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**THE GREEN TRANSFORMATION OF EUROPE:
CHALLENGES, OPPORTUNITIES, AND THE
WAY FORWARD**

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The Green Transformation of Europe: challenges, opportunities, and the way forward

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Abstract

This paper delves into the multifaceted impacts of climate change on Europe. It examines the immediate risks, including infrastructure damage and health crises, and explores the broader socio-economic consequences. The paper highlights Europe's strategic responses, such as the European Green Deal, and its efforts in pioneering innovative, sustainable solutions. Key initiatives like the Net-Zero Cities program and the role of Public-Private Partnerships are discussed, emphasizing the need for holistic, cross-sector collaboration. It also addresses the financial mechanisms and regulatory frameworks crucial for supporting the green transition. Ultimately, the paper underscores the EU's commitment to a sustainable, resilient future, balancing economic growth with environmental stewardship.

Key points:

- The summer of 2023 marked record-high temperatures, illustrating the urgent challenge of climate change.
- Climate change poses immediate risks like infrastructure damage and health crises, but also opens opportunities for green technology and sustainable economic growth.
- The European Green Deal sets ambitious emissions reduction targets, with strategies like REPOWER-EU to enhance energy security and reduce dependency on fossil fuels.
- Greece is making strides in renewable energy and climate laws, but challenges remain, particularly in phasing out lignite and fossil fuel reliance.
- Massive investment increases are needed to meet climate commitments, with the EU deploying financial instruments like the European Green Deal Investment Plan and Horizon Europe.
- EU adopts a holistic approach with initiatives like European Missions and Net-Zero Cities, focusing on collaborative, cross-sector efforts for sustainable development.
- The UN SDSN Global Climate Hub, offers scientific, human-centric solutions for a climate-neutral future, emphasizing collaboration and sustainable pathways.
- EU demonstrates strong commitment to a holistic, sustainable future, balancing economic growth with environmental responsibility.

1. Introduction

Climate change is a significant challenge to economies worldwide, including Europe. The summer of 2023 is a characteristic example, having recorded exceptionally high temperatures. The global average temperature was 16.77°C, exceeding the historical average by more than 0.6°C, whereas in Europe, the average temperature reached 19.63°C, thus more than 0.8°C higher than usual, ranking it as the fifth warmest summer on the continent (Copernicus, 2023). Addressing the crisis requires fundamental transformations across multiple dimensions: from energy systems and production processes to social behaviours.

While the risks of climate change are undisputable and increasingly perceived by the public, the crisis also offers opportunities. The right policies can promote technological innovation, boost economic growth that respects the environment and natural resources, and create jobs in new, sustainable sectors. The initiatives of the European Green Deal represent a cohesive and bold approach by the EU, demonstrating its commitment to not only meeting its climate targets but also leading the global charge in the transition towards a sustainable future. The Green Deal, therefore, stands as a beacon of Europe's dedication to a green transformation, setting a precedent for environmental stewardship, economic resilience, and social responsibility.

This article aims to explore the multifaceted impacts of climate change in Europe, discussing policy initiatives and strategies crucial for mitigating its effects and formulating the conditions for a just and inclusive green transition that leaves no one behind.

2. Climate Change induced Risks and Opportunities for the EU

2.1 Risks – Hazards

Immediate Risks

The immediate risks of climate change are tangible and diverse. They include the destruction of infrastructure and property due to extreme weather events like floods, droughts, and fires. These phenomena not only damage physical assets but also deteriorate agricultural production. Moreover, supply chains are vulnerable as well, as natural disasters can destroy transport networks and the availability of resources. Furthermore, the health implications are severe, with an increase in diseases and potential fatalities, especially among vulnerable groups. Climate change has been linked to the emergence of pandemics, such as COVID-19 (Gupta, S., et al, 2021) and is estimated to have caused over 70 000 excess deaths in Europe in 2022 alone¹.

In addition to these immediate risks, there is a profound loss of biodiversity, which leads to irreversible impacts on ecosystems and the ecosystem services that are vital for citizens. The valuation of these ecosystem services is crucial for understanding their importance and for guiding policy decisions ².

¹ <https://www.euronews.com/next/2023/11/21/more-than-70000-people-may-have-died-due-to-2022-summer-heatwaves-in-europe>

² In this context, the work of the UN SDSN Global Climate Hub, led by the author, is particularly noteworthy (see Annex). The hub has significant experience in valuing biodiversity through citizens' quantification of willingness to pay for ecosystem services, therefore contributes to a deeper understanding of the intrinsic value of biodiversity and its vital role in human life and

Climate change presents numerous challenges for Greece, impacting various sectors of its economy. The agricultural sector faces potential declines in productivity due to increased temperatures and drought conditions, potentially leading to reduced yields and food scarcity. The escalating costs of energy further exacerbate issues for both businesses and consumers. The tourism sector, a significant contributor to Greece's revenue, is especially vulnerable. Climate change-induced extreme heatwaves during the summer could deter tourists, as the industry heavily relies on mild weather conditions.

