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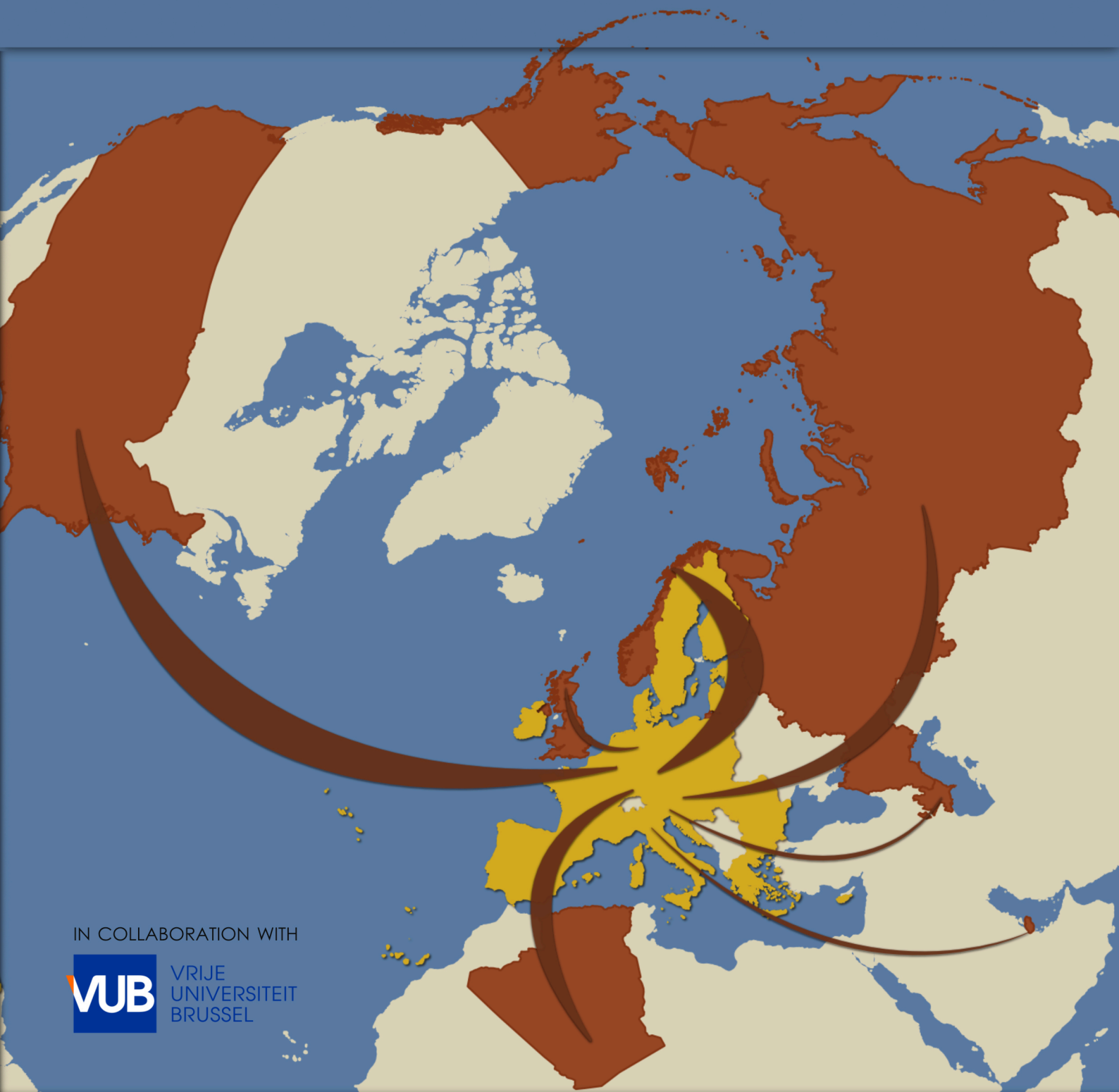
European Studies Review

Energy Trilemma
A Case Study of Germany & Romania

Smart Grid Development
And Their Impact on Energy Secruity

Energy Independence
Discourse and the Economic Reality



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European Studies Review is a peer-reviewed journal which involves students and recent graduates in publishing opinion pieces and research articles regarding European affairs. Run by students and recent graduates, European Studies Review is composed of a team of enthusiastic and passionate young people across Europe.

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Editorial

Europe's Energy Security Challenge:
A Special Issue from the Master Thesis Classroom

Energy security has returned to the centre of the policy debate. What was once often treated as a technical question of infrastructure and market design is now widely understood as a core issue of geopolitical autonomy, economic resilience, social protection and climate transition. Russia's invasion of Ukraine, the volatility of energy markets and prices, the rising cost of energy for households and industries, and the challenge of accelerating decarbonisation are all dimensions of this complex policy area.

It is against this background that this special issue of the European Studies Review brings together master theses on the broad theme of energy security in Europe. We selected this topic because it is currently high on both the policy and research agenda, but also because it lends itself exceptionally well to the kind of multidisciplinary work that European Studies Review seeks to foster. Energy security is not a single policy field. It connects external relations, internal market governance, climate policy, industrial strategy, infrastructure, public opinion, social justice and institutional capacity. It requires students to move across levels of governance and across disciplinary boundaries, as well as deal with fast-moving developments.

In this context and broader theme of energy security, each master student delineated a specific research question and developed an analytical framework to find answers. Taken together, the articles show how a general theme can generate a diverse set of empirical and conceptual questions. This variety is one of the strengths of the issue. Notable themes include energy security end geopolitical resilience following the Russian invasion of Ukraine, such as strategic autonomy in EU energy discourse, and the geopolitics of resources in the Arctic. Another theme is the governance and regulation of the energy transition within the EU, State aid for energy storage, smart grid development strategies, and the role of critical raw materials policy. Across these contributions, different insights highlight persistent tensions between climate neutrality objectives, affordability and security of supply, as well as questions of democratic legitimacy and transparency.

This special issue is also the result of a deliberate reflection on the process of master thesis supervision. Recent developments, including the increasing availability and use of AI tools, have made it necessary to rethink how academic work is guided, documented, and assessed. Rather than focusing only on the final thesis as an end product, we experimented with a more structured route in which the research process itself became more visible. Students were encouraged to document the development of their research question, literature review, empirical material, argumentation, and choices. This portfolio-based approach made it possible to follow the gradual construction of each thesis and to provide feedback at meaningful moments in the process.

In addition, we convened frequently to present and discuss progress. Throughout these meetings, students could explain their choices, receive feedback, learn from each other's challenges and refine their work in dialogue with peers and supervisors. They also created a shared academic environment in which ownership, transparency, and critical reflection became central. In a time when AI can assist with searching, summarising, structuring and writing, such moments are increasingly important. They help ensure that students remain responsible for the intellectual direction of their work and that supervisors can engage with the reasoning behind the final text, not only with the polished result.

We hope that readers will appreciate this dual contribution. The articles that follow offer insights into one of Europe's most pressing policy challenges, but they also illustrate how master thesis work can be embedded in a more collaborative academic setting. At a moment when universities are reassessing the role of independent research, supervision, feedback and responsible AI use, this project suggests that structure and dialogue are not constraints on student autonomy. On the contrary, they can strengthen it. By making the research process more transparent and cooperative, students become better equipped.

This special issue is the result of a collaboration between the supervisor, the master thesis students, and the journal's editorial and communication teams. We are grateful to all involved for their commitment, openness and intellectual engagement throughout the process. Their contributions made it possible to transform a collection of individual master thesis projects into this special issue.

We are pleased to present this collection and hope it will stimulate further discussion on both energy security in Europe and the evolving practice of master thesis supervision.

Caroline Buts, Robin Vandendriessche and Oksana Zolotarova

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Rebalancing the Energy Trilemma After the 2022 Energy Crisis: A Comparative Case Study of Germany & Romania

Stef Van Campenhout[1]

Introduction

The 2022 energy crisis marked one of the most significant shocks to European energy systems in recent decades. This study examines the *energy trilemma* through a comparative case-study perspective, analysing how two structurally distinct EU energy regimes (Germany and Romania) rebalanced energy security, sustainability, and equity in response to the crisis. By analysing developments before and after the shock, the study assesses whether the crisis reinforced or reduced structural differences between these regimes. The article is structured as follows. First, the paper presents a review of the relevant literature identifying the research gap, followed by the research question and the methodological design, including case selection and data sources. The subsequent sections provide the empirical analysis, followed by a synthesis of findings, a discussion of limitations, and suggestions for future research. The analysis ultimately suggests that the crisis resulted in dimension-specific adjustment rather than overall convergence or divergence, resulting in a nuanced pattern of convergence in energy security and equity, but divergence in sustainability.

[1] Stef Van Campenhout is a 28-year-old Belgian student holding a BSc degree in Physical Education & Movement Sciences from the Vrije Universiteit Brussel (VUB), currently completing his MSc in Business Engineering. He combines his academic pursuits with a career as Technology Consultant at EY Belgium and a professional fencing career as an elite athlete representing Team Belgium. Competing at the highest international level, he won a bronze medal at the 2023 European Games and became Belgian national champion four times.

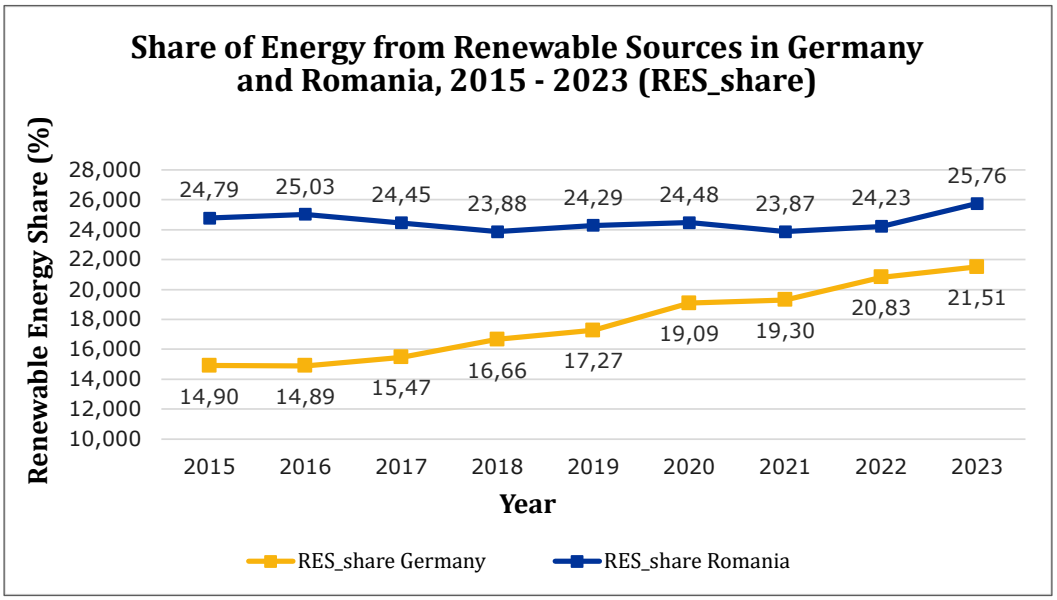

Figure 1. Share of Energy from Renewable Sources in Germany and Romania between 2015-2023. Source: Own compilation based on data from Eurostat, "Share of Energy From Renewable Sources." Dataset NRG_IND_REN

