Global Megatrends and Major Uncertainties for Green Growth

Data-Driven Roadmaps for Catalyzing Green Growth in Eastern Europe

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1. INTRODUCTION

1.1. The Urgency of Climate and Biodiversity Challenges

Humanity is facing an unprecedented ecological and systemic crisis. According to the Intergovernmental Panel on Climate Change (IPCC, 2023), the opportunity to limit global warming to 1.5°C - a threshold critical for avoiding the most catastrophic impacts - is rapidly closing. Global greenhouse gas emissions must peak immediately and decline by 43% by 2030 to stay within this safe range. Current national policies place the world on track for a temperature rise of 2.5-2.9°C by 2100 (Climate Action Tracker, 2023). At the same time, a significant proportion of citizens, political parties, and governments have consciously chosen to ignore or downplay climate challenges, further reducing the likelihood of collective action at the scale and speed required.

Europe is already experiencing the consequences. The summer of 2023 was the hottest on record, with severe droughts, floods, and wildfires across Southern and Eastern Europe causing over €13 billion in damages and straining health systems and agricultural production (Copernicus Climate Change Service, 2024). These climate shocks are no longer distant risks - they are systemic shocks to the energy system which shape economic and social realities, especially in vulnerable regions with lower adaptation capacity such as parts of Southern Europe.

At the same time, biodiversity - the foundation of natural life-support systems - is collapsing. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2022) warns that over one million species face extinction due to habitat destruction, climate change, and pollution. Nature is not just a source of beauty or inspiration; it regulates our climate, purifies water, secures food supplies, and underpins human health.

Scientific assessments confirm that Earth is already outside its safe operating space. Van Vuuren et al. (2025) project that without stronger action, all planetary boundaries except ozone depletion will worsen by 2050. Implementing the Paris Agreement, shifting to healthier diets, and improving food, water, and nutrient efficiency could ease these pressures and support a more sustainable path. Yet even with such measures, key boundaries – including climate change, biogeochemical flows, and biodiversity – are likely to remain exceeded, reflecting the inertia of Earth systems. The continued degradation of natural capital undermines the very foundations of prosperity, stability, and human well-being (Dasgupta, 2021).

This environmental crisis is unfolding against a backdrop of rising geopolitical rivalry, strategic resource competition, and economic nationalism. The International Energy Agency (IEA) (2024) points to a global trade environment that is increasingly shaped by protectionist industrial policies and fragmentation of value chains - all of which add pressure and complexity to climate action. In this setting, Europe's response must not be incremental; it must be systemic, swift, and strategically anchored.

1.2. Europe's Response and the Central Role in Green Industrial Transformation

The European Union's strategy, as articulated in the European Green Deal (European Commission, 2019) and in the Fit for 55 package (European Commission, 2021), is more than a climate policy. It is a transformative blueprint that links environmental sustainability with industrial competitiveness, economic resilience, and strategic autonomy.

This transformation grew in urgency following the energy price crises of 2021-2022 and the geopolitical shocks which followed Russia's full-scale invasion of Ukraine in 2022. These disruptions exposed Europe's structural vulnerabilities such as its reliance on fossil fuel imports and the fragility of cross-border energy markets in which gas shortages in one country resulted in soaring electricity prices across the EU. The REPowerEU Plan (European Commission, 2022) was developed to phase out Russian fossil fuel imports by accelerating energy diversification, ramping up investment in renewables and energy efficiency and reinforcing the resilience of Europe's integrated market as essential to climate and security.

This logic is reinforced in the European Commission's 2025 Competitiveness Compass, which emphasizes the urgent need to invest in clean technology supply chains, critical raw materials, and infrastructure. The reports by Mario Draghi (2024) and Enrico Letta (2024) argue for a fundamental rethinking of Europe's single market and industrial architecture to boost productivity, reduce dependencies, and seize the green growth opportunity.

The Clean Industrial Deal (European Commission, 2025a) further strengthens this approach by focusing on scaling up European clean technology manufacturing, securing critical raw materials, and reinforcing industrial supply chains to support the net-zero transition. In a world defined by carbon constraints and resource volatility, green growth is not a "nice to have" – it is a geopolitical and economic imperative. This is underscored through the introduction of the Affordable Energy Action Plan (European Commission, 2025d) which intends to lower energy costs, complete the Energy Union, attract investments and increase readiness for potential energy crises.

Security analysts and policy institutions are increasingly linking the green transition to Europe's strategic vulnerabilities. According to the Atlantic Council, Europe's structural

energy dependence represents a critical weakness in an era of great power competition (Judah et al. 2024). Decarbonisation, energy sovereignty, and the development of clean technology are therefore not solely environmental objectives, but strategic imperatives for enhancing economic security and reducing external dependencies. Similarly, the Kiel Institute for the World Economy (2025) highlights that economic resilience and security of supply in the clean tech domain - from batteries to hydrogen - are now core to European strategic autonomy.

The 2024–2029 mandate of the European Commission, under the continued leadership of President Ursula von der Leyen, places industrial competitiveness and the energy transition at the core of the EU's priorities. This "Green Deal 2.0" will aim to strengthen the implementation of earlier commitments while correcting structural bottlenecks and delivering stronger economic coherence across the Union. It will play a pivotal role in achieving the EU target of reducing greenhouse gas emissions by 55% by 2030 (compared to 1990 levels), and the newly introduced ambition by the Commission to reach 90% greenhouse gas emissions reduction by 2040, still pending agreement.

European industry faces an energy cost disadvantage on the global stage. In 2024, average industrial electricity prices in the EU (€0.199/kWh) were more than double those in China (€0.082/kWh) and the United States (€0.075/kWh) (Business Europe). In this context, green industrial policy must be strategically inclusive. It must integrate and leverage the potential of Central and Eastern Europe (CEE), where industrial legacies, and infrastructure needs are still significant, and reduce high and volatile wholesale prices which create a risk of production cuts and capital flight to regions with more affordable energy. Countries like Bulgaria, Estonia, and Romania have the capacity to become regional hubs of green supply chains. This means investing not only in decarbonisation, but also in skills, industrial ecosystems, and export competitiveness. This way, Europe can harness the full diversity of its internal market and become a true global leader in green technologies and sustainable trade.

1.3. Project Context and Objectives

This EUKI project *Data-Driven Roadmaps for Catalyzing Green Growth in Eastern Europe* (2025) focuses on supporting green industrial transformation in three CEE countries: Bulgaria, Estonia, and Romania. Its objectives are to: 1) strengthen domestic green manufacturing and technological capabilities, and 2) foster export-led growth in low-carbon technologies.

The project combines international expertise with national-level engagement of entrepreneurs, policymakers, academia, and civil society. It applies participatory scenario-building, data-driven policy analysis, and roadmap development to guide evidence-based decision-making. In this way, it supports the achievement of climate objectives in CEE by

aligning transition pathways with national industrial structures and creating opportunities for competitiveness and sustainable employment linked to low-carbon technologies.