Cascading – Contingent Risks

Cascading risks further complicate the picture. One significant and escalating concern is climate migration, which is emerging as a global humanitarian and policy challenge. It is estimated that people living in highly vulnerable locations exceed 3 billion and as climate change becomes more intensive, worsening living conditions in these areas, significant part of the population will be forced to consider relocating (IPCC, 2023). This migration is not just a local or regional issue; it becomes a continental concern, potentially challenging the entire European Union.

Additionally, interrupted agricultural supply chains are causing inflationary pressures that raise the cost of living and the budgetary burden of climate adaptation and restoration after catastrophic weather events. These interruptions trigger several economic repercussions, because the availability of agricultural products is immediately impacted by climate-induced catastrophes such as droughts, floods, or fires. As a result, several food categories become more expensive, which puts inflationary pressure and raises the living expenses of households. Given that individuals with fewer resources are disproportionately impacted by these price increases, this situation may exacerbate already-existing social inequities.

2.2 Potential Opportunities for the E.U.

Severe adverse effect notwithstanding, it must be acknowledged that the green transition opens numerous opportunities. First, the shift to a low-carbon economy creates new industries and jobs and can stimulate economic growth. Coupled with the digital transformation, a shift to green technologies has the potential to foster quality employment and sustainable growth, in the sense that it respects planetary boundaries and consider the wellbeing of future generations. In the same fashion that major technological breakthroughs ushered in the material growth of the Industrial Revolution and the recent ICT revolution, investment in green technologies and environmental innovation can deliver a new era of economic and social development. The successful outcome of this process is conditional to the supportive policies to foster the upskilling and reskilling of the workforce, increase civil awareness and compensate the groups and regions that are left behind in the green transition.

Enhanced energy security through reduced fossil fuel dependence, improved air quality, and lower healthcare costs are direct benefits. This transition also encourages innovation and technological progress, especially in renewable energy and sustainable technologies.

well-being. Results on the necessity of integrating ecosystem service valuation into policymaking, can be found in one of the reports of the SDSN Senior Working Group on the European Green Deal, titled: "Financing the Joint Implementation of Agenda 2030 and the European Green Deal" (Sachs J., Koundouri P., et al., 2022)

Investment in green technologies can restore EU competitiveness, with the EU leading by example in climate action.

3. EU Climate Targets and Policy Initiatives

The energy crisis itself acts as a driver for this transition, with initiatives like REPOWER-EU, strengthening renewable energy capacity. REPOWER-EU is the European Commission's response to the Russian-Ukrainian war, aiming to end reliance of European countries on Russian fossil fuels before 2030. The plan relies on four pillars, namely (i) energy efficiency and savings; (ii) energy supply diversification (iii) clean-energy transition acceleration and (iv) investment and reform in the energy sector. Stemming from an adverse geopolitical development (the Russian invasion of Ukraine in February 2022), the initiative aims to generate something positive by bolstering European energy security and incentivizing renewable energy deployment. REPowerEU sets a bold ambition of increasing the EU's headline 2030 target for renewables from 40% to 45% with the support of green technologies such as heat pumps, green hydrogen and solar photovoltaic panels through implying procedures for capital investment in renewable projects. Having said that, the success of the plan relies on ramping up investment in the field (more than 210 billion in the 2022-2027 period) and ensuring cross-country collaboration (Tagliapietra, 2022).

3.1 Climate Targets and the EU GD

The European Green Deal (EGD), launched in December 2019 aims at reducing greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. This an ambitious target, therefore the EGD serves as the long-term growth strategy of Europe, combining environmental, social, and economic objectives and promoting inclusion and sustainability.

In July 2021, the climate ambition of the EU was further increased by the introduction of the "fit-for-55" package which elevated the GHG emissions reduction target to 55%. The "fit-for-55" is a comprehensive set of proposals for policy amendments in a range of aspects, including the increase in the share of renewable energy in the EU's energy mix to at least 40% by 2030, the enhancement of energy efficiency across various sectors, such as buildings, industry, and transportation and the expansion of the EU Emissions Trading System (ETS) to cover more sectors and the introduction of a Carbon Border Adjustment Mechanism (CBAM) to ensure a level playing field for European industries and prevent carbon leakage. The aim of these mechanisms (ETS and CBAM) is to incentivize businesses to adopt cleaner technologies and practices and ensure fair competition within and outside the EU.

In March 2023, complementary to the EU Fit-for-55 package, the European Commission proposed the "Net-Zero Industry Act (NZIA)" focusing on the acceleration of the EU industry transformation towards net-zero emissions. The objective of NZIA is to strengthen the capacity of net-zero technologies like batteries, solar cells, hydrogen, and wind turbines, of the European manufacturers, and to channel investments in clean technologies across the EU among others.