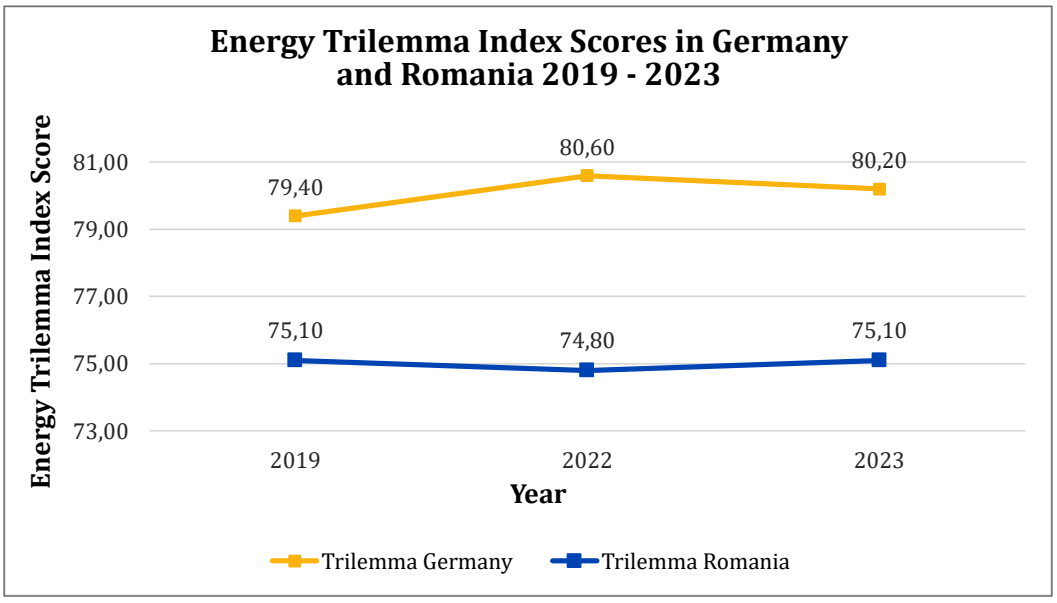

Figure 2. Energy Trilemma Index Scores of Germany and Romania between 2019-2023. Source: Own compilation based on data from World Energy Council, accessed March 5, 2026, https://trilemma.worldenergy.org/#!/energy-index.

Literature Study

Efforts to address climate change have increasingly exposed tensions between economic development, national energy security, and environmental sustainability. These tensions have been intensified by a combination of recent global crises, climate change impacts, the COVID-19 pandemic, Russia's invasion of Ukraine, fierce geoeconomic competition, and geopolitical instability in the Middle East. These developments reshaped policy-makers' understanding of energy systems and the balance between sustainability, security, and economic objectives, referred to as the energy trilemma.[2] As a result, the energy

[2] Pau Ruiz Guix, "The Energy Trilemma Once More: New Relations Between Accelerating Decarbonization, Ensuring Energy Security and Promoting Economic Development in a New Era of Geopolitical and Geoeconomic Competition," *Cuadernos Económicos De ICE*, no. 107 (July 4, 2024), https://doi.org/10.32796/

trilemma occupies a prominent position in the literature on energy policy and energy law, with one key strand focusing on its origins, three core components, and role within broader sustainable development debates.[3]

A second strand of literature focuses on the trade-offs inherent to the energy trilemma. Irfan Khan demonstrates that major CO_2-emitting countries have made significant progress towards decarbonisation while pursuing different policy pathways, shaped by domestic energy endowments, economic structures, and international climate commitments. This literature highlights that no single pathway exists for resolving the energy trilemma and that national strategies reflect political and economic constraints.[4] While much of this literature adopts a global perspective, its insights are directly relevant to the European context, where Member States continue to differ strongly in their energy policies and structures.

Within this research strand, there is also a specific focus on measuring countries' energy trilemma performance. The *World Energy Trilemma Index* (ETI), provided by the World Energy Council, is a widely used metric measuring a country's overall performance across the three dimensions.[5] Empirical applications of this index, such as the research of Luisa Marti and Rosa Puertas, identify clusters of countries and show that energy trilemma performance depends not only on income levels but also on political and institutional factors. Importantly, this research highlights the dynamic nature of energy trilemma performance, suggesting that changes in political leadership or external conditions can rapidly alter national trajectories.[6]

A third strand focuses on the challenges and trends of the energy transition. Studies document rising shares of renewable energy in the EU and declining greenhouse gas emissions, indicating progress toward long-term decarbonisation goals.[7] At the same time, persistent obstacles complicate rapid renewable deployment.[8] This literature highlights that sustainability advancements often interact negatively with energy security and economic objectives, reinforcing the relevance of the trilemma framework as a research topic.

The fourth strand of literature focuses on the political landscape of energy transitions in Europe**,** notably the multi-speed energy transition. Pérez et al. show that EU Member States can be broadly grouped into two clusters. Western and Northwestern countries

cice.2024.107.7781.

[3] Ruven C. Fleming, "Chapter IX.3: The Energy Trilemma," in *Energy Law, Climate Change and the Environment*, ed. Martha M. Roggenkamp, Kars J. de Graaf, and Ruven Fleming, vol. 9 of Elgar *Encyclopedia of Environmental Law* (Cheltenham: Edward Elgar Publishing, 2021), 31–40, https://doi.org/10.4337/9781788119689.IX.3

[4] Irfan Khan, "The Energy Trilemma: An Overview of Balancing Security, Sustainability, and Affordability," *Habitable Planet* 1, no. 1 & 2 (April 26, 2025): 56–68, https://doi.org/10.63335/j.hp.2025.0006.

[5] "WEC Energy Trilemma Index Tool," n.d., https://trilemma.worldenergy.org/.

[6] Luisa Marti and Rosa Puertas, "Sustainable Energy Development Analysis: Energy Trilemma," *Sustainable Technology and Entrepreneurship* 1, no. 1 (January 1, 2022): 100007, https://doi.org/10.1016/j.stae.2022.100007.

[7] Mohammad Fazle Rabbi et al., "Energy Security and Energy Transition to Achieve Carbon Neutrality," *Energies* 15, no. 21 (October 31, 2022): 8126, https://doi.org/10.3390/en15218126.

[8] Leda Žilinskienė, "Renewable Energy Deployment Dilemmas," *Bratislava Law Review* 9, no. 1 (July 8, 2025): 181–92, https://doi.org/10.46282/blr.2025.9.1.962.

tend to view renewable energy as both a climate solution and an industrial opportunity, while many Eastern and peripheral Member States prioritise security of supply and affordability, reflecting higher import dependence, more concentrated energy markets, and greater sensitivity to price increases. This West–East divide is rooted in structural differences in income levels, infrastructure quality, and historical energy choices.[9] Case-study research further illustrates these dynamics. A comparative analysis of Germany and Poland in 2019 reveals that, despite shared concerns about energy security, their perceptions and opinions are almost completely opposite.[10]

Russia's invasion of Ukraine in February 2022 constitutes a critical turning point in this literature. It exposed the vulnerabilities in EU energy systems, with particularly strong impacts on the European gas market.[11] In response, policy debates increasingly portray the acceleration of clean energy deployment as a way to simultaneously strengthen energy security, protect consumers from price shocks, and advance decarbonisation, aligning all three dimensions of the energy trilemma.[12]

Knowledge Gap & Research Question

Despite extensive research on the energy trilemma, multi-speed transitions, and the 2022 energy crisis, a knowledge gap remains in comparative, time-bound analyses that examine how structurally distinct energy regimes react to major geopolitical shocks within a shared EU institutional framework. Existing studies either provide static cross-country comparisons or focus on EU-wide policy responses, leaving limited insight into regime-specific adjustments over time. The central research question guiding this analysis is:

How did the 2022 energy crisis alter the Energy Trilemma balance in Germany and Romania, and did the crisis reinforce or reduce structural differences between these two representative EU energy regimes?

The following subquestions help to answer the central research question:

RQ1: *How did Germany and Romania differ in their energy trilemma profiles before the crisis?*

RQ2: *How did each trilemma dimension (security, sustainability, equity) change after 2022 in each country?*

RQ3: *Did the crisis reduce or reinforce the structural gap between the two regimes?*

[9] María De La Esperanza Mata Pérez, Daniel Scholten, and Karen Smith Stegen, "The Multi-speed Energy Transition in Europe: Opportunities and Challenges for EU Energy Security," *Energy Strategy Reviews* 26 (October 25, 2019): 100415, https://doi.org/10.1016/j.esr.2019.100415.
[10] De La Esperanza Mata Pérez, Scholten, and Stegen, "The Multi-Speed Energy Transition in Europe: Opportunities and Challenges for EU Energy Security."
[11] Simone Emiliozzi, Fabrizio Ferriani, and Andrea Giovanni Gazzani, "The European Energy Crisis and the Consequences for the Global Natural Gas Market," *SSRN Electronic Journal*, January 1, 2023, https://doi.org/10.2139/ssrn.4640202.
[12] Guix, "The Energy Trilemma Once More: New Relations Between Accelerating Decarbonization, Ensuring Energy Security and Promoting Economic Development in a New Era of Geopolitical and Geoeconomic Competition."

Methodology

Based on the tradition of comparative historical analysis as defined by James Mahoney and Dietrich Rueschemeyer,[13] this study adopts a longitudinal comparative case study design to analyse how the energy trilemma of two distinct EU energy regimes responded to the 2022 energy crisis, allowing a before–after comparison.[14] Case studies are well-suited for exploratory research and enable intensive analysis of a small number of units,[15] making this approach appropriate for examining regime-specific responses to a common external shock.

The cases were selected by ranking all 27 EU Member States according to their 2023 Energy Trilemma Index (ETI) and dividing them into an upper and lower half, representing structurally stronger and more constrained energy performance regimes. The median country of each half was selected, Germany (≈75th percentile) and Romania (≈25th percentile), as representative cases of two contrasting regimes, avoiding extreme outliers (see Figure 1). Germany and Romania occupy equivalent positions in both the 2019, 2022 and 2023 ETI rankings.[16] This selection strategy aligns with Jason Seawright and John Gerring, who emphasise that case selection in small-N research must balance representativeness with meaningful variation, as random selection risks producing unrepresentative cases.[17] The selected cases share the same EU institutional framework while differing structurally in their energy profiles and ETI performances.