1.4. Purpose of the Report and Research Methodology

The analysis presented here will directly support the scenario analysis and provide the knowledge base for a policy and industrial transformation agenda in each of the three countries - with broader relevance for the whole CEE.

This STEEPV report - structured around Social, Technological, Economic, Environmental, Political, and Value-based dimensions - serves four main purposes:

- To build a shared, evidence-based understanding of global trends and critical uncertainties impacting the green transition;
- To serve as an analytical foundation for participatory scenario-building workshops in Bulgaria, Estonia, and Romania;
- To identify entry points for green industrialisation and export competitiveness in CEE countries;
- To inform the design of tailored policy roadmaps that are actionable, future-proof, and country specific.

Methodologically, the report is based on the systematic mapping and review of relevant international, European, and national-level reports, complemented by targeted academic and policy studies. The collected materials were subjected to qualitative content analysis in order to extract key drivers, trends, and uncertainties shaping the green transition. To ensure contextual accuracy and policy relevance, the analysis was co-developed by project partners through an iterative process that combined desk research with expert dialogue and cross-country exchanges. This collaborative approach strengthened the robustness of findings and supported the alignment of perspectives across the participating countries.

The remainder of this report is structured around the STEEPV framework, analysing global megatrends and major uncertainties through six interlinked STEEPV dimensions. Each dimension highlights the drivers shaping the green transition, with particular attention to implications for CEE. The report concludes by synthesising these insights, identifying critical uncertainties for scenario-building, and outlining the next steps towards participatory workshops and policy roadmap development.

2. SOCIAL TRENDS

2.1. Global Megatrends Impacting the Green Transition

Polycrisis: The world is currently experiencing a polycrisis—the simultaneous occurrence of multiple, interconnected crises (Lawrence et al., 2024; Davies and Hobson, 2023) - including the pandemic, wars, global tensions, economic pressures, and rising populism. These overlapping challenges have shifted attention away from climate protection towards concerns over defence and economic competitiveness, while leaving large parts of the population overwhelmed and overstrained, which in turn paralyses climate action.

Demographic Shifts: According to the United Nations, by 2050 one in six people globally will be over the age of 65, compared to one in eleven in 2019 (UN, 2020). However, global demographic patterns are diverging: while developed economies - such as Japan, Germany, Italy, or South Korea – face rapid aging, many countries in low-income regions – particularly Sub-Saharan Africa, parts of South Asia, and the Middle East - experience youth bulges. In some countries, these demographic trends limit labour availability in critical sectors.

Intergenerational justice: Demographic shifts exert a profound influence on environmental decision-making. Policymakers – often from older age cohorts – are less likely to experience the long-term environmental consequences of their actions, which can lead to policy outcomes that fail to anticipate the burdens future generations will face. Evidence from Albalate and colleagues (2023) supports this concern: their analysis reveals a negative association between the share of elderly individuals in the population and both the ambition of Nationally Determined Contributions under the Paris Agreement and the intensity of regulatory initiatives, indicating that the rising political influence of older cohorts may indeed temper climate ambition.

Urbanisation and Megacities: Urban areas are growing rapidly – nearly 68% of the world population is projected to live in cities by 2050 (United Nations, 2019), up from 57% of global population in urbanised areas in 2023 (Klein Goldewijk, 2023). Urban centres now account for over 70% of global CO_2 emissions and 75% of global energy consumption (United Nations, 2022). Yet, cities also offer the most viable platforms for green infrastructure deployment, climate-smart transport, energy efficiency, and nature-based adaptation measures. Rapid, well-managed urbanisation can support both mitigation and adaptation efforts, while uncontrolled growth can exacerbate emissions and exposure to climate risks.

Rising Environmental Awareness and Social Movements: Environmental concern in societies remains high. The 2024 *People's Climate Vote* - the largest global survey of climate attitudes - found that 80% of respondents across 77 countries support bold climate action, calling their respective country to strengthen its commitments to address climate change (UNDP & University of Oxford, 2024). However, societal engagement is uneven and varies by income, age, and geography.

Climate-Induced Migration: Slow-onset climate effects – including sea-level rise, desertification, and crop failure – are displacing populations, primarily within national and regional borders. The World Bank estimates that without urgent action, over 216 million people globally may become internally displaced by 2050 (World Bank, 2021). Southern Europe is one of the regions that can experience climate-induced mobility.

2.2. Major Social Trends in Europe and Central and Eastern Europe

Demographic Decline and Workforce Shortages: Most CEE countries face steep demographic decline. According to UN Population prospects, a 19.5% population decrease is projected for Bulgaria between 2025 and 2050. Shrinkages in Romania and the Baltic States are also projected to be stark in that period, with a decline of over 15% foreseen for the former (UN, 2022). This is compounded by persistent emigration, especially of younger and skilled workers, resulting in a shrinking labour force – particularly impacting fields such as manufacturing, construction and engineering. These skills are increasingly required to meet the technological and construction challenges of the green transition and state intervention will be required to manage workforce related challenges (European Training Foundation, 2023).

Urbanisation and Regional Inequality: Urbanisation in CEE continues but still lags behind Western Europe. Cities like Tallinn and Bucharest are expanding, while rural areas face depopulation and underinvestment. Green infrastructure such as solar farms, wind, and biomass facilities is often located in rural or peri-urban areas, where insufficient grid capacity can impede development. Locating projects in previously untouched areas also raises justice concerns and local opposition. By contrast, urban areas are perceived as better prepared for investment. They are responsible for about 70% of all EU green action plans and receive most climate-related funding: 55% of total expenditure and 64% of public investment (Rodríguez-Pose and Bartalucci, 2024). This geographical bias reinforces a dual-speed transition, exacerbating territorial inequalities.

Green Transition Vulnerability and Political Polarisation: Certain CEE regions are among the most vulnerable in Europe due to high carbon intensity, coal dependency, and economic fragility. Weak institutional capacity further limits their ability to absorb transition funding and reforms (Rodríguez-Pose and Bartalucci, 2024). Poorer regions are

also more exposed to transition challenges (Taconet et al. 2020). Southern and Central-Eastern Europe are especially affected, lacking adequate insurance against disasters despite being hotspots for wildfires (Spain, Portugal, Greece), floods (Romania), and storms (Poland). This gap leaves communities to bear the financial weight. Such conditions fuel political backlash. Perceived neglect in declining regions drives populism and anti-system sentiment. In CEE, the overlap of economic stagnation and high transition exposure raises resistance to climate action and deepens political fragmentation (Rodríguez-Pose 2018).

Shifting Societal Attitudes: While climate concern is significant in CEE, behaviour change and political action lag. The *People's Climate Vote* showed strong support for renewables and sustainable transport in Romania and Estonia - particularly among youth – but also revealed scepticism about carbon pricing and energy cost hikes. Younger generations are consistently more supportive of environmental action, indicating a long-term cultural shift, albeit with unclear near-term political consequences.

