The European Green Deal Industrial Plan: Risks and Opportunities. The Chances of the Romanian Economy

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***Abstract*.** The European Green Deal Industrial Plan (EGDIP), announced by the European Commission to the other institutions and bodies of the European Union on 1 February 2023, aims to achieve a carbon-neutral European community by 2050 by transforming production and consumption paradigms.
Main objectifis of the study aimes to describe the objectives, methods, and means of the EGDIP, to assess its chances of success about the challenges and risks it entails, to analyze the geopolitical and international policy implications of the European Union and to provide a case study on the stage Romania is in assuming and implementing this plan. The most important results are to nuance the official text, drawing attention to the needs for coordinating objectives and means with other major global industrial players, distributing efforts in a fair proportion to the current carbon emissions of national economies in the European Union, and adjusting national contributions (financial in the first place) to the real possibilities of economies in crisis. In the case of Romania, we will note the incipient degree of addressing the EGDIP objectives by the central authorities and the relatively more advanced level of involvement of economic agents, in a context in which Romania already produces low carbon emissions - correlated with the small size of the industry in question and the systematic closure of coal mines. The significance of the results obtained is summed up in completing and refining the theoretical foundations on which EGDIP is based, formulating signals and warnings regarding risks and challenges in the implementation of the project – which can help decision-makers and their advisors, university professors, and researchers in the formulation of policies, but can also contribute to additional information for journalists and public opinion.
***Keywords*:** The European Green Deal Industrial Plan, greenhouse gas emissions, net-zero emissions industry, energy transition, decarbonization.

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Planul Industrial al Pactului Verde European: riscuri și oportunități. Șansele economiei românești

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Abstract. Planul Industrial al Pactului Verde European (PIPVE), anunțat de către Comisia Europeană celorlalte instituții și organe ale Uniunii Europene implicate, la data de 1 februarie 2023, vizează realizarea unei comunități europene neutre din punct de vedere al emisiilor de carbon până în anul 2050, prin transformarea paradigmelor de producție și consum. Cercetarea noastră își propune să descrie obiectivele, metodele și mijloacele PIPVE, să evalueze șansele sale de succes prin raportare la provocările și riscurile pe care le implică, să analizeze implicațiile geopolitice și de politică internaționale ale Uniunii Europene și să ofere un studiu de caz referitor la stadiul în care se află România în asumarea și implementarea acestui plan. Cele mai importante rezultate vor consta în nuanțarea textului oficial, atrăgând atenția asupra nevoilor de coordonare a obiectivelor și mijloacelor cu ceilalți mari actori industriali globali, repartizarea eforturilor în proporție corectă cu emisiile actuale de carbon ale economiilor naționale din Uniunea Europeană, acomodarea contribuțiilor naționale (financiare în primul rând) cu posibilitățile reale ale unor economii aflate în criză. În cazul României, vom constata gradul incipient de abordare a obiectivelor PIPVE de către autoritățile centrale și nivelul relativ mai avansat de implicare a agenților economici, într-un context în care România produce deja emisii de carbon scăzute – corelate cu dimensiunea redusă a industriei de profil și închiderea sistematică a minelor de cărbune. Semnificația rezultatelor obținute se rezumă la completarea și nuanțarea bazelor teoretice pe care se sprijină PIPVE, pe această bază formulând semnale și avertizări cu privire la riscuri și provocări în implementarea proiectului – care pot ajuta decidenții și consilierii lor, profesorii universitari, cercetătorii și în formularea politicilor, dar pot și contribui la informarea suplimentară a jurnaliștilor și opiniei publice.

***Keywords*:** Planul Industrial al Pactului Verde European, emisii de gaze cu efect de seră, industrie cu emisii nete zero, tranziție energetică, decarbonizare.

Промышленный план Европейского зелёного курса: риски и возможности. Перспективы для румынской экономики

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Abstract. Промышленный план Европейского зелёного курса (ППЕЗК), представленный Европейской комиссией другим институтам и органам Европейского союза 1 февраля 2023 года, направлен на достижение углеродной нейтральности Европейского сообщества к 2050 году посредством трансформации парадигм производства и потребления. Целью нашего исследования является описание целей, методов и инструментов ППЕЗК, оценка его перспектив на успех с учётом рисков и вызовов, а также анализ геополитических и международно-политических последствий реализации плана для Европейского союза. Кроме того, работа содержит тематическое исследование, посвящённое текущему состоянию реализации ППЕЗК в Румынии. Наиболее значимые результаты будут заключаться в уточнении и интерпретации официального текста плана, с акцентом на необходимость координации целей и инструментов с другими ведущими мировыми промышленными акторами, справедливом распределении усилий между странами ЕС пропорционально их текущим выбросам углерода, а также в необходимости согласования национальных (прежде всего финансовых) вкладов с реальными возможностями экономик, находящихся в состоянии кризиса. В случае Румынии будет выявлено начальное участие центральных властей в реализации целей ППЕЗК и, напротив, более активное вовлечение экономических агентов, при том что уровень выбросов углерода в стране уже сравнительно низок — что объясняется как ограниченными масштабами профильной промышленности, так и последовательным закрытием угольных шахт. Научное значение полученных результатов заключается в дополнении и углублении теоретической базы, на которой основывается ППЕЗК, а также в формулировании предупреждений и сигналов относительно рисков и вызовов его реализации. Эти выводы могут быть полезны как для политиков и их советников, так и для университетских преподавателей, исследователей, а также для повышения информированности журналистов и широкой общественности.

***Keywords*:** Промышленный План Европейского зелёного курса, выбросы парниковых газов, углеродно-нейтральная промышленность, энергетический переход, дыекарбонизация.