Greece enacted its first comprehensive climate law,³ in May 2022, targeting to reduce total GHG emissions by 55% by 2030, by 80% by 2040, and to achieve climate neutrality by 2050 and setting the law sets ambitious targets for transitioning to renewable energy, and adapting to climate change (IEA, 2023a). Besides, Greece has also made notable progress on renewable energy, which covered 20% of its total final energy consumption in 2021 (IEA, 2023b). However, despite the progress noted with regards to reducing fossil fuel usage, especially lignite in electricity generation, fossil fuels still predominantly power the country (IEA 2023a). On the face of lignite mines and fossil fuel extraction, despite initial plans to phase out lignite by 2028, Greece needs to accelerate its timeline, according to the IEA IEA (2023b).

3.2 Financing the Green Transition

According to the IPCC AR6 (2023) adaptation and mitigation financing would need to increase many-fold to meet global climate targets. The report underlines that there is adequate capital globally, however the investment gaps remain significant. This implies that there are barriers and capacity deficits across nations, regions, financial institutions, and enterprises which hinder the allocation of capital towards this end. Recent estimates highlight that annual climate finance must increase by 590% compared to 2010-20 to meet global climate commitments and avoid the most severe catastrophic effects of climate change (CPI, 2021). According to the EIB (2022) 'High cost of making changes' as well as 'access to finance' are the most frequently mentioned from a list of potential obstacles to implement climate innovation.

In this context, the EU has established a series of financial mechanisms, schemes, and institutions to promote climate finance and support the green transition enshrined in the EU Green Deal and the EU Climate Law. In December 2020, the Council and the European Parliament signed the 1.211 trillion EU Multi-Annual Financial Framework (MFF) for 2021–2027. Following the need for a decisive and integrated response to the COVID-19 pandemic, this was coupled with the Next Generation EU (NextGen EU) instrument adding 806.9 billion for the seven-year period. In addition, the EU develops the institutional framework and provides ample support through non-financial measures to actively promote green finance for sustainable development.

The European Green Deal Investment Plan aims to contribute to financing the EU green transition, while supporting the regions and communities most exposed to its impact. The plan commingles financial mechanisms, legislation and non-legislative initiatives covering three broad aspects:

(i) Funding

Over the 2021-2030 period, the Commission wants to mobilize at least €1 trillion of sustainable investment by devoting resources under the EU budget and leveraging additional public and private financing. The main executive arm for EU green finance is the European Investment Bank (EIB). In 2022 the EIB disbursed 36.5 billion for climate action and environmental sustainability projects, representing 58 % of its total lending. It provides funding opportunities for the public as well as the private sector through direct loans for public entities and large companies and framework loans for Climate Investment Portfolios. InvestEU is a critical instrument for boosting green growth, innovation and job

³ National Climate Law 4936/2022 on the transition to climate neutrality and adaptation to climate change, https://climate-laws.org/document/national-climate-law-4936-2022-on-the-transition-to-climate-neutrality-and-adaptation-to-climate-change_2ff3

creation in Europe promoted by the EIB. The bank and other cooperating partners provide direct or indirect financial support to SMEs, national and regional authorities and public-private partnerships and aim to leverage Leveraging more than 100 billion € of public and private green investment through an EU budgetary guarantee of 26.2 billion € by 2030. al.

The LIFE Program is The EU's financial instrument supporting environmental, nature conservation, climate action and sustainable energy. It provides direct financing mainly through grants (85% of the program budget) for private and public EU entities to support environment-specific and environment-integrated projects. Interested parties need to design programs spanning four key areas, namely (I) Nature and Biodiversity, (ii) Circular Economy and Quality of Life, (iii) Climate Change Mitigation and Adaptation and (iv) Clean Energy Transition. The LIFE program will disburse 5.4 billion € in total over the 2021-27 period and provide technical assistance, directly managed by the European Commission. Finally, the Horizon EU programs is a potent financing tool which emphasizes promoting cutting-edge research and innovation through cross-country and interdisciplinary research projects. The current era of Horizon Europe has a budget of EUR 95.5 billion for 2021-2027 (including 5.4 billion from NextGenEU), 35 % of which is earmarked for projects promoting climate change objectives.

(ii) Regulatory Framework

The EU plans to use a mix of regulatory initiatives and incentives to ensure that sustainability standards are considered in investment decisions, by putting sustainable finance at the heart of the financial system, by providing the public and private sector with the necessary guidance and by co-designing a supportive state aid framework with member states. At the epicenter of this process is the EU Green Taxonomy, which acts as a set of science-based and universally accepted set of principles that communicates a common definition of environmentally sustainable economic activities⁴. The eligible activities under the EU taxonomy include climate mitigation & adaptation, circular economy, sustainable water use, pollution prevention & control and the protection of biodiversity and ecosystems.

