supply chains and international partnerships via the Critical Raw Material Act. With the REPowerEU, the commission plans to clean the energy system, producing more through renewable energy, reducing energy consumption through building renovation, and diversifying the supply sources. Although the use of renewable energy has increased, the levels need to be consistent with the target. Regeneration of nature is crucial to revive and protect our biodiversity, lower emissions, and sequester carbon. The Nature Restoration Law enables the restoration of at least 20% of land and 20% of sea areas by 2030 and all ecosystems by 2050. The decision for the commission to extend the use of glyphosate for ten more years, however, comes in contradiction, obliterating the EU Pesticide Law.

Green finance is essential to fuel the ecological transition. However, it remains below the level necessary. A current initiative calls for the commission to introduce a wealth tax on large-scale wealth. At the same time, the EU Tax Observatory has estimated that a global minimum tax on billionaires equal to 2% of their wealth could raise over €235 billion.

A call for tax justice is growing to redirect some of the cost of the environmental transition to the most prominent corporate polluters, specifically the fossil fuel companies who funded climate skepticism since 1971. The fossil fuel industry has a dominant responsibility in accelerating climate change

and endangering human existence. Strong lobbies, short-termist politicians, irresponsible investors, and insufficient environmental legislation have stopped substantial progress for the last 43 years. Today, half the worldwide population is vulnerable and under threat because the fossil fuel industry emits over 75% of worldwide CO2. Shockingly, we are still subsidizing our self-destruction. Globally, fossil fuel subsidies reached 7 trillion in 2022. In the EU subsidies added up to an average of 58 billion euros annually from 2015-2021, doubling to 120 billion euros in 2022. Meanwhile the fossil fuel companies made unprecedented profits totaling 59 billion euros for the first nine months of 2022. This baffling figure is without counting the $70 trillion 2025–2050 cumulative cost of climate damages attributed to fossil fuels.

Subsidies are financed with the people's taxes to reduce the cost of producing fossil fuels and cut consumers' prices. Outrageously so, as inflation roars, people's taxes are financing Shell's CEO to nearly 12 million euros or Total Energy's CEO to 7.3 million euros. Dreadfully so, people's taxes during a climate crisis encourage pollution and emissions, discourage more environmentally friendly energies, and increase social inequalities. In 2022, the IMF suggested relocating the $7 trillion in annual subsidies from the fossil fuels industry to finance the $3.5 trillion missing of capital spending on physical assets for energy and land-use systems in the net-zero transition by 2050. If all countries raised prices to a fully efficient level, then the reduction of emissions to stay at 1.5 degrees would be met. This option would finance the energy transition without costing the people an additional penny.

A significant milestone in calling for transitioning away from fossil fuels while "accelerating action this decade to achieve net zero by 2050" took place at COP28. Considering the gravity of our planet's health and what is at stake is only our survival, it is ludicrous that our leaders did not

find the wisdom to enable a complete phase-out of fossil fuels "in a just, orderly, and equitable manner." Considering the many new plans for extractions and pipelines, it is questionable that the fossil fuel industry will diversify into cleaner energy sources. The East African Crude Oil Pipeline (EACOP), led by Total Energy, is a perfect example illustrating the duplicity of fossil fuel companies. The EACOP will move oil across Uganda and Tanzania. It will emit 34 million tons of CO2 per year. Two hundred sixty-three organizations and civil societies warned of the ecological and social dangers. The European Parliament voted in 2022 an urgent resolution asking Total Energy to immediately stop the EACOP based on "human rights violations," "acts of intimidation," and "judicial harassment," as well as the "immense risks and impacts" on communities, the environment, and the climate. Nevertheless, EACOP announced the delivery of the first 100km in Tanzania, paving the way for pipeline construction on December 12th, 2023.

Today, standing at the crossing roads of our civilization, we are contemplating our extinction as one option and our survival as the other. We need a strong european legal framework and coercive plan to protect people, environment and climate. Under the impulse of courageous decisions and a just ruling, humanity can survive, envision, and create a safer world. People, when united, are powerful. To build a more sustainable Europe, the EU formed the Climate Pact. Ambassadors, through individual actions and pledges, citizen lobbying and activism, community awareness and education, create a network of advocacy, proving that daily activism works.

Social Justice, climate justice, and environmental justice are intrinsically linked and necessary to answer the challenges posed by the triple planetary climate change crisis, biodiversity loss, and pollution. The EU GND is a robust

plan to move Europe towards energy and food independence, preserve the most vulnerable, protect our health, transition infrastructures, create jobs for a better future, and lead by example the necessary efforts to sustain our existence.

Visionary leadership is required above all. Nations must pursue ambitious and coordinated measures towards climate justice collectively. It is criminal to advocate for any delay in actions towards climate justice. Around 70% of youth aged 16-25 worry about climate change. Seventy percent of youth aged 15 to 35 say they are more likely to endorse and vote for politicians who prioritize tackling climate change. A "regulatory pause" in EU environmental laws, as French President Macron has recently called for, is absurd and vacuous. Such narratives contribute to the hunt to kill the GND when the world needs it the most for the hope of the youth, the well-being of democracy, safety, peace, and the sake of humanity.

The climate crisis is a planetary crisis. All countries are responsible for adapting, transforming, or assisting each other. The climate crisis must be addressed globally and inclusively for the best benefit of every country, every ecosystem, and every individual. A worldwide partnership will guarantee that climate justice is globally effective.

The climate crisis is drastic and impressive. However, climate justice is an opportunity to bring equality, equity, and ethics to our world.

Climate justice is all we need to design a better future.

14. Renewable energies and transition to a cleaner energy matrix

Carlos Pérez-Collazo

Filip Koprčina

From ancient times until now, energy and how we use it has shaped our societies. In this chapter, we'll explore the history of energy, looking at important moments that changed our world. Before we start, let's think about the broader picture of the energy sector. It's like a huge puzzle where different types of energy have helped us progress and be successful. Energy, in its many forms, has been vital for our technology, our communities, and making our lives better. This chapter will show you how our understanding and use of energy have not only led to technological advancements but have also been the foundation of our prosperity.

14.1. History of Energy, Industrial Revolution and Fossil Fuels

In the grand story of energy, fossil fuels have played a starring role, steering the wheels of progress and prosperity. For centuries, coal, oil, and gas have been the driving forces behind our industrial might, the warmth in our homes, and the energy propelling our vehicles. The very prosperity we enjoy today has been fuelled, quite literally, by these carbon-rich resources.

Fossil fuels have been instrumental in powering the engines of our economies, facilitating the birth and growth of industries that have defined eras. The availability and

efficiency of these fuels have spurred innovation, enabled technological marvels, and increased our living standards. They've been the bedrock of our modern civilization.

However, beneath the surface of prosperity lies a complex reality. The combustion of fossil fuels releases vast amounts of carbon dioxide (CO2) into the atmosphere, contributing significantly to the global climate crisis. The same forces that have propelled us forward economically have, inadvertently, placed our planet at risk.

It's a paradox where the price of progress, as traditionally defined, clashes with the imperative to safeguard the environment for current and future generations.

In the pursuit of a sustainable future, transitioning to renewable energy sources emerges as an imperative. Unlike finite fossil fuels, renewable sources are derived from natural elements that can be replenished over time. The sun, wind, water, and other natural processes offer a continuous and eco-friendly supply of energy, marking a departure from the exhaustible nature of traditional fuels.

14.2. Renewable energy: A source of infinite power

Renewable energy is energy generated from renewable resources, which are natural resources that are replenished by nature to replace the amount that was used or consumed in a finite amount of time in a human timescale (Park & Allaby, 2017). Most renewable resources (Figure 1) have their origin in the sun, either directly (such as photovoltaic and thermal), or indirectly (such as wind, waves, hydropower, and biomass). Other renewable resources have their origin in other natural phenomena (such as geothermal, tidal energy or salinity gradient energy).

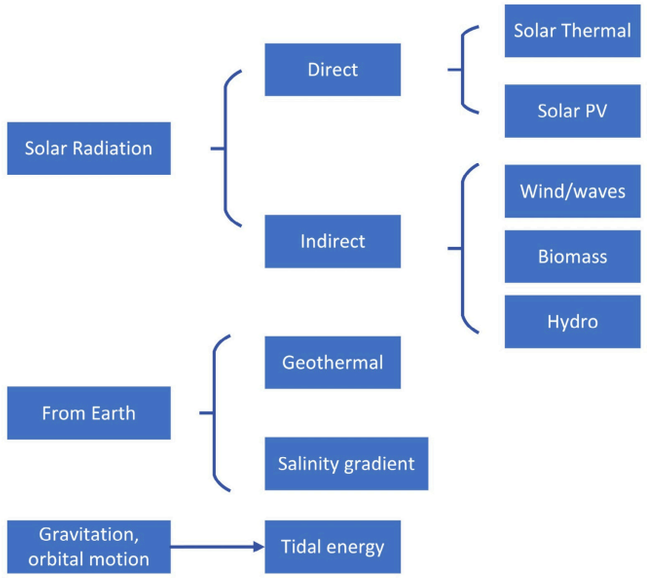

Figure 1: Renewable resources and their related renewable energies.

As a result of the energy crises at the end of the last century, research communities at western societies started to investigate how to technically harness these vast renewable resources that were surrounding us. Some, such as hydropower and wind turbines were well known and had been used by humankind for centuries, but the race to harness wind resource into electricity started there. The harness of other resources, instead, was proposed there, setting the basis for some new technologies such as: solar, biomass, wave energy, tidal energy, geothermal energy, and salinity gradient energy.

Today, just above 40 years after the start of this race, most of these renewable technologies are well known among our societies, and two of them stand out well beyond the others. It is quite remarkable that in just over 40 years, energy harnessed by wind farms and solar plants have overpassed the one coming from nuclear powerplants worldwide (Table 1).

Table 1: World electricity generation by sector 2050 Scenario based on stated policies (IAE, 2023).

	2010	2022	2030	2050
Total Generation (TWh)	**21 533**	**29 033**	**35 802**	**37 973**
Renewables	**4 209**	**8 599**	**16 915**	**37 973**
Solar PV	32	1 291	5 405	17 220
Wind	342	2 125	5 229	11 801
Hydro	3 456	4 378	4 981	6 351
Bioenergy	309	687	1 073	1 746
Concentration Solar Power	2	16	46	322
Geothermal	68	101	175	439
Marine	1	1	6	93
Nuclear	**2 756**	**2 682**	**3 351**	**4 353**
Hydrogen and ammonia	**-**	**-**	**22**	**91**
Fossil fuels with CCUS	**-**	**1**	**7**	**90**
Unabated fossil fuels	**14 479**	**17 636**	**15 406**	**11 373**

This remarkable milestone has been supported by the huge reduction on the cost of the energy harnessed by wind and solar energy, having today the cheapest cost of energy of all generation technologies, well beyond fossil fuels (Figure 2). This achievement has brought in place some credible plans to fully decarbonise our electricity systems by 2050 (Table 1), however, this is just a first step in our pathway towards a net-zero economy.

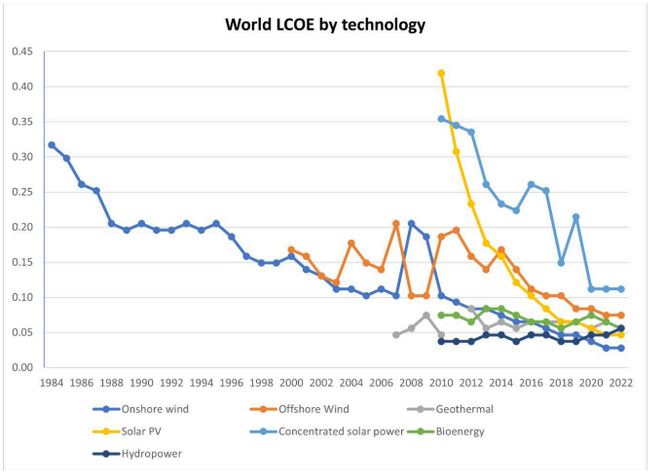

Figure 2: Average Levelized cost of energy (LCOE) by renewable energy technologies, based on (Our World in Data, 2023).

Note: data are expressed in constant 2022 EUR.

14.3. Transitioning the energy sector: Far more beyond than electricity

Decarbonising our energy sector is a key milestone in our collective effort to fight the climate crisis we're immerse in. For this, plans to boost renewable energy generation within the energy matrix have been put forward by countries on a global effort to decarbonise our economies. Following the 2022 stated policies, a fully renewable electricity and heat economic sector would be credibly achieved by 2050 (Table 1). However, the magnitude of the problem we are facing is far beyond the electricity and heat economic sectors, as these two only represent the 23% of the global direct greenhouse gas emissions (Figure 3).

Fully decarbonising other economic sectors, such as transport, industry, and construction, which combined are responsible of the 45% of greenhouse gas emissions, is the greatest challenge humankind has ever faced so far. Specially if our greed for energy and other critical raw materials keeps following an unstoppable growth. Being harshly honest, facing this challenge will mean to multiply by two our electricity systems by 2050 if we seriously aim to mitigate the effects of climate change on our daily lives. Facing such a challenge would require the greatest collective action since WW2, outlining new objectives, industrial plans, and engaging citizens, so that we all together work towards transitioning our economy to reach net-zero by 2050 (Table 2).

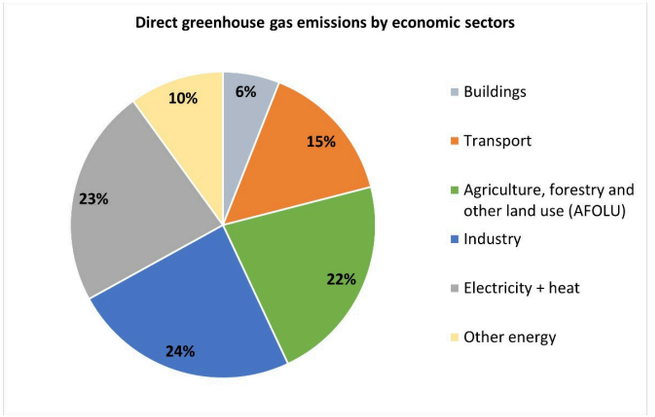

Figure 3: Total anthropogenic direct GHG emissions for the year 2019 by economic sector (Dhakal et al., 2022, p. 237).

Table 2: World electricity generation by sector on a Net Zero emissions by 2050 scenario (IAE, 2023).

	2010	2022	2030	2050
Total Generation (TWh)	**21 533**	**29 033**	**38 207**	**76 838**
Renewables	**4 209**	**8 599**	**22 532**	**68 430**
Solar PV	32	1 291	8 177	31 237
Wind	342	2 125	7 070	23 442
Hydro	3 456	4 378	5 507	8 225
Bioenergy	309	687	1 313	3 056
Concentration Solar Power	2	16	306	1 486
Geothermal	68	101	306	862
Marine	1	1	19	123
Nuclear	**2 756**	**2 682**	**3 936**	**6 015**
Hydrogen and ammonia	-	-	**373**	**1 161**
Fossil fuels with CCUS	-	**1**	**220**	**996**
Unabated fossil fuels	**14 479**	**17 636**	**11 066**	**158**

In order to face the scale of the challenge that represents the energy transition towards a net-zero economy, a multiple-scale collective-action approach should be put forward. Meaning that actions should be implemented at all levels of our society, political, industrial, and civil. There is not a single "magical" solution to face the scale of the energy transition that humankind should face in just about two decades, and every single contribution should be fostered. Cheap wind and solar power plants are called to play a fundamental role on this transition, as well as bioenergy and perhaps some new

generation nuclear power plants. The truth is that the 2050 energy matrix wouldn't look anything like it used to be just over 20 yeas ago. This huge change not just in our form of generating energy, but also in how us, as citizens and industry, use the energy is transforming our society.

For us to be successful in this endeavour, it is crucial to mobilize the citizenship, so that we ensure that everyone is aware of the magnitude of our challenge. This is key, because as important as it is to transition the energy sector into renewables, it is even more important to apply the three-Rs rule (Reduce, Recycle and Reuse). This rule summarises the degrowth theory, which proposes a downturn of our economies to tackle the finiteness of Earth's resources. Personally, I would rather prefer to call it learning back to do things as our grandparents used to, or to our origins, as a more powerful way of connecting with our collective culture and avoiding the void of facing a completely new way of doing things.

If a lesson can be taken from the 2020 pandemic, is that individual actions, as small as they may look like, when implemented as a collective action could lever a huge impact on our lives. This is perhaps the basis behind Local Energy Communities (LEC) a strong tool for citizens to foster energy transition in their communities, but also as a collective mechanism to tackle energy poverty and avoiding leaving behind the population with less resources to face the transition.

14.4. EU pathway towards Net Zero goal

This chapter explores how the European Union (EU) is working to have no net emissions, meaning they don't add more pollution than they take away. The EU has plans like the New Green Deal and Repower EU to make this happen. These plans are like a roadmap to guide the EU toward using cleaner

energy and being more responsible with the environment. This chapter shows how these plans are making a big impact on how the EU uses energy, envisioning a future where they are successful, and the environment stays healthy.

The Green New Deal is a visionary and transformative initiative designed to tackle the existential threats posed by climate change and environmental degradation, not only to Europe but to the entire world. Recognizing the urgency of the situation, the European Green Deal envisions a radical overhaul of the EU, propelling it into a modern, resource-efficient, and competitive economy. The core objectives are ambitious: achieving no net emissions of greenhouse gases by 2050, fostering economic growth independent of resource use, and ensuring that no person or place is left behind in this monumental transition. This strategic plan is not only a response to the environmental crisis but also serves as a crucial lifeline out of the ongoing COVID-19 pandemic. A substantial portion, one third to be precise, of the €1.8 trillion investments from the NextGenerationEU Recovery Plan and the EU's seven-year budget will be allocated to finance the European Green Deal. The European Commission has further demonstrated its commitment by adopting a comprehensive set of proposals, spanning climate, energy, transport, and taxation policies. These proposals aim to align the EU with the ambitious target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. In essence, the Green New Deal stands as a beacon of hope, outlining a path towards a sustainable and resilient future for Europe and setting a precedent for global environmental stewardship.

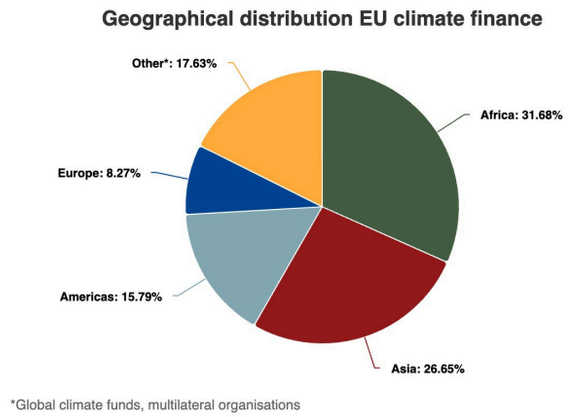

Figure 4: Geographical distribution EU climate finance (European Commission, 2024).

Emphasizing energy conservation as the most cost-effective, secure, and environmentally friendly approach to diminish Europe's reliance on fossil fuel imports, especially from Russia, the European Commission's REPowerEU Plan was launched in response to the challenges posed by Russia's invasion of Ukraine and the resulting disruptions in the global energy market. Initiated in May 2022, this comprehensive plan, focusing on energy savings, clean energy generation, and diversification of energy supplies, has yielded remarkable outcomes.

Beyond safeguarding EU citizens and businesses from potential energy shortages, the REPowerEU initiative has significantly advanced the transition to cleaner energy sources. Collaborative efforts under REPowerEU have led to a substantial reduction in Europe's dependency on Russian fossil fuels, resulting in nearly 20% energy consumption savings. The success of this initiative is further underscored by the implementation of a gas price cap, a global oil price cap, and a doubling of renewable deployment. Investing in renewable energy stands out as a pivotal element of the

REPowerEU plan, contributing positively to climate goals, energy independence, supply security, and employment generation within the EU. Noteworthy progress over the past year includes wind and solar sources surpassing gas in electricity generation, with a record 41 GW of new solar energy capacity and a 16 GW increase in wind capacity. Currently, 39% of EU electricity is sourced from renewables, and the EU aims to further elevate renewable energy capacity, setting a binding goal of 42.5% by 2030, with ambitions to reach 45%.

Conclusions

In conclusion, the narrative of our energy evolution is one of resilience and transformation. From the roots of prosperity powered by conventional fossil fuels to the urgent need for change triggered by geopolitical events, the REPowerEU Plan has emerged as a beacon guiding Europe towards a future of sustainable and clean energy. Through collaborative efforts, the EU has not only safeguarded against energy shortages but has also achieved substantial reductions in dependence on Russian fossil fuels, demonstrating a collective commitment to resilience and independence. The implementation of innovative measures such as a gas price cap, a global oil price cap, and the significant acceleration of renewables underscores the success of this initiative. Investing in renewable energy is not merely a goal but a fundamental driver of positive change, contributing to climate goals, energy security, and job creation within the EU. As wind and solar sources surpass gas in electricity generation, and with a record-breaking increase in solar and wind capacity, the EU stands at the forefront of a green revolution. The journey, marked by challenges and triumphs, propels us forward, reminding us that in the face of adversity, collaborative action and a commitment to cleaner, sustainable energy sources can

redefine our energy landscape for generations to come.

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15. Policies and International Agreements to Address the Ecological Crisis

Pierre-Jean Clausse

The exigency of the ecological crisis necessitates the implementation of comprehensive policies and international agreements to abate its repercussions. This article argues that as landmarks are reached, one exemplar in this regard is the Paris Agreement, an internationally significant accord designed to address climate change will gain traction through the politico-institutional spheres (Hone, 2017). Originating from United Nations negotiations, this accord underscores the imperative of global cooperation to mitigate the deleterious effects of climate change (Prins & Rayner, 2008). Similarly, the Kyoto Protocol, another seminal international agreement, concentrically focuses on curtailing greenhouse gas emissions as a means of mitigating climate change (Prins & Rayner, 2008). These accords collectively underscore the criticality of multilateral endeavors in effectively addressing environmental challenges. The influence of globalization on environmental governance is perceptible through the integration of telecoupling into the framework of global environmental governance (Lenschow et al., 2015). This integration has substantially broadened the spectrum of available policy and governance options, accentuating the necessity for bilateral, multilateral, and international agreements to confront ecological challenges (Lenschow et al., 2015). Moreover, the multiscale nature of environmental governance has been reinforced through transgovernmental

networks involving non-governmental organizations, private corporations, and the burgeoned transnational partnerships between state and nonstate entities (Andonova & Mitchell, 2010). These collaborative efforts illuminate the intricate and multiscalar attributes inherent in environmental issues, mandating diverse governance modalities for effective resolution (Lemos & Agrawal, 2006).

The scientific community has displayed fervent interest in international environmental regimes, particularly those delineated in multilateral environmental agreements (Young, 2011). Although these regimes have been established to contend with monumental environmental challenges, their efficacy exhibits variance (Hackmann, 2016). While certain regimes, such as the global ozone regime, have garnered widespread acclaim for their effectiveness, others, notably the global climate regime, present formidable challenges in environmental governance (Hackmann, 2016). This underscores the imperativeness of perpetual evaluation and refinement of international environmental regimes to efficaciously contend with the ecological crisis. PRC (People's Republic of China), as a key participant in global environmental governance, has made constructive contributions through the formulation of conventions and agreements centered on environmental protection (Xu & Tian, 2022). Research exploring the trajectory of practical cooperation between China and the European Union has proffered pragmatic insights for the advancement of international cooperation within the environmental protection industry (Cai, 2023). These endeavors underscore the significance of international collaboration as an integral component of addressing the ecological crisis. The exemplification of state territoriality and multi-scalar practices in global environmental governance is discernible in the case of the Global Green Growth Institute in Korea (Hwang

et al., 2016). This manifestation elucidates the influence of state territoriality and multi-scalar practices in shaping the landscape of global environmental politics. Furthermore, the scrutiny of public-private partnerships for environmental initiatives within the multilateral system emphasizes the nuanced politics and patterns of hybrid authority inherent in global environmental governance (Andonova, 2010).

The recalibration of global environmental politics has played a pivotal role in bringing to the forefront the intricate and multiscale characteristics inherent in environmental governance (Boydell, 2009). This nuanced process sheds light on the indispensable participation of various stakeholders, including transgovernmental networks, private corporations, and transnational partnerships, as articulated by Andonova and Mitchell in their seminal work (2010). The accentuation of this multiscale nature serves not only to highlight the interconnectedness of environmental governance but also to underscore the criticality of involving a diverse array of actors in navigating the complexities associated with addressing environmental challenges effectively. At the heart of this recalibration is the recognition that environmental governance extends beyond traditional boundaries, permeating various levels of governance, ranging from local to global. Non-state entities are increasingly recognized as influential actors in shaping and implementing environmental policies (p. 267). These networks operate across multiple scales, facilitating collaboration and information exchange between different levels of governance. The involvement of private corporations adds a layer of complexity to environmental governance, as their interests and activities often transcend national borders : the engagement of transnational partnerships further amplifies the interconnectedness of environmental issues, emphasizing the need for collaborative efforts on a global scale. The

accentuation of this multiscale nature in global environmental politics not only acknowledges the complexity of environmental challenges but also underscores the need for a diversified approach to governance. The involvement of diverse actors brings a richness of perspectives, expertise, and resources to the table, enhancing the capacity to devise comprehensive and effective solutions (Puetter, 2012). Recognizing the multifaceted character of environmental issues, from climate change to biodiversity loss, necessitates a holistic approach that transcends traditional governance boundaries. Moreover, the recalibration of global environmental politics emphasizes the dynamic and evolving nature of environmental governance structures. Traditional state-centric approaches are increasingly complemented by the involvement of non-state actors, creating a more inclusive and adaptable governance landscape. As state sovereignty contends with the borderless nature of environmental challenges, the integration of various actors becomes imperative to address issues that surpass geopolitical boundaries (Warren, Holden and Howell, 2017). In essence, the recalibration of global environmental politics, as exemplified by Andonova and Mitchell (2010), signifies a paradigm shift towards recognizing the multiscale nature of environmental governance. This paradigmatic transformation underscores the pivotal role played by an array of diverse actors becomes imperative in developing and implementing comprehensive solutions that address the intricate and interconnected aspects of the ecological crisis. This recalibration reflects a broader recognition of the need for adaptive and inclusive governance structures to effectively tackle the multifaceted nature of global environmental issues.

In such a framework, the European Commission plays a crucial role in leading the European community's response to the climate crisis. Since the late 1980s, the European Union

has been at the forefront of international efforts to reduce greenhouse gas emissions (Biesbroek et al., 2010). The sustainable development discourse in Europe has been a driving force behind the unified action on climate change within the European Union (Boydell, 2009). While the literature on the EU's response to the crisis has focused on intergovernmental politics, there is a growing recognition of the previously neglected role of the European Commission in this context (Warren et al., 2017). The European Commission has been instrumental in formulating and implementing policies to address the climate crisis. It has been actively involved in coordinating a unified adaptation strategy for Europe, as evidenced by the European Commission White Paper on Adaptation (Císcar et al., 2011). Furthermore, the Commission's role in EU economic governance has evolved significantly in response to the economic and financial crisis, highlighting its influence in shaping the Union's core intergovernmental bodies (Puetter, 2012). The Commission's role as a supranational policy entrepreneur has been particularly evident in the area of energy policy integration, contributing to the debate on European Union integration and the distribution of authority and policy responsibilities between member states and the supranational level (Maltby, 2013). Additionally, the European Commission has demonstrated leadership in climate change mitigation, with individual EU member states playing a crucial role in establishing the EU's agenda in this domain (Schreurs & Tiberghien, 2007). In times of crisis, such as the economic and social impacts of the COVID-19 crisis, the European Commission has responded with innovative proposals, such as the creation of a new recovery instrument named 'Next Generation EU' (Cabral, 2021). This exemplifies the Commission's ability to adapt and propose solutions to multifaceted crises, including those related to climate change. The European Commission's communication and engagement strategies have also been pivotal in engaging European citizens

and enhancing support for EU initiatives, including those related to climate action (Oomen et al., 2020). The Commission has emphasized the active and effective participation of citizens as essential to citizenship in Europe, aligning with the notion that responsible participation depends on the competence of citizens (Joris et al., 2021). However, the Commission's response to crises, including the climate crisis, has not been without criticism. There have been discussions about the decoupling of the Commission's talk, decision, and action, allowing it to maintain its reputation as an environmental policy entrepreneur while satisfying member states' preferences for economic recovery and less environmental regulation (Knill et al., 2018).

The Aarhus Convention, formally known as the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters, has significantly influenced citizen engagement in Europe. This international agreement, adopted in 1998 and entering into force in 2001, has provided a framework for enhancing public involvement in environmental decision-making processes Pasetto et al. (2019). The Convention's principles have been integrated into various European policies and directives, emphasizing the importance of citizen engagement in environmental governance. The Aarhus Convention has been instrumental in promoting stakeholder participation in environmental projects, aligning with the principles of the Earth Summit and the European Water Framework Directive (Luyet et al., 2012). It has mandated extensive obligations to engage the public in decision-making on local projects, such as renewable energy siting, and has been pivotal in ensuring public access to information and justice in environmental matters (Perlaviciute & Squintani, 2020; Mayne et al., 2016). Furthermore, the Convention has aimed to

close the distance between decision-makers and inhabitants, encouraging stakeholder participation within a flexible framework (Storie et al., 2019). In the context of flood risk management, the Aarhus Convention has emphasized community engagement and responsibility for flood risk planning, particularly in the UK and Poland, where it has facilitated the engagement of residents in flood risk governance (Driessen et al., 2018). Additionally, the Convention has been crucial in promoting participatory GIS risk mapping and citizen science, aligning with the principles of active citizen engagement enshrined in the Convention (Onencan et al., 2018). The Aarhus Convention has also influenced the nuclear sector, where participatory rights have gained importance, albeit with inconsistencies and uncertainties in the practice of public participation under the Convention (Duvic-Paoli & Lueger, 2022). Moreover, the Convention has gained added force in the national legal order through its interpretation by the Court of Justice of the EU, highlighting its multi-level governance impact on access to justice in environmental matters (Hadjiyianni, 2020). In the European context, the Aarhus Convention has laid out rights to access to information, public participation in decision-making, and access to justice in environmental matters, aligning with the principles of climate justice and energy policy (Mayne et al., 2016). It has also been pivotal in ensuring public consent for the geologic disposal of highly radioactive wastes and spent nuclear fuel, emphasizing stakeholder participation in Europe (Lawless et al., 2014). However, despite the significant influence of the Aarhus Convention, challenges remain. Citizen awareness and engagement in policy-making have been reported to be rather low, indicating the need for further efforts to enhance public involvement in decision-making processes (Brockhoff et al., 2019). Additionally, inconsistencies and uncertainties in the practice of public participation under the Convention have been highlighted, suggesting the need for greater clarity and

standardization in the implementation of participatory rights (Duvic-Paoli & Lueger, 2022). In conclusion, the Aarhus Convention has played a pivotal role in shaping citizen engagement in Europe, particularly in the context of environmental governance, flood risk management, nuclear activities, and climate justice. Its principles have been integrated into various European policies and directives, emphasizing the importance of public participation in decision-making processes. While the Convention has made significant strides in promoting stakeholder participation, challenges remain in enhancing citizen awareness and ensuring consistent implementation of participatory rights.