INTRODUCTION

The European Green Deal Industrial Plan (EGDIP), communicated on 1 February 2023 by the European Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, and the Committee of the Regions [1], constitutes an essential component of the European Union's climate and economic strategy. The Industrial Plan declares as a fundamental objective the facilitation of the transition to a net-zero emissions economy, in line with the commitments undertaken under the *Paris Agreement* and the *Fit for 55* legislative framework [2]. In a context where European industry is responsible for a significant proportion of greenhouse gas emissions, particularly in energy-intensive sectors such as steel, cement, chemicals, and aluminium production, the need for a profound transformation becomes imperative not only for environmental reasons but also for reasons of competitiveness and economic security.

The plan aims to strengthen the European Union's industrial capacities in the field of clean technologies and foster open strategic autonomy by creating a conducive framework for innovation, green investments, and sustainable industrial relocation. Through four main pillars (a predictable and simplified regulatory framework; rapid access to financing; skills development; opening up fair international markets) the Industrial Plan aims not only to decarbonize productive sectors, but also to create a coherent industrial ecosystem, capable of responding competitively to global pressures, including those coming from the *Inflation Reduction Act* [3].

More than two years after the official launch of the EGDIP project, its scientific research remains inexplicably superficial. Research programs and projects are almost missing. Very few volumes published after 2023 by prestigious publishers (one each from Routledge, Palgrave Macmillan, and Edward Elgar - quotes below) address more general themes than EGDIP, without being specifically dedicated to it. Articles in scientific journals barely approach the phenomenon, in broad contexts that are rarely specifically dedicated to it. We lack applied research products, such as impact reports and policy proposals. And where there are analytical references to EGDIP, they focus less on risks and challenges, with positive assessments prevailing.

In these circumstances, the bibliography we start from inevitably belongs to the chapter on official documents. We propose to inventory and detail them where appropriate, as support to signal a set of challenges and risks that the implementation of EGDIP implies. We will further concretize these challenges and risks in the case of Romania, so that our research can also be a benchmark for political-administrative decision-makers in Romania (possibly an example for decision-makers in other European Union member states) about the need to have technical solutions to prevent socio-economic imbalances and to optimize implementation costs, compared to benefits.

METHODS, RESULTS, AND DISCUSSION

In describing and explaining the European Green Deal Industrial Plan (EGDIP), the risks and opportunities in its implementation, but also the possibilities of application in the case of Romania, we will use, in a successive or intersecting manner, the following research methods:

- Causal analysis, where we will identify the system of causes as well as the sum of the consequences, which we will evaluate;
- Document analysis, focused on the official text, to understand its form, content, capacity, and interests of the issuer, recipients, and beneficiaries;
- Comparative analysis, which will mirror risks and opportunities, trying to approximate the priority of some or others;
- Quantitative analysis, which will lead to synthetic tables in which we distinguish the evolution over time of certain phenomena (carbon emissions, the evolution of mining operations, or the evolution of projects for the use of green hydrogen – all in Romania);
- The case study investigates in significant detail the status and capacity of Romania to implement the EGDIP objectives.

At the end of applying this methodological system to existing data (official documents and very few analytical approaches that respect the rules of scientific research), we aim to obtain a superior clarification regarding the objectives, means and expected results of the EGDIP implementation at European level, a consistent signal regarding the risks and challenges to be resolved during implementation, to signal the geopolitical consequences of the project and to exemplify through the Romanian case the need to adapt the objectives and means to the national specifics.

These results may be useful not only to administrative officials from all structures and levels involved in the formulation and implementation of EGDIP policies, but also to university professors and researchers in the field of energy policies, interested journalists, and the public in general.

SOME ESSENTIAL LANDMARKS OF THE EUROPEAN GREEN DEAL INDUSTRIAL PLAN

This industrial transformation involves the large-scale integration of net-zero technologies, such as carbon capture and storage, industrial use of green hydrogen, development of renewable energy sources, digitalization of production processes, and the circular economy. In parallel, the plan supports the development of supply chains for critical raw materials and stimulates local production of essential green equipment, from photovoltaic panels and batteries to wind turbines and heat pumps. Thus, the EGDIP is not just an environmental project, but a systemic reconstruction of the European industrial model, oriented towards resilience, innovation, and long-term sustainability [4, p. 98].

At the same time, the implementation of the EGDIP involves a complex process of technological, economic, and institutional restructuring, with profound implications for all productive sectors in the European Union. In this context, the identification and analysis of risks, but also of opportunities associated with the transition to a net-zero emissions industry, become essential for underpinning public policy decisions and ensuring the social and economic sustainability of this process.

The opportunities generated by this plan are considerable and multifaceted. First, the green transition can stimulate a European industrial renaissance by promoting clean technologies and high-value-added production, positioning Europe as a global leader in strategic areas such as green hydrogen, sustainable energy storage batteries, digitalisation, and energy efficiency. At the same time, the plan promises to create a favorable framework for innovation, with beneficial effects on start-up ecosystems, research centers, and public-private collaborations. Secondly, a significant increase in employment in green sectors is expected, but conditional on the adequate development of skills through active vocational training policies. In addition, reducing dependence on fossil energy sources and raw materials imported from authoritarian states

offers the opportunity to strengthen European strategic autonomy and economic resilience [5].

The analysis of the EGDIP is required not only as a topical approach but as a scientific and strategic necessity, as this framework represents a turning point for the economic, ecological, and geopolitical future of the European Union. In an era marked by economic and energy crises and realignments of global value chains, the European community's ability to design and implement a sustainable and competitive industrial model is becoming a fundamental test for its viability as a global actor and for its internal cohesion.

Thus, the relevance of the analysis correlates with the transformative nature of the plan: it is not limited to reducing emissions, but aims at a structural redefinition of the European industrial paradigm, from production and consumption patterns to technological governance and resource distribution. The plan integrates multiple dimensions – environmental, economic, social, and technological, which must be understood interdependently to ensure effective and equitable implementation. In this regard, the analysis requires an interdisciplinary approach, integrating contributions from economics, political science, sustainability studies, engineering, and public policy [6].