Migration Pressures: The CEE region is not expected to generate large numbers of climate migrants, but faces uncertainty from rising inbound and outbound flows, including secondary movements from Southern Europe, the Middle East, and North Africa. Such pressures may strain labour markets, social systems, and cohesion in fragile localities. The region also experiences economic outmigration alongside inflows of refugees and displaced persons, notably over 6 million Ukrainians across Europe, many in CEE. Pressures from Turkiye, intensified by shocks such as the 2023 earthquakes in Turkiye and Syria, contribute to further displacements. Within CEE, rural–urban migration is increasing, while newcomers may partly offset agricultural labour shortages in rural areas (International Organization for Migration, 2023).

2.3. Major Social Uncertainties for Europe and Central and Eastern Europe

Will the Green Transition Reinforce or Redress Regional Inequality?

Current patterns of infrastructure investment, workforce readiness, and policy capacity suggest a risk of two-speed transition. If not addressed, this may reinforce territorial divides and foster political polarisation, especially in regions that are both economically vulnerable and highly exposed to transition costs. At the same time, the green transition may intensify social inequality within society, for example when higher income groups benefit disproportionately from subsidies for small-scale photovoltaic installations, or when greenhouse gas taxes impose a relatively heavier burden on lower income households.

Will Demographic Shifts Undermine Labor Availability in Green Sectors?

A shrinking and ageing workforce may limit the scalability of green industries. The success of the green transition will depend on targeted education and retraining, as well as labour mobility within the EU. These require reliable policy roadmaps to attract both workers and companies.

Will Societal Support for Climate Action Withstand Economic and Security Crises?

Economic hardship, energy insecurity, and military conflict in Europe have already lowered the priority of environmental agendas in several Member States. It remains uncertain whether citizens will maintain support for ambitious green policies during such periods.

Can Migration Be Effectively Managed as an Adaptation Strategy?

CEE countries must prepare for a dual challenge: preventing out-migration of skilled labour while managing changing migration patterns of climate-affected populations. Planning and investment in housing, services, and integration will be key to avoiding societal tensions.

3. TECHNOLOGICAL TRENDS

3.1. Global Megatrends Impacting the Green Transition

The technological landscape is changing quickly, creating both opportunities and challenges for the twin digital and green transition. Key global megatrends include:

Advancements in Low-Carbon Technologies: Innovations in solar, wind, energy storage, green hydrogen, carbon capture and storage (CCS), and electrification are central to cutting greenhouse gas emissions across energy, industry, and transport. The International Energy Agency (2021) notes that all technologies needed to achieve significant global emission reductions by 2030 already exist. However, reaching net zero by 2050 will require rapid deployment of technologies not yet commercially available. The IEA estimates that nearly half of the reductions needed by 2050 will depend on technologies still at the demonstration or prototype stage. The greatest innovation potential lies in advanced battery technologies, hydrogen electrolysers, and direct air capture.

Lock-in Effects: These pose a critical challenge for the energy and industrial transition. Large-scale investments in fossil fuel related infrastructure, such as coal-fired power plants, create long-lived assets that shape energy systems for decades. A coal plant built today is likely to remain operational for 30–50 years, locking economies into carbon-intensive pathways and diverting resources away from cleaner alternatives. There are also renewable energy lock-ins, which emerge when new green technologies, infrastructures, and market structures create dependencies that may limit flexibility and hinder alternative sustainable solutions (Eitan and Hekkert 2023).

Digitalisation and AI for Sustainability and Growth: The convergence of digitalisation and clean technologies – driven by AI, IoT, and smart grids – is accelerating low-carbon transformation across sectors. These tools enable predictive maintenance, flexible demand management, and optimised logistics. Smart electrification of transport and heating supports the integration of renewables but also creates specific infrastructure needs, particularly for electricity grids and storage (World Economic Forum, 2022). At the same time, the growing concentration of production among a limited number of suppliers is raising concerns in microelectronics and AI.

Environmental Footprint and Energy Demand of Technology: Emerging technologies such as artificial intelligence and cloud computing play an increasingly important role in green innovation, yet they carry substantial energy demands. According to the International Energy Agency, global data centres consumed between 220 and 320 terawatt-hours (TWh) of electricity in 2022, accounting for roughly 1% to 1.3% of global

final electricity demand. Without intervention, this demand is projected to triple by 2030. The rapid development creates a challenge for energy systems whereby new generation and transmission is built on a much slower timeline than new data centres. Similarly, blockchain networks - such as Bitcoin - consume over 100 TWh annually. If these trends continue without a shift to clean electricity sources, they risk undermining broader decarbonisation efforts. (International Energy Agency, 2023b)

Increasing Demand for Low-Carbon Tech: Global demand for clean technologies is projected to triple by 2035, exceeding USD 2 trillion and creating opportunities to capture market share in clean tech manufacturing. The combined market for solar PV, wind, EVs, and, to a lesser extent, batteries, electrolysers, and heat pumps was valued at USD 700 billion in 2023—four times larger than in 2015 (IEA, 2024).

Global Rivalry in the Production of Low-Carbon Technologies: Global competitiveness remains uneven, shaped by structural cost advantages and government intervention. China dominates across all six major clean technologies, drawing on economies of scale, vertically integrated supply chains, and state support. This gives Chinese producers a significant cost advantage, with EU manufacturing of solar PV, wind turbines, and batteries costing up to 45% more (IEA, 2024). India, while still a net importer, is expected to move quickly up the value chain and could become a net exporter by 2035, specialising in solar PV modules, electric vehicles, and batteries (IEA, 2024). These cost differences risk increasing Europe's dependence on imports, raising concerns for energy security, supply chain resilience, and the EU's ability to capture value from the green transition.

3.2. Major Techonological Trends in Europe and Central and Eastern Europe

The Development of Clean-Tech and AI: The region is under-represented in clean-tech and AI patenting and continues to lag in turning academic research into industrial applications, leaving a gap between innovation potential and market adoption. Enterprises in the CEE region use AI at lower rates than the European average (Eurostat, 2025). This constrains the productivity and environmental benefits of AI adoption. Despite challenges, CEE countries may be able to harness investment in data construction centres, as major players like Microsoft and Google are already investing in nearby Poland and Austria (Research and Markets, 2024).

Technology Sovereignty: The European Union views green technologies as a key area for technology sovereignty, seeking to establish independent value chains such as for batteries through domestic production. This goal is challenged by the established dominance of Asian producers. While European countries have driven innovation in renewable energy technologies such as solar and wind, and gained global market

importance for a time, low-cost production in Asia has made it difficult to sustain market leadership.