The pivotal role of the European Commission in spearheading the unified response of the European community to the climate crisis is of paramount importance Ponte et al. (2015). The Commission's influence permeates various facets of climate-related endeavors, encompassing policy formulation, the coordination of adaptation strategies, seamless integration of energy policies, and proactive engagement with citizens (Pasetto et al., 2019). Undoubtedly, the Commission has exhibited commendable leadership and innovative approaches in tackling the multifaceted challenges posed by the climate crisis (Luyet et al., 2012). However these laudable efforts have not been without their share of ongoing debates, particularly concerning the intricate trade-offs and formidable challenges encountered in striking a delicate balance between environmental imperatives, economic recovery, and the nuanced preferences of member states (Botterill et al., 2018). Expanding our purview to the broader spectrum of the ecological crisis, it becomes evident that addressing such a multifaceted challenge demands a comprehensive framework encompassing robust policies and international agreements (Temper et al., 2015). The cornerstone of this approach lies in accentuating global

cooperation, emphasizing the indispensability of multilateral efforts, and fostering the active involvement of diverse actors in the intricate tapestry of environmental governance (Clarke & Moss, 2021). The effectiveness of international environmental decisions, delineating guidelines and frameworks for global environmental cooperation, becomes a focal point in navigating the complex landscape of the ecological crisis (Driessen et al., 2018). The role of state territoriality emerges as a critical determinant, shaping the contours of global environmental governance (Brown et al., 2019). States, with their distinct territorial boundaries, wield substantial influence in crafting and implementing environmental policies (Redclift & Rajina, 2019). Simultaneously, the intricate dance of public-private partnerships on the global stage assumes significance, embodying the nuanced politics and patterns of hybrid authority within the realm of environmental governance (Dobruszkes, 2018). These partnerships, bridging the realms of public and private entities, underscore the need for collaborative approaches to address the intricate interplay of ecological challenges (Miller, 2018). The complexity inherent in addressing the ecological crisis is further underscored by the rescaling of global environmental politics, a phenomenon that amplifies the multiscale nature of environmental governance (Onencan et al., 2018). This rescaling reinforces the involvement of transgovernmental networks, private corporations, and transnational partnerships, highlighting the necessity for diverse actors to participate actively in environmental governance (Brockhoff et al., 2019). The multifaceted collaborations among these entities, spanning various scales, are imperative in navigating the intricate web of environmental challenges effectively (He et al., 2020). As we delve into the intricacies of global environmental governance, the continuous evaluation and improvement of existing frameworks emerge as imperative imperatives (Liefferink et al., 2011). The effectiveness of international environmental

regimes, while serving as guiding pillars, demands constant scrutiny and adaptation to meet the evolving dynamics of the ecological crisis (Perlaviciute & Squintani, 2020). The ever-changing landscape necessitates a vigilant approach to global environmental governance, ensuring that policies and agreements remain robust and responsive to emerging challenges (Maye et al., 2018).

In essence, both the European institutions' central role in climate response and the imperative for comprehensive global policies underscore the intricacies inherent in addressing the ecological crisis (Mees, 2016). A holistic and adaptive approach, grounded in global cooperation, multilateral efforts, and the active involvement of diverse actors, becomes indispensable (Kelly et al., 2019). The ongoing debates surrounding the Commission's efforts illuminate the delicate balance required between environmental considerations, economic recovery, and the diverse preferences of member states (Ribeiro et al., 2016). In this multifaceted landscape, the rescaling of global environmental politics and the significance of international environmental regimes further underscore the need for continuous evaluation and improvement, ensuring the efficacy of global environmental governance in navigating the complex challenges posed by the ecological crisis (Macaulay et al., 2022).

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16. Environmental Education and Citizen Awareness: Tools for a Sustainable Future

Isabel Silva

Environmental education is an interdisciplinary and heterogeneous pedagogical field that aims to generate processes for building environmental values and practices in formal, non-formal, and informal education spaces. Its goal is to promote ecological awareness and environmental care among citizens, serving as fundamental pillars to address the challenges our planet currently faces. Rooted in various philosophical streams and social movements throughout history, environmental education is considered to have formally begun taking shape in the 1960s and 1970s, in response to growing concerns about environmental issues and the need to promote environmental consciousness and action.

In a world increasingly affected by climate change, biodiversity loss, and pollution, it is crucial that society as a whole understands the importance of preserving the environment and adopts more sustainable lifestyle practices. Doing so is essential to reduce the impact of daily decisions and to seek viable solutions for building a more sustainable future.

Environmental Education: Planting the Seeds of Knowledge

Environmental education is a continuous learning process aimed at increasing awareness and knowledge about socio-environmental issues and promoting the adoption of more responsible behaviors toward the environment. This education can occur in various contexts, including formal educational systems, community programs, awareness campaigns, and media channels.

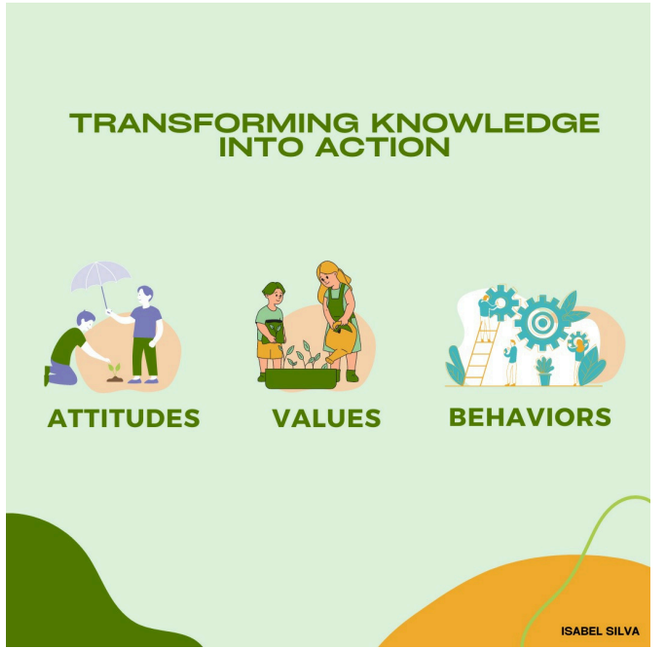
In the realm of formal education, integrating environmental education into curricula is crucial to ensure future generations are well-informed about environmental challenges and equipped with the necessary skills to address them. Countries around the world have started incorporating environmental education into their school curricula, from primary education to university levels. For instance, in Finland, an interdisciplinary approach has been implemented that weaves

environmental concepts across different subjects, enabling students to understand the interconnection between the environment, society, and economy from an early age.

Beyond the formal education system, comunity programs and awareness campaigns play a vital role in environmental education. These initiatives can engage civil society, non-governmental organizations, businesses, and local governments to impart knowledge and encourage concrete actions for environmental conservation. For example, many cities organize beach and river clean-up activities, tree-planting days, and workshops on recycling and waste management.

Citizen Awareness: Transforming Knowledge into Action

Citizen awareness extends beyond merely acquiring knowledge; it involves a shift in people's attitudes, values, and behaviors toward the environment. When individuals become aware of the importance of protecting the environment, they are more inclined to adopt sustainable practices in their daily lives and advocate for stronger environmental policies.



One of the most effective ways to promote citizen awareness is through active participation and community empowerment. When people feel part of a larger movement to protect the environment, they are motivated to take concrete actions. For example, many cities have formed volunteer groups dedicated to cleaning and restoring local natural spaces, which not only contributes to environmental improvement but also strengthens citizens' sense of belonging and responsibility towards their community.

Moreover, public awareness campaigns play a crucial role in promoting citizen awareness. Through mass media, social networks, and public events, these campaigns can reach a broad audience and convey clear messages about the importance of protecting the environment and the actions everyone can take to contribute. For instance, the "Car-Free Day" campaign encourages the use of public transport, cycling, and walking as alternatives to car use, thereby reducing

greenhouse gas emissions and promoting a healthier and more sustainable lifestyle.

Impacts and Achievements of Environmental Education and Citizen Awareness

Environmental education and citizen awareness have demonstrated numerous positive impacts on society and the environment.

Some of these impacts and achievements include:

- Behavior change: Environmental education and citizen awareness have led to significant changes in individual and collective behaviors towards more sustainable practices. For example, a study in Australia found that households participating in environmental education programs significantly reduced their energy and water consumption.

- Civic participation: Citizen awareness has resulted in increased community engagement and participation in environmental decision-making. When citizens are well-informed about environmental issues and feel empowered to act, they are more willing to engage in volunteer activities, protests, and environmental advocacy campaigns.

- Innovation and sustainable development: Environmental education encourages innovation and the development of sustainable solutions to environmental challenges. By enhancing understanding of environmental issues and the interconnectedness of the environment, society, and economy, it promotes the adoption of more responsible business practices and the creation of environmentally sustainable products and services.

- Biodiversity conservation: Environmental education and citizen awareness have contributed to biodiversity conservation by increasing understanding of the importance of ecosystems and endangered species. They have also

promoted the establishment and maintenance of protected areas and biological corridors to safeguard wildlife and natural habitats.

- Strengthening environmental policies: Citizen awareness puts pressure on governments and businesses to adopt more sustainable policies and practices. Through public participation and advocacy for environmental rights, citizens can influence policy-making that protects the environment and promotes sustainable development.

One of the most significant milestones in the development of environmental education was the United Nations Conference on the Human Environment, also known as the Stockholm Conference, held in 1972. This conference marked the beginning of a global focus on environmental management and helped establish environmental education as a key component of conservation and sustainable development strategies.

The conference issued a declaration on the emerging environmental problems and their potential short- and medium-term impacts on the sustainability of life. In this regard, one of its proclamation's states that:

"...through ignorance or indifference, we can cause vast and irreparable harm to the terrestrial environment on which our life and well-being depend. On the other hand, with deeper knowledge and more prudent action, we can achieve for ourselves and our posterity better living conditions in an environment more in line with human needs and aspirations..." (Proclamation 6). (Zabala G & García, 2008, #)

Since then, environmental education has evolved and expanded worldwide, addressing a wide range of environmental issues and adapting to the specific needs of different communities and cultural contexts. In many countries, it has been integrated into formal educational

systems and is carried out through school programs, community projects, awareness campaigns, and other initiatives.

Conclusions and Future Perspectives

Environmental education and citizen awareness are powerful tools for addressing environmental challenges and building a more sustainable future. As we face crises such as climate change, biodiversity loss, and pollution, it is essential that society as a whole is well-informed and engaged in environmental protection.

To maximize the impact of environmental education and citizen awareness, an integrated approach involving various stakeholders, including the education system, civil society, the private sector, and governments, is necessary. Moreover, it is crucial to tailor awareness and education strategies to the specific needs and contexts of each community, ensuring they are inclusive, accessible, and culturally relevant.

As we move towards a more sustainable future, it is vital to continue investing in environmental education and citizen awareness, planting the seeds of knowledge and action for the coming generations. Only through joint effort and collective commitment can we ensure the protection of the environment and the well-being of all living beings on our planet.

Key environmental education events can vary depending on the region and the specific interests of the communities and organizations involved in promoting environmental awareness. However, some events are commonly recognized and celebrated internationally.

Here is a list of some of the key environmental education events:

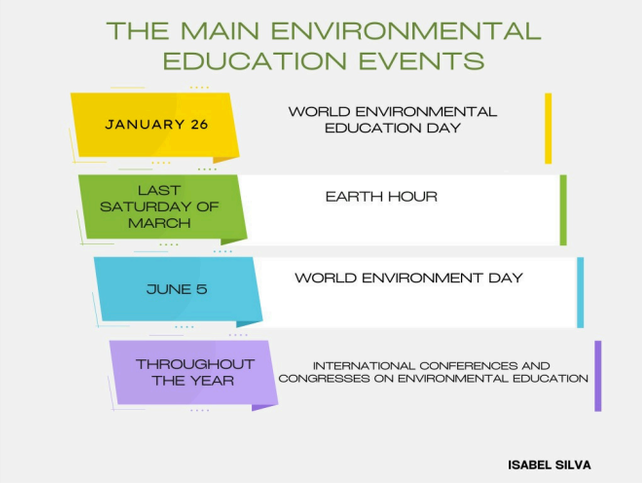
- World Environmental Education Day (January 26): This date is celebrated in many countries as an opportunity to highlight the importance of environmental education in protecting and conserving the environment.

- Earth Hour (last Saturday of March): Organized by WWF, Earth Hour is a global event in which individuals, communities, and businesses turn off their lights for one hour to show their commitment to climate action and energy conservation.

- World Environment Day (June 5): Established by the United Nations, this event is celebrated annually to foster awareness and global action in environmental protection.

Each year focuses on a specific theme.

- International Conferences and Congresses on Environmental Education: These events bring together educators, researchers, activists, and environmental leaders from around the world to share knowledge, best practices, and collaborate on educational initiatives.



These are just a few examples of significant events in the field of environmental education, but there are many other local, regional, and thematic events that also play a crucial role in promoting environmental awareness and socio-environmental action focused on health, food, and economy. These elements interact to generate sustainable actions that are easy to implement by citizens, students, communities, and other actors involved in social transformation, being an active part of change. It is vital to be a facilitator and an educator on climate issues, using the appropriate tools to create a sustainable and aware future because there is NO PLANet B.

According to Article 26 (The Universal Declaration of Human Rights - United Nations, n.d.)

2. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms; it shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.

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17. Technological and scientific innovations to face the ecological crisis

Marco Miozzo

Paolo Dini

Without any doubt technological innovation has helped in improving our lifestyle and our life conditions in many aspects: health, mobility, work, among others. From a health perspective, the introduction of antibiotics enabled the increment of the average lifespan from 50-60 up to 80-90 years old. Considering the world of work, the innovation of electricity generation, storage and transportation, allowed us to have a cheap source of energy that we could use almost anywhere, which also enabled many more innovations: the electric bulb, the refrigerator, the radio transmission, the television and finally, the internet and smartphones. However, technological advances are not coming for free and have many counterparts: the utilization of big amounts of natural resources, the increment of CO2 emissions and the unequal access to technology. Technological advances increased fast starting with the industrial revolution and have continued during the IXX and XX centuries, without generating catastrophic problems from an environmental perspective. Nevertheless, with the population growth of the last decades, the pursue toward a continual and infinite economic growth, the always increasing energy demand of the developed technology and the massive use of fossil fuels for energy generation, the C02 emissions has increased exponentially, reaching levels that are not any more manageable by our planet. This is mainly due to the *rebound effect*: when a

resource is more accessible due to an increment in its efficiency, its usage starts growing till overcoming the initial efficiency. A practical example can be considered by mobile phone batteries. They have been innovated a lot during the last decades (from the 1500 Ah of the first smartphone till the 3000 Ah of nowadays) but now they last less with a charge, since we tend to use them more and with more energy-hungry applications. Similarly, we massively started using fossil fuels and products derived from oil in the second half of the XX century due to their abundance and efficiency in extraction, but instead of reducing their extraction we started exploiting them in a more intense fashion (e.g., more cars and longer trips, more airplanes and flights, single-use plastic products, etc.). The total world energy rebound averages 102.4% over the past 50 years, which means that we have more than doubled the amount of resources we used, despite the various inventions introduced.

Nowadays we are experiencing one of the biggest innovations in the last centuries: the data revolution. The concept of the data revolution recognizes that we now face "an exponential increase in the volume and types of data available, creating unprecedented possibilities for informing and transforming society and protecting the environment" [1]. This has been mainly driven by the introduction of new technologies, such as pervasive communications, sensors, and processors with high computation capabilities. We can group these novelties in the information and communication technologies (ICT) ecosystem. However, as for oil, ICT can incur in the rebound effect phenomenon.

In this chapter, we start analyzing ICT's capabilities in solving the ecological crisis and we conclude listing some important aspects that have to be taken into consideration for enabling technologies to actually face the ecological problem and not be a part of it.

ICT for sustainability

The main revolution that we need to face within the ecological crisis is the understanding of its main causes, how it evolves, and how to react/adapt. This is really a complex task since it involves many aspects. Standard methods based on physics laws would be very difficult to derive, especially when we want to investigate the correlation of different processes in an aspect related to the crisis for obtaining a more global and general explanation (e.g., how the arctic pole ice melting changes the climate in the whole world). In many cases, we know the physics behind each process very well, but it's very difficult to combine the different processes to analyze their correlation. To overcome this, we can use data and Artificial Intelligence (AI). Nowadays we can count on systems that produce a huge amount of data for tracking all the details of human activities and of the environment, the so-called Internet of Things (IoT). Thanks to this data and the innovation in computation, AI can be used to process this data to find patterns and correlations among different processes in the world. AI has already been applied to many aspects related to the ecological crisis [2].

- In *health*, AI has been successfully used to recognise features in an image such as an X-ray scan for cancer diagnosis and to perform predictions on the protein structure (e.g., Alphafold).
- In *transportation*, AI has been used to better control the traffic load in smart cities' scenarios, to avoid car accidents and to assist the driver when driving.
- In *industry*, AI has already helped a lot by improving the efficiency of the production system and more can be done by collecting more data with new IoT solutions.
- In *electricity* systems, AI plays an important role in

forecasting the energy supplies and the demand for improving the renewable energy usage.
- In *building*, AI can help in modeling energy within buildings and across them for their optimization (e.g., to optimize heating, ventilation, and air conditioning).
- In *farms and forests*, AI can help in evaluating the emissions with satellite images, in improving production and reducing the resources used (e.g., water).

For what concerns climate change, AI techniques have been used to forecast global mean temperature changes, predict climactic and oceanic phenomena such as El Niño, better understanding of the weather system aspects (e.g., rainfall), anticipate the extreme weather events that are more common as a result of global climate change (e.g., heavy rain damage or wildfires). In particular, when predicting catastrophic events like hurricanes, it has been shown that AI can improve the estimation of the trajectory. Moreover, AI can be used to control how climate change is evolving, by predicting carbon emissions based on present trends. Of course, these solutions can have a bias, since they have been trained with data that was not affected by the climate crisis (e.g., in the case of hurricanes in the Mediterranean area, historical data do not include such phenomena since they started only recently as a consequence of the crisis).

To create synergies and network among all the people involved in this topic, the Climate Change AI community (https://www.climatechange.ai/) provides support and connections among all the researchers in the world involved in this important task. In this way, AI can also help in democratizing the research on the climate crisis by sharing knowledge and models. Of course, we still need to consider the digital gap, since not all the researchers can access the high computation infrastructures that AI needs.

Sustainability of ICT

ICT will play an important role in facing the ecological crisis, but they are also part of the problem: recently it has been estimated that their contribution to global emissions is as high as 2.1% – 3.9% [3]. Moreover, ICT is one of the sectors that is experiencing the highest growth in terms of CO2 emissions, already reaching 6% nowadays and, with the current trend, it is estimated to grow up to 15% by 2030. ICT's rebound effect is very complex to estimate, based on eight different studies it ranges between 115% and 161% [3]. In addition, new AI based services are becoming more pervasive each day in our life, with models that are dramatically increasing their complexity. A very recent example can be found in the ChatGPT service, which monthly electricity consumption is estimated to be at the moment around the millions of kWh: "*ChatGPT may have consumed as much electricity as 175,000 people in January 2023*" [4]. Similarly, Meta used 2.6 million KWh hours of electricity and emitted 1,000 tons of CO2 when developing their new LLaMA models [5], which is smaller with respect to GPT-3. This energy is estimated to have led to the emission of 1,015 tCO2e - roughly the annual carbon footprint of 150 EU citizens, the total carbon footprint of EU-27 was equal to 6.8 tonnes of CO2 per person in 2019 [6]. Unfortunately, it's not only a matter of electric energy, these solutions are also very costly in terms of water: ChatGPT may have used 255,000,000 liters of fresh water in a single month. In particular, the training procedure for GPT-3 in Microsoft's state-of-the-art U.S. data centers can directly consume 700,000 liters of clean freshwater, which is enough for producing 370 cars [7]. Furthermore, electronic waste (e-waste) is considered the fastest-growing waste stream globally, with 44.7 million tons generated in 2016, equivalent to 4500 Eiffel Towers. Global e-waste volume is projected to increase to 74.7 million tons by

2030, doubling in the last 16 years [8]. This increment is driven by the number of manufactured devices, growing from 29k millons in 2023 up to 48k million in 2030, used for digitizing our activities, i.e., the IoT services. Finally, considering the data-tsunami expected for the next few years due to the diffusion of connected devices and mobile traffic, digital technologies will need to be completely re-designed to be truly sustainable [9].

To deal with this problem, recently a transition has been proposed toward a more sustainable paradigm for AI development and usage, the *Green AI*. The goal of Green AI is to put efficiency as one of the goals of AI optimization instead of relying only on accuracy, too often with a brute force attack paradigm. However, also the hardware matters, to reduce the electronic waste and the energy used in the manufacturing of the device, which reaches 50% of the total emissions [3], we need to change from a linear and abundant digital technologies approach to a circular and sufficient one. Thus, new technologies should be built around regenerative designs and pursue system innovations that advance **circularity** and **sufficiency**. On one hand, circularity will help in reducing the extraction of natural resources by reusing the ones we already have. This is not an easy task, especially with current technologies that are not designed for recovering the minerals used, but instead just in a disposable fashion. Therefore, we need to completely change the design paradigm to simplify the process of recovering natural resources. On the other hand, the concept of digital sufficiency has to become part of the essential environmental transformation in the digital ecosystem [10]. Digital sufficiency can be divided in four main branches:

- *hardware sufficiency*, we need fewer devices to be produced and with less absolute energy demand to perform the desired tasks using circular design

principles to avoid the generation of e-waste;
- *software sufficiency*, we need to ensure that data traffic and hardware utilization during application is maintained low to reduce the need of energy-hungry data centers;
- *user sufficiency*, we need to personally put our effort using digital devices and services frugally, and being aware of their carbon footprint;
- *economic sufficiency*, the new digitalization era needs to support a transition to a new economy whose primary goal is the sufficient production and the consumption according to the planet's resources and abandon the economic growth as function of the production.

In conclusion, the magic technological innovation that can solve the ecological crisis does not exist. However, there are many technologies that can help with the climate crisis, but we need to use them carefully and consciously by embracing circularity and sufficiency to avoid further exacerbation of the problem and to promote a more equal access to technologies.

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18. The Role of the Private Sector in Combating the Climate Crisis

Bryony Cecil

The planet cannot afford delays or excuses. The climate crisis is one of the most pressing challenges facing the world today. With rising global temperatures, extreme weather events, and the loss of biodiversity, there is an urgent need for action to mitigate the impacts of climate change. While government policies and international agreements play a crucial role in addressing the climate crisis, the private sector also has a significant role to play in combating climate change.

An Overview

The Earth Summit, held in Rio in 1992, marked a pivotal moment as it led to a shift in corporate environmental strategies among business entities, resulting in increased private sector involvement in international environmental conferences (Andrade and Puppim de Oliveira, 2015). The Earth Summit had many great achievements, notably the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations, 1992). This was a significant outcome due to the private sector possessing the potential to play a diverse role in advancing the UNFCCC's objectives of enhancing, streamlining, and redirecting climate finance (Atteridge, 2010).

The Paris Agreement (2015) builds upon the UNFCCC, standing as a historic achievement within the multilateral

climate change process, as it marks the first instance of a binding accord, uniting all nations in the shared effort to address climate

change and respond to its impacts (UNFCCC, 2024). The Paris Agreement calls for increased participation from the private sector, recognising that its investment and innovation contributions are crucial for tackling climate change and realising the United Nations Sustainable Development Goals (SDGs) (UNFCCC, 2014; Brookings Institution, 2023).

"Involving the private sector requires systemic change, innovative sustainable business models, and market incentives for widespread adoption."

- Sahba Sobhani, Director of UNDP's Istanbul International Center for Private Sector in Development

The private sector has showcased its role as a pivotal player in addressing climate change since the adoption of the Paris Agreement, evidenced by the growth of global sustainable investments from $18.28 trillion to $35.3 trillion between 2014 and 2020 (Istanbul International Centre For Private Sector In Development, 2023). Thus, it should be noted that transitioning to a low carbon and climate resilient pathway requires significant investment and innovation, which is where private sector involvement is vital - it is an important source of human capital and technical knowledge (United Nations Development Programme, 2024).

Systems of governance based on private partnerships often supplement multilateral environmental regimes by bridging regulatory or governance gaps when intergovernmental collaboration is unsuccessful. The most notable feature of

private partnerships is their non-state-centric nature, which can allow for quicker implementation of climate initiatives. (Kanie *et al.,* 2019). The potential therefore, of commercial players arranged in transnational networks, to establish their own environmental regimes and subsequently influence the global climate and energy governance frameworks is considerable. Through the incorporation of market-oriented and industry-based self-regulation mechanisms, business activities have influenced the structure of worldwide climate and energy governance, sparking discussions over the role of corporate players in multi-level global environmental governance (Knox-Hayes and Levy, 2011). Private companies view these as the only methods for environmental management capable of addressing the deficiencies of conventional state-based rules that are based on command and control (Knox-Hayes and Levy, 2011).

Thus, participation of the private sector as 'rulemakers' in other international and national environmental regimes, such as the creation of voluntary initiatives that have now become accepted standards and have influenced larger regimes, has had repercussions on the global arena of climate and energy governance. One illustration of the rising influence of the private sector as regulators in global climate and energy governance is the growth of private and hybrid environmental regimes, for instance the voluntary global climate change reporting system, the Carbon Disclosure Project (CDP), and the carbon offset standards of the voluntary carbon market (VCM) such as Verra or Gold Standard.

The importance of private investment is growing, particularly as the United Nations projects that USD $4–$6 trillion in investments in low-carbon infrastructure is needed annually to meet the 2°C warming objectives set forth in the Paris Agreement (Prasad *et al.,* 2022). The magnitude

of this financial requirement underscores the reality that depending exclusively on specific government commitments is insufficient. However, the private sector is still hesitant to take climate action, despite increased knowledge that the private sector's involvement in increasing climate financing is crucial (Independent

Evaluation Group - World Bank Group, 2023). One key impediment is the price of emissions and the ambiguity surrounding carbon credits as an efficient method of climate action. Critics refer to carbon credits as "greenwashing" and suggest that businesses should aim for complete decarbonisation instead of depending on compensating measures (Greenpeace International, 2023; Devillers and Lyons, 2023). The truth is however, that many businesses are now unable to attain zero emissions at a reasonable cost, and in certain industries, it is even unfeasible (Climate Impact 2023).

Private Sector Initiatives for Climate Change Mitigation

The private sector, including businesses, corporations, and industries, has the potential to drive significant change in combating the climate crisis. Many companies have recognised the importance of sustainability and environmental stewardship, taking proactive measures to reduce their carbon footprint and mitigate climate change. Such efforts encompass investing in renewable energy, adopting energy-efficient practices, managing supply chains sustainably, and advancing low-carbon technology development.

Senior decision-makers are increasingly giving precedence to addressing climate change, and as a result, the procurement of renewable electricity (RE) is gaining significance in the

ongoing energy transition (Egli *et al.,* 2023). Many leading multinational corporations have pledged to procure 100% of their electricity from renewable sources through participation in the RE100 initiative, a voluntary campaign initiated in 2014, aimed at ensuring that corporate power consumption is entirely powered by renewable electricity (Akahoshi, 2021). The act of purchasing RE not only contributes to the reduction of carbon emissions but also stimulates the demand for renewable energy, thereby aiding in the advancement towards a low-carbon economy.

A study undertaken by Ruiz Manuel and Blok (2023) evaluated the performance of 102 of the largest RE100 members, in terms of revenue, during the period spanning 2015 to 2019. According to their findings, these corporations collectively reduced their emissions from Scope 1 (emissions originating directly from sources owned or controlled by an organisation) and Scope 2 (indirect emissions associated with the energy procurement and usage of a company) by a notable 35.6% (Ruiz and Blok, 2023). The majority of these companies either met or surpassed their targets aimed at limiting global warming to below 2°C (National Grid, 2023). Therefore, acquisition of RE and decarbonisation of organisations is vital because electricity and heat production is the largest contributor of greenhouse gas emissions (GHGs) (European Parliament, 2023; IPCC, 2014).

Nevertheless, the surge in demand for renewable electricity (RE) and the establishment of net-zero objectives do not necessarily promote the construction of new wind or solar farms. Such developments could conceivably undermine more extensive corporate efforts to curb emissions and address the climate crisis (S&P Global, 2021). It is worth noting that even among companies transitioning to "100% renewable energy," the majority of their wind, hydro, or solar power comprises

tradable instruments referred to as 'unbundled' certificates or unbundled Energy Attribute Certificates (EACs). Consequently, this transaction has minimal tangible impact as it fails to replace fossil-based electricity or contribute substantially to the decarbonisation of the grid (S&P Global, 2021).

Strategies that companies can adopt to lower their Scope 2 emissions include, but are not limited to, the installation of solar panels to generate their own clean power instead of procuring unbundled EACs. Alternatively, companies can endorse the construction of upcoming clean energy facilities by entering into long-term contracts for purchasing

power from these projects. As an example, Wells Fargo, a U.S.-based financial services corporation, has committed to acquiring all the solar energy generated by a 58MW solar farm in North Carolina, under a 20-year power purchase agreement (PPA) (Power Technology, 2021). This serves as a significant step in emissions reduction because it encourages "additionality," which entails the development of previously unrealised wind, solar, hydro, or geothermal ventures (S&P Global, 2021). In simpler terms, "additionality" in the realm of renewable energy, signifies the creation of new energy generation rather than just rearranging existing renewable energy sources (Schneider Electric, 2024).

Moreover, companies are increasingly dedicating resources to adopt energy-efficient technologies and strategies aimed at reducing their carbon footprint in day-to-day operations. These efforts encompass the implementation of energy-efficient lighting, enhanced heating and cooling systems, and optimised industrial processes to curtail energy consumption and waste. Beyond these internal endeavours, the private sector is playing a pivotal role in pioneering low-carbon innovations, such as the advancement of electric vehicles,

creation of energy storage solutions, and the continuous development of renewable energy technologies, such as solar and wind power. For instance, DHL, a global logistics company headquartered in Germany, currently boasts a fleet of 119,000 assets worldwide, of which a quarter of them are electric vehicles (EVs). DHL asserts that transitioning from diesel trucks to electric vehicles results in an average annual saving of around 100 tonnes of CO2 equivalent (CO2e) (Fleet Maintenance, 2024).

Ultimately, through investments in research and development, coupled with the commercialisation of these innovative technologies, the private sector can facilitate a transformative shift from a carbon-dependent economy to a sustainable and environmentally conscious one (Tetteh *et al.*, 2021).

Challenges and Opportunities

While the private sector has the potential to drive significant change in combating the climate crisis, there are also challenges and barriers that must be addressed. One of the key challenges is the cost of implementing sustainable practices and technologies. Many businesses may be reluctant to invest in sustainability measures due to concerns regarding the financial implications and the potential impact on their bottom line. However, it is important to acknowledge that sustainable practices can also lead to many positive outcomes, such as cost savings in the long run through reduced energy expenses, improved operational efficiency, sustainable development, biodiversity conservation and enhanced brand reputation.

In 2018, around 20% of climate finance originated from the private sector, with carbon pricing standing out as one

of the most effective policy tools for guiding expenditure and investments (Climate Links, 2021). The potential for private sector involvement in carbon markets is immense; depending on various pricing scenarios and their underlying drivers, the VCM is projected to grow to approximately $100 billion by 2030 and around $250 billion by 2050 (Morgan Stanley, 2023). However, the private sector has been hesitant to enter low-income countries where market regulation is lacking, partly due to concerns such as transparency and the risk of greenwashing accusations (ING, 2022). Moreover, evaluating additionality and establishing crediting baselines is inherently uncertain and often contentious, as it necessitates the creation of unobserved scenarios based on theoretical models, making them difficult to directly observe (Fallasch, 2020).