This study uses both quantitative and qualitative data to analyse how the energy trilemma of Germany and Romania responded to the 2022 energy crisis. Quantitative data include the World Energy Council's (WEC) Energy Trilemma Index and its three pillars: energy security, sustainability, and equity, covering the period 2015-2023. In addition, Eurostat data on renewable energy share, energy import dependency, and household electricity and gas prices for 2015–2024 complement the WEC data. Qualitative sources consist of policy and institutional documents, including National Energy and Climate Plans (NECPs) of Germany and Romania, the European Commission's Assessment of Romania's NECP, and the International Energy Agency's policy review of Germany. An overview of all quantitative and qualitative sources is provided in the appendix.[18]

The analysis is primarily exploratory, as case studies enjoy a natural advantage in this type of research due to limited cases and available data.[19] Three steps can be identified:

[13] James Mahoney and Dietrich Rueschemeyer, *Comparative Historical Analysis in the Social Sciences*, Cambridge University Press eBooks, 2003, https://doi.org/10.1017/cbo9780511803963.

[14] Ellen Skinner and Julia Dancis, "Descriptive and Explanatory Designs," Human Development - Revision, January 1, 2026, https://pdx.pressbooks.pub/humandevelopmentupdate/chapter/descriptive-and-explanatory-designs/.

[15] John Gerring, "What Is a Case Study and What Is It Good For?," *American Political Science Review* 98, no. 2 (May 1, 2004): 341–54, https://doi.org/10.1017/s0003055404001182.

[16] Further details on the ETI rankings of Germany and Romania in 2019, 2022 and 2023, including the full case-selection procedure, are provided in the Annex.

[17] Jason Seawright and John Gerring, "Case Selection Techniques in Case Study Research," *Political Research Quarterly* 61, no. 2 (February 9, 2008): 294–308, https://doi.org/10.1177/1065912907313077.

[18] The appendix as well as additional information on the data sources and analysis is available from the author upon request.

[19] Gerring, "What Is a Case Study and What Is It Good For?," May 1, 2004.

first, descriptive trends over time will be plotted for both countries. Second, cross-case comparison will be performed to identify divergences and convergences between the two representative regimes. In this study, convergence is defined as a reduction in the absolute ETI score gap between Germany and Romania over time, while divergence refers to a widening of that gap. This definition is applied to both the overall ETI score and to its three dimensions (energy security, sustainability, and energy equity) separately, allowing for dimension-specific patterns to be distinguished from overall regime-level trends. Third, qualitative sources complement the quantitative findings by providing contextual explanations for the observed results in energy trilemma performance.

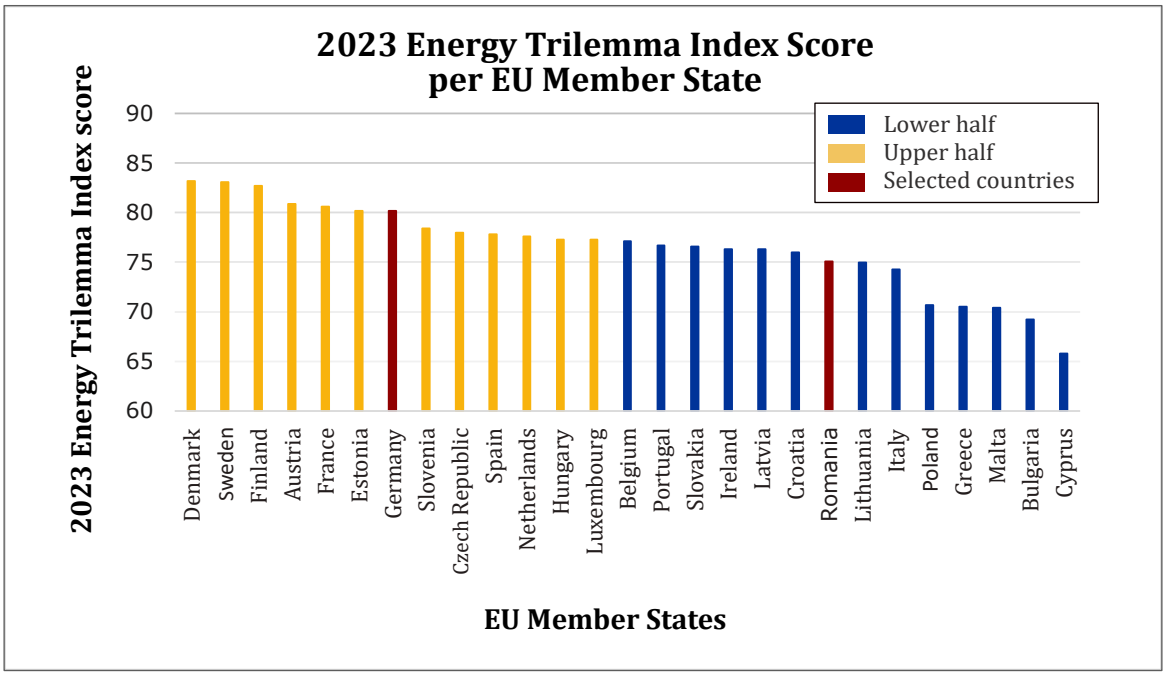

Figure 3: Energy Trilemma Index Scores of EU Member States, 2023. Source: Own compilation based on data from World Energy Council, World Energy Trilemma 2024.

Analysis

This analysis examines how Germany and Romania's energy trilemma evolved before and after the 2022 crisis across three dimensions: energy security, sustainability, and equity. The analysis distinguishes between structural and policy-driven responses, and between short- and long-term dynamics.

Pre-2022 Energy Crisis

Using 2019 as a pre-crisis benchmark, Germany's ETI was 4.3 points higher than Romania's (79.4 vs. 75.1; see Figure 2).[20] Germany combined high equity with improving sustainability, but remained structurally vulnerable in energy security with import dependency above 60%, reflecting heavy reliance on Russian gas.[21] Romania, by contrast, had a lower ETI score, but structural advantages in energy security, with significantly

[20] World Energy Council, "World Energy Trilemma Index," accessed March 5, 2026, https://trilemma.worldenergy.org/#!/energy-index.

[21] World Energy Council, "WEC Energy Trilemma Index Country Profile Germany," accessed March 5, 2026, https://trilemma.worldenergy.org/#!/country-profile?country=Germany&year=2023.; Eurostat, "Energy Imports Dependency," dataset NRG_IND_ID, last modified April 14, 2026, https://doi.org/10.2908/NRG_IND_ID.

lower import dependency (31.7% in 2019).[22] Romania's share of renewable energy (24%) exceeded Germany's (17%).[23] However, Romania underperformed in energy equity: energy poverty affected around 28% of the population, and reliance on wood for heating and ageing infrastructure impacted its resilience.[24]

Post-2022 Energy Crisis

The ETI gap widened to 5.8 points in 2022, indicating divergence driven by the crisis. By 2023, it narrowed slightly to 5.1 points as Germany's ETI declined and Romania's improved.[25] This suggests limited post-crisis convergence, although structural differences remained larger than pre-crisis levels.

Energy Security

A pattern of gradual convergence in energy security can be observed between the two countries (see Figure 3). Germany's upward trend since 2018 showed no structural break in 2022, suggesting Germany effectively managed energy security risks during the crisis, despite an import dependency above 60%.[26] Germany's policy measures (replacing Russian gas with Norwegian supply, expanding LNG infrastructure, and gas storage) helped mitigate risks.[27]

Romania's energy security was more volatile. Short-term crisis responses and structural advantages (e.g., lower import dependency) reduced its vulnerability to external shocks, resulting in a peak in 2022.[28] However, energy security declined again in 2023. Secondary effects (supply chain disruptions linked to the conflict in Ukraine, infrastructure limitations) may help explain this decline.[29]

The gap in energy security between the two countries narrowed over time, reaching its lowest point in 2023, indicating a convergence in energy security.[30] However, this convergence does not imply convergence in resilience: Germany's policy-driven response contrasts with Romania's reliance on structural advantages, which may prove fragile without active policy support.

[22] World Energy Council, "WEC Energy Trilemma Index Country Profile Romania," accessed March 5, 2026, https://trilemma.worldenergy.org/#!/country-profile?country=Romania&year=2023.; Eurostat, "Energy Imports Dependency."
[23] Eurostat, "Share of Energy from Renewable Sources," dataset NRG_IND_REN, last modified February 3, 2026, https://doi.org/10.2908/NRG_IND_REN.
[24] "WEC Energy Trilemma Index Country Profile Romania."
[25] "World Energy Trilemma Index."
[26] "WEC Energy Trilemma Index Country Profile Germany."; Eurostat, "Energy Imports Dependency."
[27] International Energy Agency, Germany 2025 (Paris: IEA, 2025), https://www.iea.org/reports/germany-2025.; "WEC Energy Trilemma Index Country Profile Germany."
[28] "WEC Energy Trilemma Index Country Profile Romania."; Eurostat, "Energy Imports Dependency."
[29] "WEC Energy Trilemma Index Country Profile Romania."
[30] "WEC Energy Trilemma Index Country Profile Germany."; "WEC Energy Trilemma Index Country Profile Romania."

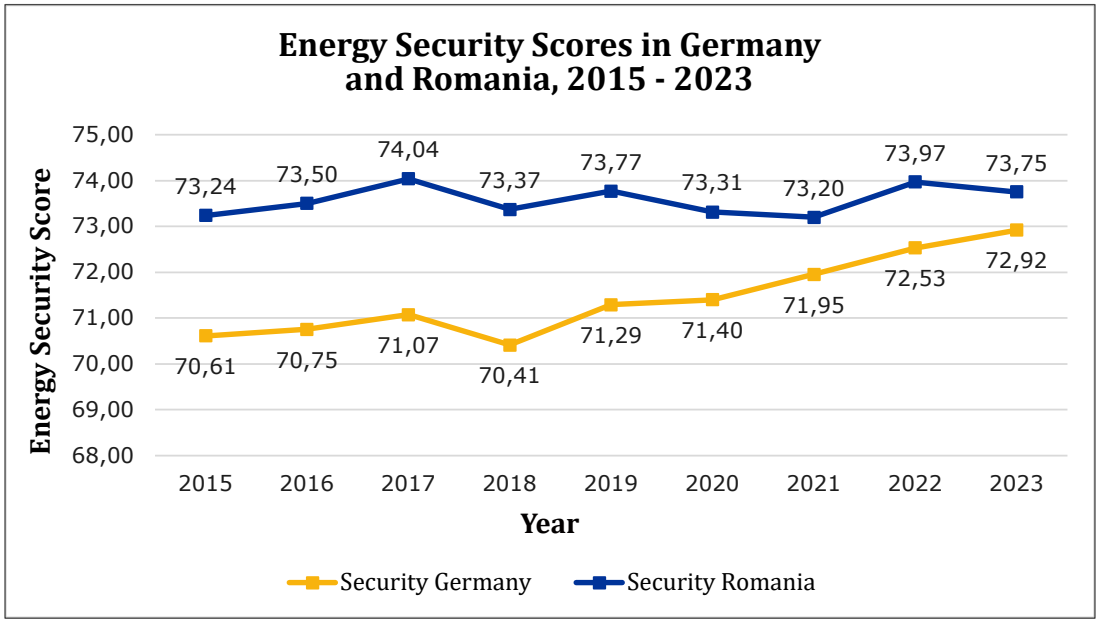

Figure 3. Energy Security Scores of Germany and Romania between 2015-2023. Source: Own compilation based on data from World Energy Council, Country Profile Germany and Country Profile Romania, Accessed March 5, 2026.