Second, the plan is an exemplary case of environmentally-oriented industrial policy, at a time when multiple states and regions are testing alternative energy transition models. Thus, its study provides a valuable comparative framework for other administrations pursuing similar objectives, contributing to the development of a political economy of decarbonization and the theoretical foundation of the concept of a "just transition" [7]. Furthermore, given that industrial transformation generates cascading effects on the labor market, vocational training, taxation, and innovation, understanding this process is essential for anticipating and managing emerging socio-economic tensions..

In this context, the notion of "net-zero emissions industry" must be understood beyond simple climate neutrality. This policy involves a profound reconfiguration of the way natural resources, energy, and technological capital are used, with the aim of minimizing environmental impact and ensuring long-term renewability. A net-zero industry means not only reducing direct and indirect emissions, but also implementing offsetting technologies, such as carbon capture and storage. It also requires a circular economic ecosystem, where processes are energy-optimized and value chains are local and resilient [8, p. 110].

Therefore, the net-zero emissions industry is not just a technological aspiration but a systemic vision of sustainable production, in which efficiency, digitalization, social equity, and resilience become basic principles. Analytical research into the EGDIP is thus crucial for assessing the EU's capacity to operate this transition in a coherent, inclusive, and geopolitically robust way. In this context, we aim to answer some fundamental questions related to the European Union's industrial transition, such as: what does the concept of net zero mean in the current economic context, how can the energy transition be defined as a systemic transformation process, and what are the main opportunities and risks associated with the implementation of the EGDIP.

To support the transition towards a net-zero emissions European industry, the European Union has developed a coherent set of legislative, financial, and regulatory instruments that form the core of the EGDIP. They aim not only to decarbonise the economy but also to strengthen industrial sovereignty, stimulate innovation, and protect European competitiveness in the face of global dynamics. The main instruments can be grouped into four strategic pillars: regulation; financing; trade, and skills.

1. *Net-Zero Industry Act* – adopted in response to similar initiatives in other advanced economies (such as the *Inflation Reduction Act* in the US) – establishes a legal framework for the development and expansion of net-zero technology production capacities in the EU. It identifies a set of "strategic" technologies for the use of solar and wind energy, energy storage batteries, heat pumps, electrolyzers, carbon capture and storage, and renewable fuels. The aim is for the EU to produce at least 40% of its annual needs for these technologies domestically by 2030 [9].
2. *Innovation Fund* and *European Hydrogen Bank* – part of the financial support policies, the *Innovation Fund* (financed by revenues from *the EU Emissions Trading System*) offers substantial grants for projects with high emission reduction potential in sectors such as heavy industry, energy, carbon capture, and energy storage. In addition, the *European Hydrogen Bank* – currently under development – aims to encourage investments in hydrogen production through contracts for difference and other mechanisms to reduce

investment risk. These tools are essential for maturing the green technology market and closing the gap with competing economies [10].

3. The *Carbon Border Adjustment Mechanism* (CBAM) is an innovative trade instrument that aims to avoid the phenomenon of "carbon leakage" by imposing taxes on imports from carbon-intensive sectors (such as the cement, steel, aluminum, or fertilizer industries) from countries with less stringent climate standards. By internalising the cost of emissions and ensuring a level playing field, CBAM strengthens the competitiveness of European industry and encourages global convergence on climate regulation [11].
4. *Social Climate Fund* and green skills initiatives – the industrial transition cannot be separated from the social dimension. The *Social Climate Fund* (part of the *Fit for 55* package) aims to support vulnerable households and small businesses affected by the costs of the transition. In parallel, green skills initiatives, such as the *EU Academy for Net-Zero Industry* and the *Sector Skills Alliances*, contribute to the retraining of the workforce and the development of human capital adapted to the needs of the transition [12].

Through these instruments, the European Union is building an integrated institutional infrastructure for industrial transformation, combining market mechanisms, public support, and redistributive policies. This architecture not only aims to achieve climate goals, but also to shape a sustainable, resilient, and self-sufficient economy.

DISCUSSION: WHAT IS "NET-ZERO"?

Net-zero carbon emissions have become the main target for achieving the European Green Deal objective. To accelerate global carbon neutrality and protect its industries, the European Union has already developed a carbon adjustment mechanism.

In the current context of the European Union, marked by ambitious objectives regarding climate neutrality by 2050, the concept of net-zero emissions takes on a profound strategic significance, going beyond the strictly ecological dimension and becoming a pillar of economic and industrial reconstruction. This involves achieving a balance between gas emissions generated and those eliminated or offset, so that the global carbon balance is neutral. In other words, the unavoidable emissions remaining after the decarbonization of industrial and energy processes must be captured, reduced through technological solutions, or offset through natural measures, such as ecosystem restoration [13, pp. 330-335].

This vision redefines the role of industry and manufacturing in the economy, as it requires major technological transformations, the reorganization of supply chains, and a reorientation of capital towards green investments. From an economic perspective, net-zero becomes synonymous with a sustainable development model, in which growth is no longer conditioned by energy intensity and the use of fossil fuels, but by innovation, efficiency, and the circular economy. European policies, in particular the Green Deal and the related Industrial Plan, recognize the cross-cutting nature of this objective and place it at the heart of competitiveness and economic security strategies by encouraging clean technologies, the digitalization of processes, and autonomy in the supply of critical resources. In this sense, net zero becomes not only a target of the European Green Deal but an indicator of the maturity of the post-carbon economy, of the capacity of Member States to reconcile the ecological imperative with social sustainability and market efficiency. Specifically, achieving this objective requires systemic transformations, such as decarbonizing the energy sector through renewable sources, electrifying mobility, making buildings more efficient, and converting heavy industries through technologies such as green hydrogen or carbon capture and storage.

Therefore, the concept of net-zero in the context of the European Union should not be interpreted as a simple reduction in emissions, but as a change in economic paradigm, in which sustainable development becomes compatible with global competitiveness and energy resilience. The concept does not only designate a quantitative reduction in greenhouse gas emissions, but constitutes a paradigmatic change in the way modern societies configure their economy, infrastructure, and development models.