Article 6 of the Paris Agreement serves as an example of how a policy framework could be established for an emissions trading system, potentially leading to a global carbon pricing mechanism (ICC, 2018). Article 6 aims to promote comprehensive, integrated, and balanced approaches that will assist governments in implementing their Nationally Determined Contributions (NDCs) through voluntary international collaboration (World Bank, 2022). If appropriately designed, this cooperative mechanism should facilitate the achievement of emission reduction targets and encourage increased ambition (ICC, 2018). Through this adaptable approach, GHG emissions would substantially decrease, while also stimulating the development of innovative and cleaner technologies, driving a transition toward a low-carbon economy and facilitating greater sustainable development.

Furthermore, in addition to catalysing carbon pricing, the successful implementation of Article 6 could open up new

avenues for climate finance, facilitate technology transfer, and enhance capacity-building efforts. It can be argued that in order for the market to fully mature, policymakers should draw upon the foundational work of International Organisations defining best practice and setting global benchmarks. The Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) for example, are working on expediting the transparency and integrity agenda, thereby fostering high-integrity VCM and Article 6 markets that can provide the financial support required for ambitious global climate action (Climate Home News (2023). The ICVCM functions as an independent governance body for the VCM, with the goal of accelerating a just transition toward limiting global warming to 1.5°C. The VCMI, an international initiative, aims to facilitate high-integrity VCMs that deliver tangible and additional benefits for the environment, safeguard natural resources, and expedite the shift toward ambitious, economy-wide climate policies and regulations (ICVCM, 2024).

As the VCM gains greater integrity and the private sector increases its investment in carbon offset projects, substantial contributions can be made toward achieving net-zero emissions, promoting sustainable development, and preserving carbon sinks. Among these projects, nature-based carbon offset initiatives require greater private sector investment. There is a significant financing gap in the agriculture, forestry, and land use (AFOLU) sectors, with less than 1% of private climate financing directed toward these sub-sectors, while a substantial 85% flows into renewable energy (United Nations Development Programme, 2024).

This discrepancy highlights emerging investment opportunities in the AFOLU space for the private sector to play a more substantial role (United Nations Development Programme, 2024). This is one way in which natural

carbon sinks can be conserved or regenerated, for example through afforestation or the forest conservation framework known as REDD+ ('REDD' stands for 'reducing emissions from deforestation and forest degradation in developing countries; the '+' stands for additional forest-related activities that protect the climate, namely sustainable management of forests and the conservation and enhancement of forest carbon stocks) (UNFCCC, 2024). These projects deliver a range of benefits beyond carbon reduction, including ecosystem preservation, and broader social and economic advantages such as local job creation and improved community healthcare (Ecoact, 2024).

Ultimately, nations alone cannot single-handedly safeguard the planet at the current pace of advancement. It is imperative to acknowledge that corporations and the private sector bear significant responsibility for environmental preservation. The market can serve as a potent tool, facilitating the necessary funding for initiating carbon offset projects, simultaneously allowing companies to offset their inevitable and unavoidable carbon emissions, whilst working towards achieving a net-zero objective. It should also

be noted that the project categories, or project technologies of VCM are constantly evolving and expanding, including energy and direct air capture (DAC) which requires significant funding (International Energy Forum, 2022).

In conclusion, the private sector needs to demonstrate greater climate leadership in order to combat the climate crisis. Through initiatives, engagement in climate policy and advocacy, addressing challenges and seizing opportunities to channel climate finance, the private sector can drive significant change in mitigating climate change. By leveraging

its influence, resources, and innovation, the private sector can contribute to the transition to a low-carbon economy and help address the urgent challenges posed by the climate crisis. It is imperative for businesses to recognise and address the importance of sustainability and take proactive measures to reduce their environmental impact, while also advocating for ambitious climate policies and promoting sustainable practices across industries. *"In the face of climate change, nothing is more dangerous than inaction"* - only through collective action and collaboration between the public and private sectors can we effectively address the climate crisis and create a sustainable future for generations to come (VCMI, 2023).

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19. Navigating the Green Economy: A Comprehensive Analysis

Manuel Lira

The green economy, responding to pressing environmental challenges, seeks a harmonious blend of economic growth and sustainability. This chapter serves as your guide, offering a concise yet potent exploration of the green economy's historical evolution, current status, challenges, and opportunities.

Beginning with the mid-20th-century environmental movements, the green economy's journey unfolds through key milestones like the Earth Summit and the Paris Agreement, emphasizing global collaboration in the face of climate change. Today, it reflects a transformative shift towards sustainable practices and global environmental consciousness.

The narrative spans global phenomena, regional trends, and key performance indicators, recognizing achievements such as renewable energy growth. Challenges persist, prompting exploration of developed and emerging economies' approaches.

Delving into green economy taxonomy, the chapter showcases the adoption of frameworks to guide sustainable investments. National perspectives highlight exemplary initiatives, while a focus on industries reveals figures depicting renewable energy growth, sustainable agriculture, and technological innovations.

Challenges and opportunities are explored in a balanced

perspective, concluding with a thoughtful examination of negative implications and mitigation strategies. The chapter closes with an emphasis on innovation and technology steering the green economy towards efficiency, resilience, and environmental responsibility.

Embark on this concise yet comprehensive journey, navigating a future where economic prosperity seamlessly harmonizes with environmental stewardship.

19.2. Evolution of the Green Economy

The evolution of the green economy is a Dynamic journey that has unfolded in response to increasing environmental awareness, global challenges, and the imperative for sustainable development. Rooted in the early environmental movement of the mid 20th century, the green economy gained momentum as societies recognized the severe ecological consequences of unchecked industrialization.

Key milestones mark its progression. International events, such as the Earth Summit in 1992, catalyzed discussions on sustainable development and the integration of environmental concerns into policymaking. The establishment of organizations like the United Nations Environment Programme (UNEP) further emphasized the need for global collaboration to address environmental issues.

In the 21th century, the green economy witnessed significant developments. The realization of climate change as a critical global challenge prompted increased emphasis on renewable energy sources, energy efficiency, and carbon emissions reduction. Milestones like the adoption of the Paris Agreement in 2015 underscored the commitment of nations to combat climate change collectively.

The key drivers shaping the evolution of the green economy include heightened awareness of environmental degradation,

the recognition of finite natural resources, and a growing consensus on the importance of balancing economic growth with ecological sustainability. These drivers have propelled into various sectors, influencing policies, technologies, and business models.

As the green economy continues to evolve, innovation, collaboration, and a commitment to sustainable practices remain paramount. The journey involves overcoming challenges, embracing opportunities, and forging a path toward a future where economic prosperity harmonizes with environmental stewardship.

19.3. Current Status of the Green Economy

Today, the green economy reflects a transformative shift towards sustainable practices, renewable energy adoption, and global environmental consciousness. Globally, the green economy has gained traction, driven by a shared commitment to address climate change, reduce ecological footprints, and promote sustainable development.

a. Global Phenomenon: The green economy has become a global phenomenon, with countries prioritizing environmentally friendly policies. Renewable energy, circular economy practices, and sustainable technologies have emerged as key components.

b. Regional Variances and Trends: Different regions exhibit varying degrees of green economic development. Some areas lead in renewable energy infrastructure, while others focus on sustainable agriculture or eco-friendly urban planning. Regional trends often align with local environmental priorities.

c. Key Performance Indicators: Measuring the success of the green economy involves key performance indicators (KPIs). Among others, reductions in carbon emissions, increased renewable energy capacity, and advancements in sustainable development goals are crucial metrics in assessing progress.

The green economy's current status is marked by notable achievements, including the exponential growth of renewable energy sources, the rise of sustainable industries, and a shift towards circular economy models. However, challenges such as unequal global distribution of green initiatives and the need for more inclusive policies persist.

While developed nations often lead in adopting green practices, emerging economies are increasingly integrating sustainability into their development strategies. The commitment to the green economy is evident in international forums, where nations collaborate to set ambitious targets and share best practices.

The current landscape signals a turning point, emphasizing that economic growth can coexist with environmental responsibility. Continued efforts, innovation, and international cooperation are crucial to sustaining and expanding the positive momentum of the global green economy.

19.4. Taxonomy

Green economy taxonomy involves classifying economic activities based on their environmental sustainability and contribution to green objectives. This classification system plays a crucial role in aligning financial flows with environmentally friendly initiatives, providing a framework for investors, businesses, and policymakers to identify and

support activities that contribute positively to sustainability goals.

The taxonomy typically categorizes activities based on their impact on environmental objectives such as climate change mitigation, adaptation, and broader environmental sustainability. This may include sectors like renewable energy, energy efficiency, sustainable agriculture, and circular economy practices. The goal is to distinguish between activities that are environmentally sustainable and those that may have adverse impacts.

Governments and international organizations are increasingly adopting green taxonomy frameworks to guide sustainable investments and support the transition to a low-carbon and resource-efficient economy. The European Union, for instance, has implemented the EU Taxonomy Regulation, which sets criteria for determining whether an economic activity is environmentally sustainable.

Investors, following green taxonomy, can make informed decisions that align with environmental goals. Companies benefit from clearer guidelines on sustainable practices, fostering transparency and accountability. The taxonomy serves as a valuable tool for promoting the integration of environmental considerations into financial decision-making processes, ultimately contributing to the broader objectives of a green and sustainable economy.

19.5. National Perspectives

National perspectives on the green economy underscore the diverse approaches countries take to foster sustainability and balance economic growth with environmental responsibility. This chapter explores leading nations' efforts, focusing on exemplars like Denmark, Sweden, and Germany, which have set noteworthy benchmarks.

Denmark stands out for its commitment to renewable energy, with wind power contributing significantly to its energy mix. Swedish initiatives prioritize sustainable living, encompassing renewable energy, waste reduction, and eco-friendly urban planning. Germany, known for its Energiewende policy, has successfully transitioned to a low-carbon economy, emphasizing renewables and energy efficiency.

a. Case Study: Spain's Initiatives

Spain serves as a compelling case study in the green economy landscape. Spain has embraced renewable energy, particularly wind and solar, making substantial investments in sustainable infrastructure. Circular economy practices, such as waste recycling and water management, align with Spain's commitment to environmental stewardship. Sustainable tourism initiatives further showcase Spain's holistic approach to green development.

b. Policy Frameworks and Regulations

Effective policies and regulations are pivotal to a nation's green economy success. Feed-in tariffs, emissions reduction targets, and circular economy regulations play crucial roles. Examining these frameworks provides insights into how nations shape their green economies, balancing regulatory measures with incentives for sustainable practices. My proposal, which is feasible, is not to overregulate but to provide a clear and broad spectrum in which development, legal certainty and environment can interact.

This section sheds an inspiration on the strategies and policies that propel countries toward a greener and more sustainable future. Deeper analysis is needed to design a proper regulatory framework. However, let me emphasize the importance of tailored approaches, considering each nation's unique challenges, strengths, and commitment to fostering

environmental well-being alongside economic prosperity. The latter is no sustainable without the first.

c. Global South vs. Global North

The juxtaposition of the green economy in the Global South and Global North reveals a complex interplay of challenges, opportunities, and differing levels of development. Following you will be provided with the distinctive approaches these regions undertake in navigating the transition toward sustainability.

c.1. Challenges Faced by Countries in the Global South

Countries in the Global South encounter unique challenges, including limited financial resources, pressing social needs, and the necessity to address immediate development priorities. Balancing economic growth with environmental sustainability poses a delicate challenge, often requiring innovative solutions tailored to specific contexts.

c.2 Recommendations for Sustainable Development

Tailored recommendations for sustainable development in the Global South include international cooperation, financial support, and technology transfer. Collaborative efforts can empower these nations to leapfrog traditional development pathways, embracing sustainable practices that align with their economic and social contexts.

The purpose of contrasting the Global South with the Global North, aims to highlight the disparities and shared objectives in the pursuit of a green economy. The importance of recognizing diverse needs, fostering international collaboration, and implementing strategies that empower nations in both hemispheres to achieve sustainable development is fundamental. The interconnected nature of global sustainability and the need for inclusive solutions that bridge geographical and developmental gaps, cannot be

ignored.

19.6. Industries Leading the Green Economy

The green economy is spearheaded by industries committed to sustainability, pioneering innovations, and eco-conscious practices. Briefly, we will explore key sectors driving the transition towards environmental responsibility.

a. Renewable Energy Sector

At the forefront of the green economy, the renewable energy sector has witnessed significant growth. Figures indicate a global surge in wind and solar energy capacity, contributing to a more sustainable energy mix. In 2022, global renewable capacity exceeded 3,300 GW, reflecting a substantial increase over the past decade.

b. Sustainable Agriculture

Sustainable agriculture plays a pivotal role in mitigating environmental impact. Figures reveal a rise in organic farming practices and agroecological approaches, ensuring food security while preserving ecosystems. Global organic farming, for instance, expanded to approximately 76.4 million hectares in 2021.

c. Technologies and Innovations

Figures demonstrate the accelerating adoption of green technologies, from electric vehicles to energy-efficient building solutions. Investments in sustainable innovations reached unprecedented levels, with global green tech investments surpassing $300 billion in 2021.

19.7 Challenges and Opportunities

Navigating the green economy landscape presents a spectrum of challenges and opportunities that shape the trajectory of sustainable development. A brief explanation of

the complexities, highlighting potential hurdles and avenues for transformative growth are mentioning thereafter.

a. Implementation

Implementing the green economy is not without challenges. Resistance to change, economic disparities, and the complexities of global supply chains pose formidable obstacles. Overcoming ingrained practices and fostering widespread adoption of sustainable alternatives require strategic planning and international collaboration.

b. Opportunities

Amid challenges, opportunities for sustainable development abound. Green job creation, technological advancements, and collaborative international efforts present avenues for transformative growth. Sustainable investments have the potential to drive economic prosperity while fostering environmental stewardship, providing a blueprint for a balanced future.

c. Socioeconomic Impacts

Ensuring that the green economy addresses socioeconomic impacts is critical. This involves designing policies that prioritize both economic and social well-being. From fostering inclusivity to addressing disparities, the green economy presents a platform to create a more equitable and resilient society.

This text is intended to provide a briefed exploration of the challenges and opportunities inherent in the green economy paradigm. As it has been mentioned, in order to undertake the potential challenges, there is the need for strategic planning, innovative solutions, and a collective commitment to surmounting challenges. Simultaneously, it evidences the vast potential for positive change, economic growth, and improved societal well-being through the embrace of a green

economy.

19.8. Negative Implications and Mitigation Strategies

While the green economy brings about positive change, it is essential to recognize potential negative implications and proactively address them. In this section challenges and effective mitigation strategies are explored to ensure the integrity and sustainability of green initiatives.

One significant challenge is the risk of greenwashing, where entities may exaggerate or misrepresent their environmental efforts. This can erode public trust and compromise the effectiveness of green initiatives. Vigilant regulation, transparent reporting, and third-party certifications are essential tools in combating greenwashing.

Striking the right balance between economic growth and environmental protection is a delicate task. Unchecked economic expansion can lead to resource depletion and environmental degradation. Mitigation strategies involve integrated policies that consider the environmental impact of economic activities, promoting sustainable practices and responsible consumption.

Mitigating negative impacts requires a multifaceted approach. Ethical business practices, stakeholder engagement, and stringent regulatory frameworks can foster transparency and accountability. Environmental education and awareness campaigns empower consumers to make informed choices, encouraging sustainable behavior.

As a base line to fortify the foundations of the green economy (addressing the negative implications) it should be identified the importance of maintaining authenticity, fostering responsible business practices, and continuously evolving regulatory frameworks. Through these mitigation strategies, the green economy can preserve its core principles,

contributing to a more sustainable and resilient global future.

19.9. Innovation and Technology

In the pursuit of a sustainable future, innovation and technology play pivotal roles, steering the green economy towards efficiency, resilience, and environmental responsibility. In the next lines the dynamic landscape of green innovation and the transformative impact of technology in fostering a more sustainable global economy are described.

Advancements in eco-friendly technologies are reshaping industries. Electric vehicles, energy-efficient appliances, and smart grid systems are at the forefront of reducing carbon footprints. These innovations enhance resource efficiency, minimize environmental impact, and contribute to the overall sustainability of various sectors.

Technological advancements extend beyond traditional sectors. Blockchain technology facilitates transparent and traceable supply chains, ensuring the integrity of sustainable products. Artificial intelligence and the Internet of Things contribute to advancements in environmental monitoring, resource management, and waste reduction.

Green finance initiatives are leveraging technology to channel investments towards sustainable projects. Fintech solutions, sustainable investment platforms, and blockchain-based financial instruments are streamlining the flow of funds to environmentally responsible initiatives. This innovative financial ecosystem is crucial in accelerating the transition to a green economy.

The rapidly evolving landscape of green innovation and technology is a reality. This evolution is showcasing how cutting-edge developments are instrumental in achieving sustainability goals. From sustainable practices in traditional

industries to groundbreaking technologies, it is evident the transformative power of innovation in shaping a more resilient and environmentally conscious global economy.

19.10. Conclusions

Our journey through the green economy traverses a transformative landscape, emphasizing a collective commitment to balance economic growth with ecological sustainability. From the early environmental movements to 21st-century global collaborations, the current status reflects a global shift prioritizing environmentally friendly policies, with notable achievements in renewable energy and sustainable industries.

Green economy taxonomy emerges as a crucial framework, guiding financial flows to environmentally friendly initiatives. National perspectives from exemplary countries like Denmark, Sweden, and Spain showcase commitments to renewable energy, sustainable living, and holistic green development.

Industries spearheading environmental responsibility, such as the renewable energy sector, sustainable agriculture, and innovative technologies, contribute significantly to a more sustainable future. Challenges and opportunities are explored, highlighting the need for strategic planning and collaboration.

Examining negative implications and mitigation strategies underscores the importance of authenticity, responsible business practices, and evolving regulatory frameworks. This baseline fortifies the green economy's foundations, contributing to a more sustainable and resilient global future.

The transformative power of innovation and technology emerges as a guiding force, steering the green economy towards efficiency, resilience, and environmental responsibility. From eco-friendly technologies reshaping

industries to the innovative financial ecosystem supporting sustainable projects, the dynamic landscape underscores the transformative potential in shaping a resilient and environmentally conscious global economy.

In conclusion, our journey emphasizes a commitment to surmount challenges collectively, recognizing diverse needs, and fostering international collaboration. This exploration serves as a blueprint—a guide towards a future where economic prosperity seamlessly harmonizes with environmental stewardship, paving the way for a sustainable tomorrow.

20. Sustainable Food to ensure food security

Amélia M Delgado

We are experiencing a climate emergency (UNEP, 2023), as we crossed 6 out of the 9 planetary boundaries, as defined by the group of scientists that verified the Earth system is regulated by 9 interrelated processes, which they also quantified (Rockström et al. 2009; Steffen et al. 2015; Richardson et al. 2023). According to these authors, these 9 planetary boundaries are interconnected within the complex biophysical Earth system and crossing them increases the risk of large-scale irreversible environmental changes. The planetary boundaries have been crossed at a fast pace, as observed in fig. 1.

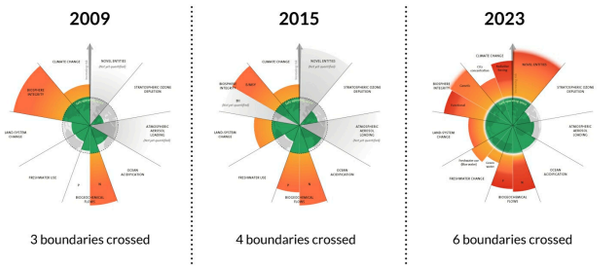

Figure 1. The evolution of the planetary boundaries' framework along time. The safe zone (within which humanity can continue to develop and thrive for generations to come) is in green. Increased risk is marked in orange and red. Source: Azote for Stockholm Resilience Centre, Stockholm University. (Based on Rockström et al. 2009; Steffen et al. 2015; Richardson et al. 2023).

The Paris agreement (UN, 2015) ambition is at stake as GHG emissions continue to rise globally, even if the main trend in the EU is in the opposite direction, thanks to the green deal and the pioneer European Climate Law (EC, 2023a). The energy sector is the main contributor, but the food sector still accounts for a relevant part of GHG emissions, according to Ritchie (2020). According to the same author, acting in one sector alone, such as focusing only in decarbonizing the energy sector, or just in reducing meat intake will not be effective since sectors and processes are mingled together and to reach net-zero we need to implement innovation across different sectors.

With respect to food, we need to consider the energy to operate machinery at the farm, the GHG emitted by food loss residues, the transportation sector and even the tourism are involved. Moreover, food is not a mere vehicle carrying nutrients. Food cultures evolved in different geographies in connection with beliefs, rituals, and the pace of nature, meeting all dimensions of sustainability. These diets are seasonal, plant-rich, varied, deeply linked to territories, and hence healthy and sustainable. Mediterranean Diet is such a paradigm, classified as intangible heritage of humanity (UNESCO, 2013) and yet, it is fading away in southern Europe, in part due to the new marketing tools used by multinationals, in part due to changes in consumers habits and taste, and in part due to the lack of food literacy. To make educated food choices, besides learning about frugality and biodiversity, also taste can and should be trained.

To change how we produce and consume food needs top-down and bottom-up actions, requiring urgent and complex changes in several sectors, thus crossing multiple sustainable development goals (SGDs). Also, acknowledging that we humans and all our activities depend on the state of the biosphere, helps to put the problem into perspective (fig. 2).

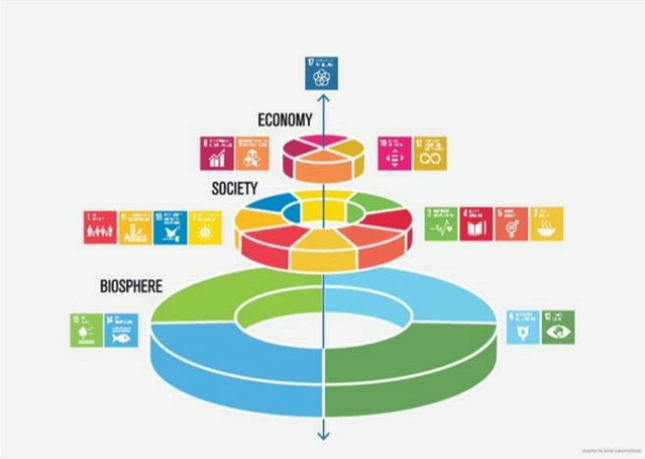

Figure 2. The SDG wedding cake, a new way of viewing the Sustainable Development Goals and how they are all linked to food. Source: Azote for Stockholm Resilience Centre, Stockholm University CC BY-ND 3.0.

The answer to the question "can I make any difference?" the answer is "yes". Improving food literacy will allow making educated choices with immediate positive impacts in individual health and (desirably) also in household economy. One person influences a few others and many options alike do make a huge difference. A recent survey (EC, 2023b) showed that more than 3/4 of Europeans view climate change as serious threat and are already taking individual action, such as reducing average meat intake. Conscious citizens are likely to pressure on other actors, to accompanying their individual action. According to the same Eurobarometer survey (EC, 2023b), 56% believe national governments also have the responsibility to take action, as well as the EU (56% of respondents), and business and industry (53%). In this last case, it means businesses will have to adapt to the current market demand for more environmental-friendly products.

The evolution of Food Systems. Major goals, steps, and impacts.

Food security was key for the first ancient civilizations to thrive. Back in the Neolithic, grains' storage (e.g., cereals & pulses), as well as fermentations (dairy, bread, wine) allowed nutrients to be preserved and food to be available longer and over longer distances. Food processing, storage and trade are that ancient, and were intense, at least in the Mediterranean, Middle-East and Asia. Lowering the risk of food insecurity, allowed civilizations to flourish and the focus was diverted from daily survival to improve social organization and thinking. Cultural advancements, as in Philosophy and Math, were possible because of adequate nutrition. In these ancient times, inequalities and asymmetries were the rule. A few initiatives to protect common people, encompass the scattered planting of key crops across the territories of the Roman Empire, and the "corn laws" to protect UK farmers from price dumping after Napoleonic wars (Chammen et al., 2018; Delgado et al, 2022). Food security and food safety are interlinked concepts. Spoiled or wasted food is not available and the onset of modern science and technology provided new ways to preserve nutrients and improve food availability. To the ancient methods of sun-drying, fermentation, or salting, others were implemented, such as pasteurization or cooling. Food processing evolved and gained traction fueled by economies of scale based in increased agricultural productivity due to mechanization and preference for monocrops – by the time called "green revolution". At first, the intention was the best one – the aim was to provide enough and affordable food to end hunger in the world, in response to UN agreements. By mid-1970s the concept of food security was launched and has been evolving since then (please see glossary for an updated definition). Food industries provided

means to decrease food loss by processing excess produce, which otherwise was lost because of the impossibility of consuming it fresh, locally. Food industries also implemented new ways of preserving nutrients longer and facilitating storage and transportation (e.g., tomato paste, cooked beans, pasteurized milk). Food safety greatly improved as well, because tight controls and vigilance were put into action and are still being worked on (Chammem et al., 2018). Except for a few conflict areas (with no available data), the daily supply of calories per person, in 2018, was, in average, more than enough to ensure survival (Our World in Data, 2023a). Therefore, the goal set in mid-1970's was more than achieved.

Current food systems are no longer able to adequately feed us all, and are unsustainable

Food has been regarded as a commodity, aligned with a mindset of infinite growth, already out of planetary boundaries. Mass production, marketing and Research & Innovation leveraged the dominance of the global food market by a few multinational companies. Such linear model of food production and consumption is summarized in figure 3.

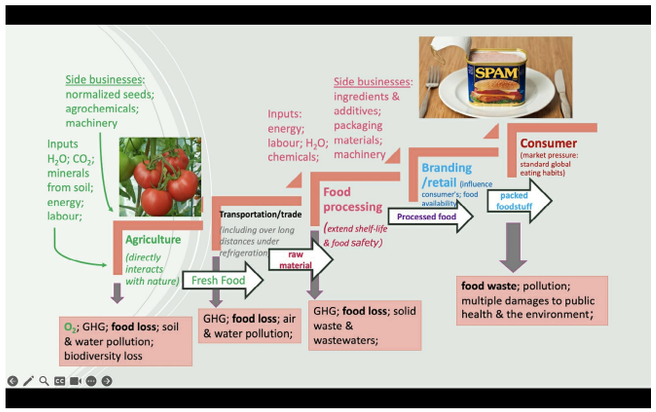

Figure 3. Mainstream food systems grew under a linear model in which food is a commodity instead of a basic human right; Such model is short-term-profit-oriented, relying in

standardization, mass production, and specialization. Source: the author.

All starts with plants that are at the base of the food chain because they capture CO_2 from the air, and minerals from the soil to produce organic compounds that are nutrients for herbivores and omnivores. Omnivores, as humans, need small amounts of animal foods (e.g., from herbivores, including dairy and eggs), and carnivores mainly eat herbivores because they are unable to synthesize many nutrients, which they require in specific chemical forms with improved bioavailability, only found in other animals. Agriculture directly interacts with nature and all life forms depend on plants. The photosynthesis is a process that releases oxygen to the atmosphere while capturing carbon and other minerals into nutrients that feed herbivores, of which carnivores depend on. Plants species interact with each other, with microbes and insects. Without them, ecosystems will collapse. Plants protect soils from erosion with their roots, help retain water by covering it (e.g., fallen leaves), serve as habitat for many species including pollinators, and $N_2(g)$ fixating bacteria. Besides macronutrients, plants provide bioactive secondary metabolites, which have been used for ages as poisons or medicines. However mainstream agriculture relies on monocrops grown in large areas at specific geographical locations (e.g., Ukraine for wheat and South America for soy). As the harvest is focused on a single product (e.g., a grain or fruit) often more than 15% of food loss is registered at the farm (FAO, 2023). Then the produce is stored, traded and transported to industrial facilities where they are frequently milled, processed and refined to obtain one or more macronutrients to be used as feed and food ingredients (e.g., fat, sugar, protein). Beneficial compounds as antioxidants, vitamins and fibers are lost down the drain aggravating pollution. At food industrial facilities, sometimes located at

another distant country, cheap foods are manufactured from these ingredients according to a formulation that includes flavorings, colorings, texturizers, emulsifiers and other cosmetic ingredients to mimic, or even outperform real, authentic foods. These ready-to-eat, colorful, soft, sweet, and addictive foods are affordable and ubiquitous. However mounting evidence has been exposing how deleterious they are to human health and the environment, including vegan options (Delgado et al., 2021; Swinburn et al., 2019; Baker et al., 2020; Neri et al., 2022; Gil, 2023). So, currently food systems have been evolved into long and intricate value chains, involving too many actors, too many steps, too long distances. On the other hand, consumer's habits comply to this model, as a nutrition transition has been noted globally including monotonous preferences of flavors and textures. Moreover only a few species and varieties of plants and animals predominate as ingredients, worldwide. Since food is linked to traditions, history and more, devoting local, seasonal foods to oblivion, contributes to cultural erosion and to biodiversity loss (due to the abandon of native plant foods and the associated traditional gastronomy).

Our dietary choices, as consumers do matter. Many of these globalized food choices are affordable and available worldwide and all year round. Yet, it should be noted that such foods are obtained from intensive agriculture, often at the expenses of deforestation. The destruction of Amazon rainforest seems unstoppable, in great part due to the production of feed ingredients and cattle to meet the increasing global demand of meat (Our World in Data, 2023b). Although to a lesser extent, identical issues are associated with vegan foods (e.g., Açai, soy derivatives).

In conclusion, can we fix our food systems to make them sustainable and adequately feed everyone?

Food has been regarded only from an economical viewpoint,

ignoring traditional food cultures that shape landscapes and memories. Humans are more and more detached from nature, physically and emotionally. Regarding food, many of us have no clue on how and where it is produced. In the supermarket shelves for fresh veggies and fruits, seasons do not exist. The same narrow choice of species is displayed all-year round, despite presented raw, pre-cut, and washed, or in mixes, to transmit the impression of variety. However, agri-biodiversity is rarely compatible with economies of scale and therefore, a fast decline in native edible plants, have been observed worldwide. Some subspecies of Mediterranean aromatic herbs (e.g., mints, oregano) were noted to be endangered (Delgado et al, 2023). Due to many factors, including nudging, food habits became more and more monotonous and homogenous worldwide. Sustainable food cultures, as Asian, Mediterranean and South American diets are devoted to oblivion or serve as inspiration for unbalanced ultra-processed foods, as is the case of pizza, that was originally a nutritionally rich street-food that turned into a calory-dense and nutrient poor counterpart. The texture and colors of the original pizza are mimicked by artificial additives. Instead of the aromas from fresh herbs, flavours are enhanced by adding glutamate and abundant saturated fats.

Food habits need to become healthier and sustainable, which can be easily achieved simultaneously because what is best for our individual health is also the best for our planet, as shown in fig. 4.

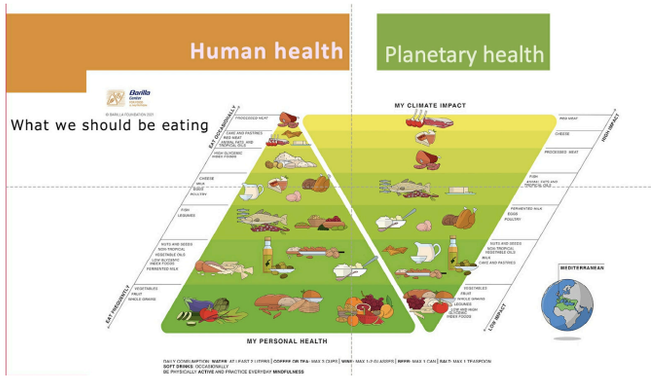

Figure 4. The double pyramid model, in this case taking the Mediterranean region as an example. The nutritional recommendations to meet individual health are represented in the upward pyramid on the left. The environmental impact of such foods is represented in te downward pyramid on the right. As longer the row as larger the impact. Adapted from Delgado et al., 2023.