Energy Equity

Germany maintained high equity scores until 2023, peaking in 2022, indicating strong affordability and access to energy. However, equity declined in 2023 due to reduced affordability following the energy crisis.[31] The electricity and gas price dynamics in Germany confirmed this, as they remained stable until 2021 before rising sharply in 2022 and remaining elevated in 2023.[32]

Romania's energy equity showed a long-term upward trend. Despite a temporary decline in 2020, equity improved between 2015 and 2022, reflecting structural progress in affordability and access.[33] Like Germany, Romania also experienced a decline in 2023, but its long-term improvement trajectory was not reversed.[34] Persistent challenges, including energy poverty, continued to highlight underlying vulnerabilities.[35]

Electricity and gas price data further illustrated these dynamics. Romania experienced a sharper but shorter price spike in 2022, with prices temporarily exceeding those in Germany before declining in 2023. This indicated greater short-term vulnerability to price shocks. In contrast, Germany's price increases were more gradual but sustained, putting prolonged pressure on affordability.[36]

[31] "WEC Energy Trilemma Index Country Profile Germany."; IEA, *Germany* 2025.
[32] Eurostat, "Electricity Prices for Household Consumers - Bi-annual Data," dataset NRG_PC_204, last modified April 16, 2026, https://doi.org/10.2908/NRG_PC_204.; Eurostat, "Gas Prices for Household Consumers - Bi-annual Data," dataset NRG_PC_202, last modified April 16, 2026, https://doi.org/10.2908/NRG_PC_202.
[33] "WEC Energy Trilemma Index Country Profile Romania."
[34] European Commission, "Romania - Final Updated NECP 2021–2030," October 16, 2024, https://commission.europa.eu/publications/romania-final-updated-necp-2021-2030-submitted-2024_en.
[35] "WEC Energy Trilemma Index Country Profile Romania."
[36] Eurostat, "Electricity Prices for Household Consumers."; Eurostat, "Gas Prices for Household Consumers."

The gap in energy equity between the two countries narrowed significantly over time and reached its lowest level in 2023 (see Figure 4). This convergence was mainly due to Romania's improvements rather than a structural decline in Germany.[37] Overall, the crisis negatively affected affordability in both countries while strengthening the observed pattern of convergence in energy equity, suggesting that the energy equity dimension is particularly vulnerable to short-term market disruptions.

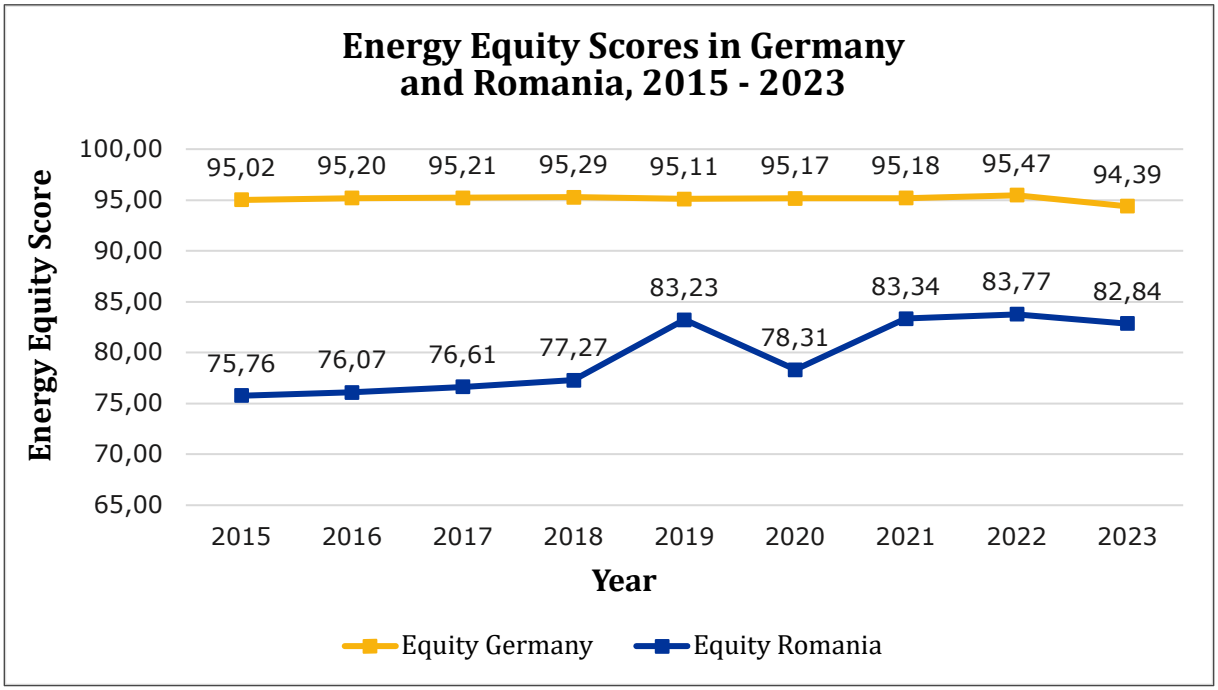

Figure 4. Energy Equity Scores of Germany and Romania between 2015-2023. Source: Own compilation based on data from World Energy Council, Country Profile Germany and Country Profile Romania, Accessed March 5, 2026.

Sustainability

Sustainability showed a clear pattern of divergence (see Figure 5). Germany's energy transition was accompanied by a steady increase in sustainability from 2018 onwards, continuing beyond the crisis.[38] This progress reflected policy measures aimed at expanding renewable energy capacity, decarbonising and hydrogen technologies.[39]

Romania, by contrast, showed a declining sustainability score after peaking in 2018, despite maintaining a renewable energy share consistently above 24%.[40] Romania's initial advantage over Germany eroded over time due to limited growth in renewable capacity, continued reliance on fossil fuels and ageing infrastructure.[41]

[37] "WEC Energy Trilemma Index Country Profile Germany."; "WEC Energy Trilemma Index Country Profile Romania."
[38] "WEC Energy Trilemma Index Country Profile Germany."
[39] IEA, Germany 2025.; European Commission, "Germany - Final Updated NECP 2021–2030," August 29, 2024, https://commission.europa.eu/publications/germany-final-updated-necp-2021-2030-submitted-2024_en.
[40] "WEC Energy Trilemma Index Country Profile Romania."; Eurostat, "Share of Energy from Renewable Sources."
[41] "WEC Energy Trilemma Index Country Profile Romania."; European Commission, "Commission Assessment of the Final Updated National Energy and Climate Plan of Romania," May 28, 2025, https://commission.europa.eu/publications/commission-assessment-final-updated-national-energy-and-climate-plan-romania_en.

The trajectories intersected in 2020, when Germany surpassed Romania. By 2023, Germany led by 1.6 points. While renewable energy shares were converging (Germany's share rose steadily while Romania's share remained relatively stable), overall sustainability performances diverged in Germany's favour.[42] Germany's progress is consistent with a policy-driven decarbonisation path, while Romania's stagnation highlights structural constraints, despite its high renewable energy share. Overall, sustainability appears to be shaped more by long-term institutional dynamics than short-term shocks, with the 2022 energy crisis reinforcing rather than altering these trajectories.

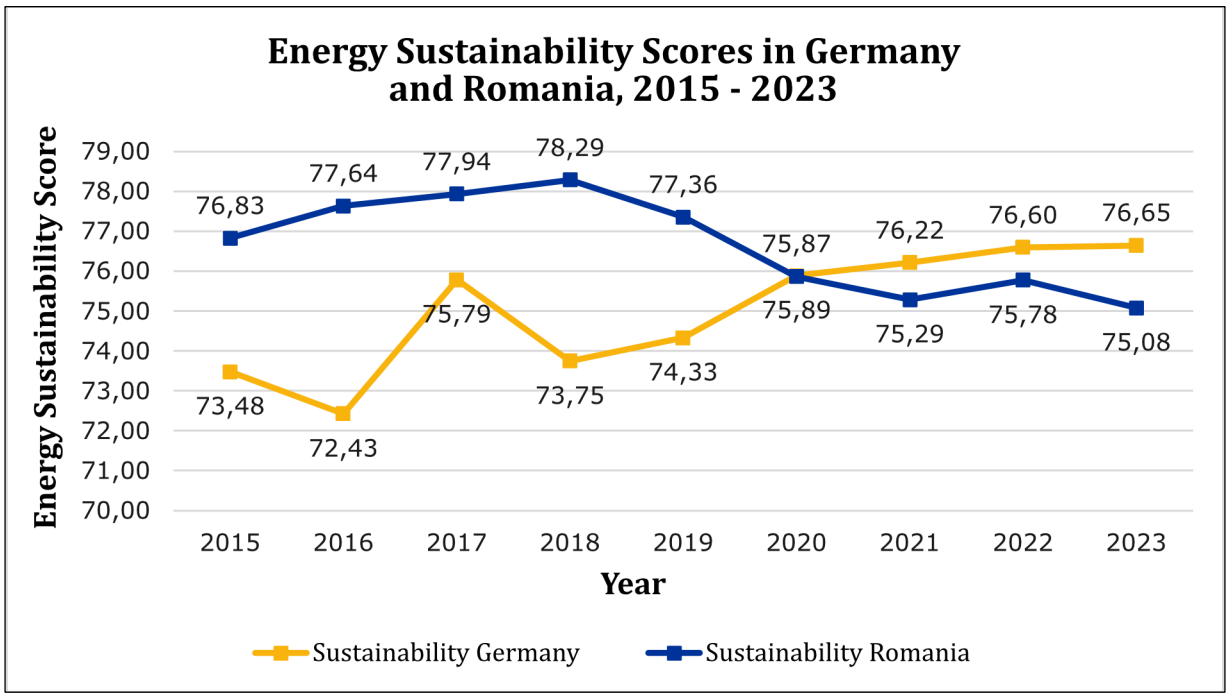

Figure 5. Energy Sustainability Scores of Germany and Romania between 2015-2023. Source: Own compilation based on data from World Energy Council, Country Profile Germany and Country Profile Romania, Accessed March 5, 2026.