Investment in Renewable Energy: Over the past decade, CEE countries have gradually increased their investment in adoption of renewable energy, aligning more closely with EU climate objectives. While initial deployment lagged Western Europe, the region has shown consistent growth in solar and wind capacity, particularly in countries such as Romania, Poland, and Hungary. The Renewable Energy Directive 2023/2413 reinforces this trajectory by setting a binding target of 42.5% renewables in the EU energy mix by 2030, aiming for 45% (European Union, 2023). Infrastructure development must grow rapidly to accommodate new renewable energy sources and the EU has a target to achieve electricity interconnection levels of minimum 15% by 2030, though certain CEE countries have still not met the 2020 targets of 10%. An estimated €584 billion in investments is required by 2030 to fit current grid infrastructure for the energy transition. (European Commission – Electricity interconnection targets; CAN Europe, 2025). Despite the progress, persistent constraints at the infrastructure level (i.e. such as grid bottlenecks, low interconnection levels, and ageing systems) and at the institutional level (i.e. permitting) continue to limit the pace and scale of renewable deployment across the region.

Regional Demand for Clean Tech: CEE is rapidly expanding clean technology deployment, despite starting from a lower baseline than Western Europe (IEA, 2022). Energy security pressures after Russia's invasion of Ukraine, along with the need to modernise ageing infrastructure, have driven investment (European Commission, 2025b). In 2022, CEE wind and solar capacity grew by 28%, above the EU average of 15%. Projections suggest up to 130 GW of solar, 45 GW of onshore wind, and 20 GW of offshore wind by 2030 – a sixfold increase (EMBER, 2023). Industrial decarbonisation is also accelerating, with investment in clean steel, low-carbon cement, renewable hydrogen, and carbon capture technologies (European Commission, 2024a).

3.3. Major Global and European Technological Uncertainties

Pace and Direction of Technological Change: The deployment of new clean technologies, such as hydrogen, carbon capture, utilisation, and storage (CCUS), or advanced materials, remain unpredictable. In some cases, such as for renewable hydrogen, initial enthusiasm (e.g., on hydrogen) has recently moderated as costs, scalability, and technical complexities remain unresolved (International Energy Agency (2024), and competition with direct electrification (such as for transport or heating) for scarce renewable electricity supply remains complex. Furthermore, global demand for space cooling is expected to intensify this challenge as demand is expected to more than triple by 2050, without action to address energy efficiency (International Energy Agency, 2018). Cooling demand is almost

entirely electric and demand during a heatwave can cause electricity prices to abruptly increase (Covatariu, 2025).

In other cases, research and development is still ongoing to address technological challenges, such as the resource consumption of carbon capture. Despite these uncertainties, many of the technologies required for deep decarbonisation, including cleantech, are now mature – and the most significant barrier is instead the need for public support to overcome high “first-of-a-kind" deployment costs and provide supporting infrastructure, for example hydrogen and CO_2 pipelines (Haley et al., 2023).

Emerging Technologies and Societal Acceptance: Emerging technologies, particularly those involving large new infrastructure buildout close to communities, will require a social license to operate. There are examples of projects, such as hydrogen and CCS, being delayed or abandoned due to social resistance, indicating that planning based purely on technical potential is not viable. Alongside technological and regulatory challenges, public perception and regulatory responses can all significantly delay or derail technological pathways (World Economic Forum, 2022). In many cases, the acceptance or resistance to a particular project is not due just to the technology being proposed, but also to the levels of trust in the project promoter, which varies between and within countries depending on the local context. As such, it is very difficult to ascertain the full risk of social resistance to the deployment of clean technologies at a specific location.

Balancing technological and behavioural solutions: Although technological solutions are essential to green growth, they must be matched by wide-ranging behaviour change amongst individual and corporate consumers. First and foremost, a behavioural shift towards new products, such as clean steel and concrete, is crucial to creating a market for what are currently emerging clean products. Policy push will be required to generate this market pull – for example, the EU is seeking to nudge this shift through revision of its procurement rules, making big buyers in government the first clients of clean industrial products. Secondly, increasing consumption efficiency will be required alongside the technological solutions for green growth, if climate targets are to be achieved. Paradoxically, efficiency improvements may increase resource consumption, with the core dilemma lying in balancing technological innovation with fundamental changes required in consumption patterns and economic models.

Physical and Digital Infrastructure Risks: The speed of transition may outpace the upgrading of physical infrastructure (e.g., electricity grids, storage, pipelines for carbon dioxide or hydrogen transport, ports) necessary to achieve green growth. This includes the interconnection of infrastructure, such as electricity networks, which can improve the business case for industrial electrification by smoothing demand patterns across a certain region where renewable energy resources are not evenly distributed (Miu, 2025). In parallel, increased digitalisation of energy and industrial systems, which is essential to

increasing efficiency and deploying key flexibility solutions, increases exposure to cyberattacks, which can disrupt critical infrastructure (International Energy Agency, 2023b).

4. ECONOMIC TRENDS

4.1. Global Megatrends Impacting the Green Transition

The global economic context is a critical driver of the green transition, influencing investment flows, supply chains, and industrial transformation dynamics. While environmental necessity is a major motivator, the green transition is increasingly driven by economic rationale and strategic competition as well. The cost of climate inaction is mounting – for instance, weather climate-related disasters and extremes caused over €162 billion economic losses of assets in the European Union between 2021 and 2023. A statistical analysis of 30 years reveals that such kind of economic losses increased over time in Europe (European Environment Agency, 2023).

Green Industrial Revolution: A worldwide shift towards low-carbon and circular economies is underway. The International Monetary Fund (IMF) estimates that global investment needs to meet climate goals could reach USD 5–7 trillion annually through 2030 (International Monetary Fund, 2022). This "green industrial revolution" is shaping a new global economic order, as government increasingly combine industrial policy with climate and clean energy targets to boost competitiveness.

Reshaping of Global Trade Patterns: Trade flows are increasingly influenced by environmental standards, carbon pricing, and supply chain reconfigurations. Geopolitics – rivalries, alliances and aspirations – are rewiring the global economy and reshaping trade dynamics, leading to a rise in "friendshoring," nearshoring, and regional trade agreements. Emerging markets, especially in the Global South, are playing a growing role in supply chains, not only as sources of raw materials but as producers of more sophisticated goods, including components for green technologies. Additionally, trade between countries in the Global South has doubled between 2007 and 2023 indicating the potential for increasing opportunities for regional economic integration and reducing reliance on traditional trading partners.

The Future of Global Trade Regime: The escalation of protectionist trade policies, particularly in the United States and parts of Asia, is introducing volatility into global markets. Measures such as green (industrial) subsidies, tariffs, and strategic industrial policies are distorting competition and complicating the global diffusion of clean technologies. The Boston Consulting Group in their January 2025 report projects that US-China trade alone may decline by up to 27% by 2033 under high-tariff scenarios, severely impacting trade in low-carbon technologies like lithium batteries, solar panels and electric vehicles (Boston Consulting Group, 2025). The future of global trade regime remains, however, highly uncertain.