A key issue for the implementation of the actions that underpin the EU Green Deal and the transition to net zero is the use of innovative financial mechanisms. Given the pronounced increase in the use of green bonds for financing sustainable projects (Anyfantaki et al., 2022), the political agreement on a EU Green Bond Standard in 2023 is of pivotal importance. Although it is still on a voluntary basis, the standard mandates that issuers of green bonds must align at least 85% of the activities that are financed with the objectives identified by the EU Taxonomy. In addition, full transparency of the use of proceeds from green bonds is required and external monitoring and supervision from the European Security Markets Authority (ESMA) is enforced to validate the procedure and protect investors from greenwashing.

Finally, incentives for redirecting corporate finance towards impactful sustainable activities are given with the enforcement of the Corporate Sustainability Reporting Directive (CSRD) which came into force in January 2023. The new directive applies more

⁴ The consultation on the EU taxonomy is an ongoing procedure, a timeline of which can be found [here](#).

stringent rules concerning the social and environmental information that companies have to report and is mandatory from 2024 for all large companies and listed SMEs (except micro-enterprises) in the EU.

(iii) Active Support

The EU apparatus is also providing technical assistance for the design, implementation, and monitoring of environmental projects on top of financial assistance through its multiple schemes. Programs such as InvestEU, Horizon and LIFE projects all incorporate advisory mechanisms to streamline funding, ensure sustainable outcomes and create bankable projects (i.e., those that meet the conditions required by the financier to finance a project).

Horizontally, research and implementation on climate-related issues is supported by the EIT Climate KIC (Knowledge and Innovation Community) which is the EU's main climate accelerator. The institution provides seed funding, guidance, organizes peer-to-peer demonstrations and promotes networking to allow for ideas to turn into business plans and for SMEs to scale up their business and serve climate needs. Through its work, it leverages public and private funds for green innovation and the dissemination of green technologies.

Regarding climate adaptation, European Environmental Agency (EEA) has developed the Regional Adaptation Support Tool for national and regional authorities. The online tool is a six-step approach for building a solid adaptation project from inception to monitoring and dissemination as a best practice. The initiative bolsters capacity building and is commingled with the financial support for adaptation projects to ensure that problem owners (i) have access to tailored financing mechanisms and programs and (ii) harness the financial resources to meet adaptation targets.

In light of regional disparities and vulnerabilities, the role of insurance and Public-Private Partnerships (PPPs) becomes increasingly vital in climate adaptation strategies. Insurance mechanisms can offer immediate financial support to affected individuals, and businesses, which ensures quicker recovery after a natural disaster (ECB, EIOPA, 2023). PPPs, through the combination of the strengths of both public and private sectors can further enhance overall resilience by innovative insurance products, diversifying risks and ensuring broad coverage. This approach acts as a safety net against the immediate impacts of extreme weather events and encourages proactive investment in resilient infrastructure.

3.3 European Union's Holistic Strategies and Climate Initiatives

In an effort to address the challenges and benefit from the opportunities of the green transformation, the European Union follows a holistic approach which recognizes that effective change requires comprehensive strategies involving a diverse set of stakeholders. This approach is evident in various initiatives, each addressing different aspects of the climate and environmental crisis but ensuring that contribute to the overall objectives of the European Green Deal.

The main pillar demonstrating the paradigm shift of EU strategy towards a smart and holistic policy framework is the "Missions" initiative. Launched under the Horizon Europe research and innovation programme in 2021 by the European Commission, European Missions (European Commission, 2023a) are targeted and ambitious projects aiming to

address some of the most urgent societal challenges, including climate change⁵. These missions, inspired by M. Mazzucato's work (2021), focus on achieving Sustainable Development Goals (SDGs) through collaboration across various sectors, including the private sector, research, and civil society. Unlike traditional industrial policies, these missions aim to achieve specific objectives through both top-down and bottom-up approaches (Terzi et al, 2023), requiring tangible results by 2030 in line with the European Green Deal. The five ongoing missions include: adapting 150 regions to climate change, combating cancer, restoring oceans and waters, creating 100 climate-neutral and smart cities, and revitalizing Europe's soils by 2030.

The "Net-Zero Cities" program, integral to the EU's mission for "100 climate-neutral and smart cities by 2030," aims to guide cities towards climate neutrality by 2030. This program focuses on transforming city operations and decision-making processes, offering tools and resources to help cities develop and implement their climate action plans. It provides a comprehensive six-step journey towards climate neutrality and access to an interactive platform detailing EU funding sources, criteria, and mechanisms. The initiative is dedicated to supporting cities at different stages of their climate journey, providing customized assistance to expedite their transition to climate neutrality.

The Mission Implementation Platform for Adaptation to Climate Change (MIP4Adapt) supports European regions and local authorities in building resilience against climate change. It offers a platform for knowledge exchange, technical assistance, and coordination, promoting effective climate adaptation strategies. MIP4Adapt, backed by Climate-ADAPT and a partnership between the European Commission and the EEA, provides a comprehensive knowledge repository and showcases successful adaptation projects, aiding regions across the EU in their climate resilience efforts.