Technologically, net-zero involves decoupling industrial activity from carbon emissions through the implementation of advanced solutions such as carbon capture and storage [14], electrification of industrial processes [15], using green hydrogen as an energy source [16], as well as the digitalization of production systems to optimize resources. In

addition, there is increasing emphasis on developing a circular production and consumption model, in which products are designed to be reused, repurposed, and recycled, so that the carbon footprint associated with each life cycle is minimized [17].

In structural terms, net-zero involves a reorganization and redefinition of the notions of economic value, progress, and profitability in an era in which the costs of climate change are becoming increasingly visible.

In conclusion, net zero is not a singular outcome, but a continuous process of adaptation and transformation that redefines the very economic logic of the 21st century. In the case of the European Union, this concept becomes the normative background of any major economic policy, being both a sustainability target and a platform for reconfiguring competitive advantage in a post-carbon world.

SHORT DISCUSSION: WHAT IS THE ENERGY TRANSITION?

The energy transition is a complex and multidimensional process, essential for achieving the European Union's climate objectives and, implicitly, for the coherent implementation of the EGDIP. Essentially, the energy transition involves the progressive replacement of fossil fuel-based energy systems with sustainable solutions with low or zero greenhouse gas emissions, such as renewables, green hydrogen, new generation nuclear energy, and energy storage and efficiency technologies [13].

In the current context, the energy transition is not only a technological or ecological issue, but also involves a systemic transformation of the economic and social infrastructure, with direct implications for energy security, industrial competitiveness, and social justice. The European Union has placed this transition at the heart of its strategic policies, through a series of legislative and financial initiatives — such as the *Fit for 55* [2], *REPowerEU* [18], *Net-Zero Industry Act* [19] and the *Carbon Border Adjustment Mechanism* [20, p. 273] - which aim to align the energy system with climate neutrality targets and decouple economic growth from carbon use.

From an industrial perspective, the energy transition involves restructuring production processes in energy-intensive sectors through electrification, efficiency, and the substitution of polluting sources with clean energy. This transformation is dependent on the rapid development of renewable energy infrastructure, the modernization of energy transmission and distribution networks, as well as the integration of storage technologies and digital consumption management. (smart grids, IA, IoT). At the same time, equitable access to clean energy becomes a necessary condition for maintaining social and economic cohesion between regions and between EU Member States [20, p. 491].

Another essential aspect of the energy transition is the interdependence between energy and strategic autonomy, especially in the tense geopolitical context and Europe's historical dependence on natural gas and oil imports [19]. Diversifying sources, relocating the production of energy equipment, and developing domestic supply chains for clean technologies thus become complementary economic and security objectives.

In conclusion, the energy transition is not only a vector of decarbonization but a central element of the European industrial reconstruction, capable of redefining economic dynamics, stimulating innovation, and supporting the emergence of a circular and resilient economy. However, its success will depend on the synchronization of public policies, the capacity to mobilize capital, and the social acceptability of the profound changes it implies. What is certain is that this energy transition must be sustainable and fair.

THE GEOPOLITICAL IMPLICATIONS OF THE EUROPEAN GREEN DEAL INDUSTRIAL PLAN

The EGDIP is not only a domestic strategy for transitioning to a net-zero emissions economy, but also a geopolitical statement with multiple global implications. In an international context marked by technological rivalries, energy tensions, and realignments of the global economic order, the European Union's move to transform its industry and infrastructure on an ecological basis reflects a broader ambition: to reposition Europe as a normative, technological, and strategic leader in the post-carbon era.

First, the green industrial transition is closely linked to the strategic autonomy of the European Union. The COVID-19 pandemic and the war in Ukraine have highlighted the structural vulnerabilities of external dependencies, both in the energy field and in terms of critical raw materials and essential technologies [22]. By stimulating domestic production of clean technologies (solar panels, batteries, hydrogen, wind turbines) and diversifying supply chains, the EU aims to reduce dependence on dominant global players such as China or Russia. This

objective is supported by more assertive trade policies (e.g., CBAM) and international agreements that seek to align external partners with new sustainability standards [23].

Secondly, the Industrial Plan has a normative diffusion effect, by promoting a development model in which decarbonization, social equity, and economic competitiveness are treated as complementary objectives. Mechanisms like CBAM can stimulate a convergence of climate policies at a global level, but can also generate trade tensions and accusations of green protectionism from developing countries. Thus, the EU must balance the firmness of its regulations with climate diplomacy and support for the transition, including through technology transfers and green financing [24].

Moreover, the European transition has significant implications for the geopolitics of resources. While in the fossil fuel era geopolitical power was associated with control of oil and gas reserves, in the green transition era, a new cartography of influence is taking shape, centered on access to critical raw materials (lithium, cobalt, nickel, rare earths) and industrial processing capacity. The European Union is trying to avoid replacing one (energy) dependency with another (mineral), through initiatives such as the *Critical Raw Materials Act*, but global competition for these essential resources can generate tensions between major economic blocs and affect supplier countries in Africa, Asia, and Latin America [25].

Ultimately, the Industrial Plan must be understood as part of a global course towards a new political economy of climate, in which the major economies – the EU, the US, and China – reconfigure their industrial policies around the criteria of sustainability, digitalization, and resilience. This dynamic opens up opportunities for strategic alliances and global standardization of green markets, but also entails risks of economic fragmentation and uneven greening of development [26, p. 54].

In conclusion, the Industrial Plan of the European Green Deal has a double geopolitical dimension: internal – to reconsolidate European cohesion and autonomy, and external – to project a new global economic order focused on sustainability, equity, and innovation. The way Europe will manage these tensions will influence not only its industrial future but also the ecological and political balance of the post-fossil world.

OPPORTUNITIES AND RISKS: BETWEEN STRATEGIC AMBITION AND STRUCTURAL CONSTRAINTS

The European Green Deal Industrial Plan is one of the most ambitious economic reconfiguration initiatives launched at the European Union level. At the same time, the scale of the objectives undertaken – achieving climate neutrality by 2050 and consolidating a competitive industry with net-zero emissions – entails a series of strategic opportunities, but also systemic risks that need to be carefully managed.