Carbon Markets: There is broad scientific consensus that a global carbon price is an effective and efficient tool for combating climate change. In 2023, nearly 25% of global greenhouse gas emissions were covered by carbon pricing, boosted by the 2019 launch of the Chinese Carbon Trading System. Other major regions with carbon pricing include the European Union and Canada, while large emitters such as India, Russia, the Gulf States, and many US states have not yet adopted it. However, globally, carbon price levels remain short of what is needed to meet the Paris Agreement goals. At the same time, disparities in price levels, regulatory oversight, and verification standards continue to limit the effectiveness of voluntary carbon markets and international linkages (Carbon Direct, 2024).

Attraction of Private Investment: Financial markets are a crucial mechanism for mobilising private investment needed for the green transition. The global green bond market exceeded USD 1.8 trillion in cumulative issuance by 2023 (Climate Bonds Initiative, 2023). At the same time, markets have shown unenthusiastic sentiment towards clean-tech and clean-energy stocks in recent years. This reflects concerns about uncertain returns, perceived risks, and persistent fears of greenwashing. As a result, the flow of capital into green investments and technologies has remained below the scale required.

Corporate Climate Commitments Persist Despite Negative Headlines: Contrary to public perception of sustainability fatigue, new data suggest that many firms are continuing to prioritize climate goals. According to PwC's 2025 State of Decarbonization, 47% of companies maintained their decarbonization targets in 2024, while 37% increased their ambition—despite economic uncertainty and political headwinds. Only 16% of firms rolled back climate commitments, indicating that corporate sustainability strategies are proving more resilient than headlines suggest (PwC, 2025). This reinforces a broader trend of climate action becoming embedded in long-term business planning, driven by regulatory pressure, investor expectations, and reputational risk.

4.2. Major Economic Trends in Europe and Central and Eastern Europe

Green Investment and Competitiveness Initiatives: The European Green Deal Industrial Plan and the NextGenerationEU fund are channelling hundreds of billions of euros into green infrastructure, clean tech manufacturing, and innovation. The 2025 EU Competitiveness Compass and Green Deal Industrial Plan highlight main drivers of long-term competitiveness, including investment, innovation, energy availability and decarbonising the economy, reducing dependencies and skills development (European Commission, 2025b).

Cost Pressures of the Green Transition: Transitioning to a green economy entails significant upfront costs. Rising energy prices, raw material scarcity (notably critical minerals), and higher compliance costs with environmental standards are creating

economic pressures, particularly for CEE economies heavily reliant on traditional industries.

Opportunities for CEE in Green Manufacturing and Export: CEE countries have strategic opportunities to become hubs to produce lithium-ion batteries, solar panels, electric vehicles, and renewable energy components. For instance, existing value chains already include major battery manufacturing facilities in Hungary and Poland and photovoltaic component assembly in Bulgaria (Racu and Poliscanova, 2024; Bruegel, 2025). The region benefits from proximity to Western European markets, and relatively low labour costs.

Slow Uptake of Green Finance Instruments in CEE: While green bond issuance has grown across the EU, CEE countries still account for less than 5% of total EU green bond volume. Barriers include underdeveloped capital markets, limited institutional investor participation, and low awareness among SMEs (European Bank for Reconstruction and Development, 2023).

Challenges for Traditional Sectors: Economic decarbonisation in Central and Eastern Europe is driving a shift from historically strong, carbon-intensive sectors such as fossil fuels, forestry, and agriculture toward emerging low-carbon industries. In Estonia, forestry and peat have long provided jobs and value added, yet the LULUCF sector has turned from a carbon sink into a net emitter due to intensive logging. Bulgaria and Romania still rely on coal as a major employer despite EU decarbonisation targets. Agriculture, one of the least digitalised sectors, lags in adopting precision technologies and sustainable practices, limiting productivity and emissions reduction (European Commission, 2024b). These transitions highlight the social and economic challenges in reorienting employment away from traditional resource and energy intensive industries toward new low-carbon technologies.

4.3. Major Global and European Economic Uncertainties

Volatility of Global Trade and Investment Flows: Increasing trade tensions, protectionist measures, and shifting geopolitical alliances introduce significant uncertainty into global investment patterns, affecting supply chains for green technologies. Supply chain diversification strategies, such as China+1 and friendshoring, add resilience to the supply chain, but also can contribute to adding complexity and cost.

Access to Critical Raw Materials: The availability of essential raw materials for batteries, wind turbines, and solar panels remains a key vulnerability. Europe's reliance on imports from geopolitically rival regions poses strategic risks. The EU Critical Raw Materials Act aims to reduce these dependencies, though its effectiveness has yet to be assessed. At present, the EU sources 98% of its rare earth materials for the clean energy sector from

China (Mariev and Blueschke, 2025). The EU is currently trying to diversify its trade agreements for sourcing critical raw materials, most recently through the selection of 13 Strategic Projects for strategic raw materials. The projects are based in countries such as Canada, Greenland, Kazakhstan and the Ukraine, and target a range of materials including those essential for electric vehicles and batteries, as well as rare earth elements (European Commission, 2025c). Meanwhile, global demand for critical raw materials is expected to rise sharply.

Distributional Impacts of the Green Transition: The economic benefits of the green transition may not be evenly distributed. Regions dependent on carbon-intensive industries could experience economic downturns, leading to social tensions and political resistance.

Cost of Capital and Inflation: Rising interest rates and persistent inflation could constrain public and private investment capacities for green infrastructure and innovation, particularly in economically weaker regions of Europe. Recently, several major green economy projects in Europe and around the worlds have been called off, citing economically unfavourable conditions and rising cost of capital.

Prioritisation of Security over Climate Goals: Considering heightened security threats since 2022, defence and energy security spending are increasing across Europe. The reprogramming of the EU budget for the 2028-2034 period is also foreshadowing a streamlining of funding programmes into several “superfunds” aligned with the Union’s main priorities (industrial competitiveness, foreign policy, and regional cohesion). There is a fear that this may divert public investments away from climate action priorities. However, there are opportunities to leverage defence and security priorities for green growth – for example, by growing a robust European supply of low-emissions steel for defence equipment manufacturing and railway infrastructure investments to increase civilian and military mobility, or by increasing interconnectivity within the Union to better weather energy price shocks.

5. ENVIRONMENTAL TRENDS

5.1. Global Megatrends Impacting the Green Transition

Environmental dynamics are a foundational driver of the global push towards a low-carbon economy. The intensification of climate-related risks and environmental degradation shapes economic, political, and technological developments worldwide.

Acceleration of Climate Change: The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) confirms that climate change is widespread, rapid, and intensifying. Without deep reductions in carbon dioxide and other greenhouse gas emissions, limiting warming to 1.5°C or even 2°C as set in the Paris agreement will be beyond reach. The impacts of climate change are increasingly severe, including rising sea levels, extreme heatwaves, prolonged droughts, and stronger storms. Extreme wildfire activity has more than doubled worldwide and fire season is getting longer and subsequent emissions are rising (NASA, Wildfires and Climate Change). These changes threaten critical infrastructure, agricultural productivity, water supply, and public health (IPCC, 2022a).