Convergence or Divergence

The ETI gap between Germany and Romania widened from 4.3 points in 2019 to 5.8 points in 2022, suggesting that the crisis initially reinforced structural differences. By 2023, the gap narrowed to 5.1 points, suggesting a limited post-crisis adjustment. However, this trend consisted of different dynamics: convergence in energy security and equity, and divergence in sustainability. Rather than simply reinforcing or reducing the structural gap, the crisis appears to have caused asymmetric adjustments reflecting each country's structural starting point.[43] These dynamics can be summarised through the underlying mechanisms driving each dimension (see Table 1).

[42] Eurostat, "Share of Energy from Renewable Sources."; "WEC Energy Trilemma Index Country Profile Germany."; "WEC Energy Trilemma Index Country Profile Romania."
[43] "WEC Energy Trilemma Index Country Profile Germany."; "WEC Energy Trilemma Index Country Profile Romania."

	Mechanism	
Dimensions	Germany	Romania
Secruity	Policy-driven resilience	Structural resilience
Equity	Shock-driven decline	Structural improvement
Sustainability	Policy-driven transition	Structural stagnation

Table 1: Post-crisis Energy Adjustment Mechanisms in Germany and Romania. Souce: Own compilation. Note: the table summarises the dominant adjustment mechanisms observed in each energy trilemma dimension following the 2022 energy crisis, distinguishing between policy-driven and structurally driven responses.

Germany's high import dependenthcy made it vulnerable to external shocks, as evidenced by the sharp increase in dependency and energy prices in 2022.[44] However, its institutional capacity and policy responses are consistent with the observed effectiveness of its crisis management.[45] Romania benefited from lower import dependency and a more diversified energy mix, supporting its energy security.[46] Its equity improvements were not stopped by the shock, despite the severe short-term price volatility.[47] Sustainability was the dimension where structural divergence is deepening, seemingly driven by Romania's stagnation linked to its challenges (ageing infrastructure, energy poverty) versus Germany's dynamic transition trajectory.[48]

Conclusion

These findings highlight that the energy trilemma does not adjust uniformly across its dimensions and that the 2022 energy crisis had asymmetric effects on Germany and Romania, shaped by each country's structural characteristics and policy capacity. This strengthens the idea that even a common geopolitical shock does not produce uniform regime adjustments, but differentiated outcomes, consistent with the idea of multi-speed energy transitions identified by Pérez et al. Convergence was observed in energy security and equity, where structural differences between the two regimes narrowed over time. In contrast, sustainability showed increasing divergence, with Germany strengthening its position relative to Romania. Germany's responses were primarily policy-driven, relying on institutional capacity to manage vulnerabilities (e.g., high import dependency), whereas Romania relied more on pre-existing structural advantages and more limited policy capacity. These findings support Khan's argument that there is no single pathway to addressing the energy trilemma. Overall, the crisis partially reduced structural differences between the two energy regimes without fundamentally altering them.

[44] Eurostat, "Energy Imports Dependency."; Eurostat, "Electricity Prices for Household Consumers."; Eurostat, "Gas Prices for Household Consumers."

[45] "WEC Energy Trilemma Index Country Profile Germany."; IEA, Germany 2025.

[46] Eurostat, "Energy Imports Dependency."; European Commission, "Commission Assessment of Romania's NECP."

[47] "WEC Energy Trilemma Index Country Profile Romania."

[48] "WEC Energy Trilemma Index Country Profile Romania."; European Commission, "Commission Assessment of Romania's NECP."

Limitations & Suggestions for Future Research

First, the analysis focuses on two cases, limiting the generalisability of the findings to other EU Member States. Second, the analysis is primarily exploratory and descriptive, meaning that strong causal relationships between policy interventions and observed outcomes cannot be established. Finally, ETI data are available only up to 2023, while overall country scores are not published annually, limiting the assessment of continuous trends and longer-term structural adjustments. Future research could use more recent data for longitudinal analyses to examine whether the post-crisis convergence in security and equity is sustained or reversed, and whether the observed divergence in sustainability grows further. Future research could also extend the analysis to a larger set of countries to assess whether the observed patterns can be found more broadly across the EU. In addition, econometric approaches could help identify causal mechanisms and explore how specific policy instruments contribute to resilience across different dimensions of the energy trilemma.

Smart Grid Development Strategies in Europe and Their Impact on Energy Security: A Comparative Study of Belgium and Germany

Nasim Jamei[1]

Introduction

The European energy system has recently experienced several challenges. Factors such as climate change, political tensions, and the rapid growth of renewable energy have increased pressure on electricity networks. Traditionally, energy security has mainly been defined as the availability and affordability of energy. In actual electricity systems, however, the concept is broader. It includes reliability, resilience, flexibility, and security of supply.[2] At the same time, the increasing use of renewable energy, particularly wind and solar, has changed how electricity systems work. These sources are variable and depend on weather conditions. As a result, they increase uncertainty and make real-time balancing more difficult.[3] Because of this, traditional centralised grid systems are no longer sufficient. In this context, smart grids are seen as a key solution. Smart grids use digital com-

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[2] International Energy Agency, *World Energy Outlook 2023* (2023), https://www.iea.org/reports/world-energy-outlook-2023; European Commission, "Commission Recommendation of 14 March 2023 on Energy Storage – Underpinning a Decarbonised and Secure EU Energy System," *Official Journal of the European Union* C 103, (2023), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023H0320(01); Benjamin K. Sovacool and Ishani Mukherjee, "Conceptualizing and Measuring Energy Security: A synthesized approach," *Energy* 36 no.8 (2011): 5343–5355, https://doi.org/10.1016/j.energy.2011.06.043.

[3] ENTSO-E (European Network of Transmission System Operators for Electricity), "*ENTSO-E Market Report 2023*," (2023), https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/nc-tasks/ENTSO-E_Market_Report_2023.pdf; IPCC (Intergovernmental Panel on Climate Change), "Summary for Policymakers," In *Climate Change 2022: Mitigation of Climate Change, Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by P.R. Peter D Lund, Juuso Lindgren, Jani Mikkola, and Jyri Salpakari, "Review of Energy System Flexibility Measures to Enable High Levels of Variable Renewable Electricity." *Renewable and Sustainable Energy Reviews* 45(2015): 785–807, https://doi.org/10.1016/j.rser.2015.01.057.

munication, sensors, and automated control systems in order to improve monitoring, system coordination, and balance between supply and demand.[4] They are expected to support renewable energy integration and improve system stability.[5] However, the development of smart grids in Europe is not equal across countries. There are infrastructure limits, different regulations, cybersecurity risks, and different national energy structures.[6] Therefore, smart grids should be seen not only as technical systems. They are part of a wider socio-technical transformation of the energy sector.[7]

This study examines how smart grid strategies in Belgium and Germany shape energy security within the broader context of the European energy transition, using the two countries as comparative case studies. Germany and Belgium are very different cases. Germany has a highly decentralised system, meaning power is generated across many small, scattered locations rather than at one massive central power plant, with more than 50% renewable electricity,[8] while Belgium relies more on cross-border electricity trading and has strong offshore wind development.[9] These differences make them suitable for comparison because these countries represent two common patterns in Europe. The first pattern is based on decentralised energy production and a high share of renewables, present in countries such as Italy and Austria. The second pattern combines strong grid interconnections with offshore wind development. The United Kingdom and the Netherlands are good examples (see Figures 1 and 2).

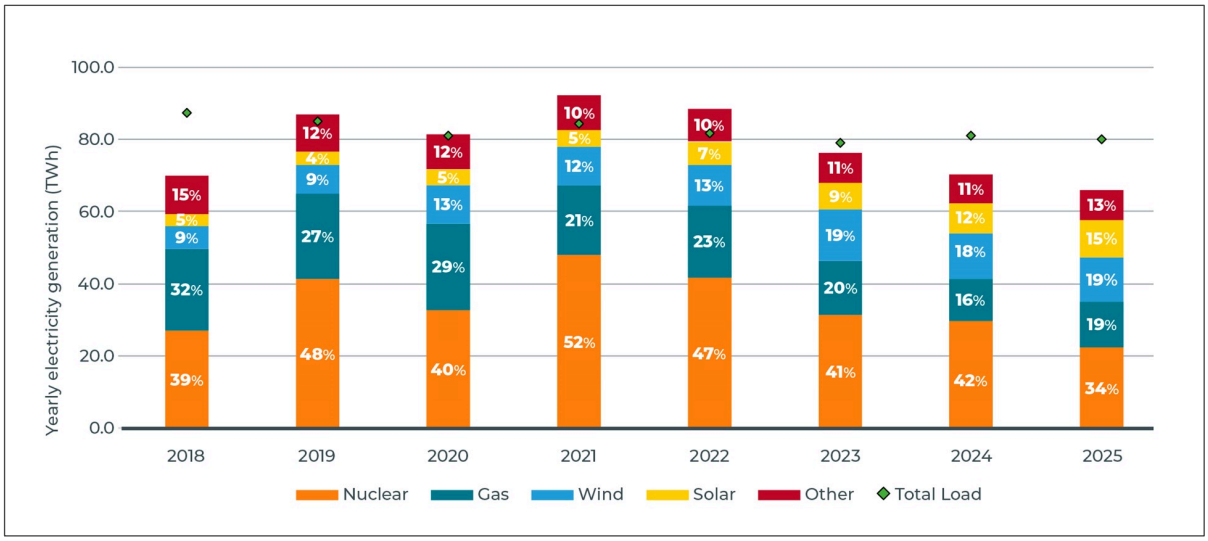

Figure 1: Yearly Belgium electricity generation mix (with regard to total demand). Source: ELIA.BE.

[4]. Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang, "Smart Grid - The New and Improved Power Grid: A Survey." *IEEE Communications Surveys & Tutorials* 14 no.4 (2012): 944–980, https://doi.org/10.1109/SURV.2011.101911.00087

[5] International Energy Agency, *World Energy Outlook* 2023, European Commission, "Commission Recommendation of 14 March 2023 on Energy Storage."

[6] ENTSO-E, Market Report 2023; ISGAN (International Smart Grid Action Network), *Smart Grid Case Studies 2021: Resilience and Cybersecurity* (Vienna: ISGAN, 2021), https://www.iea-isgan.org/publications/.

[7] Frank W. Geels, "Technological Transitions as Evolutionary Reconfiguration Processes: A Multi-Level Perspective and a Case-Study," *Research Policy* 31, no. 8-9 (2002): 1257-1274, https://doi.org/10.1016/S0048-7333(02)00062-8; Jochen Markard, Rob Raven, and Bernhard Truffer, "Sustainability Transitions: An Emerging Field of Research," Research Policy 41, no. 6 (2012): 955-967, https://doi.org/10.1016/j.respol.2012.02.013.