Our analysis identifies the following opportunities:

- Redefining European competitive advantage – The Industrial Plan offers a chance to reposition the EU in the global economy by harnessing its potential in innovation, regulation, and technology. Developing green industrial ecosystems around renewable energy, green hydrogen, digitalization, and the circular economy can transform Europe into a global hub for sustainable technologies and green standards [27].
- Sustainable reindustrialization – the transition to a net-zero emissions industry involves massive investments in infrastructure, research, production modernization, and workforce retraining. They can generate a new wave of skilled and secure jobs, especially in regions affected by industrial decline, contributing to economic revitalization and reducing regional disparities.
- Strategic autonomy and economic security – by reducing dependence on energy imports and green technologies from outside the EU, the Industrial Plan contributes to strengthening European strategic autonomy. Initiatives such as the *Net-Zero Industry Act* and the *Critical Raw Materials Act* aim to relocate production capacities and diversify supply chains, in a global context marked by fragmentation and volatility.
- Normative leadership in the global climate transition – the EU assumes its role as a model of green governance by exporting standards, technologies, and good practices. Instruments such as CBAM can drive international convergence on climate policies and stimulate ambitious action among trading partners [28].

By contrast, we list the following risks:

- Socio-economic fragmentation – the green transition is not uniform across all EU regions. Economies dependent on carbon-

intensive industries or with low levels of technological innovation may feel disproportionate pressure, which risks deepening economic inequalities and social tensions. Without strong support mechanisms, such as the *Just Transition Fund*, these imbalances may undermine European cohesion [29].

- Global competition and the risk of competitive disadvantage – in the absence of a harmonised global framework, the implementation of strict environmental standards may expose European industry to risks of losing competitiveness compared to actors in regions with more permissive regulations. The efficiency of compensatory mechanisms (e.g., CBAM) will be essential to avoid the relocation of production and emissions.
- Pressures on public budgets and unequal access to financing – the industrial transition requires the mobilization of hundreds of billions of euros in public and private investment. Disparities between EU Member States in terms of fiscal capacity and access to finance can create implementation gaps, despite coordination efforts and support through EU funds (*NextGenerationEU*, *InvestEU*, the *Innovation Fund*).
- Geopolitical risks and new dependencies – while the plan aims to reduce dependence on fossil fuels, the transition involves new strategic dependencies, notably on critical raw materials and storage technologies. Without a coherent strategy for responsible extraction, recycling, and international agreements, the EU risks replacing one vulnerability with another, of a different nature.

In conclusion, in a critical assessment, the success of the EGDIP will depend on the capacity of European and national institutions to anticipate and manage these tensions through flexible policies, robust public-private partnerships, and solidarity mechanisms. Beyond climate goals, the real stakes are building an equitable, resilient, and inclusive green economy, capable of generating prosperity in an era of accelerating change.

CASE STUDY: ROMANIA'S INTERESTS AND CAPACITY IN IMPLEMENTING THE EUROPEAN GREEN DEAL INDUSTRIAL PLAN

Unfortunately, over two years after the public announcement of the EGDIP, Romania does not have a unified legislative framework that provides a strategic approach. In the context of the presidential (cancelled and resumed) and parliamentary elections, the conjunctural statements of decision-makers have not materialized. In May 2024, a state counselor at the Prime Minister's Chancellery stated that the Government had started working on the *Green Industrial Plan for Romania*, which will be available in the second half of 2025 [30].

However, the general political context seems less favorable to the operationalization of the EGDIP, as long as the Minister of Energy has serious reservations regarding the usefulness and reasonableness of the European Green Deal with regard to the specific case of Romania. In January 2025, he announced that he was preparing a report on the "negative effects of Green Deal policies" on the Romanian energy sector. Among the concrete details, he refers to the need to use coal-fired power plants ("We must not give up on coal-fired power plants until we put something in place - in the short and medium term, gas-fired power plants; in the long term, nuclear power plants"); necessary investments in storage, to benefit from green energy even when there is no sun or wind; necessary investments in networks, to have a truly single and functional European market and to accommodate prosumers as well. Romania wants to use equipment manufactured in Romania and Europe, not to subsidize production from other parts of the world with European money, because "While the European Union is rushing to become a world leader in decarbonization through the Green Deal, the global economic reality shows us that this model risks leading to a loss of competitiveness and economic relevance. 80% of the supply chain for photovoltaic panels is controlled by China, and Europe subsidizes their installation, instead of investing in their local manufacturing. With all the associated risks in the area of energy security. High energy costs are another example of a self-imposed burden. The CO2 emission certificate and the marginal price mechanism artificially double energy prices and make our industries uncompetitive. While energy prices in the EU are triple those in the US or China, European factories are closing or moving to other regions. This is not just a wake-up call, but an ongoing economic tragedy." [31]

Romania's positioning towards the EGDIP objectives starts from several strong points, which are natural or historical data:

1. The sharp deindustrialization that Romania went through in the years after 1989, which

led to the (virtually) disappearance of energy-intensive industries, positions the economy as one of the least polluting in the European Union. The latest data in the field (2022), provided by Eurostat [32], indicates Romania as the penultimate economy in terms of "greenhouse gas (GHG) emissions per capita" criteria:

Table 1.
Greenhouse gas (GHG) emissions per capita for European Union countries (2022)

Country	GHG Footprint (tonnes CO_2 per capita)
Cyprus	16.6
Luxembourg	15.5
Ireland	14.2
Germany	13.1
Estonia	13.0
Belgium	12.4
Greece	11.8
Austria	11.7
Finland	11.6
Czechia	11.4
Slovenia	10.9
Croatia	10.8
Denmark	10.8
Poland	10.8
Italy	10.7
Netherlands	10.6
Lithuania	10.1
Malta	9.9
Spain	9.5
Bulgaria	9.3
France	9.3
Slovakia	9.2
Latvia	9.0
Hungary	8.5
Romania	8.0
Portugal	8.0
Sweden	7.9

Under these conditions, Romania's comparative effort to reduce pollution becomes the easiest to achieve, except for Sweden (at the limit), and on par with Portugal.