Crossing Planetary Boundaries: Research by Richardson et al. (2023) indicates that six of the nine planetary boundaries - including climate change, biosphere integrity, and freshwater use - have already been transgressed. These transgressions increase the risk of large-scale, irreversible environmental changes that could destabilize Earth systems and human societies; in other words, these findings suggest that Earth is now well outside of the safe operating space of humanity. Building on this work, van Vuuren and colleagues (2025) project that without stronger environmental action almost all planetary boundaries will worsen by 2050, and even under ambitious sustainability pathways, several – including climate change, biodiversity and biogeochemical flows - will stay transgressed due to inertia in Earth and social systems.

Rise of Nature-Based Solutions: There is growing recognition of the role of ecosystems in mitigating climate change and enhancing resilience. Initiatives such as the UN Decade on Ecosystem Restoration are promoting reforestation, wetland restoration, and regenerative agriculture to restore natural carbon sinks and biodiversity. Nature-based solutions (NBS) also offer critical co-benefits—protecting against floods, improving water security, and supporting livelihoods. Notably, NBS have increasingly been applied in urban areas (IPCC, 2022a). The Dasgupta Review (2021) highlights that natural capital should be treated as a productive economic asset (such as contributing to ecosystem-based adaptation efforts), and underinvestment in nature weakens both ecological and financial resilience.

Biodiversity Loss: The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment underscores the severity of biodiversity decline, noting that one million species are at risk of extinction due to human activities. This erosion of biodiversity undermines critical ecosystem services - such as pollination, water purification, and climate regulation - that are essential to economic well-being and human survival (IPBES, 2022). The Dasgupta Review (2021) emphasizes that biodiversity is an economic asset, and its loss represents a systemic risk to long-term prosperity. The 2023 Planetary Boundaries update finds that biodiversity integrity - measured both by extinction rates and functional capacity - is among the most critically transgressed Earth system boundaries. Restoring biodiversity is therefore not only an ecological necessity but a foundation for planetary stability (Richardson et al., 2023).

5.2. Major Environmental Trends in Europe and Central and Eastern Europe

Climate Risks in CEE: Europe is warming at more than twice the global average. CEE countries are increasingly exposed to extreme heat, drought, and flood risks. IPCC projections expect Eastern Europe to experience increased flooding from rainwater in case of global warming increase to 1.5°C and an increase in fire weather should global warming increase to 2°C (IPCC, 2022b). According to the European State of the Climate Report, Southern Europe is particularly vulnerable to heatwaves and wildfires and, according to World Weather Attribution (2025), neighbouring Turkiye, Greece and Cyprus have already experienced a 22% increase in wildfire intensity. Southeastern Europe has been already badly affected by climate risks – it experienced its longest heatwave on record in July 2024, lasting 13 consecutive days and affecting 55% of the region (World Meteorological Organisation, 2025).

Water Stress and Soil Degradation: Several countries in Southern Europe, but also in CEE regions suffer from chronic water stress and deteriorating soil quality, worsened by unsustainable agricultural practices and climate change. Several river basins including Danube, Tisza and Prut are showing signs of hydrological stress which is expected to increase as competition for freshwater grows. Southeastern Europe is expected to experience degradation in the form of water and wind erosion, reduction of soil fertility and water retention which will worsen resilience to drought and flooding (Food and Agriculture Organisation of the United Nations, 2015). Water efficiency, drought-resistant crops, and soil regeneration practices are increasingly being integrated into EU policy frameworks.

Renewable Energy and Land Use Conflicts: The expansion of wind and solar farms in CEE, while critical to decarbonisation, can lead to land use conflicts, especially in ecologically sensitive or agriculturally valuable areas. Strategic land-use planning and environmental impact assessments are vital to balancing energy transition and biodiversity protection.

Countries with higher-than average proportion of Natura 2000 protected areas, many of which are in CEE, including Bulgaria (35%) and Romania (23%) may face challenges (European Environment Agency, 2025).

5.3. Major Global and European Environmental Uncertainties

Potential Tipping Points: Climate science warns of approaching tipping points—thresholds beyond which major and potentially irreversible changes in the Earth system may occur. These include polar ice sheet collapse, Amazon rainforest dieback, and disruption of the Atlantic Meridional Overturning Circulation (AMOC). If triggered, such shifts could accelerate global warming through self-reinforcing feedback loops, potentially leading to runaway climate change. These events carry global consequences and are difficult to model or predict precisely, partly because interacting tipping elements could produce a "tipping cascade" of compounding impacts (Lenton et al., 2019; Armstrong McKay et al., 2022).

Ecosystem Recovery Rates: The restoration of degraded ecosystems is not always predictable. Recovery often faces significant time lags, and ecosystems may not return to their original state if key thresholds have been crossed e.g. in species composition, soil quality or hydrological balance.

Competition between Land Uses: As demands for land grow - for renewable energy, food, carbon sequestration, and habitat protection - conflicts between competing uses are likely to intensify. Integrated spatial planning is essential to manage these trade-offs effectively; if not managed though participatory and just governance frameworks, land-use competition might pose a systemic risk to both mitigation and adaptation.

6. POLITICAL AND POLICY TRENDS

6.1. Global Megatrends Impacting the Green Transition

The political and policy landscape is rapidly evolving, reshaping the green transition and influencing the ability of European regions to capitalize on emerging green growth opportunities.

Fragmentation of Global Governance: Multilateral institutions are facing increased strain as geopolitical tensions rise. Diverging national interests, particularly regarding climate governance, have led to fragmented approaches and weakened collective action. Recent events, such as the U.S. withdrawal from the Paris Agreement and disputes over climate finance at COP29, highlight the challenges in achieving unified global responses to climate change. Furthermore, tensions between the EU and Russia or China complicate consensus. Regional blocs like BRICS are gaining influence, and climate diplomacy within the UNFCCC framework has become more contested and politicized.

Populism: Populist parties are gaining larger shares in the national parliaments of many EU member states, complicating cooperation within Europe and hindering democratic action on climate change mitigation. As a result, EU strategies aimed at ambitious climate policies and leadership in green markets are weakened, contributing to a further decline in public trust.

Conservative Backlash: Economic pressures and uncertainties strengthen support for conservative political forces investing less effort in decarbonization and environmental policies in general. Besides slowing down the green transition, this leads to companies becoming hesitant to invest into green technologies when facing insecurity and unreliability in climate and environmental policies.

Use of Trade Policy to Advance Climate Goals: Governments are integrating climate objectives into trade policies through instruments like carbon border adjustment mechanisms (CBAMs), green subsidies, and import regulations on high-emission goods. These measures aim to drive decarbonisation globally while protecting domestic industries (European Commission, 2023a; European Commission, 2023b).

Security Overriding Climate Priorities: Heightened military tensions and global supply chain disruptions, notably since 2022, have shifted attention towards energy security and defence resilience. While not eliminating climate action, this reordering of priorities often delays or complicates green policy implementation.