In this context of holistic strategies, the findings and recommendations of Lafortune et al. (2022) in 'Achieving the SDGs: Europe's Compass in a Multipolar World' are particularly relevant, emphasizing the EU's critical role in global sustainable development and the urgent need for progress on the SDGs in the face of multiple global crises.

4. Challenges and Controversies

4.1 Social and Political Backlash

Policymakers in the EU do not just have to face the growing costs of climate inaction and upfront costs of adaptation and mitigation projects. A growing concern is the elevated resistance from affected sectors, citizen groups and regions which threatens to derail the trajectory to net zero and undermine flagship EU initiatives such as the Green Deal. Apart from climate change denial, growing frustration with the repercussions of green policies fuel populism across the continent and hinder the efforts for the green transition⁶.

A major issue facing policymakers across the EU is that, following the seminal declarations of the previous decade such as the Paris Agreement and the EU GD, now is the time to implement the legislated policies, which require an immense share of funding. While, in principle, subsidizing investment in renewable capacity is viewed positively, support wanes once people realize that one's subsidy is another's taxation (Blanchard et

⁵ The five Missions are: (i) Adaptation to Climate Change, (ii) 100 CLimate-neutral Cities, (iii) Beating Cancer, (iv) Restore our oceans and waters by 2030, (v) a Soil deal for Europe 2030.

⁶ <https://www.ft.com/content/f6667506-d38f-43c2-8e75-b39c72112a41>

al., 2023). Coupled with the recent energy and cost of living crises, this has resulted in a growing discontent with economic policies to support the green transition. According to a recent poll only 39% of respondents strongly supported or tended to support a ban in petrol and diesel cars in high-income European economies⁷. An attempt to levy a fuel tax in France spurred riots by the *Gilet Jaunes* movement and led to the retraction of the initiative in 2019, whereas a proposal for a gas boiler ban was dropped this year. Moreover, the public's indignation is exacerbated by the lack of scrutiny in major polluters and the dual message conveyed through the still massive amount of funds directed to fossil fuel companies as subsidies⁸⁹.

Having said that, climate change is changing Europe's economic geography, with some regions facing greater risks than others, thus creating disparities regarding the vulnerabilities at the regional level. For example, coastal areas are particularly vulnerable to sea level rise, posing risks to infrastructure and the livelihoods of communities living near the sea. Perhaps more importantly, the effects of economic policies to achieve net zero affect EU regions in a very diverse fashion. Recent empirical evidence reveals that the socio-economic ramifications of EU strategy are extremely non-linear, with less developed, peri-urban and rural regions in Southern and Eastern Europe being adversely affected by the policies that underpin the green transition (Rodriguez-Pose and Bartolucci, 2023). Insofar as the green transformation is a structural one, it encompasses elements of creative destruction. Decarbonizing the energy industry comes at a short-term cost in terms of employment in "coal regions". According to the IMF (2022) only 1% of workers will need to reallocate or the green transition, which is considerably smaller to 2,5% associated with the transition from manufacturing to services in the late 20th century. Nonetheless, this still affects many workers in a handful of regions and warrants massive investment in infrastructure, upskilling and reskilling of the labour force.

Finally, the transition to net zero by 2050 is impeded by vested interests and the power of traditional sectors in the EU economy. The recent outcome of the Dutch elections mirrors the support gained by the populist Farmer Citizen Movement (BBB) in the 2022 uprising against legal action to curtail nitrogen-based emissions. In October 2023, the new version of the Reach legislation aimed at reducing harmful chemicals and microplastics was abandoned due to heavy pressures from the chemical industry on the ground of undermining EU competitiveness in the field¹⁰. Furthermore, the recent block of the German Constitutional Court on mobilizing idle funds from the pandemic relief package for fighting climate change indicates that European institutions operate in a 20th century mindset, which could prove catastrophic in the face of 21st century challenges.

4.2 Geopolitics

The fulfilment of the pledges included in the EU GD is also contingent on geopolitical risks and shifts in international relations. The recent war in Ukraine stirred the path of EU's

⁷ <https://www.ft.com/content/437a1058-d0d3-40cf-8eea-6a7b3e626cde?desktop=true&segmentId=d8d3e364-5197-20eb-17cf-2437841d178a#myft:notification:instant-email:content>

⁸ <https://www.imf.org/en/Blogs/Articles/2023/08/24/fossil-fuel-subsidies-surged-to-record-7-trillion>

⁹ <https://www.theguardian.com/environment/ng-interactive/2022/may/11/fossil-fuel-carbon-bombs-climate-breakdown-oil-gas>