When observing fig. 4, it becomes evident that the foods we should be eating in larger amounts (veggies and fruits) are the ones better to our health and have the lowest environmental impact. These foods occupy the base of both pyramids, in a long row on the left side (human health) and a short one on the right side (low footprint). The same foods, red meat, occupy the top of both pyramids, meaning that only minimal amounts should be consumed because it is deleterious to human health and to the environment.

Revamping ancient food habits, well-fit to each territory and culture can be a successful strategy if consumers' food literacy is improved, allowing them to make educated food choices. Eating is as much a sensorial experience as is emotional. The scents, the place, the people surrounding us, decoration details and even the music, influence the way we perceive taste and how much food we eat. That is, the environmental stimuli influence our food

intake, and perceived taste (Mantau et al., 2018), as do biological determinants, such as genetical differences in the composition of our saliva (Constanzo, 2023). As social beings we comply to social norms, seeking approval for our behaviors, and our food choices also reflect that (Robinson, 2015).

Since discussions on sustainability are becoming mainstream, the concept of sustainable diets is reaching a broader audience. The perception of individual wellbeing and the concerns about the environmental footprint of foods is a rising trend. Major barrier has been referred to be the difficulties in eating less meat and getting more information about plant rich diets. Lourenço et al (2022) investigated the mental pathways and predisposition of individuals, in Brazil, to reduce or exclude meat intake, along with the consequences of the perception of barriers and impacts of such decision. These authors found out that behavioural changes are possible and identified main perceived barriers, in the studied population, to be the enjoyment of meat meals and the lack of information about plant-based and plant rich diets.

Therefore, peoples can be encouraged to recover memories and traditions, opting for plant rich diets, selecting seasonal, local and varied foods. However, as everything related to climate action, it has to be tackled in a multidisciplinary way and requires cooperative action from multiple actors in the food value chain.

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21: Sustainable lifestyle habits

Agnieszka Oleksyn-Wajda

"We do not inherit the Earth from our ancestors; we borrow it from our children" Antoine De Saint-Exupery

Introduction

In July 2023, the world witnessed an unprecedented climate occurrence: it was recorded as the hottest month ever experienced by humanity. This alarming observation was widely reported by leading global media, including Forbes, Reuters, and BBC, which cited research from the University of Leipzig and the World Meteorological Organization. According to their findings, this month surpassed all previous records for global heat since the beginning of temperature recording. Karsten Haustein, a noted climatologist from the University of Leipzig, emphasized the gravity of the situation in his statement to Forbes, highlighting that Earth hadn't faced such extreme temperatures for approximately 120,000 years.

From global warming to global boiling point

Responding to these startling figures, António Guterres, the Secretary-General of the United Nations (UN), declared a significant shift in climatic reality: the transition from an era of global warming to an era of global boiling. He stressed, however, that despite the dire situation, it's still not too late to mitigate climate change, which is predominantly driven by human activities. His call to action extended beyond policymakers to encompass businesses, cities, regions, financial institutions, and individual citizens, underscoring the need for collective efforts in tackling this global crisis.

In an age riddled with challenges such as climate change, environmental pollution, and the quest for social and economic justice, aligning actions with the principles of sustainable development has never been more critical. This paradigm shift is not just a necessity but is increasingly being embraced by a growing number of people who recognize the urgent need to balance socio-economic advancement with environmental stewardship. Sustainable development has emerged as a universally endorsed solution.

Confronted with the imperative to reevaluate and reshape economic development models, the international community, especially the European Union (EU), has acknowledged the urgency of transitioning towards sustainability. This approach is pivotal to prevent further environmental and climatic degradation while ensuring the well-being of future generations. The EU, with its member states, is striving to lead this transformation, aiming to become the first continent to operate entirely under this new socio-economic model.

The future of Europe is inextricably linked to the health of our planet. EU countries are firmly committed to achieving climate neutrality by 2050, in line with the Paris Agreement. The European Green Deal as a comprehensive policy package is designed to guide the EU towards a green transition, aiming to establish climate neutrality by 2050. It lays the foundation for transforming the EU into a society that is not only fair and prosperous but also boasts a modern, competitive economy.

Sustainable lifestyle is not an option, but an imperative

Attaining a sustainable environment and thriving economy hinges on the widespread adoption of sustainable living practices. This way of life involves more than just reducing overconsumption; it's about a holistic approach to life that carefully considers the ecological footprint of our everyday actions. Sustainable living touches on every aspect of human

life, from work to leisure, encompassing not only what we do but where and how we do it. This broad perspective includes the choices we make at home, in our workplaces, and during our leisure time, and extends to our social interactions, family commitments, educational pursuits and hobbies.

The key to sustainable living lies in understanding the interconnectedness of our actions and the natural world. Every choice, from the food we eat to the way we travel, from the products we buy to the energy we consume, has an impact on the planet. Therefore, it's not just about the actions we take, but also about the intent and mindfulness behind those actions.

In today's world, where the consequences of human activities on the environment are increasingly evident and severe, adopting a sustainable lifestyle is not merely an option but an imperative. To cultivate such a lifestyle, we can engage in various practical measures as indicated below.

Creating a sustainable environment necessitates a holistic approach, extending from our homes to our travel habits, diet, consumption patterns, and lifestyle choices. At the heart of sustainable living is the optimization of energy use in our homes. This can be achieved by energy conservation, water-saving measures also play a crucial role. This involves not just being mindful of water usage but also actively engaging in practices that reduce, reuse, and recycle waste, thereby minimizing our ecological footprint.

When it comes to travel and transportation, making environmentally conscious choices is key. This includes preferring public transit, carpooling, biking, or walking for shorter distances. Moreover, being mindful of the environmental impact of long-distance travel can lead to more sustainable choices in terms of frequency and mode of transportation.

Our dietary habits and food consumption also greatly influence our environmental impact. A shift towards a plant-based diet, known for its lower ecological footprint compared to meat-heavy diets, can make a substantial difference. Supporting local and organic farming practices not only aids in reducing the carbon footprint associated with food transport but also promotes biodiversity. Additionally, minimizing food waste through efficient meal planning and proper food storage is an essential aspect of sustainable living.

Incorporating sustainable practices into our daily routines, hobbies, and entertainment is essential. This includes choosing eco-friendly products and services, engaging in activities with minimal environmental impact, and supporting businesses and initiatives that are committed to sustainability. Such lifestyle choices, when collectively adopted, can lead to profound changes in reducing our ecological footprint and promoting a healthier planet.

Lastly, mindful consumption is a crucial element. It involves a conscious approach to purchasing, focusing on acquiring fewer items of higher quality and ethical production standards. Embracing the principles of the circular economy, which emphasize the design of durable, repairable, and recyclable products, can significantly reduce waste and resource depletion. This approach not only conserves natural resources but also encourages a shift from a disposable culture to one that values longevity and sustainability.

EU regulations - sustainable products and ecodesign

A sustainable lifestyle is only a part of the entire transformation that primarily concerns businesses and industrial sectors. To facilitate this, it is essential to establish a legal ecosystem that supports transformation for all - both for economic entities and the consumers. Crucial on that way seems new set of regulations on ecodesign, which

aim is to revolutionize sustainability standards to enhancing consumer awareness about the environmental sustainability of products. These regulations aim to make products not only more environmentally friendly but also to integrate circular economy principles and enhance energy efficiency throughout their lifecycle. This initiative marks a significant shift from the previous 2009 Ecodesign directive, which primarily focused on energy-related products. Under new regulations, products should be designed to be more durable, reusable, repairable, and recyclable, with an increased emphasis on the incorporation of recycled materials. This regulatory shift presents a substantial opportunity for both businesses and consumers, playing a pivotal role in achieving climate neutrality, reversing biodiversity loss, reducing Europe's reliance on external resources, and bolstering economic competitiveness.

Digital Product Passport to empower consumers

Another solution to strengthen the sustainable consumption is a Digital Product Passport introduced by the EU legislator. The legal framework and general requirements for this instrument have been outlined in the Ecodesign regulation draft. The requirements related to the digital product passport will be however included in delegated acts and will cover information to be included in the product passport. The product passport is intended to facilitate consumers making informed purchasing decisions, so it should contain reliable data about a given product, but also guarantee transparency of information for enterprises in the supply chain. It can additionally serve as a tool for market research and enable the modification and improvement of products.

It is worth noting that some organizations and businesses are already undertaking initiatives that anticipate the planned

regulations concerning digital product passports, thus supporting the market's transformation towards sustainable development. An example can be the CIRPASS project, funded by the European Commission under the "Digital Europe" program, aims to create foundations for implementing programs concerning digital product passports from 2023. Within this framework, a pilot is being developed to introduce this technology into the textile and clothing industry. It seems crucial in fashion industry, known as the one of the most influencing the environment and climate industry what results among others from fast fashion and overconsumption.

Digital product passport seems to be important step towards dismantling the traditional “take, make, dispose” model, which has been detrimental to our planet, health, and economy. The move towards sustainable products as the standard will not only facilitate energy savings, promote repairability, but also encourage environmentally conscious decision-making among consumers.

Greenwashing – barrier to a sustainable lifestyle

The phenomenon of greenwashing has also been a barrier to a sustainable lifestyle, as consumers have been exposed to this practice in their daily purchasing choices for many years. Biologist J. Westerveld was one of the first to define greenwashing, referring to organizations that spend more time and money advertising themselves as eco-friendly than actually engaging in environmental practices. This assertion remains relevant today, as greenwashing is seen as creating the impression that a product, service, or company is in line with sustainable development principles. While initially a term mainly used in public relations, greenwashing has recently appeared in a broader sense in financial and capital markets, as a practice of providing partial and incomplete information, focusing on insignificant data, omitting key indicators, and

taking information out of context – all to portray a company's actions in a more favorable light.

Recent studies on greenwashing reveal specific actions and strategies. The non-profit organization Planet Tracker, in its January 2023 report "Greenwashing Hydra," showed that this practice is becoming more sophisticated and takes various forms. According to this report, six types of greenwashing can be identified, including greencrowding, greenlighting, greenrinsing, greenhushing, greenlabelling and greenshifting. The last one, i.e. greenshifting is when companies shift the responsibility for environmental burdens onto consumers.

At this point, we are witnessing a pivotal moment in eliminating the greenwashing. New EU regulations aim to meticulously regulate the way products are marketed in terms of their environmental impact and longevity. It intends to introduce standardization in labeling and prohibit misleading claims about environmental benefits, especially those based solely on emissions-offset schemes.

These regulations seem to shift towards a more accountable and transparent approach to sustainability in business operations what should empower the consumers in their decisions and lifestyle. As these regulations take effect, they will undoubtedly reshape not only the corporate landscape, but also consumers lifestyle.

Conclusion

Certainly, the core of shifting the current paradigm lies in transforming business practices, embracing circularity, and restructuring the operations across diverse industries. This fundamental change requires a comprehensive reevaluation of how businesses operate, moving away from linear models to ones that emphasize reuse, recycling, and sustainability. However, it's important to recognize that individual lifestyle

choices also play an important role in this transformation. The collective habits and preferences of consumers significantly influence the value chain, driving demand for sustainable products and practices. As such, fostering a sustainable lifestyle is not only complementary to but also a necessary component of the broader shift towards a more sustainable and circular economy. This holistic approach, combining both business innovation and consumer behavior, is essential for achieving meaningful and lasting environmental and social impact.

Therefore, the importance of personal initiative in adopting a sustainable lifestyle cannot be overstated. It encompasses everyday choices in our consumption habits, travel modes, energy use, and diet. Embracing a lifestyle that minimizes environmental impact involves choosing energy-efficient appliances, reducing waste, opting for public transport or cycling, and adopting a plant-based diet, among other practices. These individual efforts, driven by a deeper understanding of the ecological consequences of our actions, play an important role in shaping a sustainable future.

However, individual actions alone are not sufficient. The role of regulatory bodies, particularly at the European level, is crucial in creating an environment that facilitates and encourages sustainable living. The introduction of policies that promote sustainable products, ensure transparency and provide accurate information to consumers, is a significant step forward. These measures not only empower consumers to make informed choices but also hold businesses accountable for their environmental claims, thereby addressing the issue of greenwashing.

The synergy between personal responsibility and supportive regulatory frameworks creates a powerful force driving the shift towards sustainability. As we make choices that align with sustainable practices, we are bolstered by laws and

regulations designed to foster an environment conducive to these choices. This combination of personal and systemic change is vital in ensuring that our actions today do not compromise the ability of future generations to meet their own needs.

Remembering the profound truth that "We do not inherit the Earth from our ancestors; we borrow it from our children" (*Antoine* De Saint-*Exupery)* serves as a poignant reminder of our responsibility. It underscores the need for a sustainable lifestyle, not just as a choice for today, but as an essential commitment to the future. The steps we take now, supported by comprehensive policies and personal conviction, lay the foundation for a world that respects and preserves its resources for those who will inherit it.

22: Fast fashion and its impact on the environment.

Clara Tomé

Let´s start from the very beginning. What are clothes? Well, looking at it from a very simple and pragmatic perspective they are just fabrics that we use to the merely purpose of cover our bodies, and that is all. However, it would be unfair to ignore the ancient cultures, stories and handcraft traditions that lie behind fashion and that weave our identities, forms of self- expression and values that belong to this industry as well but which at the same time are in danger by the current modern era of fast fashion.

As defined, fast fashion involves rapid and cheap production, frequent consumption and short-term use of clothes, where the lifespan of products is very short, creating a cycle where overproduction and overconsumption play a mutual reinforcement generating such a significant profit that any environmental and social aspects involved in the process are not a concern, much less a priority, even in cases where human rights are being violated or entire rivers, lands, and ecosystems are being devastated. Because if there is a system that is collapsed and obsolete that is fashion.

We live on a global disposal society where we do not value the processes of how the things we own are made, where they come from, or where they go after passing through us. Just to put you in situation, normally when we buy a T-shirt from a common clothing brand we tend to ignore by choice or by lack of information (because let´s be very honest, brands do not make it easy to trust on their green and sustainable claims) all

what hides behind:

- 2,700 liters of fresh water1, which equivalent to meet your drinking needs for approximately 2.5 years2. What blows my mind since, during my visit to the UN Water Conference last year, I had the chance to talk to indigenous communities from countries like Mexico or Kenya and learn that there are people that does not even have 5 liter of clean water per day.

- Color clothes entails water and air pollution: the World Bank estimates that 17-20% of industrial water pollution comes from textile dyeing processes. In Bangladesh, for example, the government has declared three rivers as “biologically dead” because of the garment factories discharges, turning rivers into red lifeless and toxic waters.

- Synthetic materials powered by the bad boys aka fossil fuels: most of the materials used is synthetic, resulting not only on major greenhouse gas emissions3, but on

- between 200,000 and 500,000 tones of microplastics4 from textiles releasing from our washing machines straight into the oceans, and into the stomach of different species as dolphins, turtles or whales, affecting entire marine ecosystems.

- Modern slavery, low wages, forced overtime, lack of job security, poor health, exhaustion, sexual harassment, discrimination and denial of other basic human rights 5

- Short lifespans: Just 1% of the global clothing production is recycled into a new garment6, which means that after your use, there is 99% of possibilities that your garment will end up either on a landfill or burnt in a third world country, having serious impacts on the health of livelihoods around. Just imagine living in a country or area where tons of discarded or unwanted clothes arrive every day, where breathing toxic chemicals from incinerated polyurethane every day from

clothing that you did not buy nor produce is part of your routine, because that is the quickest method to get rid of large quantities of clothing.

When I knew about all these impacts, as a fashion model and as someone who used to be obsessed with clothing, style, and trends, I was completely devastated, and I couldn't ignore anymore the catastrophic journey that a garment undergoes until it reaches our hands.

However, I can´t blame anybody, it is not our fault entirely, we are just victims playing blinded on a system based on exploitation (of natural resources and people) that is profiting off the very same “throw-away” culture it's responsible for building, shaping us on a way where we are unable to ask ourselves simple questions like “who made my clothes?” because we are very busy hunting for the last bargains on Black Friday or choosing the trendiest outfit for the next event.

I think it is an issue of what we give importance to, what we value as a society, where are we directing our focus. I feel very related to this aspect since I had a profound realization about how I used to channel myself just into getting certain job or achieving a particular goal, not valuing the journey in between. So when those were already accomplished, I would focus on what is next, because honestly, doesn’t matter how much I used to achieve, it was never enough. At that time I didn´t realize that maybe that was actually a way t

satisfy a greed of more. And I guess as humans many of us somehow function this way, not valuing the procedure but just projecting ourselves on the final good or the ultimate outcome, because we are so in rush that when the anxious future becomes our present, when we have that desired garment in our hands or we already have dressed it couple times, we just look after the next purchase, our next need to be created and

satisfied, because we have been programmed to be part of a system where more means better and happier, where material success, results, immediate gratification and continuous goal setting rule our modern society. All of those are inextricably linked with values as growth, competition and accumulation of wealth, —something that capitalism has done an excellent job of embedding in our minds as measurements of success and happiness, leaving us with no perception of any other reality.

That is very well reflected on the fast fashion system. People want more, more clothes, shoes, accessories, not because they truly need them, but because there are some psychological reasons that play into our subconscious decisions when buying clothes as insecurities, social acceptance, validation from peers or social media followers, sense of belonging, or simply just to feel good or rewarded7. Dr. Terrelonge explains: “Feeling is

stronger than knowing,” so despite of knowing the environmental and social effects that lie behind fast fashion, the feelings of instant gratification, social status, attention, self- expression and confidence play much higher and are also reinforced by social media. Also, the affordability and easy accessibility are other priority factors that cast a shadow over the low quality and low wages that lie behind when breaking down price tags.

From a self-identity standpoint, if we agree with the premise of “we are what we wear”, then we should embody everything that fast fashion represent and entail and that we do not want to look at. Following that hypothesis, we are then all the environmental and social damages that are behind everything we wear. However, as I was saying, we can´t demonize fashion itself, because although is true that most of our clothing comes from a fast fashion method, there are also many

small businesses operating in a different manner, considering the wellbeing of the people and the planet in many of the stages of the value chain. In contrast to fast fashion, those are based in slow fashion procedures, with limited collections and pieces, natural and plant - based materials, considering fair wages, respecting human rights, minimizing their impact on the environment and/or prioritizing quality over quantity. While it is true that these brands constitute a small minority due to the limited profitability associated with doing things in the right way, affordability becomes an issue for the consumer, since these products often are more expensive because production costs are higher. Nevertheless, it is crucial to understand that these more sustainable products are not necessarily more expensive. Rather, we are paying the real and fair costs of labor, quality, time, and that value is reflected in the price. Indeed, I suggest we ask ourselves a more pertinent questions: why does a T-shirt imported from China priced at just 5 euros?

What lies behind its actual cost?

The problem we confront nowadays is rooted in the challenge of distinguishing between what is sustainable and what is fast fashion due to insufficient information transparency. Greenwashing practices are being used by most fast fashion companies to improve their image and to hide their core identity. Claims of being *eco-friendly, conscious,* and *sustainable* are often unreliable, where companies create a false impression of their positive environmental impacts, leading consumers to be deceived and make misinformed purchasing decisions. I personally find crucial to develop critical thinking and not believe what is just displayed on a label, avoiding the trap of believing that a company is acting ethically and responsibly towards people and the environment simply because they have launched one “sustainable” collection that just represents a fraction of the overall production8 or because

now they use “*ecofriendly* packaging”, while keeping the same detrimental business model. We must consider other factors such as the ethical production and fair labor practices, repair and upcycling practices or how the brand takes responsibility for their garments at the end of the life cycle, evidence of action and not just good sounding targets as “*net zero*” or “*carbon neutral*” without an action plan nor updates on the progress.

Another aspect often overlooked in sustainability discussions is the quantity of garments produced since fast and massive production is a fundamental trait of fast fashion that most of companies are not willing to give up on because of profit reasons. Volume is the elephant in the room that no one wants to address, and personally sometimes I think it doesn't matter how big are the efforts from a fashion company if it does not overcome the excessive production that leads to the current issue of textile waste. This becomes evident when countries like Ghana or Chile must deal with millions of tons of clothing coming from places like Europe. The reliability of responsible reuse or recycling for the clothes we discard is questionable, especially when they already have predetermined destinations.

So far, we can conclude that most of the responsibility falls on companies' shoulders, since they are the ones who choose profitability over the environment or people wellbeing.

However, it is impossible for me not to wonder, aren't we the ones who choose them? There is a lot of debate about whether the fault lies with the consumer or with the brands, and yes, I firmly agree that companies are the ones who must change their systems, for which reinforced policies are necessary that obligate certain requirements such as a limit on the volume of production, transparency, resource stewardship, animal welfare, fair wages... But I refuse to believe that there is no other option for us than being mere victims of the system, or

as I like to call it "passive consumers". I consider that there is a level of consciousness that is perhaps a privilege to access, that turns us into conscious consumers, where a second dimension is triggered in which we are capable of appreciate moral aspects of the goods we consume. When I talk about privilege, I am talking about recognizing each person's capacity regarding to time, lack of resources and other priority needs that come before accessing that knowledge or education. Indeed, the fact that you are taking the time

right now reading these lines and absorbing knowledge is a privilege that not everyone can afford. So, the first thing to do is to recognize the privilege of each one, and from that state decide if we want and can, to the extent possible, contribute to a better world through our role as consumers.

The truth is, I don't understand much about economics, but there is a doctrine that believes in the formula that demand makes supply, and another that supports that supply creates its own demand. Under my understanding both are factual, although I lean more towards the first formula, since I understand how culture also influences demand. Cultural values play a significant role in shaping market trends9, like we have seen on the last years in many Western countries, since the emphasis on sustainability and environmentally friendly practices started to grow. That has led to an increasing demand of products as sustainable apparel and consequently textile companies have begun to address this kind of demand, although they have done so more through marketing strategies or greenwashing tactics, rather than with tangible and meaningful actions.

Thus, we can say that us, as people, have begun to somehow build a culture of sustainability through new beliefs, education and principles that were not that present years ago. This is where we enter as a market driving force, by

influencing companies to create clothing according to our new values or accepted social norms. In fact, there is a phrase that I love from Anna Lappe that says: "'Every time you spend money, you're casting a vote for the kind of world you want'" and it couldn't make more sense to me. But how can you vote mindfully when you might not know certainly if a brand is as sustainable as it claims? Well, a helpful tip that I use when I do not feel like making my own research about a brand is simply checking Good On You website, they just do it for you. It is the fashion's most trusted source of sustainability ratings to compare how well brands address their impacts on people, the planet, and animals. Once you know, we must drive collective efforts to fill the gap between knowledge and behavior, and act accordingly by purchasing more consciously, and just if we truly need it, because there is nothing more sustainable than what we already have. By buying second hand, repairing, swapping, up-cyling your clothes or not purchasing at all we are also contributing to valid forms of sustainable fashion without having to spend a lot.

We are so lost into consumerism obsession that we have forgotten that we are just one of the million species. The earth does not belong to us, is to be shared by all the species in our ecosystem. Why are we destroying our home for a garment that we do not want to wear twice? We need to reconsider our relationship with nature, keep strengthening our values and redefine what we deem as important for our individual and collective wellbeing.

Because, at the end, whatever the price tag says, fashion should not cost the planet.

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23: Keep Moving; But Do It Right. Navigating the Intersection of Sustainable and Just Mobility

Samira Ibrahim

In the contemporary discourse on environmental challenges, mobility emerges as a critical focal point, intricately connected to sustainability and climate justice. This essay explores the multifaceted reasons why mobility is crucial, emphasizing the interconnectedness of sustainability and climate justice for a harmonious and equitable global future.

In the contemporary discourse on environmental challenges, the theme of mobility has emerged as a critical focal point, intimately connected to both sustainability and climate justice. This essay delves into the multifaceted reasons why mobility is a crucial theme in discussions surrounding sustainability and climate justice, emphasizing the interconnectedness of these concepts in the pursuit of a harmonious and equitable global future. As the European Union (EU) seeks to navigate these challenges, this article explores comprehensive solutions to achieve sustainable and just mobility, considering environmental, social, and economic dimensions.

Sustainability Imperative

Sustainability, as a guiding principle, seeks to address the needs of the present without compromising the ability of future generations to meet their own needs. Mobility plays a

pivotal role in the sustainability paradigm, as the modes and patterns of transportation profoundly impact environmental health. The extensive reliance on fossil fuel-driven vehicles contributes significantly to air pollution, greenhouse gas emissions, and the depletion of finite natural resources. Sustainable mobility, therefore, involves transitioning towards eco-friendly alternatives, such as electric vehicles, public transportation, and active modes like walking and cycling.

Additionally, sustainable mobility extends beyond the environmental dimension to include social and economic aspects. Access to affordable and efficient transportation is fundamental for social inclusion, economic development, and reducing disparities among different segments of society. By fostering sustainable mobility practices, communities can enhance resilience and improve overall well-being, ensuring that the benefits of transportation are equitably distributed.

Climate Justice Nexus

Climate justice addresses the disproportionate impacts of climate change on vulnerable populations, emphasizing the ethical imperative of addressing historical and contemporary inequalities. In the context of mobility, climate justice becomes particularly salient as certain communities bear a disproportionate burden of the negative consequences associated with transportation-related emissions. Low-income neighborhoods often experience higher levels of air pollution due to the proximity of major transportation arteries, resulting in adverse health outcomes for residents.

Furthermore, the global south is frequently more vulnerable to the impacts of climate change exacerbated by emissions from industrialized nations. The imperative of climate justice demands a reevaluation of mobility patterns, with an emphasis on redistributing the associated burdens and

benefits more equitably. By prioritizing the development of sustainable transportation infrastructure in marginalized communities and implementing policies that promote environmental justice, societies can work towards rectifying historical injustices exacerbated by unsustainable mobility practices.

Interconnected Perspectives

The interconnectedness of sustainability and climate justice in the context of mobility necessitates a holistic approach to policy and planning. Initiatives to promote sustainable transportation must be coupled with efforts to address systemic inequalities and ensure that the benefits of these initiatives are shared by all. This involves engaging with communities to understand their unique needs and challenges, fostering collaborative decision-making processes, and implementing policies that prioritize both environmental sustainability and social justice.

Electric Vehicles Sustainability Paradox

The surge in popularity of electric vehicles (EVs) is often hailed as a green step towards sustainability. However, a critical examination reveals complexities and challenges. The extraction of raw materials for EVs, concentrated in developing countries, leads to environmental degradation and social injustices elsewhere, exacerbating global inequalities.

Life Cycle Assessment

EVs produce zero emissions during operation, but their overall impact requires a life cycle assessment (LCA). Manufacturing involves raw material extraction with associated environmental degradation. Energy-intensive processes challenge the claim that EVs are inherently sustainable, demanding a transformative shift towards renewable energy sources.

Battery Concerns

The cornerstone of EVs is lithium-ion batteries, posing environmental challenges. Extraction from ecologically sensitive areas leads to habitat destruction and water pollution. Limited battery lifespan raises disposal concerns, emphasizing the need for developed recycling infrastructure. The sustainability claims surrounding EVs rely on addressing these challenges.

Energy Source Dependency

The environmental benefits of EVs depend on the source of charging electricity. Regions reliant on fossil fuels may transfer emissions from tailpipes to power plants. A comprehensive shift to renewable energy is crucial for maximizing EVs' environmental benefits.

Resource Extraction and Environmental Degradation

The production of electric vehicles relies heavily on the extraction of critical raw materials, such as lithium, cobalt, and nickel, predominantly sourced from developing countries. This process often involves environmental degradation and human rights abuses, creating a dichotomy where the environmental benefits of EVs in one region come at the expense of environmental and social injustice elsewhere. Communities near extraction sites often bear the brunt of pollution and habitat destruction, exacerbating existing socio-economic disparities.

The concentration of resource extraction in specific geographic regions exacerbates global inequalities, perpetuating a cycle of environmental injustice where affluent nations benefit from green technologies while marginalized communities shoulder the environmental burdens.

Infrastructure and Land Use

The widespread adoption of EVs requires robust charging infrastructure, raising environmental impact questions. Construction and maintenance contribute to resource strain and biodiversity loss. Addressing these concerns is vital for evaluating EVs' role in environmental sustainability.

EU's Multifaceted Approach

Creating a sustainable and just mobility system in the European Union (EU) extends beyond EVs. Solutions include investing in public transportation, active transportation infrastructure, and promoting shared mobility services. Integration of multi-modal transportation, smart city initiatives, and incentives for green vehicles contribute to a comprehensive strategy.

Solutions for Sustainable and Just Mobility in the EU

The interconnectedness of sustainability and climate justice in the context of mobility necessitates a holistic approach to policy and planning. Initiatives to promote sustainable transportation must be coupled with efforts to address systemic inequalities and ensure that the benefits of these initiatives are shared by all. This involves engaging with communities to understand their unique needs and challenges, fostering collaborative decision-making processes, and implementing policies that prioritize both environmental sustainability and social justice.

In the planning and implementation of mobility solutions, involving communities and considering their specific needs is crucial. Engaging in transparent and inclusive decision-making processes ensures that mobility solutions address the unique challenges and requirements of diverse populations. By combining these strategies, the EU can move towards a more sustainable, just, and inclusive mobility system that addresses both environmental concerns and social equity.

In conclusion, mobility is at the crossroads of sustainability and climate justice, presenting challenges and opportunities in addressing environmental issues. As the global community seeks to mitigate climate change, adopting a comprehensive and interconnected approach to mobility is crucial. By navigating the intricate dynamics of mobility, societies can pave the way for a future that is ecologically sound, socially just, and inclusive.

In conclusion, mobility stands at the crossroads of sustainability and climate justice, embodying the challenges and opportunities inherent in addressing environmental issues. As the European Union grapples with the imperative to mitigate climate change and achieve sustainable development, the theme of mobility serves as a critical juncture for transformative action. By adopting a comprehensive and interconnected approach, the EU can navigate the intricate dynamics of mobility to create a future that is both ecologically sound and socially just. Through the implementation of targeted solutions, the EU can lead the way towards achieving sustainable and just mobility, setting an example for global efforts in shaping a more equitable and environmentally conscious future.

In conclusion, the eco-friendly image of electric vehicles is not without its complexities and challenges. A comprehensive evaluation of the entire life cycle of electric vehicles, from production to disposal, reveals environmental impacts that are often overshadowed by their zero-emission operation. Addressing the sustainability paradox of electric vehicles requires a holistic approach, including advancements in battery technology, responsible sourcing of materials, and a transformative shift towards renewable energy sources. Until these challenges are adequately addressed, the sustainability claims surrounding electric vehicles remain contingent on broader systemic changes in the automotive and energy

sectors.

The transition to electric vehicles, while offering environmental benefits, is not immune to perpetuating climate injustices. The extraction of raw materials, socio-economic disparities in access, and global energy dependencies create complex dynamics that demand attention. Policymakers, industry leaders, and advocates must work collaboratively to address these issues, ensuring that the adoption of electric vehicles contributes to a more equitable and sustainable future. Environmental justice should be at the forefront of the electric mobility transition, fostering a global commitment to mitigating climate change without sacrificing the well-being of marginalized communities.

24: Sustainable Tourism

Anna Staszewska

Tourism is taken here to represent the combination of leisure and recreation as well as human travel and sightseeing. This wide concept is used because it is considered that a restricted definition of tourism would ignore a major part of the visitation to, and pressure upon, a and facilities. While it is known that different types of visitors impose different types of impacts and make different demands upon resources and areas, they are all part of the same phenomenon, namely the leisure population of people participating in activities and inactivity for enjoyment on a voluntary basis during leisure or spare time (Butler, 1991).