2. Romania seems to have the most important resources in the European Union in the field of critical materials needed for the production of green technologies: magnesium, graphite, bismuth, and vanadium. Ideally, these should constitute the foundation for a local industry that would provide Europe with the necessary equipment (photovoltaic panels, wind turbines, etc.) [33], including appealing to foreign investors.
3. In recent years, even in the absence of EGDIP, Romania has systematically closed coal mines: Petrila (2015), Uricani și Paroșeni (2017), Lonea și Lupeni (2024). A table regarding coal production (2010-2024) [34], [35] is relevant:

Table 2
Evolution of coal production in Romania from 2010 to 2024

Year	Coal Production (Million Tonnes)
2010	31.13
2011	35.51
2012	33.95
2013	24.72
2014	23.57
2015	25.50
2016	22.99
2017	25.76
2018	23.65
2019	21.65
2020	15.03
2021	17.74
2022	18.21

2023	14.79
2024	N/A

Mainly because of this, but also because of the systematic reduction of polluting industrial activities, carbon emissions on Romanian territory have constantly decreased [36], [37], [38] as indicated in the following table:

Table 3
Romania's carbon emissions from 2010 to 2024

Year	Estimated CO_2 Emissions (million tons)	Key Notes
2010	95	Post-crisis recovery, high industrial output
2011	93	Slight decrease, energy efficiency measures
2012	91	Continued efficiency improvements
2013	90	Gradual decline, renewable investments begin
2014	88	More renewables, mild winter
2015	86	Coal use decreases, renewables increase
2016	85	Steady decline, EU targets influence
2017	84	Industrial modernization
2018	83	Renewable energy share grows
2019	81	Energy transition accelerates
2020	75	COVID-19 pandemic, reduced economic activity
2021	77	Partial rebound post-pandemic
2022	76	Green Deal policies, more renewables
2023	74	Continued decarbonization efforts
2024	72	Ongoing emission reduction, green investments

4. In case it cannot or does not want to align with EGDIP, Romania has the most important possibilities for classical energy production in the European space, especially those based on coal exploitation. At the same time, a judicious exploitation of the hydropower potential and the completion of the nuclear facility at Cernavodă would also offer massive export possibilities.

On the other hand, the factors not favoring a green industrial policy in Romania (mostly already mentioned by the Minister of Energy, above), can be listed as follows:

1. Lack of economic motivation, as long as Romania can easily meet its needs and massively export cheap energy, with classic solutions.
2. The lack of determination (and professionalism?) of decision-makers, starting with officials in line ministries, and continuing with those in state-owned energy companies. In general, Romania has demonstrated a weak absorption capacity for European funds, and a radical change with the implementation of EGDIP is not expected.
3. Insufficient clarity regarding the expenses following the commissioning of green energy capacities. Estimates regarding maintenance are expected (How much does it cost? Where will the specialists who will provide it come from? Who pays?), but also clarifications regarding the recycling of these capacities, when their lifespan expires (How much does it cost? Where will the specialists who will provide it come from? Who pays?). The problem is at the European level, not just in Romania.
4. The lack of advanced domestic technologies (also a problem valid at the European level), which makes it dependent on foreign manufacturers, especially Chinese ones.
5. Insufficient financial resources, given that external debt is growing exponentially, country ratings are declining dramatically, and military spending is increasing (up to 5% of GDP only due to NATO membership).

6. The imbalances have already proven that if we rely excessively on green energy production, which depends on the season and weather phenomena, and offers peak production during the day (photovoltaics). But the factories of the future will work (already work!) computerized and robotically, throughout the day and night, and energy is needed continuously in the same quantity.

Under these conditions, an approximation of the chances for Romania to mobilize and succeed in implementing the EGDIP objectives must be reserved. Probably, as in the case of other European policies, we expect the granting of extended deadlines, then summonses and sanctions, and the measures taken under pressure will not be consistent and effective.

We are already witnessing such a landscape, seeing how the various policies and measures to green the economy are not coordinated, and promise figures whose sustainability is questionable:

- *The National Recovery and Resilience Plan*, which pledged (2021) a total of €29.2 billion for Romania, includes measures such as Romania's commitment to close coal mines by 2032 and promoting energy efficiency in the construction sector [39]. The first of the measures is being carried out vigorously and with great economic and social costs, but the amounts promised by the European Union have been greatly reduced for various reasons.
- *The National Plan for Large Industry* (2024) [33] promisses €2 billion for a reindustrialization scheme; €500 million state aid and fiscal incentives for large investments, especially in less developed regions; €1 billion over six years for decarbonization and energy efficiency in heavy industry; €250 million state aid for companies producing industrial raw materials. The deep economic crisis looming in Romania, which is forcing the government installed in June 2025 to implement austerity measures, is already calling these amounts into question.
- *The National Hydrogen Strategy* [40]**,** which focuses on renewable hydrogen for transport and energy, proposes to remove legislative barriers and support EU hydrogen targets for 2030. This strategy, adopted in parliament in July 2023, has led the major Romanian players on the energy market to already launch projects: Hidroelectrica's Solar and Green Hydrogen Project (2023) [41]**,** E.ON Romania's Hydrogen Blending Pilot Project (2024) [42]**,** OMV Petrom's Green Hydrogen Initiatives (2024) [43]**,** SAPE's Green Hydrogen Energy Storage Project (2024) [44]**.** Most recently, The Romanian Hydrogen and New Energy Technologies Hub, or Ro-HydroHub, a strategic project aimed at advancing hydrogen-based technologies, was officially launched on 13 March 2025. The project, funded through the Smart Growth, Digitization, and Financial Instruments 2021-2027 Program (PoCIDIF), represents a nearly EUR 140 million investment to modernize Romania's energy sector while accelerating the transition to green energy [45].