¹⁰ <https://www.ft.com/content/e6569817-108d-4f2d-9350-6e967ad98038?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8#myft:notification:daily-email:content>

energy transition, since natural gas from Russia was *de facto* considered as transition fuel as renewable energy capacity would be developed. Decreasing the bloc's energy reliance from Russia resulted in revitalizing or prolonging the functioning of coal plants across the continent, raising issues for the short-term effects on CO₂ emissions^{11,12}. Nonetheless, the EU responded swiftly, mainly through REPOWER-EU, and shielded itself through brokering LNG deals and investing on supporting infrastructure, ensuring minimum storage capabilities through cooperation and diversifying fuel supply¹³. Having said that, the policy response indicates that the energy crisis can act as an opportunity for the EU to speed up renewables deployment through fiscal incentives and reduction in red tape associated with green investments and to promote energy efficiency in buildings transport and consumption (IEA, 2022).

Given the prominence of renewable energy in the pathway to net zero (42.5% target of energy production for 2030), the EU must not risk a new dependence. The adverse effects of relying on Russia for energy security should act as an alarm for the future, as China is dominant in the renewable energy market. Following a ramping up of investments after 2020, China will control more than 80% of solar manufacturing capacity by 2026¹⁴. In addition, key materials for renewable energy are located or controlled far from the EU's sphere of influence, with 63% of the world's cobalt extracted in the Democratic (60% of this refined in China) and 100% of materials used for permanent magnets refined in China (European Commission, 2023c). The launch of the Eu Critical Raw Materials Act as part of the Green Deal Industry Plan aims to address precisely these issues¹⁵. It identifies crucial raw materials for the European green transition with a high risk of supply disruption and incentivizes increased participation of EU sources in extraction and processing. Moreover, it prohibits more than 65% of the annual consumption of each material to come from a single third country.

Finally, the desired mitigating effect of EU policy on global GHG emissions depends stringly upon the policy response from third parties. As mentioned before, carbon pricing delivers substantial emissions abatement if it is global, otherwise large enterprises *outsource their emissions* and not just their operations. Although initiatives like the CBAM protect EU interests and bolster the effectiveness of the ETS, it in oly through international cooperation that global targets (such as the 1.5 temperature rise) will be met, as enshrined *inter alia* in SDG 17. As highlighted by Blanchard et al (2022), the EU can reap significant gains from leading the political consensus at an international level in the green transition front and remain at the environmental policy frontier for the decades to come.

4.3 Policies as Enablers for the Green Transition

Against this backdrop, the EU policy response (at the union and the member state level) warrants elaboration in terms of design, implementation and monitoring. Policymakers

¹¹ <https://www.reuters.com/business/energy/germany-approves-bringing-coal-fired-power-plants-back-online-this-winter-2023-10-04/>

¹² <https://energypress.gr/news/nea-paratasi-mehri-telos-toy-2025-sti-leitoyrgia-trion-lignitikon-stathmon-tis-dei-gia-logoyis>

¹³ <https://www.bruegel.org/dataset/national-energy-policy-responses-energy-crisis?s=09>

¹⁴ <https://www.reuters.com/world/china/china-will-dominate-solar-supply-chain-years-wood-mackenzie-2023-11-07/>

¹⁵ https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1661

need not only to assess the perils of climate change and act decisively; they have to consider how to engage the private sector and civil society, how to break technological and political lock-ins of past decades and how to ensure that the effects of policy outcomes are not lopsided. To this end, we propose that the basic tenets of EU climate policy are the following:

- i) Economic policies need to be based on undisputed scientific evidence, which are conveyed to the public, accordingly, focusing on the socio-economic pathways shaped by specific actions compared to inaction. Costs and benefits of policy commitments should be outlined, focusing on the trade-off between short- and long-term effects, as this will enhance commitment from civil society.
- ii) As initiated by the Mission approach, EU and national plans need to follow a bottom-up approach which tenders to e specific needs and capacities of local stakeholders. Apart from providing tailored support for adaptation and mitigation solutions, this fosters a sense of ownership in local communities.
- iii) Policies have to be holistic and combine elements of supply and demand to harness synergies. For example, fiscal incentives for increasing renewable energy capacity can be commingled with public procurement for such projects.
- iv) The international community needs to exhibit a certain degree of harmonization in terms of climate policies and avert from eliciting short-term gains in competitiveness, for example by applying lax environmental standards for industry.
- v) The transition to a low-emission economy must be designed in a fair and equitable manner, ensuring that costs and benefits are distributed proportionately. A just transition relies on targeted support for vulnerable groups and investment in life-long learning¹⁶.
- vi) Industrial policy for the green transition needs to be bold, holistic and aligned with long term targets. Changes in human behavior matter, however the key for every major transition has been technological change (Terzi and Fouquet, 2023). Green innovation has the potential to steer the transition and thus minimize the necessary contributions from consumers and workers, ameliorating their resistance.
- vii) EU, national and international institutions have to target big polluters in the energy and industrial sectors. Increased scrutiny is required to gather the fair share of tax revenues from multinationals and tackle greenwashing by large corporations. The recent reform in the UN is a promising development in the tax front¹⁷. Furthermore, strengthening the monitoring mechanisms for corporate sustainability and enhancing the capabilities of the EU Transparency Register to document brown lobbying activities are initiatives that would set the example that the EU takes climate change very seriously.