[8] Eurostat, "Share of Renewable Energy in Gross Final Energy Consumption by Country," data extracted January 2024, https://ec.europa.eu/eurostat/databrowser/view/sdg_07_40/default/table?lang=en.

[9]. IEA, World Energy Outlook 2023 (2023).

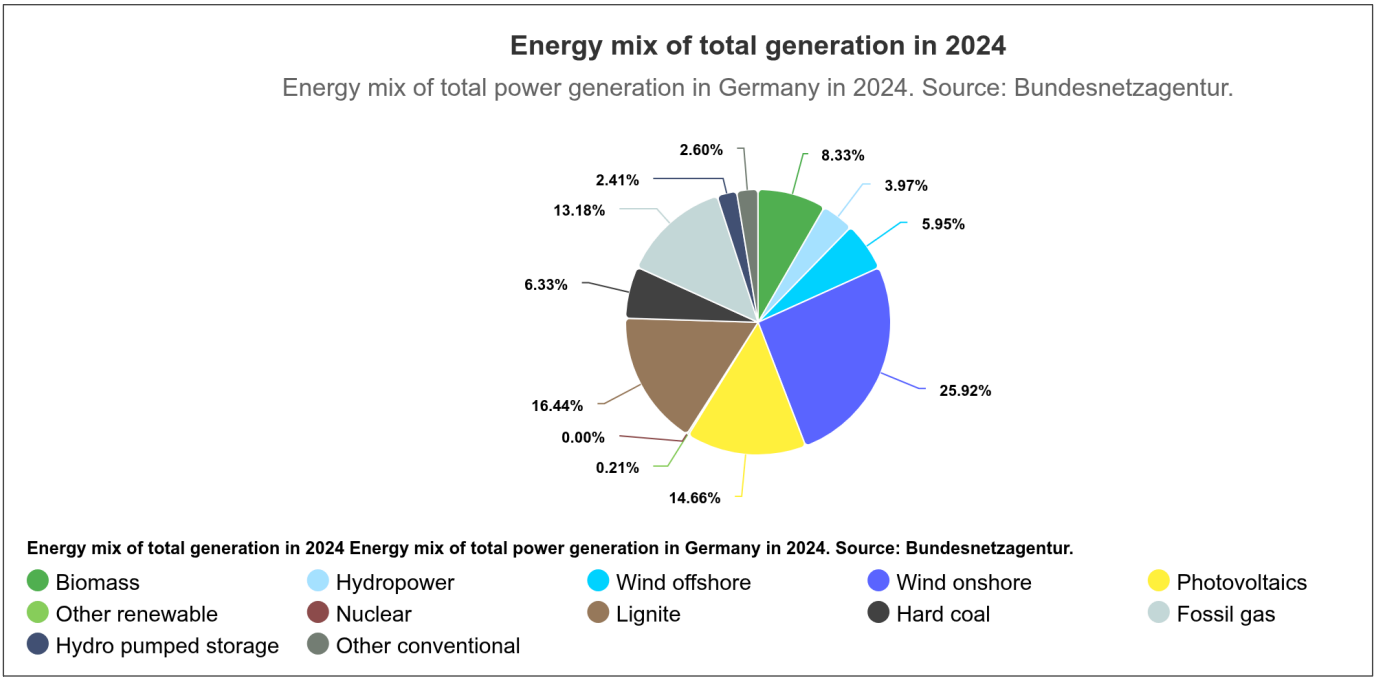

Figure 2: Energy mix of power generation in Germany in 2024. Source: SMARD.de

The main question in this study is how these two countries' approaches make a difference. To answer this, I ask three sub questions. First, what are the main similarities and differences between the smart grid strategies in Belgium and Germany? Second, how do these strategies deal with key issues like digitalisation, decentralisation, flexibility, and cybersecurity? Third, how do they affect energy security, especially security of supply, flexibility, and resilience? The study helps us understand how different national choices about smart grids can shape energy security in Europe.

Literature Review

The meaning of energy security has changed over time.[10] Early studies focused on energy supply and price stability.[11] The European Commission and the International Energy Agency (IEA) also defined energy security this way in the past. However, today most researchers agree that this old definition is too narrow. The energy transition has made electricity systems more complex. Because wind and solar power depend on weather conditions, high shares of renewable energy increase uncertainty and require new balancing solutions. The Intergovernmental Panel on Climate Change (IPCC) and European Network of Transmission System Operators for Electricity (ENTSO-E) point out that this makes energy production hard to predict.[12] K. Guerra and colleagues add that renewable

[10] Aleh Cherp and Jessica Jewell, "The concept of energy security: Beyond the four As," *Energy Policy* 75 (December, 2014): 415–421, https://doi.org/10.1016/j.enpol.2014.09.005.

[11] Benjamin K Sovacool and Ishani Mukherjee, "Conceptualizing and Measuring Energy Security: A synthesized approach," *Energy* 36 no 8 (2011): 5343-5355, https://doi.org/10.1016/j.energy.2011.06.043; Lynne Chester, "Conceptualising Energy Security and Making Explicit Its Polysemic Nature," *Energy Policy* 38 no 2 (2010): 887-895, https://doi.org/10.1016/j.enpol.2009.10.039; European Commission, *EU Energy System and Energy Security Report* (Brussels: European Commission, 2023), https://energy.ec.europa.eu; IEA, *World Energy Outlook* 2023 (2023).

[12] IPCC, "Summary for Policymakers," in *Climate Change 2022: Mitigation of Climate Change*, ed P R Shukla, J Skea, R Slade, A Al Khourdajie, R van Diemen, D McCollum, M Pathak et al (Cambridge, UK and New York: Cambridge University Press, 2022), https://www.ipcc.ch/report/ar6/wg3/; ENTSO-E, European Resource Adequacy Assessment 2023 Edition (Brussels: ENTSO-E, 2024), https://www.entsoe.eu/eraa/2023/report/

energy often does not match demand. This mismatch requires constant adjustments to keep the grid stable.[13] Therefore, digital and flexible networks are becoming more important.

Smart grids are an important technology to make power systems more reliable. They allow real-time monitoring, faster fault detection, and better coordination between electricity supply and demand.[14] But smart grids alone are not sufficient. The European Commission and ENTSO-E note that physical infrastructure is still very important. Transmission bottlenecks and old equipment remain major problems in Europe.[15] This creates a tension in the literature: some scholars focus on digital solutions, while others emphasise physical upgrades. I believe both are necessary, and the balance between them depends on national contexts like Germany and Belgium.

Resilience is the ability of an energy system to resist shocks, adapt, and return to normal operation. The IEA strongly links resilience to decentralisation and flexibility.[16] From a socio-technical perspective, other scholars argue that resilience depends not only on technology. It also depends on institutions, policies, and governance. According to socio-technical systems theory, energy systems develop through the interaction of technology and society.[17] Further studies confirm this by showing that policy design and governance structures shape resilience outcomes in Europe.[18] Where do scholars disagree? Some focus on technical resilience, while others highlight social and institutional factors. My study follows the latter view because I am comparing national strategies –and strategies are shaped by institutions, not just technology.

Flexibility is a key requirement for modern energy security. The IEA defines flexibility as how quickly a system can respond to changes in supply and demand.[19] Paul Denholm and

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ERAA_2023_v2_Executive_Report.pdf; Brian Vad Mathiesen, Henrik Lund, David Connolly, Henrik Wenzel, Poul Alberg Østergaard, Bernd Möller, Steffen Nielsen, Iva Ridjan, Peter Karnøe, Karl Sperling, and Frede Hvelplund, "Smart Energy Systems for Coherent 100% Renewable Energy and Transport Solutions," *Applied Energy* 145 (2015): 139-154, https://doi.org/10.1016/j.apenergy.2015.01.075.

[13] K Guerra et al, "Facing the high share of variable renewable energy in the power system: Flexibility and stability requirements," *Applied Energy* 310 (2022): 118561, https://doi.org/10.1016/j.apenergy.2022.118561.

[14] N Shaukat, S M Ali, C A Mehmood, B Khan, M Jawad, U Farid, Z Ullah, S M Anwar, and M Majid, "A Survey on Consumers Empowerment, Communication Technologies, and Renewable Generation Penetration within Smart Grid," *Renewable and Sustainable Energy Reviews* 81 (2018): 1453-1475, https://doi.org/10.1016/j.rser.2017.05.208.

[15] European Commission, *EU Energy System and Energy Security Report* (2023), https://energy.ec.europa.eu; ENTSO-E, "Statistical Factsheet 2024" (2024).

[16] Seyed Mohsen Hosseini, Kash Barker, and Jose E. Ramirez-Marquez, "A Review of Definitions and Measures of System Resilience," *Reliability Engineering & System Safety* 145 (2016): 47–61, https://doi.org/10.1016/j.ress.2015.08.006; IEA, *World Energy Outlook 2023* (2023).

[17] Ochen Markard, Rob Raven, and Bernhard Truffer, "Sustainability Transitions: An Emerging Field of Research," *Research Policy* 41, no 6 (2012): 955–967, https://doi.org/10.1016/j.respol.2012.02.013; Benjamin K Savacool and Ishani Mukherjee, "Conceptualizing and Measuring Energy Security"; Frank W Geels, "Technological Transitions."

[18] Caroline Kuzemko and Jessica Britton, "Policy, Politics and Materiality across Scales: A Framework for Understanding Local Government Sustainable Energy Capacity Applied in England," *Energy Research & Social Science* 62 (2020): 101367, https://doi.org/10.1016/j.erss.2019.101367.

[19] IEA, *World Energy Outlook 2023* (Paris: IEA, 2023); Brian Vad Mathiesen, Henrik Lund, David Connolly, Henrik Wenzel, Poul Alberg Østergaard, Bernd Möller, Steffen Nielsen, Iva Ridjan, Peter Karnøe, Karl Sperling, and Frede Hvelplund, "Smart Energy Systems for Coherent 100% Renewable Energy and Transport Solutions," *Applied*

Maureen Hand state that high renewable penetration requires strong system flexibility.[20] This includes storage, transmission, and grid expansion. The literature divides flexibility into two types: operational flexibility, or short-term balancing using demand response, storage, and smart control, and structural flexibility, or long term changes through infrastructure and market design. Smart grids mainly improve operational flexibility.[21]

However, the European Commission and ENTSO-E show that structural flexibility depends on physical infrastructure and cross-border connections.[22] Future European systems need both digital and physical flexibility. I find this distinction useful because it helps explain why Germany and Belgium need different smart grid strategies. Agora Energiewende describes Germany's need for operational flexibility due to decentralised renewables, while Elia highlights Belgium's reliance on structural flexibility through imports.[23] These examples show that flexibility is essential in a pan-European electricity system. Because Member States have different system characteristics, they face different flexibility challenges. Cross-border integration helps manage these differences and supports a more reliable and efficient European grid.