During the process of tourist exchange, the tourist destination becomes the aim of the tourist trip, a desirable "purpose" for travel, provided fully available to visiting together with all belonging to its cultural and natural values. It is associated with the formation of two levels relationship: on the one hand, on the occasion and in connection with the tourist movements, and on the other - in the contacts that tourists make with the local community, expressed through the complex guest-host relationship (Stankova, Kalychev, 2020).

According to the literature, tourism impacts breakdown into economic, social, and environmental ones. Sharpley identifies residents' perceptions of tourism impacts, finding them to be influenced by their engagement into tourism businesses, individual profile (skills, relative wealth), or closeness to the

downtown area of the city (Jimenez-Medina et all, 2021).

Growing concern for environmental, economic, and socio-cultural consequences of tourism development has given rise to influential changes in the industry, devoting increasing attention to sustainable forms of tourism. While different terms are employed, these new forms of tourism center on combining economic progress (Lansing, De Vries, 2007).

From an economic perspective, tourism has increased in importance because of its enormous contributions to national economies. Tourism has had a significant amount of planning and investment in the last several decades, expanding the world's tourism industry. Because of this growth, the tourism industry has provided numerous employment opportunities to the locals at various tourist destinations (Amiruddin S., et al., 2022).

Research made by the World Bank demonstrates that host countries and communities have experienced substantial economic progress through sustainable tourism development. For instance, Mauritius is one of many small islands that has turned to tourism in order to gain economic prosperity. Being aware of the limits to tourism development given its small size and limited resources, the number of international tourist arrivals per year is limited, promoting the island as a high-quality, luxury destination. An important consideration in sustainable initiatives is the involvement of local residents, guaranteeing that the benefits are shared on a community-wide basis. Part of sustainable tourism is the ongoing attempt to build tourism properties with local capital, using local workers, and local management. After construction, many corporations make a continuous effort to support local businesses and workers (Lansing P., et al. 2007).

The close links between tourism, the environment, and development, have been recognized for many years - certainly

from long before Our Common Future. The Royal hunting reserves of a thousand or more years ago are examples of the contemporary appreciation of the environment as a leisure resource. They were perhaps the first examples of management by sustainable development in a tourist context, being maintained on a renewable basis for tourism, usually in the form of hunting, by the top social class in the land. They were relatively successful in a narrow sense because of often draconian enforcement of restrictions upon use, and because the level of use was normally low enough threaten the renewable nature of the resource, which was primarily large-animal wildlife and the associated vegetation (Butler R.W., 1991).

Sustainable tourism

Sustainable tourism may be regarded mostly as the application of the sustainable development idea to the tourism sector – that is, tourism development that meets the needs of the present without compromising the ability of future generations to meet their needs or, in concerts with Budowski's symbiosis scenario, tourism that wisely uses and conserves resources in order to maintain their long-term viability. Essentially, sustainable tourism involves the minimization of negative impacts and the maximization of positive impacts. Yest, while sustainable tourism may therefore be regarded as a form of sustainable development (i.e. development as a process) as well as a vehicle for achieving the latter (i.e. development as a goal), there is not as direct a relationship between the two terms as might be expected (Weaver, 2006).

Many tourism institutions and policy-makers have recently embraced 'sustainability' in their attempts to define the role of tourism in development. Discussions and research on 'sustainable tourism' have proliferated in the international agenda, starting from Agenda 21 issued at the UN Rio

Conference on Environment and Development in 1992, up to the recent Sustainable Development Goals (SDGs) launched in 2015 (UNWTO 2010; United Nations 2015). Tourism can contribute to achieving these goals, including decent work and economic growth (SDG8); reduced inequalities (SDG10), as well as peace and justice (SDG16).

The historic agreement among world leaders at the United Nations in 2015 on a universal 2030 Agenda for sustainable Development committed all countries to pursue a set of 17 Sustainable Development Goals (SDGs) that would lead to a better future for all. The bold agenda sets out a global framework to end extreme poverty, fight inequality and injustice, and fix climate change until 2030.

As the 17 SDGs and the corresponding 169 SDG targets offer the world a new direction, tourism can and must play a significant role in delivering sustainable solutions for people, the planet, prosperity and peace.

Tourism as an economic powerhouse is the third highest world category in export earnings in 2015, representing 10% of world GDP, 30% of services exports and 1 out of every 10 jobs in the world. Tourism has the potential to contribute, directly or indirectly to all of the goals. In particular, it has been included as targets in Goals 8, 12 and 14 on inclusive and sustainable economic growth, sustainable consumption and production (SCP) and the sustainable use of oceans and marine resources, respectively (Tourism for DGS, 2023).

Source: Based on https://unstats.un.org/sdgs/report/2023/progress-midpoint/; https://tourism4sdgs.org/tourism-for-sdgs/tourism-and-sdgs/ Nov 2023

From the other hand UNWTO 2030 (World Tourism Organization) pointed the Tourism Roadmap for Inclusive Growth shall provide a new opportunity for partnerships for development – SDG 17. The projects proposals reflect UNWTO

Member States needs to build a more resilient, sustainable and innovative tourism sector that generates jobs and promotes inclusive, low-carbon growth in line with all three dimensions of sustainable development: people, the planet and prosperity.

Investing in people, boosting infrastructure development, shaping better policies and institutions, building resilience, stimulating entrepreneurship, fostering innovation and digitalization, and making sustainable use of rich biodiversity and culture should be at the core of our efforts to unlock the potential of tourism growth while mitigating migration and preserving each destination's natural and cultural assets (Tourism for DGS, 2023).

Sustainability in tourism is still conceptualized largely in terms of economic and financial growth, whereas social and environmental sustainability have remained subordinate to the economic dimension. For example, in many destinations, ecotourism is promoted as a way of integrating local livelihoods into transnational flows of capital, goods, and culture. However, tourism economy, especially when carried out by large investors active in multiple destinations, may threaten local traditional ones. Also, fostering economic growth does not guarantee that the surplus, employment, fits and adverse effects generated through tourism are distributed evenly (Jokela S., Minoia P., 2021).

The concept of sustainable tourism was created in 1995 at a conference on the Spanish island of Lanzarote. So-called Lanzarote Charter for Sustainable Tourism was developed there. It was specified that the development of sustainable tourism should be based on the concept of sustainable development, which was ecofriendly, integrated with the environment, economically feasible and ethically and socially acceptable to local communities. Also the European Council formulated in 1998 the definition of Sustainable Tourism as any form of tourism that respects the environment, ensures

long-term protection of natural and cultural resources, and is socially and economically acceptable (Knap R., 2017).

Sustainable tourism development recognizes the interdependency between the long – term viability of economic investment in tourism projects, programs and policies and the successful management of the natural, built and human resource bases. Therefore, sustainable tourism development seeks to maintain and enhance the quality of life, and the quality of the tourist experience, at destination areas through the promotion of economic developments which conserve resources. Moreover, sustainable tourism development recognizes the links which exist between destination areas and the cultural resources (Hunter C., Green H., 1995).

Even if the Cronin in 1990 provides a list of criteria that must be met for tourism development to conform to the principles of sustainable development, should (Hunter C., Green H., 1995):

- Follow ethical principles that respect the culture and environment of the destinations area, the economy and traditional way of life, the indigenous behavior, and the leadership and political patterns,
- Involve the local population, proceed only with their approval and provide for degree of local control,
- Be undertaken with (intra-generational) equity in mind, i.e with the idea of access to a fair distribution of benefits and costs among tourism promoters and host people and areas, not only now, but in the future,
- Be planned and managed with regard for the other economic sectors, and,
- Be assessed on an ongoing basis to evaluate impacts and permit action to counter any negative effects.

Even that those sentences were write almost 40 years ago they are still present. If we would like to have sustainable tourism we must follow some rules. The first one is to respect environment, tradition and habitants of the region.

For resume examples of the sustainable tourism:

First example of green tourism is **marine green** a kind of tourism form based on marine tourism resources, through the extension of marine ecology, tourists can satisfy their leisure tourism desire. It can be seen that marine tourism is based on the development of social and economic conditions. Marine green tourism industry is a series of social distribution and consumption economic activities based on marine space and marine resources. With the improvement of people's awareness of environmental protection and the enhancement of marine ecological awareness, marine green tourism has become a new growth point of marine economy (Shen Z., 2020).

It can be seen that marine green tourism resources are rich and diverse, so it can be said that scientific and reasonable classification is an important basis for the development and utilization of marine resources, as well as the understanding and protection of marine ecology Shen Z., 2020).

The next one is **rural tourism** is a small flow product with high cultural content and strong experience. The core of the product is culture and people, and the essence is cultural experience+ rural leisure "green vacation". As a tourist cultural resource, rural landscape is not only extremely scarce, but also very fragile. In the era of mass tourism, rural tourism has gained absolute advantages in development and competition, but it has also fallen into a pattern of homogenization. The development of rural tourism can stimulate local farmers' sense of identity and pride in rural culture to the greatest extent, thus realizing the inheritance and protection of rural

culture from the perspective of protecting the whole rural cultural space. Tourism lifestyle is increasingly respected by residents, and the public's love for rural tourism is also showing a new normal. In tourism development, the protection of residential buildings and the maintenance of natural ecology and historical and cultural atmosphere must be placed in the top priority (Fan H., 2020).

The concept of a **green product** is one that is easier to use than to define. Green tourism is used to indicate environmentally friendly tourism but have different focuses and meanings. Often such claims use terms which lack of accepted or standard definitions, or utilize extravagant language to wash the emptiness of the claim being made. These terms are used for two purposes: first, to tell customers that the holiday destination they are going to is beautiful and unspoilt. Green tourism or another term related to environmental concern is mostly used to label nature holidays to exotic destinations. Second, green tourism claims can be used to signal that tourism operations taking place in that area do not harm the environment. In loose terms, a product or service can be said to be green when it is beneficial to the producer and consumer without harming the environment. The difficulty starts when a stakeholder attempts to measure the negative effects of their activities on the environment. Even in cases where measurement seems possible, the next difficulty arises at agreeing the criteria to be considered and the threshold levels of unacceptable effects. Tourism traditionally has been considered a relatively green industry, with the exception of its transport and land development implications, and for this reason it has only recently become an area of concern (Furqan A., et al. 2010).

And the last example is **enotourism**, also referred to as a wine tourism is defined in different ways, but usually lists the following common elements (Knap R., 2017):

- Tour of the vineyards and wine producers,
- Participation in all wine events,
- Explore all other elements of cultural heritage related to wine region.

The key of the implementation of sustainable tourism is the level of tourist education of the population in general, especially in the kindergartens, schools as well as specialized training of the professionals of tourism. Modern tourism is a powerful tool for environmental education of the population, introducing environmental problems for tourists and the methods of the solutions, as in the process of tourist activity people constantly cooperate with the natural environment (Malska M., et al., 2017).

So after reading this chapter every of us can make small steps to make tourism more accessible and sustainable. And every time when we would like to travel we have to think about the local culture, tradition, music, food and people which would like to have the same environment then before our visiting.

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25. The Interplay of the economy and climate change

Tosin Iduh

Climate change has become one of the most pressing environmental threats to be addressed in the next decades, while already being perceived as a global risk that poses diverse social and economic challenges. But beyond the immediate effects on the natural ecosystem, the ripples of climate change are also extending into the core aspects of our economy.

Discussions regarding the management of climate-related risks and opportunities often underscore the strategic role of the economy and its players, as a key enabler to support climate change adaptation and mitigation practices to help drive innovation and green development. This chapter draws on different sources to provide an overview of the interconnections between the economy and climate change, while exploring some of the negative effects that deter sustainable growth in the long run.

In this section resilient approaches are discussed through selected examples, as a way to harness climate-related opportunities, also highlighting how the integration of climate and environmental factors within corporate and governmental planning could ultimately lead to diverse advantages supporting a sustainable future.

1. The interconnexions between climate change and the economy

Quantifying the effects that climate change could have on

the global economy is a challenging task with uncertainties around the expected evolution of climate trends and human response. However, over the years, a broad range of studies have provided greater insights for a better understanding of physical and transition risks, as well as robust evidence on the potential consequences that the prolonged changes in the state of climate can present at a social and economic level.

Human action has been seen as a common factor in the development of both elements, and when trying to identify positive or negative outcomes, it is important to understand the relationship between their main drivers, that is, the aspects of climate change that are influencing economic trends and forecasts, as well as the extent and mode of current economic dynamics contributing to an effective or unsuccessful transition pathway.

A failed transition could result from a number of factors, some of which may include global inaction, insufficient investment levels, lack of realistic commitments, or poor environmental policies. Nevertheless, the growing consensus around this topic can guide us through a generic analysis, by providing a broader view of the main defies and opportunities arising from a changed climate.

1.1 Potential impacts of climate change from an economic perspective

Climate-related hazards are likely to affect several sectors and industries, but despite the international awareness and the widely acknowledged challenges to be faced, some market participants may not fully grasp climate-related risks due to their medium to long-term nature, what may lead to such threats not being considered as immediately relevant within key strategic and financial plans.

The consequences of climate-related risks can differ by

region, and may depend on aspects such as a country's energy matrix, the evolution of regulation, demographics or the current political and economic context. Based on their level of exposure, world economies may experience various forms of deterioration due to extreme weather events, that could lead to significant macroeconomic implications. These events have the potential to disrupt economic output across multiple sectors, impacting commercial activities and foreign investments.

There are also further effects that could unsettle markets, regarding investment flows and capital levels. Following an extreme weather event, rising costs may occur due to damages on physical assets, resulting in diminished net wealth over the long term if such threats become cyclical. Moreover, uncertainty regarding the climate outlook and its potential impacts might give rise to skepticism among investors or financial actors, likely leading to reduced investments and stagnant growth.

When assessing climate change risks, these are typically divided into two main categories, physical risks, which refer to acute or chronic physical impacts, and transition risks, which relate to the exposure of companies to changes in policies and regulation, technological shocks, market shifts or reputational disputes. The potential consequences deriving from physical hazards can be associated with increased costs and economic losses when analyzed from a business perspective, but the degree of severity or the extent to which these factors may affect an organization's core business will vary according to their readiness and ability to recognize, manage, and eventually mitigate material risks.

The following table reproduces examples provided by the Task Force on Climate-Related Financial Disclosures (TCFD) recommendations on potential financial impacts:

Climate-related risks	
Physical risks	Potential Financial Impacts
Acute Increased severity of extreme weather events such as cyclones and floods	- Reduced revenue from decreased production capacity (e.g., transport difficulties, supply chain interruptions) - Reduced revenue and higher costs from negative impacts on workforce (e.g., health, safety, absenteeism) - Write-offs and early retirement of existing assets (e.g., damage to property and assets in "high-risk" locations) - Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil fuel plants) - Increased capital costs (e.g., damage to facilities) - Reduced revenues from lower sales/output - Increased insurance premiums and potential for reduced availability of insurance on assets in "high-risk" locations
Chronic Changes in precipitation patterns and extreme variability in weather patterns Rising mean temperatures Rising sea levels	

Regarding transition risks, these may arise from the uncertainties surrounding the world's shift towards a more sustainable economy, and while they are broad in nature they can also be challenging to assess. An important consideration when outlining alternatives to tackle climate change, is the need to transition to a low-carbon economy but this requirement entails changes within the legal, technological, and economic scene that could affect organizations across different industries.

The TCFD recommendations identified four groups of climate-related transition risks and their potential financial impacts, underlining diverse drawbacks like increased costs, write-offs and early retirement of existing assets, changes in revenue mix and sources or reduced revenue from decreased production capacity.

Climate-related risks	
Transition risks	Potential Financial Impacts
Policy & Legal - Increased pricing of GHG emissions - Enhanced emissions reporting obligations - Mandates on and regulation of existing products and services - Exposure to litigation	- Increased operating costs (e.g., higher compliance costs, increased insurance premiums) - Write-offs, asset impairment, and early retirement of existing assets due to policy changes - Increased costs and/or reduced demand for products and services resulting from fines or judgements
Technology - Substitution of existing products and services with lower emission options - Unsuccessful investment in new technologies - Costs to transition to lower emissions technology	- Write-offs and early retirement of existing assets - Reduced demand for products and services - Research and development expenditures in new and alternative technologies - Capital investments in technology development - Costs to adopt/deploy new practices and processes
Market - Changing customer behavior - Uncertainty in market signals - Increased cost of raw materials	- Reduced demand for goods and services due to shift in consumer preferences - Increased production costs due to changing input prices (e.g., energy, water) and output requirements (e.g., waste treatment) - Abrupt and unexpected shifts in energy costs - Change in revenue mix and sources, resulting in decreased revenues - Re-pricing of assets (e.g., fossil fuel reserves, land valuations, securities valuations)
Reputation - Shifts in consumer preferences - Stigmatization of sector - Increased stakeholder concern or negative stakeholder feedback	- Reduced revenue from decreased demand for goods/services - Reduced revenue from decreased production capacity (e.g., delayed planning approvals, supply chain interruptions) - Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention) - Reduction in capital availability

The tangible links between extreme weather events and economic repercussions highlight the vulnerability of global economies to climate change, as these events can disrupt economic output across sectors while affecting economic activities. Whether we limit warming to the required levels to avert climate-related impacts will ultimately depend on the initiatives and early actions promoted in the following years.

1.2 The influence of the global economy on climate change

One of the key resources upon which our economies are based is fossil fuels, yet it also stands as one of the main factors influencing climate change. Emissions related to human activity have increasead dramatically since the beginning of the industrial era. With evidence showing the world is warming faster than at any point recorded in history, fossil fuels are seen as the primary cause of global climate change, as they contribute to more than 75% of greenhouse gas emissions worldwide and almost 90% of carbon dioxide emissions according to the United Nations. The production and consumption of food, powering buildings, manufacturing commodities, or the use of land, are a few examples of economic activities that are contributing to the increase of

greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) special report on the impacts of global warming of 1.5°C above pre-industrial levels, revealed that human-induced warming reached approximately 1°C above pre-industrial levels in 2017, increasing at 0.2°C per decade, with most land regions rising their temperature more rapidly than the global average since the 1970s. The Panel also indicated that identified changes in the state of the climate could persist for an extended period of time, typically decades or longer, therefore looking at sustained climate-related influences that would need to be managed in a consistent manner, but besides the unfavorable effects highlighted from the interrelation between the economy and climate change, a number of elements are still regarded as practical tools to materialize the route towards net zero.

Decarbonizing the real economy is frequently viewed as the central strategy to address climate change and promote sustainable growth across various sectors, with financial actors and economic resources being considered as crucial components of the emissions reduction equation. However, the financial industry cannot walk alone in this challenging path and requires the support of other relevant stakeholders, in particular governments, who are to play a critical role in facilitating investment-led growth initiatives and robust regulation to support sustainable development, while creating synergies to enact global efforts towards a same purpose.

On an international scale, we are already seeing how most economies and organizations are working to reduce their green-house gas emissions to help limit global temperature rise to 1.5°C. We have witnessed progress with optimistic pledges at a regional level like the one presented by the

European Union (EU), ambitioning to become climate-neutral by 2050 as part of the EU green deal long-term strategy. While it has been estimated that approximately €520 billion must be invested annually between 2021 and 2030 in order to implement the European Green Deal, the EU will also need to invest an additional €92 billion between 2023 and 2030 to increase its manufacturing capacity for net-zero technology.

The intricate relationship between fossil fuels, climate change, and economic activities demands urgent attention and comprehensive action, with evidence of accelerated global warming underscoring the urgency to transition towards enhanced sustainable practices.

2. Financial actors: Catalysts for change

Climate change has become a worldwide concern and requires a global coordinated response from both the private and public sectors. Central banks, financial institutions, and other relevant economic actors have the opportunity and the capacity to deliver the right support and resources for transformational change. Financial expenditure and environmental commitments are specific requirements to accelerate the net zero pathway with the right policies and incentives, but these needs differ across regions and industries, and the transition to a low carbon economy is likely to require high levels of investment to promote innovative solutions. The International Energy Agency estimated that annual clean energy investment worldwide will need to increase by 2030 to around $4 trillion.

Within the context of the energy transition, the role of financial institutions extends beyond their mere financial capacity to support the shift towards more sustainable business models. It involves a joint effort to align financial services with industries and enterprises actively committed in reducing green-house gas emissions with credible transition

plans, while supporting them in their own decarbonization journey. The allocation of financial resources remains key, but equally important is the strategic destination of these funds, what emphasizes the pivotal nature of sustained engagement practices, prevailing over strict divestment policies in the fight against climate change.

Taking a broader look, and focusing on advances at a regional level, the European Central Bank has labelled climate change as one of its main priorities, viewing it together with the transition to a greener economy as potential factors that could affect price stability, due to their influence in the European economy and the impact they could have on risk profile and assets value on the Euro system balance sheet. In order to ensure the effectiveness of policies, the ECB established within its agenda three core objectives around climate change, which relate to managing and mitigating associated financial risks with the appropriate economic impact assessment, promote sustainable finance to support an orderly transition to a low-carbon economy, and share its expertise to foster broader changes.

Addressing climate change is going to require a united global effort, among central banks, financial institutions, and relevant economic players that are uniquely positioned to drive transformative change. Collective and coordinated initiatives will certainly reinforce the call for strategic, and sustained global action to address climate-related challenges from a financial standpoint.

3. Resilience: An opportunity for growth

While posing significant threats to ecosystems and societies, climate change also presents unique opportunities for growth and development. In this section the benefits of resilience are explored, being described as the ability of a system and

its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, by guaranteeing the preservation, restoration, or improvement of its essential basic structures and functions. By prioritizing resilience and addressing climate-related risks, there is a potential to unlock economic, social, and environmental benefits.

Addressing the effects of a changed climate can imply increasing efforts to help cut emissions and limit the world's rising temperature, but also develop adaptation plans for an effective response to these challenges, through innovation and cutting-edge solutions that can lead to improved resilience and reduced vulnerability, being described as the process of adjustment to actual or expected climate and its effects.

Knowing climate related risks cannot be reduced completely, adaptation strategies are deemed essential for an adequate management, relying on a range of resources that could help governments build resilience through different approaches: (i) promote an inclusive approach ensuring vulnerable populations are equipped with the adequate institutional, financial and technological instruments, (ii) provide extensive support to foster a wide access to climate adaptation tools, financing and climate-related information, (iii) safeguard vital infrastructure and improve the design of land use plans (iv), anticipate risks and impacts to ensure a swift an adequate response and minimize or prevent damages, (v) impact management at a macro level and (vi) holistic approach focused on cross-sectorial implementations and supervision.

In sensitive sectors like agriculture, where climate change can negatively interfere in rural activities, hinder production levels or affect the environment, adaptation stands as an effective tactic to manage threats arising from escalated

climate events. Best practices can be implemented at a local level, while replicating successful initiatives like the use of alternative crops, the construction of more resilient infrastructure or by fostering changes in land use.

When observing adaptation strategies at a regional scale, the European Union launched the EU mission on adaptation to climate change in 2021. By 2030, the mission seeks to assist at least 150 local governments and regions in becoming climate resilient, with three major goals; increase resilience, accelerate the speed to a resilient future, and prepare Europe for climate disasters. This is expected to be accomplished by testing novel ideas and scaling them up, fostering the ideal environment for reforming our communities, and offering examples of profound climate resilience.

The progress seen at both regional and international levels, specially illustrated by the ambitious European Green Deal, continues to offer a glimpse of hope in the achievement of net zero ambitions, but sustained commitment and strategic investments will remain essential to accomplish a resilient and climate-neutral world.

4. Conclusion

The intricate relationship between climate change and the economy underscores the pressing need for collective global action. As we navigate this critical juncture, advancing in global commitments within the public and private sectors to tackle environmental and climate challenges has become paramount. A just transition is essential, particularly for developing economies, ensuring that the burdens and benefits of climate change are equitably distributed, by embracing a fair transition we can ensure that vulnerable communities are not left behind, while we create a more inclusive and sustainable future.

It is clear that governments and financial actors have the capacity to promote sustainable investments towards adaptation and mitigation strategies, paving the way for a more resilient global network. The urgency of early action cannot be overstated, as it is an essential factor in forging a fair transition to safeguard both our environment and economic well-being. Only through collective action, increased awareness, and decisive measures, we will be able to build a sustainable bridge to a future where economic and natural ecosystems coexist harmoniously.

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26. European Climate Pact and Climate Ambassadors

Carmen Marques Ruiz

Climate change is a global challenge and an existential threat for humankind. Europe is a leader in the international scene on climate change and other environmental issues in a time of multiple crisis and conflicts. As a strong supporter of multilateralism, the European Union is pulling its weight to address climate change both through its foreign policy and internally through legislation and funding.

The European Green Deal is a key policy of the Von Der Leyen European Commission. It is the center piece for the ecological transition in Europe and has three main objectives: to make Europe the first climate neutral continent in 2050, to ensure that Europe's economic development respects planetary boundaries and to make certain that nobody is left behind in this ecological transition. In the last 4 years, the European Green Deal has been developed through an impressive array of EU legislative activity, like the EU Climate Law which writes into law the EU objective of becoming climate neutral by 2050; or the "Fit for 55" initiative designed to reduce net greenhouse gas emissions by at least 55% by 2030. The European Green Deal has a very broad scope and affects many policies such as climate, energy, circular economy, waste, biodiversity, pollution, oceans, transport, food and agriculture, industry, buildings, research and innovation, finance…

Addressing climate change requires not only an interdisciplinary approach and the adoption of new

legislation, but also winning the hearts and minds of European citizens. The dimension of the challenge is so huge that we need to make sure that the new policies designed in Brussels, with the involvement of the governments of all EU Member States and the European Parliament, go beyond EU offices in rue de la Loi, and are implemented and supported by citizens, institutions, and enterprises all over Europe. Otherwise, the European Green Deal will not fly.

The European Climate Pact

The need to connect and inspire EU citizens led to the creation of the European Climate Pact (ECP) in 2020, as a key element of the European Green Deal. The ECP is a European initiative launched by the European Commission, designed to mobilize European citizens around the European Green Deal. "The European Climate Pact is a movement of people united around a common cause, each taking steps in their own worlds to build a more sustainable Europe". The European Climate Pact's motto is "My World. My Action. Our Planet".

There are two key ideas behind the European Climate Pact: a just ecological transition and democracy.

A just ecological transition requires to combine a bold ecological transformation (allowing for climate neutrality and respect of planetary boundaries.) with justice and support for the most vulnerable people. In other words, public climate and environmental policies should be designed and implemented leaving no one behind.

On the other hand, the European Green Deal needs to be understood and accepted by European citizens to be successful. The democracy requirement goes in both directions: climate policies need to be properly explained and accepted by citizens but also citizens' views should be

considered in the design of European policies through a consultation and participatory process. The Peer parliaments organized by the ECP Ambassadors in the first years at the beginning of the European Climate Pact, respond to this approach.

The European Climate Pact has the following objectives:

1. Raise awareness about climate change and other environmental issues.
2. Inform citizens of the EU policies, initiatives, and funding on these topics.
3. Connect and share knowledge about climate change and climate action, including best practices.
4. Develop and scale up solutions to fight climate change and adapt to its consequences.
5. Encourage change by empowering people to take climate action in their everyday life.

The ECP community is composed of a network of Ambassadors and partner organisations, the European Climate Pact Secretariat, the national coordinators, and the European Commission, in particular DG CLIMA and its offices in the EU Member States. The European Commissioner in charge of the ECP was Vice-President Frans Timmermans until 2023 and is now Wopke Hoekstra , the new Climate Commissioner, under the leadership of Vice-President Maroš Šefčovič.

The European Climate Pact Secretariat, selected via a call for tenders, ensures the EU coordination, the organization of webinars and, the sharing of information on EU Climate policies and Ambassadors' activities. During the first 3 years the ECP Secretariat was in hands of a consortium led by ICF, a global consulting and technology company. Since mid 2023 the ECP Secretariat is run by Ecorys, a Dutch consulting and communications company with global reach. In each EU Member State, there is a national coordinator who is the main

point of contact of Ambassadors at national level. National coordinatora are expected to provide guidance, capacity development and networking to ECP Ambassadors and to organize events.

Since 2019, the impact of climate change and the need to act has become more evident. At the same time, the EU ecological transition and the ECP have faced increasing difficulties due to several crisis in cascade. The ECP was launched during COVID times. After COVID, the invasion of Ukraine by Russia in 2022 created a huge energy crisis in the EU which accelerated the transition to renewable energies and reduced the EU dependence from Russia but fostered inflation and increased poverty. This, combined with a feeling that other parts of the world are not following the same environmental rules, is creating anxiety and fear, and pushing people towards populist parties and against the European Green Deal. In the runup to the European Elections of 2024, a big debate is taking place. Criticism of the European Green Deal and its impact on farmers' livelihoods is spreading in public opinion and becoming one of the big issues of a polarized political debate.

The ECP Ambassadors

The European Climate Pact has a network of 894 Ambassadors all over Europe. European Climate Pact Ambassadors are volunteers who have been selected by the European Commission because of their professional achievements and their commitment to the ecological transition. I have the honour of being one of them since early 2021.

We are people from all over Europe who believe that we can make a difference, that a better and more sustainable world is possible. European Climate Pact Ambassadors inform, inspire and support climate policy and action in their communities and networks Our role is to raise awareness on climate

change, to explain EU climate policies and to mobilize all kind of actors: people, enterprises, civil society, cities, regional governments, academic institutions, and public entities… to take meaningful and ambitious climate action.

European Climate Pact Ambassadors are appointed by the European Commission, but we are independent from it. We do not receive instructions from the European Commission, because we are not EU officials or employees. However, we are connected to the EU project and represent European values. We are not paid for our activities as Ambassadors and, therefore, we are not in the European Commission's payroll. On the contrary, Ambassadors invest time, energy, and money on a free basis to contribute to the ECP. The lack of financial support is a serious handicap, because having some funding from the EU, even very limited and for specific projects, would hugely improve the impact of our initiatives.

Ambassadors cannot speak or negotiate on behalf of the European Commission but we are expected to respect the principles and values of the European Climate Pact which are:

Science, responsibility, and commitment: in a world where climate deniers still exist and fake news are increasingly widespread, science and trustworthy actions should be the basis of Ambassadors' activities.

Transparency: Ambassadors should share information on their activities with other Pact actors and with the public. The whole point of being an Ambassador is to give visibility to the European Climate Pact. Secrecy makes no sense.

No greenwashing: Ambassadors' commitments should be concrete, public, and transparent. It is important that allegations of sustainability or climate neutrality are evidence based and not part of a hollow public relations campaign.

Ambition and urgency: dealing with the climate crisis

requires bold and ambitious action. Time is running out to respect the limit of 1,5 °C and vague declarations of intent are not enough.

Action tailored to local contexts: this is a real challenge. Climate change is a global threat that requires local action. Ambassadors can multiply and increase the effectiveness of climate policies through their networks and communities.

Diversity and inclusiveness: climate change is often used as a weapon to attack others. This is threatening the success of climate policies creating opposition of people who feel threatened. One should keep in mind that the changes needed are so important that the whole society should be involved. Climate action cannot be restricted to people who are activists or experts.

In principle the mandate of a European Climate pact Ambassador lasts one year but it can be renewed on a yearly basis if there is evidence of the Ambassador's work. You don't need to be European to be an Ambassador of the European Climate Pact, but recently the requirement of living in the EU has been introduced. Now, if you want to become an ECP Ambassador, these are the main requirements:

1. Reside in an EU Member State.
2. Make a climate action commitment as a Pact Ambassador by outlining at least three tangible actions you plan to undertake throughout the year.
3. Complete the e-learning onboarding course.

At the beginning, one could apply anytime to become an Ambassador through the webpage of the ECP. This, however proved to be too difficult to manage. Now , if you are interested, you can apply only during a limited period of time. In 2023, the European Climate Pact launched a call for ambassadors which was open from 15 September to 15 October 2023. As a result, over 300 new Ambassadors were selected.