Overall, in the *2025 Country Report* [46], The European Commission notes that 1.7 GW of solar installed in 2024, raising renewables to 48% of electricity generation (above EU average), 3% decrease in energy consumption in 2023 (under the criteria „Energy Efficiency"), but serious challenges remain: regulatory barriers, grid limitations, and high energy prices (€103/MWh in 2024) slow down renewable integration.

CONCLUSIONS

The EGDIP is an ambitious initiative that promises to redefine European industry with the aim of achieving a net-zero emissions target by 2050. However, while the vision is clear, the implementation of this plan faces a number of fundamental challenges that cannot be ignored. The transition to a green economy can generate significant benefits, such as creating sustainable jobs and accelerating technological innovation, but the process involves considerable risks related to short-term economic impact, social fragmentation, and implementation difficulties.

First, the initial costs of industrial conversion and infrastructure development for a zero-emission economy can be huge, and the risk of economic disruption in key sectors cannot be ruled out. The plan also depends on a significant appetite for private investment, which may be hampered by regulatory uncertainty and volatility in international markets. In addition, while the European Union promises a just transition, there are concerns about social cohesion, and less developed regions could face considerable difficulties in adapting to the new standards.

Second, geopolitical risks and dependence on external technologies are major obstacles. In a global context where competition for critical

resources, such as raw materials for batteries and hydrogen, is intensifying, the European Union will need to protect its technological sovereignty and ensure near-total energy independence to prevent any geostrategic vulnerability.

Thirdly, the specific problems of national economies are among the most diverse and contradictory (as the case of Romania shows), and the EGDIP and related instruments do not sufficiently respond to these specificities.

In conclusion, while the EGDIP is an important step towards a sustainable future, its success depends on the ability to implement reforms within a coherent and flexible framework and on the balanced management of economic, social, and geopolitical risks. Only by addressing these challenges realistically and well-foundedly can Europe turn this plan into a genuine opportunity, without compromising internal stability and cohesion.

References

[1] European Commission. *Communication: A Green Deal Industrial Plan for the Net-Zero Age*. Available at: https://commission.europa.eu/document/41514677-9598-4d89-a572-abe21cb037f4_en. (accesed: 30.06.2025)

[2] European Council. *Fit for 55*. Available at: https://www.consilium.europa.eu/en/policies/fit-for-55/. (accesed 12.05.2025)

[3] European Commission. *The Green Deal Industrial Plan: Putting Europe's Net-Zero Industry in the Lead*. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_23_510. (accesed 12.05.2025)

[4] Florence School of Regulation. *The Green Deal Industrial Plan*. Available at: https://fsr.eui.eu/the-green-deal-industrial-plan/. (accesed 12.05.2025)

[5] Gancarczyk, M., Bohatkiewicz-Czaicka, J., Gancarczyk, J., Tomczyk, D. *Energy Cluster Policies for Sustainable Industrial Transformation.* New York, Routledge, 2025, 130 pp.

[6] Veugelers, R., Tagliapietra, S., Trasi, C. Green Industrial Policy in Europe: Past, Present, and Prospects. *Journal of Industry, Competition and Trade*, 2024, vol. 24, no. 1, pp. 4-22

[7] European Commission. *The Just Transition Mechanism: Making Sure no One is Left Behind*. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en. (accesed 12.05.2025)

[8] Tagliapietra, S., Veugelers, R. (eds) *Sparking Europe's New Industrial Revolution. A Policy for Net Zero, Growth and Resilience.* Brussels, Bruegel Blueprint Series, 2023, 277 pp.

[9] European Commission. *The Net-Zero Industry Act: Making the EU the Home of Clean Technologies Manufacturing and Green Jobs*. Available at: https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en. (accesed 20.05.2025)

[10] European Commission. *Competitive Bidding*. Available at: https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/competitive-bidding_en. (accesed 20.05.2025)

[11] European Commission. *Carbon Border Adjustment Mechanism.* Available at: https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en. (accesed 20.05.2025)

[12] European Commission. *Social Climate Fund*. Available at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/social-climate-fund_en. (accesed 20.05.2025)

[13] Yergin, D. *Noua hartă: energie, climă și ciocnirea națiunilor.*[The New Map: Energy, Climate, and the Clash of Nations]. București, Litera, 2020, 480 pp.

[14] IEA, *Carbon Capture Utilisation and Storage*. Available at: https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage. (accesed 20.05.2025)

[15] GridX, *Electrification.* Available at: https://www.gridx.ai/knowledge/electrification. (accesed 20.05.2025)

[16] Odenweller, A., Ueckerdt, F. The Green Hydrogen Ambition and Implementation Gap. *Nature Energy*, vol. 10, No. 5, 2025, pp. 110-123.

[17] Ellen MacArthur Foundation. *The Butterfly Diagram: Visualising the Circular Economy*. Available at: https://www.ellenmacarthurfoundation.org/circular-economy-diagram. (accesed 20.05.2025)

[18] European Commission. *REPowerEU. Affordable, Secure and Sustainable Energy for Europe*. Available at: https://commission.europa.eu/topics/energy/repowereu_en. (accessed 20.05.2025)

[19] European Commission. *The Net-Zero Industry Act: Making the EU the Home of Clean Technologies Manufacturing and Green Jobs*. Available at: https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en. (accesed 20.05.2025)

[20] European Commission. *Carbon Border Adjustment Mechanism.* Available at: https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en. (accesed 20.05.2025)

[21] Scholten, D. *Geopolitics of the Energy Transition.* Cheltenham, Edward Elgar Publishing Limited, 2023, 566 pp.