Security of supply means having continuous electricity in normal and critical conditions. The IEA and ENTSO-E note that in Europe, the security of supply depends more and more on cross-border electricity trade.[24] Interconnected systems improve supply security because countries can import electricity when needed. This is very important in Belgium, where imports play a key role. According to the Elia Group, Belgian Transmission System operator for high-voltage grid, cross-border flows are essential for system stability.[25] But interconnection also creates risks. If one system fails, problems can spread to other countries.[26] Therefore, I argue that security of supply depends on finding a balance between connectivity and system robustness that each country must determine based on its own situation.

Cybersecurity is now a very important part of energy security. Smart grids use digital communication systems, which makes them at risk of cyberattacks. The 2021 report by the International Smart Grid Action Network (ISGAN) shows that cybersecurity is a global

Energy 145 (2015): 139–154, https://doi.org/10.1016/j.apenergy.2015.01.075; Paul Denholm and Maureen Hand, "Grid Flexibility and Storage Required to Achieve Very High Penetration of Variable Renewable Electricity," *Energy Policy* 39, no 3 (2011): 1817–1830, https://doi.org/10.1016/j.enpol.2011.01.019.

[20] Denholm and Hand, "Grid Flexibility and Storage".

[21] Fang et al., "Smart Grid – A Survey".

[22] European Commission, *EU Energy System and Energy Security Report*, Brussels: European Commission, (2023), https://energy.ec.europa.eu; ENTSO-E, "Statistical Factsheet 2024" (2024).

[23] Agora Energiewende, "Climate-neutral power system 2035: How the German power sector can become climate-neutral by 2035," news release, (2022), https://www.agora-energiewende.org/news-events/power-sector-decarbonisation-by-2035-how-germany-can-meet-the-g7-commitment; Elia, "Elia Publishes Its Adequacy & Flexibility Study for Belgium for the Period 2024-2034," news release,(2023), https://www.elia.be/en/newsroom/2023/06/20230629_pressrelease_adeqflex.

[24] IEA, *World Energy Outlook 2023* (Paris: IEA, 2023); ENTSO-E, *Market Report 2023*, Brussels: ENTSO-E, (2023).

[25] Elia Group, *Annual Report 2023*, Brussels: Elia Group, (2023), https://www.elia.be.

[26] Inga Boie, Camila Fernandes, Pablo Frías, and Marian Klobasa, "Efficient Strategies for the Integration of Renewable Energy into Future Energy Infrastructures in Europe – An Analysis Based on Transnational Modeling and Case Studies for Nine European Regions," *Energy Policy* 67 (2014): 170-185, https://doi.org/10.1016/j.enpol.2013.11.014.

priority that requires strong international cooperation and standards.[27] Carol Vigurs and colleagues also highlight that digital risks must be included in energy system planning.[28] As Ivan Pearson explains, weak cybersecurity can reduce both reliability and resilience.[29] Europe's energy grid is going digital, that means cybersecurity can't be an afterthought.[30] However, there is an argument about who should take the lead: international bodies, national governments, or grid operators.[31] My study will not solve this debate, but it will compare how Germany and Belgium address cybersecurity within their smart grid strategies.

The literature shows that smart grids are important for energy security, resilience, flexibility, and security of supply. However, there is still limited research comparing different European countries in terms of this subject. There is a gap in understanding how flexibility differs between internal and external systems, how resilience depends on socio-technical conditions, and how smart grids work differently in decentralised systems like Germany compared to import-dependent systems like Belgium.

Methodology

This research uses a qualitative multiple case study design to examine how smart grid strategies affect energy security during the European energy transition. Belgium and Germany provide the empirical context for this analysis. These two countries are selected because they are structurally different, allowing the analysis to show how system characteristics influence smart grid strategies and their effectiveness. A qualitative approach is adapted because the research focuses on policies, institutions, and strategies. The research questions ask how smart grid strategies influence energy security and what the key similarities and differences are. Such questions seek to understand processes, context, and meaning, not to measure causal effects or test statistical relationships. This approach follows the multiple case study method developed by Robert K. Yin which allows in-depth analysis of each case.[32] It also supports meaningful comparison between the cases. Secondary data forms the basis of the analysis because access to primary field data was limited. Sources include EU policy documents, national energy strategies, and reports from transmission system operators. Academic articles on smart grids and energy security are also used. Together, these sources provide both policy and technical insights. Documents selection was based on clear criteria such as the data of the two countries, a time frame

[27] SGAN (International Smart Grid Action Network), "How to Improve the Interoperability of Digital (ICT) Systems in the (Electric) Energy Sector," *ISGAN Annex 6 Report*, (2021), https://iea-isgan.org/how-to-improve-the-interoperability-of-digital-ict-systems-in-the-energy-sector/.

[28] Carol Vigurs, Chris Maidment, Michael Fell, and David Shipworth, "Customer Privacy Concerns as a Barrier to Sharing Data about Energy Use in Smart Local Energy Systems: A Rapid Realist Review," *Energies* 14, no 5 (2021): 1285, https://doi.org/10.3390/en14051285.

[29] Ivan L G Pearson, "Smart Grid Cyber Security for Europe," *Energy Policy* 39 (2011): 5211–5218, https://doi.org/10.1016/j.enpol.2011.05.043.

[30] ENISA, "Smart Grids Under Cyber Threat: ENISA's NIS360 Report Calls for Stronger Security Measures," 2024, https://argen.energy/blog-posts/smart-grids-under-cyber-threat-enisas-nis360-report-calls-for-stronger-security-measures/.

[31] Alessandro Lazari, "Cyber Resilience as a Pillar of European Energy Security," CERRE (December, 2025), https://cerre.eu/publications/cyber-resilience-as-a-pillar-of-european-energy-security/.

[32] Robert K Yin, *Case Study Research and Applications: Design and Methods*, 6th ed, Thousand Oaks, CA: Sage, (2018).

between 2015 and 2025, and the level of the source such as EU, national, or technical reports.

Three methods are employed to analyse the data. Together, they form an integrated analytical approach. First, a structured comparative analysis is applied. It identifies similarities and differences between Belgium and Germany. Key indicators for comparison include grid digitalisation, renewable energy integration, flexibility mechanisms and grid constraints. All indicators are taken from the literature.

Second, the study uses thematic analysis following Virginia Braun and Victoria Clarke.[33] Data is coded step by step. The goal is to find patterns across the dataset. Four main themes are used: digitalisation, decentralisation, flexibility and cybersecurity, which are based on both literature and data because they appear very often in academic studies and policy reports about smart grids and energy security. Moreover, many researchers and organisations use them. They match my research questions directly. Indeed, My subquestions ask how smart grid strategies deal with digitalisation, decentralisation, flexibility, and cybersecurity, so these themes align with the research framework. Transparent coding is used to improve reliability.

Third, the findings are interpreted using the framework of Aleksei Cherp and Jessica Jewell,which defines energy security in three dimensions including security of supply, system flexibility, and resilience.[34] This helps to connect the results to a broader theoretical context. To improve validity, the study uses data triangulation by comparing different sources, such as policy documents, reports, and academic studies. This reduces biases and strengthens the results.

However, this study has several limitations. The use of secondary data means that the analysis depends on the quality and possible bias of the original sources. Cybersecurity issues are often less documented in secondary data, which may limit the depth of analysis in this specific theme. Moreover, as a qualitative case study, the findings cannot be generalised statistically. Instead, the study aims for analytical generalisation, which is consistent with case study research.[35] But I took steps to address these limitations such as only using official and reliable sources like government reports and peer-reviewed articles. I also compared different document types to check for bias. Despite its limitations, the study is still relevant. It offers a clear framework to compare how different countries use smart grids to improve energy security.

Findings

This study shows that smart grid development in Germany and Belgium plays an important role in European energy security. Smart grids help balance renewable energy in real time and reduce the cross-border congestion. Germany uses intelligent distribution net-

[33] Virginia Braun and Victoria Clarke, "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* 3, no 2 (2006): 77–101, https://doi.org/10.1191/1478088706qp063oa.
[34] Aleh Cherp and Jessica Jewell, "The Concept of Energy Security."
[35] Robert K Yin, *Case Study Research and Applications: Design and Methods*, 6th ed, Thousand Oaks, CA: Sage, (2018), ISBN 9781506336169.

works, including smart meters and decentralised control systems. These technologies help integrate more than 50% renewable electricity.[36] This role is not uniform and depends on system structure, infrastructure and regional integration. Digital technologies such as real-time monitoring and decentralised controls are necessary to maintain system stability. In 2015, redispatch volume in Germany reached 15.4 TWh (Terawatt-hour, a unit for massive electricity amounts).[37] The associated costs amounted to approximately €412 million. In the fourth quarter of 2024 alone, congestion management measures 10,424 GWh. This represents an increase of 19% compared to the same quarter in 2023. The costs for the fourth quarter of 2024 were about €928 million.[38] These figures indicate that digitalisation alone cannot resolve congestion problems. Therefore, physical infrastructure remains essential for reliable grid operation. (See Figures 3-4)

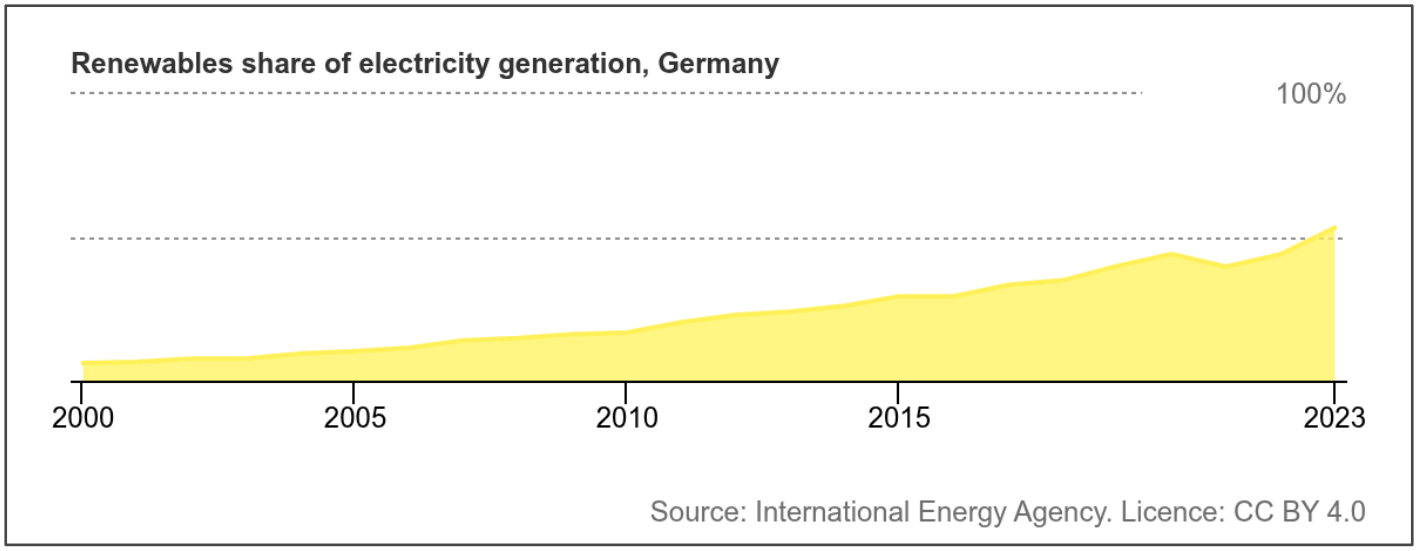

Figure 3: Germany's share of renewable energy, 2000 – 2023. Source: Eurostat, 2026.