We are a very diverse bunch of people: teachers, journalists, students, politicians, lawyers, economists, city mayors or members of city councils, influencers, activists, entrepreneurs, public officials, scientists and researchers, sportspeople… This is probably our strength: to come from so many professional and social backgrounds. Although being young and proficient in social media might be an advantage, there are Ambassadors from all stages of life: from teenagers to people in their sixties or seventies. Ambassadors come from all over Europe and reflect its diversity, both in terms of languages and cultures. We come from both urban and rural areas because it is important to reach every EU citizen independently from where they live and to connect outside the bubble.

Our activities as Ambassadors range from giving conferences, taking part in panel discussions, teaching, being active on social media, working in TV channels or radio, creating podcasts and webpages, organizing or attending meetings both at local, national and international level, organizing hands-on activities like cleaning beaches or planting trees, writing books, articles and newsletters, organizing public campaigns, reaching out to public institutions, animating citizens' initiatives which contribute to the EU climate goals, organizing Peer parliaments, giving interviews, developing clean energy projects,… Some of us have been able to attend the different Climate COPs such as COP26 in Glasgow, COP27 in Sharm El Sheik and COP28 in Dubai, as speakers in side events. Now, in the runup to the EU elections, we are expected to organize "climate action group activities" to mobilize EU citizens for climate and environment in the elections.

The creation of a European Climate Pact Community implies a sense of belonging and support, that cannot always be guaranteed by online webinars or a webpage. This is why there have been some in person meetings of Ambassadors in

Brussels and I hope that there will be more of these in the future. In principle this should be done on a yearly basis. In 2021 and 2022 there was no meeting of this kind. On 1st February 2023, the European Climate Pact celebrated two years of climate action and gathered, for the first time in person, its Ambassadors and other interested people. On 27 October 2023, the European global stock take was organized in Brussels to discuss EU and global progress towards the goals of the Paris Agreement, ahead of COP28. Many Ambassadors attended the meeting and a set of proposals from the ECP Ambassadors to the COP was presented. On 5th March 2024, a general meeting of Ambassadors in Brussels is foreseen.

Being an Ambassador is definitely an asset. It offers you great opportunities to take part in different climate activities and debates, to meet outstanding people committed to the European project and climate action and to reach out to citizens, institutions, civil society, and companies on a key topic of our time, so important for our survival. It allows you to connect with a wide range of actors all over Europe and beyond, sharing knowledge and experiences to promote climate action, and creating partnerships. Being part of a network of ECP Ambassadors, who combine high professional standards and commitment, is very inspiring and empowering.

Nevertheless, being an Ambassador is not always easy. Beyond access to information, webinars and increased visibility, our activities have found cooperation and recognition from the European Commission but little concrete support. In 2023 coordination was very weak because the transition from the first to the second ECP Secretariat took very long, Nevertheless, fortunately the ECP is still alive and running and Ambassadors have shown resilience and commitment fulfilling their role with competence and enthusiasm.

The community of ECP Ambassadors in Spain is particularly dynamic and strong. We are proud of having a strong network of Ambassadors who support each other and work as a team having regular online meetings and developing joint projects. At present we are 118 Ambassadors out of a total of 763, which shows the strong interest on climate in Spanish society and the very serious impact of climate change in my country. The cooperation with the office of the European Commission in Spain and Europe Direct has worked well. In Spain the official national coordinator was Asebio (Spanish Association of Bio-enterprises) from 2021 to 2023 and now it is Ecoserveis (a consulting company from Barcelona, specialized in energy). On a voluntary basis, I have also acted as an informal coordinator of the Spanish Ambassadors.

To develop a strong network of Ambassadors and to interact with the different regions of Spain, we have organized several national meetings of ECP Ambassadors. The first national meeting of Spanish Ambassadors was held in December 2021, on COP26, at the European Commission offices in Madrid . This was followed by other meetings in Valencia (February 2022) on the future of Europe; in Aranda del Duero (June-July 2022) I Climate rural forum; in Barcelona (September 2022) on climate and youth; in Lerida (Abril 2023) on the agro-food industry; in Aranda del Duero (May 2023) II Climate rural forum; in Cadiz in (November 2023) on blue economy, and in Madrid (December 2023) on COP28.

After three years, the European Climate Pact has matured and adapted its functioning to the new realities of the ecological transition both in Europe and in a troubled world. The huge potential of the ECP Ambassadors should be used fully and in a more strategic way, providing them with the tools and resources needed. This is necessary in view of the challenges ahead. 2023 has been the hottest year in history.

With a pandemic and two running major conflicts in Ukraine and Gaza pushing the international climate agenda behind the frontline and diverting finance to a military effort, we are facing, in 2024, a crucial year of elections all over the world, including the elections to the European Parliament. Let's hope that the outcome of the elections in 2024 preserves the ambition of the European Green Deal. The ECP and its Ambassadors should help EU citizens realize that the future of Europe and our planet is green. We don't have time to waste.

27. Development of sustainable urban space. Green infrastructures towards climate resilience

Cristina Sousa Coutinho Calheiros

1. Human-built environment and urban transformation

The latest projections by the United Nations suggest that the global population could grow to around 8.5 billion in 2030, 9.7 billion in 2050 and 10.4 billion in 2100 (UN, 2022). The increase in urban population and its intersection with climate change pose significant challenges for sustainable development. As it densifies, the demand of space for building and higher impermeabilization of surfaces occur, resulting in fragmentation of green areas, ecosystem degradation, loss of biodiversity, heat island effect, water, air and land pollution and consequently leading to deterioration of human wellbeing and disconnection to nature. Besides that, as a consequence of climate change, extreme events are also occurring more often such heavily rains, originating floods, and in the opposite, occurrence of droughts and heat waves. By addressing these interconnected challenges through holistic and collaborative approaches, cities can strive to become more inclusive, safe, resilient, and sustainable, ultimately improving the wellbeing of urban residents and the health of the planet.

Urban settlements besides contributing with about 85% of global GDP (gross domestic product), they consume about 70% of global resources and 70% of all energy generated, generate about 50% of all waste, and emit 70% of all greenhouse gases. An environmental transition is essential and can be

effectively underpinned by a circular economy approach. This approach goes beyond mere resource conservation; it also focuses on minimizing environmental and climate impacts. By transitioning to a circular economy model, it is possible to create a system where resources are used efficiently, products are designed for longevity and recyclability, and waste is minimized through reuse, recycling, and regeneration. This not only helps conserve resources but also reduces the overall environmental footprint, mitigates climate change, and promotes sustainability across various sectors of the economy (European Investment Bank, 2021).

Cities have thus unique characteristics that allow them to be cradles and catalysts for circular change, since they (European Investment Bank, 2021):

(i) have density and scale of citizens, business, materials and resource flows,

(ii) can connect stakeholders and promote a culture of collaboration,

(iii) can lead by example offer/procure circular solutions/ services,

(iv) have autonomy to regulate/incentivize,

(v) can define and communicate circular vision and strategy,

(vi) can embed circular principles in city infrastructure and services.

Having in consideration the Proposal for the European Partnership Driving Urban Transitions, four priority themes have been identified as crucial to support urban transition, being sustainable land-use and urban infrastructure one of them, followed by digital transitions and urban governance, from resilience to urban robustness, and inclusive public spaces (JPI Urban Europe, 2020). Considering the design,

planning, and development of the built environment, particularly focusing on the building envelope, is crucial. This aspect can significantly contribute to climate change mitigation, facilitate adaptation, and enhance environmental and public health. By adopting such an approach, it is possible to determine patterns of exposure, assess social and physical vulnerability, and gauge the capacity for resilience within communities (Calheiros and Pereira, 2023).

Leveraging nature and the environment is a strategic approach for urban renewal and rehabilitation, aligning with smart and sustainable development agendas and addressing global imperatives like climate change mitigation and adaptation (Pearlmutter et al., 2020).

2. Nature is back

Nature is being called back to the city not just for aesthetic purposes but for its valuable services – ecosystem services. The human being depends on nature, as hardly survives 3 minutes without oxygen/air, 3 days without water and 3 weeks without food (White, 2023). According to the Millennium Ecosystem Assessment (2005) "ecosystem services are the benefits people obtain from ecosystems". The ecosystem services framework categorizes the benefits that ecosystems provide into four main groups: (i) Provisioning Services that involve the tangible products obtained from ecosystems, including food, water, fiber, and other raw materials that support human life and economic activities, (ii) Regulating Services that encompass the benefits derived from the regulation of ecosystem processes, which have direct impacts on human well-being, e.g. include the regulation of climate, water purification, air quality control, and the regulation of diseases through natural processes, (iii) Cultural Services that are non-material benefits that ecosystems provide to humans, contributing to the overall quality of life and societal well-being, e.g. include

aspects such as cognitive development, spiritual enrichment, educational values, cultural diversity, aesthetic enjoyment, and cultural heritage appreciation, and (iv) Supporting Services that are associated to fundamental processes that enable the provision of all other ecosystem services, e.g. soil formation, photosynthesis, primary production, nutrient cycling, water cycling, and other ecological processes that sustain life and ecosystem functioning. Understanding and valuing these ecosystem services are essential for effective environmental management, conservation efforts, and sustainable development planning, as they highlight the interconnectedness between ecosystems and human well-being.

Ecosystem services are usually ignored since we do not have to pay for them, which is why they are often easily discarded and sidelined when considering the implementation of urban infrastructures. Indeed, the reliance on grey infrastructure for various urban needs, such as flood prevention, has been a common practice globally. However, there is a growing recognition concerning the advantages of integration of Nature-based solutions (NBS) as part of green infrastructures (GI) in order to deliver multiple benefits. The European Commission defines GI as "a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services". Nature-based solutions can thus integrate these GI as being "…solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services." (European Commission, Directorate-

General for Research and Innovation et al., 2020, p. 4).

Example of cities sharing space with vegetation is the case of Porto, where in the historical city center it was possible to implemented a green roof integrated in the landscape after retrofitting of an existing infrastructure (Figure 1).

Figure 1. Green roof at Praça de Lisboa, Porto, Portugal

3. Building a green infrastructure

The GI can be considered at the local, regional or national scale. They act as a structuring element of the urban landscape, improving connectivity between territories, increasing soil permeability and promoting multifunctional areas, helping to maintain the services provided by ecosystems. In addition, they contribute to the mitigation and adaptation to the effects of climate change. Potential components of a green infrastructure are considered according to the European Union (EU, 2013):

- Areas identified of high biodiversity value which act as hubs for green infrastructure, such as protected areas (e.g. Natura 2000 sites).

- Core areas outside protected areas containing large healthy functioning ecosystems.

- Restored habitats that help reconnect or enhance existing

natural areas, such as a restored reedbed or wild flower meadow.

- Natural passages for wildlife that can act as ecological corridors or stepping stones, that include natural landscape elements such as water courses, forest patches and hedgerows.

- Elements designed as eco-ducts or eco-bridges, which were featured to allow species to circulate in the face of insurmountable obstacles and landscape barriers.

-Multifunctional areas where the maintenance and regeneration of ecosystems is associated with consistent land use.

- Elements with adaptive function and mitigation to climate change, such as marshes, floodplain forestsand bogs. Preventing flood, acting as water storage and CO2 intake, providing space to species to react to change in climate conditions.

- Areas that are the target of interventions to improve general ecological quality and landscape permeability.

Combining GI with traditional grey infrastructure can indeed lead to improved overall system performance, increased resilience, cost savings, and better community protection. One notable example of this approach is the concept of a "sponge city," which aims to enhance water availability in urban areas by retaining urban runoff for reuse. The objective underpinning this strategy is to assure that most of the rain water is absorbed and reused through improved water permeation, retention and storage, purification and drainage, as well as water saving and reuse. This can be achieved through a combination of NBS and grey infrastructure. Examples of NBS are, green roofs, green walls, bioswales, tree trenches, rain gardens, swales, detention basins, wetlands and ponds (Figure 2).

Figure 2. Examples of Nature-based solutions in urban context: (a) wetland, (b) vertical garden, (c) floating wetland, (d) rain garden

Four main goals have been identified by European Union that can be addressed by NBS (EC, 2015):

I) Enhancing sustainable urbanization through NBS: it can foster economic growth and at the same time a better environment, making cities more attractive, and promoting human well-being.

II) Restoring degraded ecosystems through the use of NBS: it can enhance ecosystem resilience, allowing them to provide vital ecosystem services and meet other societal challenges.

III) Developing climate change adaptation and mitigation schemes through the use of NBS: it can provide more resilient responses and enhance the storage of carbon.

IV) Improving risk management and resilience through the use of NBS: it can lead to greater benefits than conventional methods and provide synergies in reducing multiple risks.

Resourceful and circular cities, with a strong nature-based component and having in consideration the built materials, will provide multifunctional and multipurpose spaces. The enhancement of circular economy with NBS in the built urban environment has been gaining interest, where green building materials, systems, and sites are dimensions considered (Pearlmutter et al., 2020).

The inclusion of NBS through the provision of ecosystem services can counteract the impact of climate change and urbanization and can contribute to a circular economy, to different extents (Calheiros & Stefanakis, 2021). The following urban circularity challenges can be addressed with NBS in order to support cities to shift to circular management of resources (Atanasova et al., 2021): (I) restoring and maintaining the water cycle (by rainwater management), (II) water and waste treatment, recovery and reuse, (III) nutrient recovery and reuse, (IV) material recovery and reuse, (V) food and biomass production, (VI) energy efficiency and recovery, and (VII) building system recovery.

Government policies are instrumental in driving the adoption and integration of green solutions, including NBS, into urban environments. These policies and incentives can be tailored to promote specific types of NBS, such as green roofs, green walls, or urban forests, as well as targeted benefits like stormwater management and mitigation of the urban heat island effect. To fully implement NBS and ensure their widespread adoption, several key factors need to be addressed such, Identifying and Overcoming Barriers, Standardization of guidelines for Liability, development of Policies, Incentives, and Strategies, leveraging NBS Service Providers, and increasing awareness and promoting education about the NBS benefits. Addressing these factors comprehensively, stakeholders can create an enabling environment for the implementation of NBS, unlocking their potential to enhance urban sustainability, mitigate climate change, and improve the quality of life in cities.

4. Conclusions

The development of territories and the evolution of cities have often led to disruptions in natural flows, resulting in increased impermeability, habitat fragmentation,

and ecosystem degradation. Green infrastructure, operating at various scales and leveraging nature to generate environmental, economic, and social benefits, plays a crucial role in mitigating the adverse effects of urbanization and strengthening urban ecosystems. Green infrastructure contributes to biodiversity conservation, climate change mitigation and adaptation, economic development (such as job creation and increased property valuation), and social well-being (such as improved water management and access to green spaces). By transitioning from mono-functional to multifunctional areas and integrating green infrastructure with grey infrastructure, cities can become more resilient to climate change, while fostering a transition to a low-carbon economy. The strategy for transforming territories involves incorporating NBS, in line with the European Union's efforts to build resilient cities, towards circularity.

Green infrastructure has already demonstrated its contributions to various areas, including disaster risk management and environmental resilience. Moving forward, it is crucial for green infrastructure to become a mainstream element in urban planning and territorial development. Overall, government policies and incentives are essential tools for accelerating the adoption of green solutions in urban environments, leading to more sustainable and resilient cities. By creating a supportive policy environment, governments can catalyze private sector investment, foster innovation, and unlock the full potential of nature-based solutions to address pressing urban challenges.

To achieve the ambitious goals of the 2030 Agenda and the Paris Agreement, substantial global investments and a transformative approach to infrastructure development are necessary. This requires a concerted effort from governments, policymakers, businesses, and communities to prioritize sustainable infrastructure that enhances resilience,

promotes equity, and safeguards the environment for future generations.

Acknowledgments

Author is thankful to FCT - Foundation for Science and Technology within the scope of UIDB/04423/2020 and UIDP/04423/2020.

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28. Sustainable Supply Chains: navigating the path to environmental and social equilibrium.

Irene Ghaleb

International trade plays a crucial role in providing goods and services to nations, promoting economic growth, reducing poverty and improving the quality of life.[1] However, the pursuit of economic prosperity does not always align with social and environmental sustainability. Datas report that more than 50% of worldwide emissions are attributed to eight supply chains, including food, construction, fashion, fast-moving consumer goods, electronics, automotive, professional services, and freight (see Figure 1). These sectors collectively contribute over half of the global greenhouse gas emissions, with a noteworthy portion being indirectly influenced by a small number of companies[2]. In the era of ESG (Environmental, Social, and Governance), sustainable logistics opens new development possibilities for businesses and new business models. Additionally, the growing global awareness of the impact of trade on society and the planet underscores the responsibility of trade and corporate policies. It is essential to integrate measures to ensure a sustainable future. For years, we have observed the complex relationship between international trade and social and environmental sustainability, and now more than ever, a holistic and balanced approach connecting producers to consumers is needed.

The challenges are clear. Firstly, **the social impact** that became a mask and accomplice of the supply chain system.

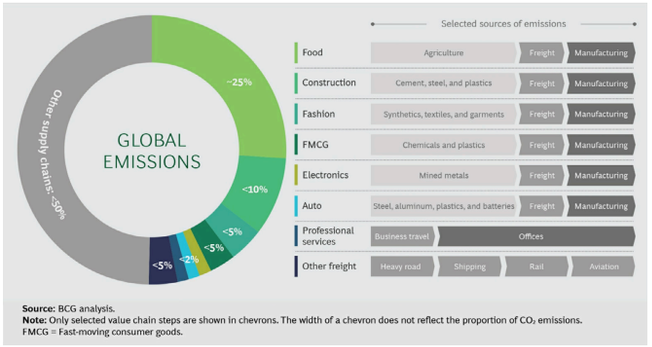
The globalization of trade has allowed entire nations to significantly reduce extreme poverty, create jobs, and consequently improve living conditions. However, this is only one side of the coin. Production brings with it relentless rhythms of work, exploitation, and human rights violations. To address this issue, it is essential to promote fair wages, safe working conditions, and the protection of human rights within international trade agreements. The implementation of social protections, such as labour standards, can ensure a fair distribution of economic benefits and promote social well-being in various nations. Companies should refer to the United Nations Universal Declaration of Human Rights, international covenants on civil, political, and economic rights, and international covenants on human rights. Civil and political rights, as well as economic, social, and cultural rights, are established by the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, as well as the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (ILO Declaration on Multinational Enterprises), which sets common expectations on a wide range of labour, employment, social security, social policy, and other issues[3].

Secondly, the **environmental impact** of international trade contributed to the environmental degradation of the last century. Wherever possible, the strategy has been to attempt to conceal the exploitation of nature. As a matter of fact, environmental implications are evident and worsen in countries where environmental standards are low. Companies based in nations with stringent environmental regulations often conduct their polluting operations in countries with comparatively lax policies. This phenomenon is primarily influenced by the stringent environmental regulations in their home countries, which encourage these firms to engage in pollution abroad, rather than being drawn by less strict environmental policies in foreign nations.[4] However, let us

not forget that we live in a global system where if we pollute on the other side of the world, it is as if we pollute in front of our own home.

Nowadays the price pressure is high, and natural resources are believed to be abundant. Some consequences already evident include toxic waste, water pollution, loss of biodiversity, deforestation, overexploitation of natural resources, long-term damage to ecosystems, water scarcity, hazardous atmospheric emissions, and air pollution. Moreover, the capacity for productivity within our global natural resources has been impaired in numerous locations, jeopardizing the future fertility of the earth.[5]

Companies aiming to be competitive in today's market and wanting to preserve the health of future generations have a duty to collaborate with their suppliers to address environmental issues, encouraging full environmental responsibility and supporting the use of renewable energy. The adoption of **ecological standards** and the promotion of eco-friendly production practices can reduce, though not eliminate, the harmful effects of trade on the environment.



Source: BCG analysis.
Note: Only selected value chain steps are shown in chevrons. The width of a chevron does not reflect the proportion of CO_2 emissions.
FMCG = Fast-moving consumer goods.

Food supply chains as primary goods

Consumers play a fundamental role in **influencing the demand for goods and services**. However, while some consumption is essential for survival (primary goods), such as in the food sector, there are also 'secondary' consumptions

involving non-essential purchases. An example is the fashion sector.

How can we reduce our impact and shift the global food production chain towards greater sustainability? First and foremost, we must consider that this sector encompasses a complex network of interconnected activities that transform raw materials into food and transport it from farms to our tables. The entire process involves multiple actors, locations, movements, and raw materials. Therefore, while agriculture is crucial for feeding the global population, it also has significant environmental and social repercussions.

The expansion of agricultural land and excessive land use has caused various environmental problems, including climate change, loss of biodiversity, and pollution of water, soil, and air. The consequences can be immediate, such as the destruction of landscapes and natural ecosystems, or indirect, such as soil sealing and deforestation, which increase the risk of floods. Desertification, changes in land cover, and sudden floods are all phenomena caused by climate change.[6] Additionally, the food sector is the largest consumer of freshwater in Europe, estimated at 40%.[7] Irrigation practices and intensive farming can cause water scarcity and water pollution due to the excessive use of fertilizers and pesticides. Water and soil consumption can be reduced by promoting efficient and sustainable land management, such as agriculture and permaculture combined with reforestation initiatives, contributing to biodiversity conservation.

According to the Food and Agriculture Organization (FAO) of the United Nations, livestock farming is responsible for over 18% of global greenhouse gas emissions.[8] Moreover, the livestock sector is one of the fastest-growing subsectors in agriculture and the sector with the highest land exploitation. The only way is to promote low-carbon farming practices and reduce food waste (currently, 17% of the produced

food is discarded[9]). Food production chains are essential for sustaining the growing global population, but our daily choices can still embrace sustainable practices, transforming our food systems into instruments of change.

The Consumer Society and Standardization of Production

There are other sectors that are not essential. The consumer society is characterized by the widespread adoption of secondary consumption, unrelated to food. This 'wellness democracy' began between the two wars in the United States and spread to Western European countries in the second half of the 1950s. The standardization of production, the increase in national and per capita well-being, urbanization, the emergence of the welfare state, and the expansion of the American model all favoured the development of the consumer society, considering consumption as an important aspect of an individual's social existence. As such, it is based on the democratization of luxury, i.e., the expansion of access to 'secondary' consumption for a large part of the population whose resources were previously entirely or almost entirely consumed by meeting primary needs. The consumer or consumer civilization is therefore based on the purchase of superfluous products, such as **excessive** clothing purchases, which often respond to needs created by advertising pressure and/or social imitation phenomena widespread among large segments of the population.

When assessing the ecological consequences of consumerism, many individuals concentrate on the volume of **waste generated by households and businesses**. While the total amount of municipal solid waste has risen significantly in recent decades, with an almost 200 percent increase since 1960, the proportion that is recycled has also seen an increase, from approximately 6 percent in the 1960s to about 35 percent today. However, the majority of waste generation in a consumer-driven society occurs **during the extraction,**

processing, or manufacturing phases, which are typically concealed from consumers. The vast majority of this material is discarded as mining waste, crop residue, logging waste, chemical runoff, and other by-products before reaching the consumption stage. One of the most comprehensive attempts to quantify the overall ecological impact of consumption is the ecological footprint measure. This method estimates the amount of land area a human society needs to fulfil its requirements from nature and to assimilate its waste and pollution. Although the specifics of ecological footprint calculations may be debated, it provides a valuable means to compare the overall ecological impact of consumption in different countries.[10]

Addressing the current **unsustainable consumption and production patterns** is crucial for achieving sustainable development, especially in a world projected to have a population of 9.5 billion by 2050, with around 1.2 billion people currently living in extreme poverty. Changing these patterns is essential for eradicating poverty and hunger, as well as for safeguarding and effectively managing the natural resource base and ecosystems that form the foundation of development. The health of ecosystems is paramount for the well-being and resilience of those living in poverty. Presently, more than 60 % of the ecosystems and their services, which are fundamental to our existence, are either degraded, overexploited, or already lost. Unsustainable consumption and production practices contribute to water and air pollution, land and forest degradation, waste generation, and the use of harmful chemical substances. The ongoing strain on the planet's natural resources and life support systems is expected to intensify with population and economic growth unless consumption and production patterns become more efficient and less polluting. [11]

Supply chains: Social and Environmental Sustainability

Achieving sustainable development requires decoupling economic growth from resource use and environmental degradation to ensure inclusive socio-economic development is sustained.
The imperative to **mitigate environmental impacts** within supply chains necessitates a paradigm shift in **the strategies employed by businesses and organizations**. Leaders must reconsider and revamp their approaches to the production, transportation, and distribution of goods and services. Sustainable sourcing and responsible procurement stand out as critical components, involving meticulous **supplier selection** based on adherence to environmentally friendly and ethical practices. Equally important is the **procurement of materials** aligned with sustainability objectives.

Energy efficiency and the integration of renewable resources are foundational to sustainable supply chain management. Initiatives targeting energy efficiency optimize operational processes, manufacturing techniques, and transportation systems to curtail energy consumption and greenhouse gas emissions. Simultaneously, incorporating renewable energy sources like solar and wind power diminishes dependence on fossil fuels, making the supply chain more sustainable, energy-efficient, and environmentally responsible.

Circular economy principles are pivotal, advocating a departure from the linear take-make-dispose model. Prioritizing waste reduction and maximizing resource utilization through strategies like product reuse and material recycling minimizes waste generation, conserves resources, and reduces environmental consequences. Moreover, practices like a zero-waste-to-landfill policy, environmental KPIs, and regular tracking of key metrics are essential. [12]

Addressing social impacts within supply chains involves considerations of **equity, safety, health, welfare,**

philanthropy, ethics, and human rights. However, challenges arise in applying these dimensions universally, especially in industries affecting underdeveloped countries. Bridging this gap is crucial for advancing social performance globally. The prioritization of social impacts within supply chains considers three key criteria: **labour intensity, risk or opportunity to affect social themes, and the gravity of a social issue**. Assessing labour input, impact on critical aspects like human rights and governance, and the severity of social concerns aids in prioritizing areas for attention.[13]

Technology plays a vital role in modern supply chain sustainability, driving environmental and social progress. It facilitates real-time data analytics, transparency via blockchain, safety, risk assessment with supply chain management software, operations optimization with AI, and sustainable planning through digital twins. These roles empower organizations to navigate sustainability complexities, fostering responsible practices and positive change.[14]

Ultimately, addressing social and environmental issues within supply chains is not just a sustainability imperative but also crucial for economic growth. Sustainability, as a **joint responsibility among businesses, governments, and civil societies, creates a win-win scenario where businesses contribute to a more sustainable and equitable world while reaping economic benefits.**

Conclusions

Global collaboration and economic progress can be facilitated by international trade. However, the pursuit of economic prosperity often clashes with social and environmental sustainability. More than 50% of global emissions are linked to eight major supply chains, necessitating a holistic and balanced approach to connect

producers and consumers.

The challenges involve the social impact of supply chain systems, where globalization has reduced extreme poverty but brought about exploitation and human rights violations. To address this, fair wages, safe working conditions, and human rights protections are crucial, supported by international agreements and standards. The environmental impact, especially in countries with lax regulations, has led to pollution and resource depletion. Companies must collaborate with suppliers to promote environmental responsibility and embrace sustainable practices, mitigating the harmful effects of trade.

The food sector, a primary goods supply chain, faces challenges like environmental degradation and water scarcity. Sustainable practices, efficient land management, and reducing food waste are essential for transforming food systems into instruments of positive change. The consumer society, characterized by secondary consumption, has led to ecological consequences, with waste generation occurring throughout the supply chain. Shifting consumption and production patterns is crucial for achieving sustainable development, considering the projected global population growth and the current challenges of extreme poverty and environmental degradation.

Supply chains must adopt sustainable practices, emphasizing responsible sourcing, energy efficiency, renewable resources, circular economy principles, and social considerations. Technology plays a crucial role in navigating these complexities, offering tools for data analytics, transparency, safety, and sustainable planning.

In essence, addressing social and environmental issues within supply chains is not only a sustainability imperative but also essential for economic growth. A joint responsibility

among businesses, governments, and civil societies can create a win-win scenario, contributing to a more sustainable and equitable world while reaping economic benefits.

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29. Action engagement in Workers' Union and in policymakers

Paolo Della Ventura

From the beginning, I have tried to interpret my mandate as ambassador of the European Climate Pact (EUCP) in a "political" way. I thought then, and continue to think, in fact that the best and most important climate action I could do was to be able to engage policymakers in climate action.

Because we can think about many possible climate actions, but only the policy makers and more generally the public decision makers who have the real levers to act, through policies and administrative acts.

So I thought about what I could do to try to succeed in this goal.

I started contacting all the politicians I knew, particularly at the local (regional and municipal) levels, and started talking to them about the importance of climate action and the risks and impacts of climate change. I tried to explain to them that it's important to act now.

In this area, I decided I could try to do something concrete. Thus, I directly participated in the drafting of the electoral programme of a civic list for the last municipal elections for the city of L'Aquila (Spring 2022), the city where I live, in the Abruzzo region, center Italy. With the dedicated point to the "**Climate Budget for L'Aquila**".

Declared objective was of organising the activities of the municipal administration, orienting them towards urban climate leadership.

Unfortunately, the elections were not won by that list. Even though it brought 4 out of 32 councillors to the City Council. With this reduced representation, and the head of the list, there was (and is) continuous discussion on possible actions. For example, in the following late autumn, I I pushed for a Council Question on the provision in the municipal budget of national and European funds for climate adaptation measures, their programming and expenditure.

Other activities as ambassador of the European Climate Pact, in an attempt to activate public decision makers, included organising two **public meetings**. The first, in June 2022, on the topic of "**Climate change: risk and its perception**", to which almost 40 mayors of the province territory and representatives of national and regional parks were invited. The meeting was also registered as a Satellite Event of the EUCP, on the European Commission website.

Six months later I organised the second public meeting, in december 2022 in L'Aquila, on the topic "**Energies for a new climate**" which dealt with the conclusions of the recently concluded COP27 in Sharm el Sheikh, with climate issues and renewable energies, and during which the book "Primavera ambientale" (Environmental Spring)" by national journalist Ferdinando Cotugno, about climate movements and climate activism was also presented, in the presence of the author and energy policy expert Gianluca Ruggieri. The meeting also included a contribution/interview by Professor Carlo Carraro, vice president of the IPCC Working Group III. Also this event was also registered as a Satellite Event of the European Climate Pact.

Since the summer of the same year, on the other hand, I began to emphasise within the trade union of which I am a member (the main Italian trade union, the CGIL: Confederazione generale italiana del lavoro), -and in its the importance of climate action and the drive, by planning and guiding it, of the green transition of the economy and society.

It was precisely within the Union that I took my greatest action.

- Climate crisis and ecological transformation: the Union's role in climate action

From June 2022 to February 2023, in fact, the **local, regional and national congresses** of the labour sectors (the one I directly belong to is that of the Knowledge Workers: School, University and Research Institutions. The **FLC CGIL**) and the general confederation congress of the **CGIL** were held.

From the outset, I emphasised the crucial importance of Green Transition issues, also in my role as ambassador of the European Climate Pact. Highlighting and emphasising that these are issues to which all those important for the progress of society and for a fairer and more equitable society are linked: education, school, work, economy, health, migrations. That, although many in politics, in information, in society, persist in denying or delaying because of ignorance or direct and indirect interests, the ecological and energy transition is happening and will happen anyway. And that in a particular way a Union and more in general an organization of the workers, can decide to try to leade it or to suffer it. Guiding it, imagining new organizational models, new jobs, new safeguards. For a future that is already present. And I refer in particular to all green jobs and related sectors. Also

in particular the decisive factor of overcoming the resistance of energy-intensive sectors, overcoming the false alternative between energy transition and work. And you can only win with training and information.