Rise of Green Industrial Strategies: The EU, United States, and China are all pursuing assertive green industrial policies, to some extent marking a strategic shift from market-led to state-led green transition with heavy geopolitical undertones. China has emerged as the dominant player, especially in solar photovoltaic manufacturing and electric vehicles, controlling around 80% of global solar module production and a significant share of battery supply chains. This raises competitiveness concerns in the EU and US, accelerating policy responses such as the EU Green Deal Industrial Plan and the US Inflation Reduction Act (OECD, 2024). These industrial strategies reflect a new phase of climate policy being increasingly linked to geopolitics – while they might accelerate innovation, they also risk subsidy races, trade tensions and the exclusion of less-developed, lower-income economies.

6.2. Major Political and Policy Trends in Europe and Central and Eastern Europe

Implementation of the European Green Deal and Fit for 55: The EU continues to advance the European Green Deal and its operational package, Fit for 55, even amid economic and geopolitical shocks. These frameworks set binding targets for emissions reduction (55% by 2030), renewable energy share (42.5% by 2030), and improved energy efficiency (European Commission, 2023a). Some Member States in CEE face particular challenges in meeting these goals due to higher energy intensity and historically high dependency on fossil fuels, prompting the need for targeted support.

Introduction of the Carbon Border Adjustment Mechanism (CBAM): Introduced in 2023, CBAM applies a carbon price to selected imports, aiming to prevent carbon leakage and level the playing field for European industries. CEE industries exposed to global markets (e.g., steel, cement, fertilizers) will need to adapt quickly to remain competitive (European Commission, 2023a).

Strategic Sovereignty and Reindustrialisation: The Draghi Report reflects growing EU concern over competitiveness and overreliance on foreign supply chains. It recommends reforming fiscal rules to allow large-scale investment in clean tech and digital infrastructure, especially in lagging regions. However, there is a risk that investment continues to concentrate in large and well-off cities, deepening divides, unless state aid and cohesion funding are more strategically aligned (Draghi report 2024).

Governance capacity gaps in CEE countries present notable obstacles to advancing the green transition. Constraints such as limited administrative resources and capacities, fragmented institutions, and political turnover can delay renewable energy projects and complicate the enforcement of environmental standards. Limited stakeholder engagement may also reduce policy coherence and societal support.

Institutionalisation of Biodiversity Valuation and Ecosystem Services in EU Policymaking: The EU Biodiversity Strategy for 2030 and the Nature Restoration Law integrate natural capital valuation and ecosystem service accounting into governance frameworks. This approach enhances policymaking and private sector reporting by linking environmental assets to socio-economic outcomes (European Commission, 2023b).

6.3. Major Global and European Political Uncertainties

Durability of Climate Commitments Under Geopolitical Pressure: Changing political leadership in key countries and across the EU may affect the longevity of climate policies. Economic downturns affecting public opinion or security crises could deprioritize environmental goals.

Policy Alignment Between Different Regions in the EU: Disparities in economic development, institutional capacity, and political culture can lead to diverging preferences for climate ambition and burden-sharing, both between different EU countries, but also an a sub-national level (e.g., rural-urban divide), the extent of which is hard to predict, but will have major repercussions on the EU's overall political ambition of green transition.

Impact of Global Trade Conflicts on Climate Cooperation: Rising tensions between the EU, China, and the US may complicate international climate finance, technology transfer, and the formation of joint standards.

Effectiveness of the Green Deal Industrial Plan: Delivering on the promises of reindustrialization and clean tech leadership requires overcoming bureaucratic delays, state aid disparities, and mismatched skills in the labour market. EU's potential in bringing down energy prices to more aligned level other major industrialised countries also plays a role in determining the success of European industry.

Public Support and Social Acceptance of Climate Policies: Economic hardship and unequal distributional impacts of climate policies may trigger protests and erode support, particularly in regions most affected by industrial restructuring.

7. VALUES

7.1. Global Megatrends

Growing Societal Emphasis on Climate Justice: There is increasing global recognition of the ethical imperative to act on climate change for the benefit of future generations. Youth-led movements, such as Fridays for Future, and indigenous climate leadership have propelled climate justice into international political discourse. The IPCC (2023) underscores that equitable climate action is central to resilience and long-term sustainability. Climate action is also increasingly recognised by courts, as illustrated by quite a few significant wins in climate litigation cases brought before the court, especially in youth climate cases (Drugmand, 2024).

Willingness to support climate action: Andre and colleagues (2024) show a global shift in values towards climate action: 69% of respondents across 125 countries expressed their willingness to contribute 1% of their household income to address global warming, 86% expressed approval of pro-climate social norms and 89% demand intensified political action. Yet, there is a disconnect between actual willingness to contribute and perceived willingness of others to do the same: although 69 % said they would personally contribute, respondents believed on average that only 43 % of others would do the same. Such misperceptions risk slowing coordinated action, underscoring the importance of raising awareness of the actual extent of public support to unlock stronger and more confident public engagement in climate mitigation.

Changing Consumer Behaviour Towards Sustainability and Ethical Consumption: Consumer preferences in Europe and globally are shifting measurably toward sustainability-driven choices, with implications for product design, supply chains, and brand positioning. A NYU Stern Center for Sustainable Business (CSB) & Circana report found out that sustainable products held 18.5% of the market share in consumer-packaged goods, with an increase of 1.2 points as compared to the last year. Moreover, the sustainable products markets share has increased by 4.8 points since 2015 (NYU Stern Center for Sustainable Business, 2024).

The trend towards sustainability-driven choices is especially pronounced among younger consumers, who increasingly prioritize transparency, ethical sourcing, and climate impact when making purchasing decisions. (McKinsey & NielsenIQ, 2023).

Demand is rising for carbon labelling, ethical sourcing, circular economy business models, and transparency across supply chains.

7.2. Trends in Europe and Central and Eastern Europe

Shifts in Cultural and Societal Values Towards Sustainability - with Regional Differences: A growing number of Europeans view environmental protection as a personal and civic responsibility, the translation of those values into behaviour – such as paying more for sustainable products or supporting strong climate regulation – still shows variance across the continent. For instance, Eurobarometer (Eurostat, 2024) reveals notable East-West differences for instance when it comes to paying a higher price for more sustainable products. In contrast, CEE countries, while aware of environmental issues, often prioritise affordability and economic stability. Lower income levels, higher energy poverty, and historically linked distrust in public institutions can dampen willingness or ability to engage in pro-environmental behaviours, even where concern exists.

7.3. Major Uncertainties

Will Sustainability Values Strengthen or Fragment Under Economic, Political, and Security Crises? Sustainability agendas may face backlash or erosion in times of inflation, war, or economic recession. As public attention shifts toward short-term stability, long-term climate action could be deprioritized.

Pace at Which Societal Values Drive Actual Behavioural and Policy Change: Although surveys suggest rising environmental awareness, this does not always translate into changes in consumer habits, political preferences, or regulatory support. Institutional inertia and cost considerations often slow progress.