i) ¹⁶ According to Cameron et al. (2020) ensuring a just transition requires the process to be locally driven to ensure the needs and capabilities of affected regions are considered and targeted policies should be part of long-term EU strategy. These EU initiatives also need to be aligned with national economic policies and subject to regular and transparent assessment

¹⁷ <https://taxjustice.net/press/un-adopts-plans-for-historic-tax-reform/>

5. Conclusions

As Europe deals with the worsening effects of climate change caused by humans, it becomes clearer that continuing with business as usual and following to methods from the 20th century is not a viable option. The EU, at a critical point, aspires to be the pioneer in climate action, having set ambitious targets for 2050 and formulated an array of initiatives and instruments for their implementation.

The core challenge lies in achieving a decarbonized economy that balances competitiveness with energy security and adheres to sustainable development principles. This necessitates a nuanced understanding of the complex dynamics of climate change, including the provision of support to communities and sectors disproportionately affected by the green transition. The EU's policy framework has evolved to focus on mission-oriented actions, transcending traditional sectoral or enterprise-focused approaches, and demanding coordinated efforts across the public and private sectors, academia, and civil society. This comprehensive strategy requires an unprecedented mobilization of financial resources and a commitment to international collaboration.

In response to the climate crisis, the EU has demonstrated a decisive commitment to adopting a holistic approach, laying the groundwork for long-term resilience and sustainability. Key initiatives like the European Green Deal and the Net-Zero Cities program signify major steps towards transforming Europe's economic landscape through sustainable practices and inclusive policies. The increasing emphasis on Public-Private Partnerships (PPPs) in building resilience and mitigating climate-related risks highlights the necessity for cross-sector collaboration.

The success of these initiatives depends on strong regulatory and financial systems supporting them. The Global Climate Hub (GCH) helps coordinate these efforts by providing information and solutions that are based on science and focus on people. Together, these plans and instruments make it possible for a just transition that benefits all.

References

- Anyfantaki, S., Migiakis, P. M., & Pasiou, K. (2022). Green finance in Europe: actors and challenges. *Bank of Greece Economic Bulletin*, (55).
- Blanchard, O., Gollier, C., & Tirole, J. (2023). The portfolio of economic policies needed to fight climate change. *Annual Review of Economics*, 15(1), 689-722.
- CAMERON, B. M. A., Claeys, G., MIDÓES, M. C., & Tagliapietra, S. (2020). A Just Transition Fund-How the EU budget can best assist in the necessary transition from fossil fuels to sustainable energy.
- Climate Policy Initiative – CPI (2021). Global Landscape of Climate Finance 2021.
- Copernicus (2023). Summer 2023: the hottest on record. Copernicus.eu. <https://climate.copernicus.eu/summer-2023-hottest-record>
- ECB, EIOPA, (2023), Policy options to reduce the climate insurance protection gap Discussion Paper. https://www.ecb.europa.eu/pub/pdf/other/ecb.policyoptions_EIOPA~c0adae58b7.en.pdf
- European Commission. (2023a). Horizon Europe: EU Missions. Retrieved from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en
- European Commission. (2023b). NetZero Cities: Towards climate neutral European cities by 2030. Retrieved from <https://www.netzerocITIES.eu/>
- European Commission (2023c). Critical Raw Materials Act Factsheet. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/fs_23_1663
- Gupta, S., Rouse, B. T., & Sarangi, P. P. (2021). Did climate change influence the emergence, transmission, and expression of the COVID-19 pandemic? *Frontiers in medicine*, 8, 769208.
- IMF (2022), *iWorld Economic Outlook 2022*
- Intergovernmental Panel on Climate Change (IPCC). (2023). *Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press. doi:10.1017/9781009325844
- Lafortune, G., Fuller, G., Bermont Diaz, L., Kloke-Lesch, A., Koundouri, P., Riccaboni, A. (2022). *Achieving the SDGs: Europe’s Compass in a Multipolar World*. Europe Sustainable Development Report 2022. SDSN and SDSN Europe. France: Paris.
- Mazzucato, M. (2021). *Mission economy: A moonshot guide to changing capitalism*. Penguin UK.
- MIP4Adapt, <https://climate-adapt.eea.europa.eu/en/mission/the-mission/about-mip4adapt>
- Rodríguez-Pose, A., & Bartalucci, F. (2023). The green transition and its potential territorial discontents. *Cambridge Journal of Regions, Economy and Society*, rsad039.