I have had the good fortune to meet people, women and men, who as territorial, provincial and interregional Union leaders have immediately understood the importance and centrality of these issues.

And so I went from level to level, from the municipal to the provincial to the interregional, in each of these union levels, with the illustration to the delegates of how the themes of the ecological and energy transition can and should be carried out as instances, political, in the union and by the union. As main political subject. Not party, but surely political.

By embracing the issues of climate change, its risks and impacts in society at every level and in every area and, consequently, of the relative and necessary changes in society. By including these issues in Union work agenda and in its main demands to be presented to politics, local government and government.

This thesis has been accepted in the political documents of the regional congresses, is of section (FLC) is of confederation (CGIL). And by the interregional secretaries this thesis was finally brought to the relevant national congresses.

Today, I am an active member of the provincial and interregional trade union bodies, thus keeping the focus on the issues of green transition into the agenda. Collaborating in the interregional Union line and politics on the environmental issues.

- Training and climate action within and for the Union

In doing this, since December 2022 I started **following two offshore wind projects** presented off the coast of Abruzzo (Eolico Medio Adriatico Offshore) and Molise (Eolico Offshore Molise), the latter currently the most important in Italy in terms of installed capacity.

The interregional Union, starting from its congress, **decided the line** to declare itself in favor of these two important projects (the first for 0.8 GW, the second for 1.8 GW, then reduced with the final project to 1.05GW). Creating synergistic alliances on this line with some of the most important Italian environmental organizations, such as Legambiente and WWF Italy, despite the opposition of some local committees opposing to the construction of these plants. Organizations that also at national level are in favor of renewable energy, of course.

In those days I was **in Brussels** for an event of the European Climate Pact, with the European ambassadors and with the then European Commission Vice President Frans Timmermans. But I was asked to speak for the interregional congress, so I sent **my contribution** of which the key points are reported below:

To avoid climate catastrophe, comrades, we must act now, moving toward decarbonization of the economy, industry, civil and private activities, and society. To do this we have until 2030 to act, climate science warns us, to get to net zero by 2050. And it is the same climate science that tells us that it can be done, the technologies exist; we know what needs to be done: to push society as a whole to the use of energy from

renewable sources (sun, wind, water, in particular) for all its needs, rapidly abandoning the use of fossil sources: coal, gas and oil. What is lacking, however, comrades, is the political will to do this quickly.

And here's where the role of trade unions comes in: to understand, to take all this into their own "political" actions, to push the activities of government, of local governments, to take climate actions to mitigate the risks of the climate crisis. And, ultimately, transform society.

(...) What is needed, then, is a capacity for vision of the future, even in the medium term, not only in the long term; a capacity to imagine a new society, to try to govern new industrial models, new industries, new work models and new jobs. This transformation is already taking place. It must be thought out and planned, however, in order to play a leading role in public life, as well as in private life.

Because, comrades, everything related to climate will have cascading impacts: on health, on schools, on jobs, on rights, on equality. Climate migration, energy poverty, social justice, which is not coincidentally increasingly associated with climate today.

And so, comrades, the union can and can, must and must address all of these. Because, at this particular moment in history, nationally and continentally, only the Union has the numbers and the tools to be able to take the political lead in all these processes. Because party politics, at best, only talks about it; at worst, it just does not see the problem, the issue, so central.

Only the Union can transform society, leading it in a progressive transformation of the society in which we live today and the society in which future generations will live.

As mentioned before, my contribution became part of political document of interregional CGIL Abruzzo Molise congress.

In the meantime, **in Brussels** I presented **to the former VP Timmermans**, explaining to him on the sidelines of the event, **a document** on what I think should be the "political" role of the ambassadors (as illustrated at the beginning) and my work as EUCP ambassador inside the Union.

Returning to the climate action within (and of) the Union, and always thanks to skills and understanding of the local Union secretaries, late the last February was organized a **training meeting for the cadres of all sectors of CGIL Abruzzo Molise** on the issues of climate change and green transition. There I could talk to them, with the help and support of films, data, graphic and images, the point about the climate crisis and the need to act quickly on the climate and the energy and ecological transition.

In the last spring, I have written and co-signed (together with the general secretary CGIL Abruzzo Molise), the **finalized Relation to the opinion of Assent** in relation to the "Offshore Wind Medium Adriatic" project, within of the authorization iter previewed from Italian laws.

At the moment, the authorization process of this project is still suspended. I keep following, instead, the project "Molise Offshore Wind", arrived at the presentation to the authorities of the final project.

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[6]I want to thank here, everyone for their role and support: Miriam Del Biondo (provincial secretary FLC CGIL L'Aquila), Pino La Fratta (interregional secretary Abruzzo Molise FLC CGIL); Francesco Marrelli (general secretary of the Chamber of Labour CGIL L'Aquila), Paolo De Socio (general secretary of the Chamber of Labour CGIL Molise) and Carmine Ranieri (general secretary CGIL Abruzzo Molise).

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30. Climate Racism: An Urgent Call for Environmental Justice

Rosmel Rodríguez

"The scarcest resource is human ingenuity, and fortunately, it is a resource that does not run out." Julian Simon

The concept of climate racism has gained significance in recent years, highlighting how certain marginalized populations disproportionately face the impacts of climate change (Nelson & Grubesic, 2018). Typically located in the poorest regions of the planet, far from resources and under neglectful governments or with scant conditions, these vulnerable communities (Silva Lopes, 2023) require assistance to defend themselves against increasingly constant climate disasters (Agyeman, Bullard, & Evans, 2003).

Communities in marginalized areas face a range of environmental and social risks that increase their susceptibility to disasters (Bull-Kamanga et al., 2003). These risks include environmental degradation, deforestation (Bradshaw, Sodhi, Peh, & Brook, 2009), air pollution (Künzli et al., 2001), water pollution (Bain et al., 2014), and soil degradation (Lal, 2001), soil sealing and erosion, contributing to deteriorating living conditions in these areas and worsening the effects of climate change. Thus, exposure to natural disasters such as floods (Jongman et al., 2012), landslides (van Westen et al., 2006), fires, and earthquakes is exacerbated by the lack of preventive measures and preparedness (Twigg, 2004), as well as by the fragility of emergency response and recovery systems (Oliver-Smith,

1996), as in the case study of São Gonçalo, where residents observe the loss of their homes after a landslide.

This situation is worsened by the lack of financial and technical resources to implement adequate solutions (Birkmann et al., 2013), by the low participation of the population in decision-making (Fung, 2006), and by the lack of coordination among different levels of government and the institutions responsible for risk management (Cohen & Werker, 2008). The social and economic inequalities affecting these communities (Pelling & Wisner, 2009) also play a role, creating conditions of vulnerability that are amplified in the context of natural disasters and extreme weather events.

It is widely recognized that the Global South will bear the brunt of the effects of climate change, with extreme weather events and changes in temperature and precipitation patterns posing a significant threat to the survival and well-being of communities in these regions (Diffenbaugh & Giorgi, 2012). Phenomena such as prolonged droughts (Wilhite & Pulwarty, 2017), increasingly frequent and severe floods (Hirabayashi et al., 2013), tropical storms (Knutson et al., 2010), and rising sea levels (Church et al., 2013) are particularly vulnerable to the impacts of climate change due to their environmental and socioeconomic conditions (Revi et al., 2014).

In addition to natural disasters, unregulated growth and the lack of state regulation in these areas exacerbate the risks faced by residents. Climate change can also be attributed to unregulated global production and consumption practices, further contributing to the environmental hazards facing vulnerable populations.

The consequences of climate change have far-reaching effects on public health and food security (Wheeler &

von Braun, 2013) in the Global South. Residents of these communities are at greater risk of vector-borne diseases (Ermert et al., 2012), respiratory and cardiovascular diseases (Brook et al., 2010), and food insecurity due to the impacts of climate variability and extreme events (Mora et al., 2017). Climate variability and extreme events can also affect agricultural production and food availability (Lobell et al., 2011), which in turn can result in food insecurity and malnutrition in these communities (Lloyd et al., 2011).

The limited availability of resources and uncertain funding for climate change initiatives further hinder these communities' ability to implement long-term solutions (Leichenko & Silva, 2014). The lack of coordination and governance mechanisms within public institutions, as well as the absence of technical and scientific capacity, pose significant obstacles to addressing climate change in these areas (Béné et al., 2012).

The unequal distribution of risks and damages caused by extreme events and climate change is evident in marginalized communities like the favelas of Brazil (Moss et al., 2010). These communities, predominantly inhabited by racialized and marginalized populations, often find themselves in high-risk areas with poor infrastructure, making them particularly susceptible to the impacts of climate change (Adger et al., 2005).

In their efforts to adapt to climate change and increase resilience, communities in the Global South face several challenges, including limited economic resources (Leichenko & Silva, 2014), weak institutional structures (Béné et al., 2012), and a lack of technical and scientific expertise. These factors hinder the implementation of policies and measures to adapt to and mitigate the impacts of climate change. The intricate and uncertain nature of climate change impacts

(Moss et al., 2010), as well as the interactions between social, economic, and environmental factors (Adger et al., 2005), further complicate planning and decision-making processes.

Current resources available to address climate change in the Global South are inadequate and uncertain, restricting communities' ability to implement long-term solutions (Ayers & Huq, 2009). This situation is exacerbated by the fragility of public institutions, which often lack efficient coordination and governance mechanisms (Pelling & High, 2005). Similarly, the lack of technical and scientific capacity in the Global South poses a significant barrier to addressing climate change, as communities often lack access to relevant information and knowledge (Muttarak & Lutz, 2014). This context makes it challenging to identify and prioritize appropriate adaptation and mitigation measures (Eakin & Lemos, 2006).

The uncertainty regarding the impacts of climate change and the complex interactions between social, economic, and environmental factors present additional challenges in planning and decision-making (Dessai et al., 2004). Addressing these challenges requires integrated and participatory approaches involving multiple actors and sectors (Few et al., 2007).

The concept of climate racism, though not yet widely disseminated, is necessary to expose this reality that manifests as a fundamental prism to unravel socio-environmental inequalities (Bullard, 1990). Delving into the concept of climate racism reveals a complex and multifaceted reality in which socioeconomic and racial inequalities are closely intertwined with the impacts of climate change.

Through the analysis presented, it becomes clear that the world's most vulnerable and marginalized communities, often

inhabited by racialized populations, face the most severe risks associated with climate change. These communities, situated in high-risk areas with limited access to financial, technical, and infrastructural resources, are disproportionately disadvantaged in responding to and recovering from natural disasters and extreme weather events.

The evidence accumulated through various studies underscores the urgent need to address climate racism as a critical aspect of the global fight against climate change. It is not only essential to implement policies and measures that mitigate the effects of climate change but also crucial to ensure that these policies are inclusive and equitable, recognizing and addressing the underlying inequalities that exacerbate the vulnerability of marginalized communities.

To advance towards true climate justice, it is imperative to adopt integrated and participatory approaches involving all stakeholders, including affected communities, in planning and decision-making. This involves not only increasing climate resilience and adaptation capacity of these communities but also proactively working to dismantle the power structures and inequalities that perpetuate climate racism.

The recognition and confrontation of climate racism must be central pillars in the global climate action agenda. Only through genuine and sustained commitment to addressing these injustices comprehensively can we hope to build a fairer and more resilient future for all. This requires unprecedented collaboration among governments, international organizations, civil society, affected communities, and the private sector. Each actor has a crucial role to play in identifying sustainable solutions and implementing strategies that not only reduce greenhouse gas

emissions but also promote social and economic equity.

The fight against climate change is also a fight for social justice. Recognizing and acting against climate racism is an essential step towards ensuring that climate actions are not only effective but also just and equitable. By doing so, we will not only be responding to the climate crisis but also advancing towards the realization of a more inclusive, equitable, and sustainable global society.

In conclusion, climate racism is not just a reflection of existing inequalities but also an urgent challenge that we must collectively face. By addressing this challenge head-on, with commitment, compassion, and collaboration, we can hope not only to mitigate the devastating effects of climate change but also to build a world where dignity and justice are accessible to all, regardless of their race, geographical location, or socioeconomic status. The time to act is now; our responsibility to future generations and to the planet cannot be underestimated.

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31. The Importance of ESG Criteria and Sustainability in the European Green Deal

Miguel Luis Lapeña

In a world facing unprecedented climate challenges, the urgency to act decisively and collectively has never been more critical. Climate change, along with biodiversity loss and increasing pressure on natural resources, demands a radical reevaluation of how we live, work, and conduct business. In this challenging context, the European Green Deal emerges not only as an ambitious policy but as a necessary beacon towards a sustainable and resilient future.

Launched by the European Commission, the European Green Deal is a comprehensive response to these challenges. Its aim is to transform the European Union into a modern, resource-efficient, and competitive economy, ensuring that by 2050, Europe becomes the first climate-neutral continent. This plan spans from dramatically reducing greenhouse gas emissions to investing in green technology and fostering biodiversity and the transition to a circular economy. However, achieving these goals depends not only on government action but requires the active engagement and transformation of the entire economic and social fabric, including the private sector.

This is where ESG (Environmental, Social, and Governance) criteria play a crucial role. Far from being mere add-ons or "good practices," ESG criteria are positioned at the heart of this transformation. They represent an integrated approach

that recognizes the inseparability of economic, social, and environmental aspects of sustainable development. In this chapter, we will explore how ESG criteria are not only fundamental for the long-term viability of businesses but are essential for achieving the goals of the European Green Deal

Corporate sustainability, understood through the lens of ESG criteria, translates into practices ranging from reducing carbon footprint and efficient use of resources to promoting fair work environments and implementing ethical and transparent corporate governance. These practices not only enhance the resilience and competitiveness of businesses but also contribute directly to the goals of the Green Deal, closing the loop between corporate action and global environmental sustainability.

This chapter will delve into the interconnection between corporate sustainability and the goals of the European Green Deal, highlighting how, by actively adopting and promoting ESG criteria, businesses can play a leading role in the transition towards a greener future. We will illustrate how this alignment is not only possible but imperative, offering concrete examples and arguing that together, we can make a significant difference in the fight against climate change and in promoting a truly sustainable economy.

This chapter aims to inspire a shared vision, where the joint efforts of governments, businesses, and society at large converge towards a common goal: the realization of the European Green Deal. Through this dialogue between corporate sustainability and environmental policy, it becomes clear that the path to sustainability is both an imperative and an opportunity, opening new avenues for innovation, growth, and collective well-being in the 21st century.

The Green Heart of Europe: The European Green Deal

The European Green Deal represents the European Union's most significant ambition to lead a new era of global sustainability. It is not merely a set of environmental policies; it is a holistic vision that seeks to redefine the economy, society, and human interaction with the planet. This Deal stands as a revolutionary commitment towards Europe's climate neutrality by 2050, marking a milestone in the fight against climate change.

Climate Neutrality by 2050

Climate neutrality, the central goal of the European Green Deal, involves balancing greenhouse gas emissions with the amount of gases removed from the atmosphere. Achieving this goal requires a profound transformation across all sectors of the economy, from energy to agriculture, through transportation and construction. Transitioning to renewable energies, improving energy efficiency, and promoting sustainable mobility are just a few of the actions necessary to achieve climate neutrality and avert the worst impacts of climate change.

Resource-Efficient Economy

The Green Deal also aims to transform the EU's economy into one that is resource-efficient. This implies adopting production and consumption models that minimize waste and maximize the use of renewable resources. The circular economy plays a crucial role in this regard, promoting the reuse, repair, recycling, and remanufacturing of products and materials. This transition not only reduces pressure on natural resources and the environment but also opens new business opportunities and fosters innovation.

Biodiversity Protection

Biodiversity is the foundation that supports life on Earth, providing essential services such as pollination, water purification, and climate regulation. However, biodiversity is endangered by human activity. The European Green Deal places special emphasis on protecting and restoring ecosystems and biodiversity. This includes measures like expanding protected areas, restoring degraded ecosystems, and adopting more sustainable agricultural practices. Protecting biodiversity is not only vital for human well-being and the health of the planet but also essential for economic and social resilience.

A Comprehensive Economic and Social Strategy

Beyond its environmental goals, the European Green Deal is a comprehensive economic and social strategy. It recognizes that the transition to a green economy must be fair and inclusive, leaving no one behind. This involves supporting the regions and sectors most affected by the transition, through investments in skills and clean technologies, and ensuring that all citizens have access to the opportunities this transition offers. The Deal also seeks to strengthen the competitiveness of the European economy, creating quality jobs and promoting sustainable growth.

The European Green Deal is the green heart of Europe, a bold and comprehensive plan that seeks to transform the continent into a global leader in sustainability. By embracing the principles of the circular economy, investing in green technologies, and ensuring that the transition is socially fair and inclusive, the European Green Deal aims to secure a sustainable, competitive, and climate-neutral future for Europe.

Corporate Sustainability and ESG Criteria: A Strategic Imperative

The concept of corporate sustainability has evolved significantly over the past decades, shifting from a peripheral concern to a strategic imperative at the core of business operations. This evolution reflects a broader understanding of sustainability, encompassing not only environmental but also social and governance dimensions—collectively referred to as ESG criteria. These criteria have become crucial for assessing the sustainability and societal impact of businesses, guiding companies towards practices that are not only environmentally friendly but also socially responsible and governed by ethical principles.

Environmental Criteria

Environmental criteria consider how a company performs as a steward of the natural environment. This includes aspects such as carbon emissions reduction, energy efficiency, waste management, and water conservation. Companies are increasingly expected to minimize their environmental footprint and contribute to the preservation of natural resources. In the context of the European Green Deal, environmental criteria align closely with the objectives of climate neutrality, resource efficiency, and biodiversity protection. Businesses adopting sustainable environmental practices are directly contributing to these goals, demonstrating leadership in the transition to a green economy.

Social Criteria

Social criteria examine how a company manages relationships with its employees, suppliers, customers, and

the communities where it operates. This encompasses labor practices, employee relations, diversity and inclusion, health and safety, and community engagement. Social sustainability is essential for building a resilient and inclusive society, one that can support the transitions required by the European Green Deal. Companies that prioritize fair labor practices, community well-being, and consumer protection are not only contributing to a more equitable society but also building trust and loyalty among stakeholders, enhancing their long-term success.

Governance Criteria

Governance criteria focus on a company's leadership, executive pay, audits, internal controls, and shareholder rights. Good governance practices ensure that companies are managed ethically, transparently, and responsibly, with accountability to stakeholders. In the era of the European Green Deal, governance plays a critical role in ensuring that environmental and social objectives are integrated into corporate strategies and decision-making processes. Companies with strong governance structures are better positioned to navigate the complexities of the transition to a sustainable economy, making them more resilient and competitive.

The Strategic Imperative of ESG

Adopting ESG criteria is no longer optional for companies aiming to thrive in the new economic landscape shaped by the European Green Deal. It represents a strategic imperative that aligns business practices with the broader objectives of sustainability and societal well-being. Companies that lead in ESG performance are likely to experience numerous benefits, including enhanced brand reputation, increased investor and

consumer trust, reduced regulatory and legal interventions, and improved financial performance.

Moreover, as the European Union moves forward with the implementation of the Green Deal, regulatory frameworks and financial markets are increasingly favoring sustainable business practices. This includes the EU taxonomy for sustainable activities, which provides a classification system to guide investment towards environmentally sustainable economic activities. Companies aligned with ESG criteria are better positioned to attract investment, benefit from financial incentives, and participate in the green transition.

In summary, the adoption of ESG criteria is a strategic imperative for companies seeking to navigate the challenges and opportunities of the 21st century. By integrating environmental, social, and governance considerations into their core operations, businesses can contribute to the realization of the European Green Deal, fostering a sustainable, inclusive, and resilient future.

ESG and the European Green Deal - Charting a Path to a Sustainable Future

The European Green Deal and the principles of ESG criteria represent two sides of the same coin, each reinforcing the other in the journey towards sustainability. As Europe embarks on this ambitious path to become the first climate-neutral continent, the role of the private sector, guided by ESG criteria, becomes increasingly pivotal. The successful implementation of the Green Deal relies not only on policy and regulation but also on the active participation and transformation of businesses across all sectors.

Corporate sustainability, driven by ESG criteria, offers

a comprehensive framework for businesses to align with the goals of the European Green Deal. By addressing environmental challenges, fostering social inclusion, and practicing ethical governance, companies can contribute significantly to building a sustainable, resilient, and equitable future. This alignment not only enhances the competitiveness and viability of businesses but also propels society towards the realization of a sustainable economy.

The journey towards sustainability is complex and requires the collective effort of all stakeholders - governments, businesses, civil society, and individuals. However, by embracing the principles of the European Green Deal and integrating ESG criteria into their strategic imperatives, businesses can lead the way. They can demonstrate that economic prosperity does not have to come at the expense of the planet or social well-being but can be achieved through a commitment to sustainability, innovation, and responsible leadership.

As we look towards the future, it is clear that the integration of ESG criteria and the goals of the European Green Deal chart a path towards a sustainable economy that benefits everyone. This chapter has explored the synergy between corporate sustainability and environmental policy, highlighting the essential role that businesses play in the transition to a green future. It is a call to action for companies to lead by example, driving forward the changes needed to address the pressing environmental and social challenges of our time.

Together, through the adoption of ESG criteria and the realization of the European Green Deal, we can forge a sustainable path forward, ensuring a healthy planet and a prosperous society for generations to come.

32. Social perception and Climate Change Communication

Tomàs Molina

In 1990, the Intergovernmental Panel on Climate Change (IPCC) released its inaugural report, catalyzing the imperative for global and planetary cooperation to not only mitigate and reverse climate change but also to adapt to and mitigate its adverse effects on society and the planet. The demands for reducing, mitigating, and adapting to climate change also encompass the necessity for effective social communication regarding scientific insights and the crucial decisions that the global community must make concerning political, social, and economic issues intertwined with this challenge.

Unlike other subjects in scientific communication, addressing climate change and the corresponding actions for reduction, mitigation, and adaptation is overly complex to address and relatively nascent in terms of communication strategies. This complexity arises from numerous factors, including the intricate nature of the scientific content that needs to be conveyed. Statements about climate change involve diverse levels of certainty, varying degrees of consensus among specialists, and the additional layer of complexity introduced by the statistical and probabilistic foundations underlying data treatment.

Information related to climate change often sparks political controversy, alongside economic and even geopolitical interests. In the over 30 years since the release of the first

report, there has been an opportunity to assess the accuracy of the change predictions and evaluate the effectiveness of the actions taken. During this period, climate changes have accelerated, emphasizing the imperative for coordinated efforts among nations to both limit and adapt to these changes. Consequently, there is a growing need for enhanced communication in an increasingly globalized society.

In September 2015, leaders from around the world reached a consensus at the United Nations on a new sustainable development agenda slated for implementation before 2030. This comprehensive framework comprises seventeen global goals, encompassing ambitions to eliminate poverty, safeguard the planet, and guarantee shared prosperity, with climate change designated as goal number 13. Each objective comes with specific milestones that must be achieved by 2030.

In March 2019, Antonio Guterres, the Secretary-General of the United Nations, issued a solemn declaration (Guterres, 2019), emphasizing that the current generation of leaders had fallen short in effectively addressing climate change. He underscored that the world was now entering a state of Climate Emergency, necessitating urgent and ambitious measures to curtail carbon dioxide emissions into the atmosphere. Guterres warned that failure to act promptly would result in the irreversible loss of the window of opportunity to tackle this critical issue.

Guterres' pronouncement was a response to widespread social movements and street unrest, manifested through global strikes and demonstrations led by the younger generation, particularly high school, and university students, with the notable leadership of 16-year-old Swedish activist Greta Thunberg.

These declarations of a Climate Emergency have

reverberated across institutions worldwide. The impact is evident even in media representation, such as the notable decision by the British newspaper "The Guardian" to shift from using the term "climate change" to "climate emergency" (Carrington, 2019). In the Catalan region, media outlets like Televisió de Catalunya and La Vanguardia have followed suit, and this transformative trend is extending to a significant portion of audiovisual media globally.

While awareness of the reality of climate change is becoming more prevalent across society, the actions and policies aimed at combating and mitigating future changes do not garner as broad a consensus as one might anticipate. This lack of agreement extends even to the most committed individuals in the fight against climate change, who frequently harbor doubts and reservations regarding specific measures, such as the placement of renewable energies or restrictions on urban mobility.

The implementation of the 2030 Agenda, coupled with a rise in violent incidents and the onset of droughts and high temperatures, has fueled political controversies and even given rise to conspiracy theories. These theories suggest an alleged scheme to manipulate the climate and possibly reduce the global population through artificially induced droughts or destructive actions orchestrated by presumed malevolent elites. Social networks serve as an ideal platform for the dissemination of these conspiracy theories (Douglas & Sutton, 2015; Phillips et al., 2022).

The growing social and political pressure to fulfill the emissions reduction targets outlined in international agreements to mitigate global warming is intensifying the debate. However, it is also giving rise to increased noise and misinformation. This underscores the imperative for a more robust and effective communication strategy to address these

complex issues.

In recent years, a transformative shift is underway across all societal levels, driven by the pressing need to combat climate change. The urgency to swiftly curtail greenhouse gas emissions, as mandated by the Paris Agreement (UNFCCC, 2015), has prompted actions by various administrative tiers that directly impact the daily lives of the population. This reality is unfolding globally, affecting all countries and the entirety of humanity. Simultaneously, there has been an undeniable surge in social awareness, with an escalating demand for immediate action by authorities on matters related to energy, transportation, and climate.

However, this period has also witnessed a notable increase in the politicization and controversy surrounding climate issues, encompassing measures and actions being implemented and even challenging the foundational understanding of climate change. Several factors contributing to this response from the population include a superficial comprehension of the problem, a sense of being overwhelmed by its magnitude, feelings of hopelessness and a lack of foresight. Additionally, there may be shortcomings in how the issue has been communicated to the public (Moser, 2016; Moser & Ekstrom, 2010).

Scientific communication has made significant strides in recent decades, including efforts in communicating climate change. However, there remains a critical need to enhance communication concerning the actions and strategies adopted by society in the essential fight against this issue and in adapting to resultant changes.

The global experience of the COVID-19 pandemic, which necessitated widespread restrictions on freedom of movement and universal vaccination mandates, offers

valuable lessons for managing substantial challenges. In the context of climate change, this underscores the imperative to refine communication strategies, moving beyond merely disseminating knowledge about climate change. It is now crucial to convey the entire cultural, political, economic, and social process that humanity as a whole must embrace. This comprehensive approach aims to ensure that a well-informed public opinion contributes to an improved decision-making process (Manzanedo & Manning, 2020).

The sheer magnitude and urgency of the actions required to achieve emissions reductions and address the climate emergency are giving rise to increased resistance or rejection in certain areas. This trend is fueling both academic and political discussions regarding the capability of democracy to effectively manage an environmentally sustainable world (Wong, 2016).

Furthermore, the persistent and at times distorted usage of terms such as sustainability, environmentalism, and ecology by advertising, political entities, and economic interests is leading to a state of overexposure within society. These concepts are being invoked to justify a wide array of actions. Consequently, policies and initiatives associated with these terms are starting to face societal skepticism, particularly within specific social groups. This skepticism is being wielded as a tool in various directions across the ideological spectrum in the ongoing political debate (Radcliffe, 2000).

The concept of environmental authoritarianism originated in densely populated and underdeveloped countries, particularly those facing environmental degradation in the pursuit of economic development, exemplified by China and other nations in Southeast Asia (Beeson, 2010). The escalating pressure resulting from heightened socioeconomic

vulnerability worldwide, driven by environmental changes and intensified meteorological phenomena, places all forms of government in an urgent situation requiring protective measures for the environment, production systems, and the population (von Stein, 2022).

Despite the challenging economic and social landscape, implementing emission reduction measures is particularly demanding for any government system. In democracies, the imperative for consensus adds an additional layer of complexity. In September 2023, the European Union took a significant step by deciding to grant a moratorium from 2030 to 2035 on the obligation to transition the most polluting internal combustion vehicles from its Euro7 standard (Consejo de la Unión Europea, 2023). The United Kingdom also enacted a similar regulation (UK Government, 2021). The increasing influence of social pressure has become a pivotal factor in the capacity to implement substantial measures that impact the entire population.

Recently, there has been a growing discourse on mental health concerning individuals' perception and personal capacity to react and adapt to climate change. The concept of eco-anxiety or climate anxiety has garnered particular attention, especially among younger segments of society (Pihkala, 2020). Despite being a field with limited published research, its impact is evident in movements like Fridays for Future or Extinction Rebellion. Additionally, it is reflected in the heightened intensity of actions by certain collectives, such as "Futuro Vegetal," who used impact glue to adhere to the ground at Barajas airport in Madrid, or "Just Stop Oil," who threw tomato juice on the bulletproof glass protecting Van Gogh's Sunflowers (Stanley et al., 2021).

This anxiety, evolving into anger and, in some cases, more

aggressive actions, may also transform into fear or even paranoia. It can serve as the catalyst for thoughts linked to conspiracy theories, seeking someone or something to blame for climate change or its effects. Scientific knowledge on this matter is still limited and scarce, but emerging research is beginning to underscore its implications on social behavior, affecting the acceptance of climate science and even influencing political preferences (Biddlestone et al., 2022).

In recent years, there has been a global rise in populist and authoritarian leaders and policies that have directed slogans and actions against environmental policies (McCarthy, 2019). These positions often involve direct confrontations with proposed solutions for mitigating climate change and, in some instances, outright denial of the root causes of the problem. The political battleground for climate change is particularly pronounced in the United States (Dunlap & McCright, 2008).

The Sustainable Development Goals and the 2030 Agenda have become entangled in this tumultuous political and academic debate, creating a complex landscape where discerning genuine arguments and weighty information becomes challenging (Larsen et al., 2022; Mediavilla & Garcia-Arias, 2019).

The perception and social response to the current situation, amidst the urgency and emergency of swiftly implementing measures to curb global warming, underscore the imperative for enhanced communication and information dissemination within society. Equally critical is the necessity for informed governance that navigates the intricacies of both the message itself and the required actions.

In an increasingly globalized world, where arguments, news, and even political and social trends engage in a multicultural interplay, climate change communication

demands a comprehensive global perspective. The priorities and perspectives differ for those living in developed nations compared to the rest of the world, yet policies and communicative strategies often emanate from the wealthiest countries. Climate change communication must encompass adaptation and mitigation strategies tailored for individuals and societies with limited participation in decision-making processes. A communication approach that considers the diverse perspectives and sensitivities of the global population is essential to ensure the message resonates effectively and comprehensively with the maximum number of people (Jan Servaes, 2022).

Communication Strategies for Climate Change

As part of my doctoral research focusing on climate change communication, with the aim of enhancing awareness in public opinion and improving decision-making, we examined three distinct study groups: "Communicators of Science," "Science Creators," and "Decision Makers." The "Communicators" encompass weather presenters from various countries globally. The "Science Creators" were divided into two groups: National Meteorological Services and members of the drafting committees of IPCC 4 and IPCC 5 reports. The "Decision Makers" included individuals who actively participated in COP26 in Glasgow in 2021 in the United Kingdom.

Surveys were distributed to the first two groups, and personal interviews were conducted with the third group. We received responses from communicators in eighty-one countries worldwide. For national weather service science creators, we obtained responses from forty-four countries, and from the sub-group of IPCC report editing team science creators, responses from nine scientists. In the case of decision

makers, a total of twenty-four interviews and contacts were conducted.

Based on the surveys and interviews conducted, the following are some key conclusions:

State of Opinion on Climate Change:

As a foundational insight into the overall social perception of climate change gleaned from our diverse study groups, there exists a prevalent sense of concern, though not yet reaching an alarmist level. Notably, the Science Makers, individuals with extensive knowledge of science and deep involvement in climate change research, exhibit a somewhat higher tendency toward alarm regarding the issue. In the Six Americas test, 66% of science communicators expressed concern, while 58.5% of science creators reported feeling alarmed. Decision makers, on the other hand, expressed concern at a rate of 65% (see Table 7.1).