[22] European Commission, *Competitive bidding*, https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/competitive-bidding_en (20.05.2025)

[23] Sgaravatti, G., Tagliapietra, S., Zachmann, G. *Adjusting to the Energy Shock: The Right Policies for*

European Industry. Available at: https://www.bruegel.org/policy-brief/adjusting-energy-shock-right-policies-european-industry. (accesed 20.05.2025)
[24] Dechezleprêtre, A., Haramboure, A., Kögel, C., Lalanne, G., Yamano, N. *Carbon Border Adjustments: The Potential Effects of the EU CBAM Along the Supply Chain*. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/01/carbon-border-adjustments_b9049067/e8c3d060-en.pdf. (accesed 20.05.2025)
[25] European Commission. *Critical Raw Materials Act*. Available at: https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en. (accesed 20.05.2025)
[26] Proedrou, F. *EU Energy Geopolitics. Strategic Premiums, Challenges, and Dilemmas in the Global Energy Transition Era*. London, Palgrave Macmillan, 2025, 154 pp.
[27] Comisia Europeană, *Planul industrial din cadrul Pactului verde: plasarea industriei europene cu zero emisii nete în poziție de lider*, https://romania.representation.ec.europa.eu/news/planul-industrial-din-cadrul-pactului-verde-plasarea-industriei-europene-cu-zero-emisii-nete-pozitie-2023-02-02_ro (27.05.2025)
[28] Energy Transition Commission, *Solidifying the Eu's Leadership in the Global Energy Transition*, https://www.energy-transitions.org/publications/eu-leadership-in-global-energy-transition/ (27.05.2025)
[29] Allianz Research, *Divided We Fall – The Risks of Competitive Fragmentation on Europe's Road to Net Zero*, https://www.allianz.com/en/economic_research/insights/publications/specials_fmo/241209-net-zero-competition.html (27.05.2025)
[30] *Guvernul lucrează la Planul Industrial Verde pentru România* [The Government is working on the Green Industrial Plan for Romania]. Available at: https://www.energynomics.ro/guvernul-lucreaza-la-planul-industrial-verde-pentru-romania. (accesed 30.06.2025)
[31] *Ministrul Energiei continuă să critice Pactul Verde European: „Riscă să ducă la pierderea competitivității și a relevanței economice"* [The Minister of Energy Continues to Criticize the European Green Deal: "It Risks Leading to the Loss of Competitiveness and Economic Relevance"]. Available at: https://www.digi24.ro/digieconomic/energie/ministrul-energiei-continua-sa-critice-pactul-verde-european-risca-sa-duca-la-pierderea-competitivitatii-si-a-relevantei-economice-43699. (accesed 30.06.2025)
[32] Eurostat. *EU Greenhouse Gas Footprint: 10.7 Tonnes Per Capita*. Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20250219-1?utm (accesed 30.06.2025)
[33] Ernst, I. *Romania's Ruling Coalition Announces Grand Reindustrialization Scheme*. Available at: https://www.romania-insider.com/romania-ruling-coalition-reindustrialization-plan-sept-2024. (accesed 30.06.2025)
[34] YCHARTS. https://ycharts.com/indicators/romania_coal_production. (accesed 30.06.2025)
[35] CEIC. https://www.ceicdata.com/en/indicator/romania/coal-production. (accesed 30.06.2025)
[36] United Nations Framework Convention on Climate Change. *Information on Data Sources*. Available at: https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review/transparency-data-and-tools/greenhouse-gas-data/information-on-data-sources. (accesed 30.06.2025)
[37] International Energy Agency. *Romania*. Available at: https://www.iea.org/countries/romania/emissions. (accesed 30.06.2025)
[38] Emissions Database for Global Atmospheric Research. *GHG Emissions of All World Countries. 2024 Report*. Available at: https://edgar.jrc.ec.europa.eu/report_2024?vis=co2gdp. (accesed 30.06.2025)
[39] Radu, C. *The European Commission Has Approved Romania's €29.2 Billion National Recovery and Resilience Plan / How the Money Will Be Shared Out*. Available at: https://economedia.ro/the-european-commission-has-approved-romanias-e29-2-billion-national-recovery-and-resilience-plan-how-the-money-will-be-shared-out.html. (accesed 30.06.2025)
[40] European Commission. *Romania's Recovery and Resilience – Supported Projects: Reforms*. Available at: https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/recovery-and-resilience-plan-romania/romanias-recovery-and-resilience-supported-projects-reforms_en. (accesed 30.06.2025)
[41] *Hidroelectrica Plans a 300 MW Solar and Green Hydrogen Project in Romania*. Available at: https://www.enerdata.net/publications/daily-energy-news/hidroelectrica-plans-300-mw-solar-and-green-hydrogen-project-romania.html. (accesed 30.06.2025)
[42] *Romania: Successfully Tests Blending Hydrogen in Natural Gas Distribution Grid, Households*. Available at: https://energyworld.ro/2024/03/29/romania-successfully-tests-blending-hydrogen-in-natural-gas-distribution-grid-households/. (accesed 30.06.2025)
[43] *OMV Petrom Gets Resilience Funds for Two Green Hydrogen Plants in Romania*. Available at: https://www.romania-insider.com/omv-petrom-resilience-funds-two-green-hydrogen-plants-romania-2024. (accesed 30.06.2025)
[44] *Sape Receives Funding Through the PNRR for the Energy Storage Project Using Green Hydrogen*. Available at:

https://www.thediplomat.ro/2024/09/12/sape-receives-funding-through-the-pnrr-for-the-energy-storage-project-using-green-hydrogen/. (accesed 30.06.2025)
[45] *Ro-HydroHub: Romania Unveils Eur 140 Mln Hydrogen Technology Hub to Boost Green Energy*. Available at: https://www.romania-insider.com/romania-hydrohub-march-2025. (accesed 30.06.2025)
[46] European Commission. *2025 Country Report - Romania. Accompanying the Document Recommendation for a Council. Recommendation on the Economic, Social, Employment, Structural and Budgetary Policies of Romania*. Available at: https://publications.europa.eu/resource/cellar/20da8e4f-4162-11f0-b9f2-01aa75ed71a1.0002.03/DOC_1. (accesed 30.06.2025)

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