Sachs J., Koundouri P., Becchetti L., Brunnhuber S., Chioatto E., Cordella M., Devves S., Halkos G., Hansmeyer C., Landis C., Morone P., Patel K., Plataniotis A., Romani I., Spani R., Stavridis C., Tessari F., Theodossiou N., Wetzel D., Zachariadis T. (2022). Financing the Joint Implementation of Agenda 2030 and the European Green Deal. Report of the UN Sustainable Development Solutions Network. <https://resources.unsdsn.org/financing-the-joint-implementation-of-agenda-2030-and-the-european-green-deal>

Tagliapietra, S. (2022) 'REPowerEU: will EU countries really make it work?', *Bruegel Blog*, 18 May

Terzi, A., & Fouquet, R. (2023). The Green Industrial Revolution: Lessons from the History of Past Energy Transitions. In *EconPol Forum* (Vol. 24, No. 06, pp. 16-22). CESifo.

Terzi, A., Sherwood, M., & Singh, A. (2023). European industrial policy for the green and digital revolution. *Science and Public Policy*, scad018.

IEA, A. (2022). 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas. *IEA Online Fuel Report*.

IEA (2023)a. Executive summary - Greece 2023 - Analysis - IEA. IEA. <https://www.iea.org/reports/greece-2023/executive-summary>

IEA (2023)b. Energy Policy Review, <https://www.iea.org/reports/greece-2023>

Appendix - The role of the Global Climate Hub

Against this backdrop, the international scientific community has a material role to play by promoting science-based and human-centric knowledge, developing solutions towards the green transition and co-shape economic and social policy.

The Global Climate Hub (the Hub) is the response of the UN Sustainable Development Solutions Network to the multifaceted challenges posed by climate change, suggesting a transformative approach in existing economic, production and energy systems, supported by scientific research¹⁸. In other words, it acts as an initiative for change, leveraging science-based solutions to drive a holistic and equitable transition towards a more resilient and climate-neutral EU and global system.

The Hosting Institutions of the Hub are the Athens University of Economics and Business (AUEB) and the “Athena” Research and Innovation Centre in Information, Communication and Knowledge Technologies (ATHENA RC), both of which are part of the Alliance of Excellence for Research and Innovation on Aephoria (AE4RIA), an initiative for collaboration between research institutions, innovation accelerators, and science-technology-policy interface networks focused on sustainable development¹⁹.

The Hub consists of nine separate units, each contributing a unique perspective and expertise towards the development of comprehensive and customized strategies for climate neutrality and resilience: 1. Climate Data and Digital Platforms, 2. Atmospheric Physics and Climatology, 3. Climate and Energy Modelling, 4. Climate, Land Use, Water-Food-Energy-Biodiversity Nexus Modelling, 5. Climate and Health, 6. Innovation Acceleration for Climate Neutrality and Resilience, 7. Just Transition, 8. Transformative and Participatory approaches and 9. Education, Training, Upskilling and Reskilling.

What makes this initiative exceptional is its steady commitment to base its recommendations and action plans in the latest scientific knowledge, data, and technologies. By fostering collaboration amongst experts from diverse fields, the Hub ensures that the solutions it proposes are not only innovative but also feasible and applicable to the unique contexts of different countries. At the core of the Hub is the interdisciplinary, science-driven approach regarding the development of sustainable pathways for the medium and long-run. These pathways are then presented to stakeholders as the scientific basis on which to co-design the final pathways to be implemented, using transformation participatory approaches. The final part of the Hub approach entails our work on the socio-economic narrative underpinning the transition pathways, the elaboration of financing schemes and mechanisms for the transition and the allocation of economic and social costs considering the most vulnerable segments of society and the “leave no person behind”.

The GCH's recent report²⁰ evaluates Integrated Assessment Models (IAMs) to inform net-zero pathways, particularly relevant to the EU's energy sector. This includes using the BALMOREL model to project decarbonization scenarios aligned with the Fit-for-55 and RePowerEU initiatives. Furthermore, the report explores renewable energy's role in enhancing ecosystem services in Southeast Asia and uses the FABLE Calculator for sustainable land-use and food system pathways in Greece. These efforts by the GCH

¹⁸ <https://unsdsn.globalclimatehub.org/>

¹⁹ <https://ae4ria.org/>

²⁰ <https://unsdsn.globalclimatehub.org/un-sdsn-global-climate-hub-report-modelling-net-zero-pathways/>

demonstrate the potential for integrating diverse research into coherent environmental, energy, and socioeconomic pathways, underscoring the importance of comprehensive models in guiding financial investments and policy decisions towards achieving net-zero by 2050.

The SDSN Global Climate Hub collaborates closely with national governments and society, aiming to implement these robust action plans and secure a sustainable future. The Hub operates within the frameworks of the UN Agenda 2030 and the Paris Climate Agreement, ensuring its alignment with global sustainability goals and climate commitments.