PERCEPTION OF CLIMATE CHANGE	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
SCIENCE COMMUNICATORS	23,60%	66%	7.4%	1%	0	0
IPCC SCIENCE CREATORS	58.3%	41.7%	0	0	0	0
DECISION	25%	65%	10%	0	0	0

MAKERS						

Table 7.1: Perception of Climate Change among Various Study Groups based on the Six Americas Survey

Decision-makers generally perceive that the prevailing opinion within their respective countries is largely one of concern. However, in some instances, less committed perceptions also emerge, particularly in countries where climate change does not directly result in negative repercussions for the population (see Table 7.2).

PERCEPTION OF CLIMATE CHANGE	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
DECISION MAKERS	25%	60%	0	10%	5%	0

Table 7.2: Decision-Makers' Perception of Public Opinion on Climate Change in Their Respective Countries.

The extent to which decision-makers perceive the prevailing opinion within the general society significantly influences the pace at which national and international policies are incorporated into the efforts to combat and adapt to climate change. As observed, decision-makers are more inclined to initiate and justify policies when they sense a demand for action from the broader society.

Communicative Resources for Climate Change on an International Scale

A shared perspective among the three study groups concerning the paramount communicative element related to climate change is the necessity for a well-informed society on the subject. While it may appear that having an informed society is an outcome of effective communication, according to the interviewed groups, without a solidly established

state of social opinion and public inquiry, the task of communicating to the media, ensuring research, or making political decisions on any topic, including climate change, becomes considerably more challenging (see Table 7.3).

Ninety-seven percent of communicators and eighty-six percent of decision-makers emphasize the importance of establishing a foundational level of social awareness. This acts as a catalyst, triggering increased demand for information and exerting pressure on decision-makers to implement policies with broader societal impact. According to science creators from the IPCC, society and governing bodies have a knowledge level of climate change that, on average, does not surpass 6.3 out of ten. Studies conducted in vulnerable communities in Bangladesh and Ethiopia have demonstrated that even a relatively modest knowledge base about climate change within a community can effectively stimulate social demand for adaptation strategies against climate change (Kabir et al., 2016; Tilahun et al., 2019).

In the surveys conducted among communicators, there was no indication that they perceived the existing baseline knowledge about climate change in the societies of the eighty-one countries surveyed as a hindrance to reporting on the subject. From this, we can infer that the current level of knowledge about climate change on an international scale is robust enough to establish a societal opinion conducive to acceptance and even demand for action against climate change.

Another overarching communication resource among the groups has been the imperative for political decisions at both national and international levels, manifested in the form of regulations, treaties, or, more broadly, government actions. The need for national and international regulations on climate change ranked as the second choice among communicators

and third among decision-makers. Additionally, science creators identified the complexity of decision-making as the primary impediment to the effective dissemination of knowledge from the IPCC reports to society.

The second most frequently mentioned option by decision-makers is the imperative for "bottom-up" action, extending from local to national and even international levels.

This assertion aligns with the shared perspective of the three interviewed groups that a well-informed society at the grassroots level is more demanding and more receptive to decisions related to climate change adaptation and mitigation. Moreover, government action, manifested through national and international regulations, agreements, or treaties, is perceived as one of the most effective means of communicating climate change.

It is noteworthy that the group of science creators has identified political controversy in the third position and interested disinformation in the second position, potentially related to it. These elements are seen as factors complicating the dissemination of knowledge about climate change in society.

The link between the battle against climate change and a shift in the existing economic model has emerged consistently among decision-makers and communicators. Notably, both communicators and their audiences rank references to economic models, ethics, and inclusion in the necessary economic transition in the fifth position. Additionally, it is noteworthy that science creators prioritize the economic and social intricacies of decision-making.

In summary, the key communicative resources that stand out from our research are the imperative for a well-

informed society, government action propelled from the grassroots level, translating into regulations, treaties, and national/international agreements. There is also a recognition of the communicative complexity inherent in the need for an ethically inclusive economic change in the fight against climate change.

Climate Change Messages

A consistent recommendation across the three study groups regarding climate change messages is the emphasis on avoiding fear-inducing messages. The consensus on this recommendation is particularly strong among IPCC science communicators and creators, as well as in interviews with decision-makers.

There exists a social and academic debate on whether instilling fear in society stimulates action (Gifford, 2011) or if, conversely, positive messages enable more coordinated societal action in the fight against climate change (Kundzewicz et al., 2020).

The findings from our research recommend the use of positive and non-fear-inducing messages that facilitate the bottom-up action advocated by decision-makers. Even the most disruptive movements we interviewed, leading climate hacktivism actions, convey a positive message calling for action, social mobilization, and committed struggle.

Another point of consensus among the study groups regarding messages and their content is the importance of delivering a realistic message that counters misinformation. In this regard, science creators emphasize that messages must incorporate the latest scientific content tailored to each specific audience.

Presently, messages transcend mere written or literal content; they often embody images, actions, or informational approaches, known as message framing in English (Badullovich et al., 2020; Rothman & Salovey, 1997). This framing induces either action or inaction. In our research, the recommendation to render climate change messages visual and understandable, employing graphics, everyday examples, and commonplace situations, has also surfaced. Such visualization of the message frame aims to induce action.

According to our research, messages conducive to greater societal engagement in the fight against climate change are those that are realistic, contain a positive vision, and inspire action.

It is widely agreed that combating and adapting to climate change will necessitate a transformation in the economic and energy model, requiring a multitude of national and international agreements. Given the complexity and extensive scope of information involved in these processes, messages need to closely align with the content of reports generated by science.

Decision-makers underscore the importance of disseminating information that simultaneously educates society, while IPCC science creators emphasize the imperative to combat disinformation.

In conclusion, we stress that the most effective messages avoid inducing fear in society, possess a positive nature, and encourage action. These messages must be realistic, grounded in data from reliable sources, and serve the dual function of educating and informing society. The framing of messages is also crucial, making the use of graphics and images advisable, coupled with an approachable tone intended to be understood

by the widest possible audience.

Public Opinion and Climate Change Governance

In our interviews and discussions with decision-makers, we delved into the expectations surrounding the United Nations Framework Convention on Climate Change (UNFCCC) conferences. The predominant theme that emerged was the imperative to increase or maintain ambition in the fight against climate change, with "ambition" encompassing various facets. This includes not only the reduction of emissions and mitigation efforts affecting all parties but also the essential support that more developed and powerful entities can provide to their less developed counterparts. This support extends to various capacities, encompassing adaptation, financing, and training processes (UNFCCC, 2020).

Everything related to the concept of ambition at these summits is intertwined with the level of emissions and the pace of their reduction, consequently tied to the energy transition and the associated socio-economic model change. A debate ensues between economists and climatologists concerning the optimal speed for this transition. The economic discourse, featuring insights from Nobel laureates in economics (Nordhaus, 1992; N. Stern et al., 2022; N. H. Stern, 2007), significantly influences decision-makers' discussions on the desired speed and stringency of emissions reductions at COP summits.

It is evident that any shift in the necessary model change to reduce emissions necessitates concurrent enhancements in the support provided to less developed countries during implementation and adaptation to the new reality. The success of this entire process also relies on fostering a favorable public opinion that understands the imperative for these changes

and actively supports their promotion.

Many expectations voiced by decision-makers regarding the COP align with this trajectory: the imperative for transparency and mutual trust, the necessity to minimize the number of countries positioned as winners or losers in this scenario, and the call for actions that set mutual examples among the governmental efforts of diverse nations. Essentially, it is a call for each other to unite and share a collective standpoint, which, as we have seen, also encompasses the societal opinion within their respective countries.

Our research has underscored the pivotal role of society's fundamental knowledge to comprehend the climate change-related information reaching them. This understanding is evident in the call for the broadest possible consensus among decision-makers worldwide. A global communication strategy on climate change, adaptation, and mitigation is essential to foster the minimum international social consensus necessary for collaborative decision-making.

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33. Young Climate Activism

María Serra

I am Maria Serra Olivella, born in Barcelona but raised in a village near Montserrat. I turned 21 this summer, but I took to the streets in the name of Climate Justice when I was just 16. Like many, my activism is born out of fear and the vision of the abyss just a few meters away, but in these pages, I hope to convey the happiness and hope it has brought me.

I've always said that I'm not an activist; I do activism. I've balanced activism with studies for five years, and this year I am graduating in International Relations. My friends will tell you that I'm cheerful, a bit absent-minded, and occasionally even a party-goer, very few would describe me as an "activist". I am a young woman with a deep sense of empathy and social justice, with a passion for writing and communication, knowing how to write, and having a certain talent for communicating. I serve activism with all my gifts and my time until it no longer needs me. Being the daughter of a journalist mother, a reader from the cradle, there was always something in me that saw the problems and, to some extent, the connections between them. My first steps into the world of activism began with feminism, its wave of demonstrations, and the #MeToo movement. It always seemed magical to me to see people protesting, creating community, supporting each other, and raising their voices against injustices. I admired individuals who, with dreams and efforts, formed a collective with the goal of improving their community, of living better. I vividly remember presenting a primary school project on

Malala Yousafzai and thinking that I wanted to be like her when I grew up. Seeing a teenager risking her life so that girls in her community could go to school is my childhood's superhero story.

When I was about fourteen, meat disappeared from my plate upon realizing that vegetarianism and veganism were causes I sympathized with, and my stomach twisted at the sight of slaughterhouse images. I never became vegan, nor do I consider myself the person with the most love and empathy for animals like fish or chickens, but vegetarianism led me to environmentalism. Once I entered the abyss of the climate crisis, there was no turning back, it consumed me and became my obsession. I remember my heart being in pieces, I was a feminist, vegetarian, and wanted a better future for my generation... But was there a way to fight for everything at once?

I found the way years later, I fell in love with climate justice, a fight that, in my opinion, encompasses everything. It was in 2019 when I was incredibly fortunate to witness the awakening of a generation of strong, brave, and very capable young people. I saw the rise of the Fridays for Future movement in Sweden and Germany, led by Greta Thunberg and Luisa Neubauer. At that time, I was starting high school at a new institute and looking to surround myself with people who shared my concerns about feminism, social justice, and climate. I like to think that all the necessary forces, stars, and planets aligned for me to find the right people at the right moment, and somehow, I found myself at the assembly that founded Fridays For Future Barcelona.

I remember that fifteenth of February perfectly: I met with a group of university students, and on an ordinary afternoon after math class, the adventure of my life began. From the moment I walked out that door, my life took a 180-degree turn;

I was never just a student again. That same day, I was voted the youth spokesperson for the movement, and days later, I gave my first interview. That Friday, we went to Plaza Sant Jaume and appeared in the press as the first young people to strike for the climate, a week later we were 100. A month later was the first global climate strike, on March 15, 2019, we were 15,000 students in Barcelona, a million in 125 different countries.

I don't always find the words to explain what my life was like back then, to some extent, I remember everything like a movie. I went from studying physics and chemistry to writing and presenting press conferences, from doing math homework every afternoon to coordinating interviews with all media and managing the movement's networks. Obviously, at sixteen, divine thought did not teach me to do any of the things I mentioned earlier, we had help. The movement understood from the beginning that we needed to learn from the successes and mistakes of past movements, previous revolutions, and century-old struggles. There was an incredible deployment of adults, individually or from different organizations, who trained us and gave us resources to learn how to lead what was, at that time, the largest student movement in recent decades. As a spokesperson, I received countless hours of altruistic training on communication, how to speak in media, climate science, and social justice. Knowledge without which I would have been unable to lead or represent the movement.

I could tell quite a few anecdotes about my parents' and teachers' reactions to all this show. Can you imagine your daughter telling you from one week to the next that she's going to skip class every Friday and that she represents a student movement with millions of people? My parents are still shocked to this day, but after some conversations, they saw that I was very serious and had very clear ideas. I believe this is an experience shared by thousands of young people but, in my case, I didn't give them much choice. I

was going to demonstrate whether they wanted me to or not, it was something bigger than me, much more important than the philosophy and history classes that occupied my Fridays. At that moment, I felt that my duty as a citizen was to strike on Fridays, to force our government to declare a climate emergency and start real actions to reduce emissions. And why? Because all of that depended on my entire future. The press, politicians, people on the street, everyone placed their hope in us, we felt we carried the duty to save the world on our shoulders. Months later, the movement gained national recognition and we were coordinated internationally. After months of massive strikes every Friday, with hundreds of themes and dozens of connected movements, after an tireless summer of work, on September 27, 2019, we made history. We were nearly 100,000 in the streets, the largest ecological demonstration in Catalonia, and with more than 7 million around the world. I had the privilege of leading the demonstration and reading the manifesto in Plaza Cataluña filled with people, with memories and historic moments that have been engraved in an entire generation.

Amidst a frenetic pace, I never stopped studying; sleeping was negotiable, but studying was not. I completed my high school diploma in two years with good grades, passed the university entrance exams, and got into university. It took a toll on my health on many days, and I still believe that improving my future should not be a risk factor for any other aspect of life. For me, activism and high school were equally important for my future, and I made sure to prioritize both. After the September strike, we were exhausted but buoyed by the hope of possible change and a society that clearly wanted it as much as we did.

Weeks later, protests erupted in Chile, and COP25 was relocated to Spain. In two weeks, I received accreditation

and was confirmed as part of the international delegation of Fridays for Future, representing Spain's youth at the United Nations. This was possible because in 2019, the world's largest environmental NGOs gave half of their accreditations to young activists. They believed that after mobilizing 7 million people for the climate, our voice and narrative should be present at the United Nations. I started my climate activism in February, and eight months later, I was at the UN's most important conference on Climate Change, alongside presidents, world delegations, and international press.

COP25 was one of the most surreal experiences of my life, two intense weeks that were exhausting but very hopeful. My role at the conference was to act as a spokesperson for Spanish and international media, organize press conferences for FFF International, and protests within the building. There, I met a delegation of forty activists from around the world representing Fridays for Future from their countries and continents. I went from admiring activists like Greta Thunberg, Luisa Neubauer, and Vanessa Nakate to working with them daily for weeks. It's hard to explain the talent, ambition, and bond that existed among the young activists, many of whom I still work with daily and remain very good friends with. Despite the tenacity and immense power that was concentrated in civil society in Madrid and the climate demonstrations in the city with more than half a million people, the conference failed with very few advances in financing and almost none in mitigation and adaptation. After 8 months of constant and tireless work, mobilizing 7 million people globally, and getting the media to constantly talk about climate change... the conference's failure was a cold shower for many. I think we naively placed too much faith and hope in world leaders than they deserved and, naively, saw much more power in the mechanisms of the United Nations than they actually have. COP25 taught me a lot; I had the opportunity

to work with incredible young activists but also to meet indigenous communities and hundreds of people from civil society who have been fighting for our future for decades with sweat and tears. I also got to listen to indigenous philosophies, to women land defenders from Latin America, farmers from Africa... a well of infinite wisdom that I will never find a way to repay. The international community around the UN conferences has reaffirmed to me the importance of the local and that change needs to be real at a territorial level. The only way I found to pick up the pieces of my hope after the catastrophe in Madrid was to see the COPs as an end-of-year exam, not as a stable engine of change. The results reflect a battle of political interests and do not at all reflect society or serve to judge the work done in the streets by thousands of activists.

COP25 in Madrid was the first of three United Nations conferences I attended over the next five years: Madrid, Glasgow, and Egypt. I would like to emphasize that I defend the existence of these negotiations and will tenaciously argue that changing an economic system worldwide in a fair and democratic way must take time and countless discussions. The alternative to the COPs that we criticize so much is eco-fascism, the forced and non-consensual reduction of emissions and economies, which are not perfect but are necessary. However, the pattern of these conferences has mostly repeated; I've seen incredible people fight tirelessly, very important work has been done by civil society, and snail-paced advances by superpowers like the USA, China, or India.

I'd like to tell you what I'm doing five years later, but first, we must face the demise of Fridays for Future as we knew it: the COVID-19 pandemic. In my philosophy, social movements are living beings that are born, grow, reproduce, and die. Social movements are born in a specific context and

with specific objectives to achieve; in the case of Fridays for Future, the movement was designed to sound the alarm. The protests aimed to put the issue on the table, to be heard by science, and to declare climate emergency states to start demanding real and forceful actions. The Friday strikes had a significant and powerful impact that, inevitably, diminishes over time. Fridays for Future, along with other movements like Extinction Rebellion or the Sunrise Movement in the USA, achieved what ecology had not achieved in 70 years, to make climate change a topic of discussion for all citizens and politicians. They also popularized terms like climate crisis, eco-social transition, or Climate Justice, terms that gained popularity in 2019 and that today can be heard from many politicians. We alerted the entire world that our world needed urgent change, but we were not equipped to change it. I was locked down during the second semester of my second year of high school, I didn't graduate from high school and took the university entrance exams in July, but that was by far the least important thing. We were confined a month before the second global climate strike, everything was ready, with very high expectations of attendance... the world in the streets was never the same again. In many countries, the movement did not recover after the pandemic, a myriad of economic and democratic crises arose, and when we finally were able to go out, we were not the same, and neither was the world around us.

After the pandemic, there was a huge restructuring of the movement; massive strikes no longer made sense, and we urgently needed another strategy. Many of us, now a bit less young being "climate adults", continue to fight truthfully. In my opinion, both paths are necessary; some have gone down the path of radicalization in the streets (there you can find STOP OIL throwing paint at art) and others have taken the path of "climate diplomacy", my path.

In the past two years, I have focused on creating mechanisms and structures for young people that ensure a fair and truthful participation in climate justice issues. Together with Earth Uprising, we have negotiated and brought to reality Youth Climate Councils and citizen assemblies for young people around the world. Catalonia has indeed been a pioneer, and in October of this year, the first positions for the Youth Climate Council of the Generalitat were announced. After years of shouting for action, we have moved to taking action by requesting seats and power in decision-making spaces.

During these years, I have also had the privilege of advising and participating in young consultancies for international organizations like Greenpeace or Oxfam International. In the latter, I also had the opportunity to intern for six months and help with international campaigns like #MakePollutersPay or Ticket to the Future. In Earth Uprising, I was the European representative until 2023, attending with them the COP27 in Egypt, where I could collaborate with organizations I admire very much like Fashion Revolution or Save the Children.

Currently, I am focused on communication and education, explaining stories about the climate crisis or how it affects us, and being able to help these stories have a positive impact. In this context, I have the pleasure of being part of educational projects like Lead Today, to teach compassionate leadership in schools and institutes, or projects like Curv, which reimagine social networks for a better world. Activism continues to be my reason for being, and I hope in the coming years it can also be my job.

Within the climate movement, I found a family, but also a reason for being, and even more importantly, I found hope. I would like to talk to 16-year-old Maria, the girl who was deeply scared and who didn't see a future for her generation. Give her

hope, tell her everything we have done and what millions of young people do every day.

My generation does not have a future, but it is building one.

34. Inclusion in the Fight Against Climate Change

Rinaldo Pinto

Franco Pinto

In the silence of the night, as the wind strikes the windows forcefully, I find myself reflecting on the challenges that Rinaldo, my son, and many other vulnerable people might face due to climate change. Rinaldo, with his disability, lives life with a set of unique challenges. These can be exacerbated by the effects of climate change, which can affect his health, daily activities, and his ability to fully participate in society. Our story originates from an environmental awareness rooted in our family. From the beginning, the motifs we focused on led us to adopt eco-friendly practices, showing a constant concern for resource waste. However, with Rinaldo's growth, we discovered a new issue: climate justice. This awareness has reinforced our belief in the need to step up our efforts. Our commitment to climate justice materialized when we asked the European Commission to designate Rinaldo as an Ambassador for the European Climate Pact. The decision to involve Rinaldo was driven by our desire to make a more significant contribution to environmental awareness. We believed his designation could positively counteract actions for the environment. Climate justice is a crucial theme that intersects various dimensions, including social equity and the differential impact of climate change on vulnerable communities, including people with disabilities. People with disabilities, along with other vulnerable populations, are often the most affected by extreme weather events and the loss

of natural resources essential for their survival. Therefore, it is crucial to address climate justice by carefully considering the impact on people with disabilities and adopting inclusive measures to protect their rights and well-being.

Public Hearing and Field Commitment

Invited as speakers, we had the opportunity to participate in a panel of the European Commission, a public hearing organized by the EESC Permanent Group on Disability Rights "Climate justice as it affects people with disabilities in Europe and the world." During the hearing, we discussed the importance of considering the impact of climate justice on people with disabilities. Parallel to our advocacy work, we started the project "One More Sapling." This initiative involves donating saplings to mayors, associations, influencers, cooperatives, and festivals operating in the territory, emphasizing the value and meaning of environmental education, climate justice, nature, and the environment. On these occasions, we take the opportunity to raise awareness about the environment, the inclusion of people with disabilities, and, above all, climate justice. We are constantly present on social media, which represents a reservoir of people we try to sensitize with our posts and the communication of our projects and our multiple communication activities. Through sharing information and promoting discussions, we aim to engage a wider audience in the issues of climate justice and the inclusion of people with disabilities. In addition, we collaborate with associations and participate in themed events in the territory. These collaborations allow us to expand our network and share our knowledge and experiences with other organizations working towards similar goals. Another example of our commitment is the "EcoChallenge Festival," an innovative event that hosted conferences with experts in inclusion and climate justice. The challenge between groups, using previously collected scraps, promoted sustainable

creativity, involving people with and without disabilities.

The Journey of Inclusive Training

Travel is a metaphor for interest in the knowledge of the world, of the worlds around us; it is motivation for meeting, dialogue, and comparison, for the desire for proximity that asks to be listened to because in proximity, human relations are accentuated, and the true dialogic sense imparts new energy to human relations. And through the exercise of travel and meeting, the heart is enriched with constructive feelings, but also with effective learning, in being witnesses to contextualized strategies that involve the discovery of the ethics of relationships and listening to humanity that suffers and rejoices, that is restless but that waits and proposes strategies for resolution and complex problems.

Thus, I tell you who I am: my name is Rinaldo and I am a young man with a disability who has always wanted to stimulate and sensitize people on the importance of acting immediately to stop climate change but also to operate together a networked projectuality that could expand the area of participation and shared commitment. To achieve this goal, I undertook a journey with a bag containing some saplings to donate to municipalities, cities, associations, festivals, and companies that were at the forefront of the fight against climate change. For me, the journey was a continuous encounter and comparison with the people I met and, in the company of my father Franco, I did everything to disseminate ideas related to climate change and good practices. Traveling, meeting, comparing, participating, sharing, learning new good practices, for me has been a moment of personal growth that has made me stronger in facing certain issues related to climate and climate changes. I found, through human exchange and interpersonal relationships, new energies and new stimuli, which increasingly led me to build networks with motivated people attentive to issues related to the most

fragile people. The moments lived during the journey made me live and discover the full sense of social inclusion, emotional, experiential, and human inclusion. I felt within me the sense of belonging to a group, and therefore I felt the beauty that comes from feeling welcomed, listened to, included, and recognized. The living and true sense of inclusion gave me new strength and new energies, interior that represented an added value to my existence and my being with others in the world and in the context of social life. To include to participate, to include to be and to be there: this was the emotional support, the idea that pushed me to make my journey, a journey in search of the other, of others to feel included and to include myself among others and with others. And so everyday life is also crossed by the seasons, by time, and by social life that feels the repercussions that climate change brings especially to the most fragile people but also to those less exposed. Thus, inclusion and active participation in the fight against climate change have made my journey very interesting, alive, and dialogic.

During this journey, I met people who shared my same goals and purposes, thus finding agreements and effective and concrete collaborations. I felt encouraged and supported, and together we carried out effective initiatives and concrete projects. We donated and planted saplings in all the places we visited and we encouraged other people to do the same gesture, not only to save the environment and promote environmental consciousness and education but also to promote social inclusion. Furthermore, during the meetings, we recounted our experience and our stories among the stories so that our projectual and human experience would be a living and concrete testimony in order to provoke a reflective and humane impact. Every small action is an important action, with a halo effect with a resonance capable of disseminating words and lively gestures, through emotions, and the construction of alphabets aimed at the realization of

more inclusive, more conscious testimonies.

Climate Change and Social Inclusion

My shared and participated journey allowed me to reach a milestone: to have contributed to giving a positive ecological footprint to the world and to have inspired people to do their part to stop climate change and promote social inclusion. The project that allowed me to travel is titled: "One More Sapling" and every time I donated the sapling along with the group, I noticed a greater involvement among the participants, who, in turn, felt the desire to donate a sapling themselves, and all this, in addition to growing the number of participants, gave way to open a debate on climate urgencies and on the themes of fragility and inclusion; the debate that opened offered the opportunity to broaden the emotional and passionate involvement of those present.

I am proud to have sensitized people on these important themes and motifs, demonstrating that it is possible to make a difference, even if climate change is a constant threat. For this reason, the journey that began in 2022 continued also in 2023 and will follow in the following years, involving and collaborating with more and more people with disabilities and ordinary people, as well as an increasing number of associations and schools, to face this great challenge together and reach an ever-greater number of people. For me, traveling and meeting people was a moment of personal growth and also of group sharing; and all this contributed to give the journey, the form of a dialogic journey that allowed to mature other ideas and other projects for the future.

The Logbook

Among the most significant events, the "One More Sapling" donation made stops in the cities of Barletta, Lecce, and Senigallia; participation in two very important International Festivals:

"Il Giullare" which invited theatrical companies comprised of actors with and without disabilities to confront each other on the stage of the wonderful city of Trani, in Puglia;

The Summer Jamboree, which was the International Festival of music and culture from America in the '40s and '50s. Over the years, always mindful of the environmental impact, I sensitized the two organizers to make the Festival increasingly eco-sustainable. Besides these two significant Festivals, "One More Sapling" also made stops at:

The Harbor Master's Office and Coast Guard of Barletta, an operational organization committed to safeguarding the marine and coastal environment;

In Spain, with fellow Spanish Ambassadors of the European Climate Pact, during their event organized and held at the European Commission's Barcelona headquarters, "Youth and Climate Change";

Barletta Sportiva, an important local sports association that, in addition to great champions who ran marathons around the world, organized and managed activities with people with disabilities;

Amiche del Cammino, a large group of women of all ages led by coach Rita who met several times a week to go on long walks, have beautiful chats, lots of laughter and photos, involving and including in the group even the most vulnerable, sensitive, and fragile women. Finally, but only in chronological order, a very important stop was organized with the Legambiente Barletta association with which a large dissemination action was planned and carried out with great public success with the participation of hundreds of people. The project with Legambiente took place on November 21, 2022, National Tree Day. The project was divided into two phases:

a) a didactic action of about two hours for each school;

b) a three-hour excursion to Baden Powell Park. During the educational phase, the kids were informed by my group's representatives and by Legambiente about various issues; in this sense, the same involvement of all participants made them active protagonists in discussions on strategies and roles to support for environmental defense and they were also invited to create short texts, slogans, and graphic representations of the topics discussed.

During the excursion to the park, they observed and learned about various plant species and reflected on what was explained in class. The project concluded with an exhibition of the works at the park and the planting of some trees. It saw the participation of many primary school children, lower and upper middle schools, authorities such as the Deputy Mayor, the councilor for education, and the councilor for the environment, as well as many associations from Barletta and neighboring cities.

Conclusions

As an Ambassador of the European Climate Pact, I want to continue to realize my actions throughout Italy and the rest of Europe, starting from my city and my territory.

With my project "One More Sapling," I want to involve people with and without disabilities, public institutions, associations, schools, and companies that are at the forefront of the fight against climate change. I want to organize informative meetings, awareness events, educational activities, walks, and tree planting. I want to collaborate with organizations like Legambiente, Retake, Il Giullare, and Barletta Sportiva, to promote the importance of fighting climate change and social inclusion. In every activity, Rinaldo, with the help of his parents, especially his mother, and the people close to him, has proven to be a worthy Ambassador of the European Climate

Pact. He has promoted inclusion and awareness of climate change, encouraging people to take small steps to counteract climate change. Rinaldo and all of us hope that his and our efforts in the many activities carried out will be enough for his position as Ambassador of the European Climate Pact to be reconfirmed and he can continue to spread the message of the importance of the fight against climate change. I would like to clarify that all the activities mentioned above were carried out by Rinaldo with financial means from the family. There has been no external contribution for any of the activities.

With the help of my family, dearest friends, and the group of people who follow me in the most varied activities, I intend to promote my actions and my work as an Ambassador through the involvement of a wide audience. I plan to organize awareness events, informative meetings, walks, tree planting, educational activities, and events that have these three common denominators: Environment, People with Disabilities, and Social Inclusion of the most fragile people. Furthermore, I intend to share my work on social media, contact public institutions, associations, schools, and companies, organize conferences and seminars, and participate in music and culture festivals. My intention is to sensitize people about the importance of the fight against climate change and social inclusion.

CONCLUSION

As we reach the closing pages of this book, we are filled with a profound sense of hope and gratitude for each author who has contributed to this work. Their participation reflects not only a rich diversity of ideas but also showcases the invaluable range of perspectives that enrich the movement for sustainability. Each of these Climate Pact Ambassadors brings a unique view, deeply rooted in their own experiences, cultures, and realities. Together, they have created a mosaic of voices that not only warns us of the challenges we face but also illuminates pathways to a future where humanity and nature coexist harmoniously.

This book serves as an example of what can be achieved when borders dissolve, and voices unite with a shared purpose. Every page reflects the collective effort of individuals committed to a cause that transcends nationality and difference, proving that regardless of where we come from, the call to protect our planet and its resources is universal. Thanks to the European Climate Pact, people from all corners of the continent have been empowered to raise their voices and act, building bridges that connect cultures, generations, and disciplines in a symphony of commitment and resilience.

The European Climate Pact stands as a bulwark for change in these times of environmental and social crisis, demonstrating

that true power lies in the collaboration and commitment of citizens. Every author in this book is living proof of how individual efforts, when united in a common cause, can become a formidable force for real change. From scientists who have dedicated their lives to studying ecosystems to young activists advocating for a future still under construction, to community leaders navigating the challenges of sustainability in their own contexts—each contributor brings an essential piece to this puzzle of the climate crisis.

The diversity of voices here reminds us of the importance of inclusion in the environmental struggle. Every story and perspective represent part of the world's complexity, showing us that there is no singular solution. The European Climate Pact has served as a platform to amplify these voices, underlining the need for varied, contextual approaches that respond to the realities of each community. This multiplicity of visions encourages us to see sustainability not as a rigid goal but as a dynamic, adaptive process—a movement that requires flexibility, creativity, and unyielding commitment.

While the words of this book hold power, their true value lies in the action they inspire. Each reader is invited to join this journey, to become an ambassador for a more sustainable world, to make their own contribution—large or small—in the protection of the planet. The transformation of our societies is not solely the responsibility of governments or institutions; it is a call to humanity, an invitation to each of us to become active participants in building a better world. In every act of environmental awareness, in every small step toward sustainability, lies the collective impact of all who have contributed to this work.

Sustainability can be understood as the pursuit of harmony between the continued growth of society, rooted in an economy conscious of our true needs, while seeking the

coexistence of our species with all other living beings through respect and environmental protection. May these words serve not only as the end of a book but as the beginning of a renewed commitment—a commitment that encourages each reader to play a part in this global mission. For within the diversity of voices in these pages, and in the collective effort of the European Climate Pact, lies the reminder that, united, we can build a future where sustainability is not a distant ideal but a living reality for all.

Rosmel Rodríguez

EU CLIMATE PACT AMBASSADORS:

FOR A SUSTAINABLE WORLD

EUROPEAN CLIMATE PACT