Will "Green" Values Converge Across EU Societies, or Will Gaps Widen? Diverging economic trajectories, media narratives, and historical legacies may deepen value-based divisions within Europe, potentially undermining cohesive EU climate governance.

8. CONCLUSION AND NEXT STEPS

8.1. Synthesis of Key Findings

The STEEPV analysis has shown that the global green transition is unfolding within a complex and volatile environment, shaped by both accelerating megatrends and heightened geopolitical, economic, social, environmental, and value-based uncertainties.

Continued Global Green Transition: At the industry level, momentum toward decarbonisation continues across technologies, markets, and societies. The rapid rollout of low-carbon technologies, such as solar panels and electric vehicles, alongside growing competition with geoeconomic rivals, signals a clear shift toward net-zero economies. Yet this technological progress is uneven, with Asia maintaining cost and scale advantages in production. For Europe, the challenge is not only sustaining research and innovation activities but also translating it into resilient value chains.

Heightened Geopolitical and Market Uncertainties: The global political and economic landscape is becoming more fragmented. Rising protectionist policies, particularly trade measures targeting strategic sectors, coupled with renewed security concerns in Europe, introduce major risks that may slow or distort the green transition. These uncertainties also increase volatility in trade, access to critical raw materials, and investment flows, creating vulnerabilities for clean-tech supply chains.

Environmental Pressures and Climate Risks: The transition is taking place against accelerating climate impacts and environmental degradation. Southern and Eastern Europe are already experiencing severe droughts, floods, and wildfires, while planetary boundaries such as climate change, biodiversity and biogeochemical flows remain exceeded, bringing the Earth outside its safe operating space. These escalating risks increase the urgency of rapid decarbonisation and adaptation but also highlight potential tipping points that could undermine long-term resilience. The environmental dimension underscores that delay or fragmentation in transition policies carries not only economic and political costs but existential risks.

Social and Value-Based Dimensions: In developed economies, the social dimension of the transition is marked by demographic decline and rising migration pressures from neighbouring regions. Vulnerable areas face greater exposure to climate risks and fewer resources to manage them, fuelling discontent and in some cases political polarisation. At the same time, societal support for climate action remains high, especially among younger generations, though scepticism toward costs and instruments such as carbon pricing persists. The values dimension is therefore critical: whether Europe's citizens continue to

view climate action as a priority amid economic and security crises will strongly influence the long-term trajectory of the transition.

Europe's Position and Internal Tensions: Europe's leadership in setting global environmental standards (the "Brussels effect") remains strong. However, internal divisions, growing energy security priorities, and potential trade-offs between security and climate objectives add significant uncertainty to the Green Deal's successful implementation. Moreover, investment continues to concentrate in stronger regions and major cities, raising the risk of a "dual speed" transition that exacerbates territorial inequalities.

Central and Eastern Europe's Role: Bulgaria, Estonia, and Romania – while well-positioned to benefit from new green technologies – face persistent structural challenges: lower innovation capacity, demographic decline, skills shortages, and weaker readiness to absorb green investment. Traditional sectors such as coal, forestry, and agriculture remain significant employers, complicating economic diversification. Yet the region has opportunities to become a hub for clean-tech production and exports if supported by targeted policies, infrastructure upgrades, and workforce development.

Overall Synthesis: The findings highlight a paradox: while technological and industrial momentum toward net-zero is clear, geopolitical fragmentation, environmental shocks, regional disparities, and contested societal values create uncertainty over the pace and equity of the transition. Europe's ability to balance competitiveness, security, and justice will determine whether the green transition strengthens cohesion and resilience, or deepens divides both within the EU and globally.

8.2. Critical Uncertainties Identified for Scenario Building

The STEEPV analysis highlights multiple areas of uncertainty that will shape the pathways of the global and European green transition. For scenario development, at least six clusters of uncertainty merit attention:

Stability of Climate Commitments Amid Geopolitical and Security Crises

- Political instability, renewed security imperatives, and shifting budgetary priorities may reduce the weight given to long-term climate objectives.
- This could result in delays, dilution, or reorientation of transition policies in Europe and globally.

Future of Global Trade and Protectionism

- The evolution of global trade regimes will strongly affect supply chains for environmental goods.
- A shift toward stronger regionalisation could create new opportunities for intra-European supply chains, while also raising barriers for access to external low-carbon tech markets and critical raw materials.

Evolution of Technological Leadership in Green Industry

- The pace of technological development and adoption, including Europe's ability to sustain leadership against the US and China, remains uncertain.
- Deep tech, digitalisation, and new energy technologies will be pivotal for competitiveness and export potential, but their diffusion depends on infrastructure, finance, and societal acceptance.

Scale and Timing of Environmental Shocks

- Intensifying climate risks – heatwaves, floods, droughts, and wildfires – may accelerate demand for adaptation and resilience, or alternatively overwhelm policy capacity.
- Global tipping points (e.g. slowdown of Atlantic Meridional Overturning Circulation, biodiversity collapse) represent a systemic uncertainty with cascading economic and social consequences.

Social Cohesion, Migration, and Demographics

- Labour shortages, ageing populations, and outmigration of skilled workers create uncertainty around CEE's capacity to support a green industrial base.
- At the same time, migration inflows from climate-affected regions or neighbouring conflicts may alleviate workforce gaps but also strain social systems and cohesion.

Societal Support and Value-Based Divides

- Public willingness to accept transition costs, trust in institutions, and generational differences in climate concern are decisive.
- A critical uncertainty is whether societal support for climate action can withstand economic hardship, energy insecurity, or populist mobilisation.

8.3. Next Steps

Following the STEEPV analysis, the EUKI project *Data-Driven Roadmaps for Catalyzing Green Growth in Eastern Europe* (2025) will move into a new phase centred on scenario development, design of roadmaps, and knowledge transfer. The first step will be a structured consultation with stakeholders to prioritise the most critical uncertainties. This process will identify the two drivers that are both highly impactful and highly uncertain, which will serve as the axes for scenario planning.

On this basis, participatory scenario-building workshops will be launched in Bulgaria, Estonia, and Romania, engaging entrepreneurs, policymakers, academia, and civil society. These workshops will develop three to four distinct future scenarios for the green industrial transition and export strategies, while also testing which strategies prove robust across multiple possible futures.

The insights generated will then be translated into concrete outputs: policy guidelines for governments, business strategies to strengthen green sector development and exports, and investment priorities aligned with plausible future contexts. A strong emphasis will be placed on fostering cross-border cooperation within the CEE region to maximise synergies and scale.

Finally, the project will ensure broad dissemination and spillover of results. Findings will be shared with other European countries through regional workshops, policy briefs, and targeted knowledge-transfer initiatives. This will support coordinated efforts to enhance the export potential of low-carbon technologies from Central and Eastern Europe and ensure that the lessons learned extend beyond the three focus countries.

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