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[36] Jan Wohland, Mark Reyers, Carolin Märker, and Dirk Witthaut, "Natural Wind Variability Triggered Drop in German Redispatch Volume and Costs from 2015 to 2016," *PLOS ONE* 13, no 1 (2018): e0190707, https://doi.org/10.1371/journal.pone.0190707.

[37] Redispatch volume shows how often transmission lines are congested. This process is called redispatch. In simple terms, the higher redispatch volume means there are more physical bottlenecks in the grid. This also means the grid is underdeveloped, and as a result, grid management costs go up.

[38] Bundesnetzagentur, "Netzengpassmanagement im Q4 und Gesamtjahr 2025," SMARD, https://www.smard.de/page/home/topic-article/216804/219906/.

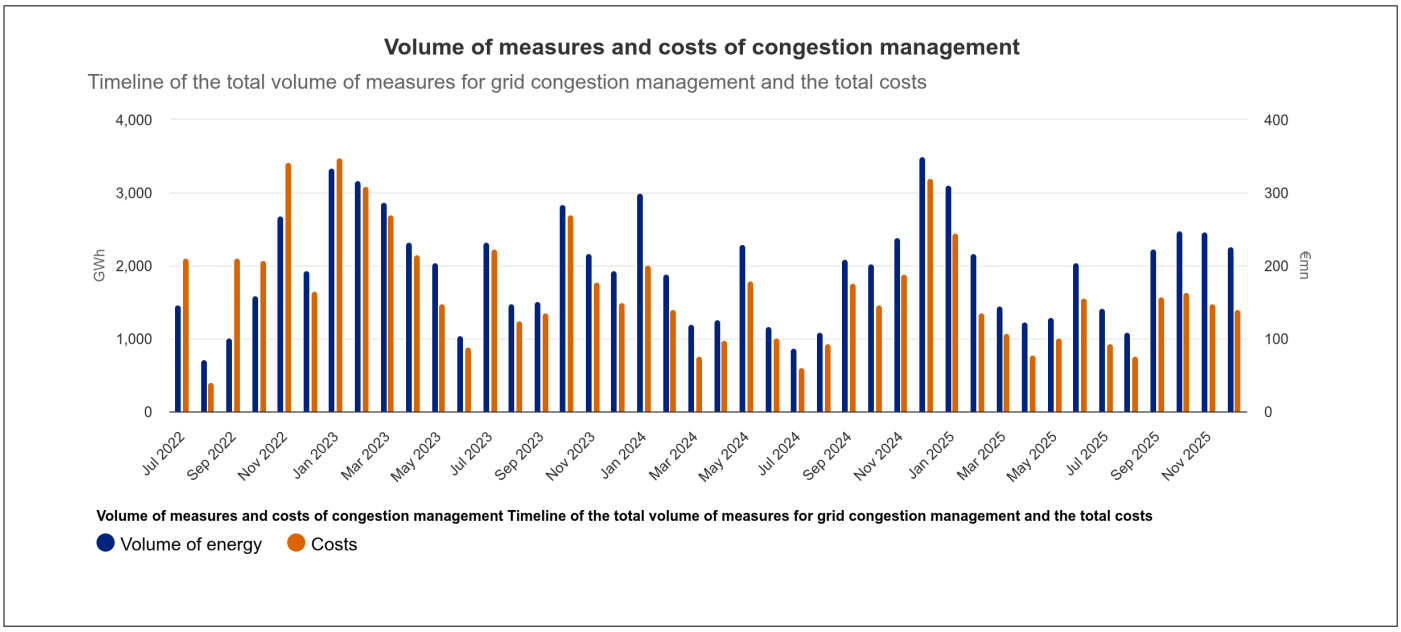

Figure 4: Monthly volume (GWh) and costs (million €) of congestion management measures in Germany, July 2022 - May 2025. Source: Bundesnetzagentur / SMARD.de (2025).

However, smart grid technologies such as dynamic line rating (DLR) and real-time decentralised control can reduce costs effectively. Research shows that DLR deployment in Germany decreases congestion and may save up to €4 billion annually in a fully decarbonised electricity system. In addition, DLR combined with higher wind power generation could save around €400 million per year in the short term and €900 million by 2030.[39] Therefore, smart grids are an important complement to physical infrastructure for reliable and secured grid operation (see Table 1).

In Belgium, digitalisation contributes to energy security in a different way. Belgium relies significantly on electricity imports, which typically account for around 20-25% of total electricity consumption per year (see Figure 3).[40] It means that security of supply depends on cross-border coordination. Digital systems allow real-time balancing with neighbouring countries, which, despite limited internal production, help maintain stable electricity supply.

[39] Philipp Glaum and Fabian Hofmann, "Enhancing the German Transmission Grid Through Dynamic Line Rating," *Applied Energy* 343 (2023): 121199, https://doi.org/10.1016/j.apenergy.2023.121199.
[40] ENTSO-E, "Statistical Factsheet 2023"; IEA (International Energy Agency), "Belgium – Energy Mix", Paris: IEA, (2024), https://www.iea.org/countries/belgium/energy-mix; CREG (Commission for Electricity and Gas Regulation), "CREG Annual Report 2023", Brussels: CREG, (2024), https://www.creg.be/en/publications/annual-report-ar2023.

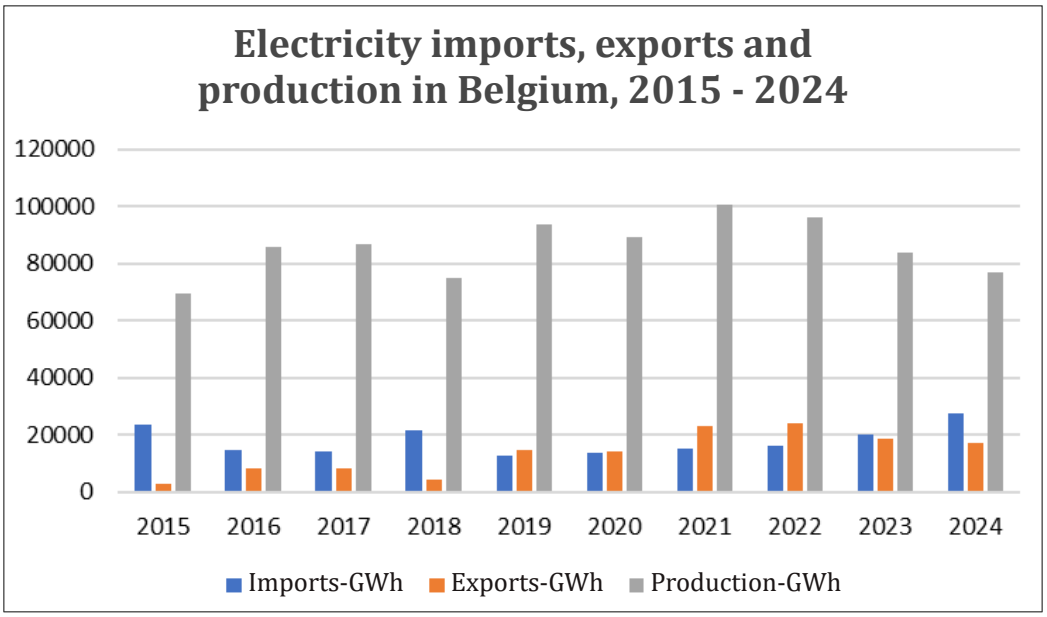

Figure 5: Electricity imports, exports and production in Belgium (2015–2024). Source of Data: IEA (2026)

Belgium is an important transit hub in Europe. The country uses advanced smart grid technologies, such as dynamic line rating and coordinated congestion management with the German TSO 50Hertz (a German Transmission System operator). These technologies help increase cross-border electricity capacity by around 10%. These two technologies prevent blackouts. By using existing lines more efficiently and coordinating across borders, the risk of large-scale blackouts in Europe is reduced.[41] These smart grids support a resilient and connected European energy system (see Figure 5).

A second key finding relates to flexibility, which is essential for reliability and resilience. In Germany, flexibility is mainly internal and includes demand response, storage, and digital control systems. In Belgium, flexibility is mainly external and depends on interconnections and electricity imports. Decentralisation also affects energy security. Germany's decentralised renewable system increases complexity and requires advanced coordination. Belgium has a more centralised system. Its offshore wind capacity reached 2.26 GW by the end of 2023.[42] This reduces internal complexity. Belgium imports and exports electricity to balance its grid because wind power is not always reliable and local storage is too limited, although a centralized system with offshore wind would be easier to manage domestically. Finally, infrastructure is identified as a major limitation in energy security. Around 40% of the EU electricity grid is more than 40 years old, and required investments are estimated between €584 billion by 2030.[43] This shows that current infrastructure limits the ability of smart grids to fully support energy security (see Table 1).

Indicator	Germany	Belgium	Interpretation	Indicator
Renewable share	>50% (2023)	~30% (2023)	Higher RES, more system complexity	Renewable share
Import dependency	Low	20–25%	Belgium relies on regional integration	Import dependency
Redispatch (grid stress)	>20 TWh	Low–moderate	Internal vs external balancing	Redispatch (grid stress)
Offshore wind	Limited	>2.2 GW	Strategic specialisation	Offshore wind
System structure	Decentralised	Interconnected	Different smart grid roles	System structure

Table 1: Key Comparative Indicators Sources: Eurostat (2024); IEA (2023); Agora Energiewende (2022); Elia (2023)

Discussion

The findings can be interpreted using socio-technical systems theory, which explains that energy security is shaped by the interaction of technology, institutions, and infrastructure.[44] From this perspective, smart grids contribute to energy security, but only as part of a broader system. A central issue concerns the role and limits of digitalisation in improving system reliability. While many studies describe digital technologies as tools for efficiency, the findings show that their impact on energy security is conditional upon proper implementation, supportive regulation, skilled users, and robust cybersecurity.[45] In Germany, digitalisation is necessary to manage renewable variability, but high redispatch levels indicate that system reliability is still constrained by grid capacity.[46] This supports the argument that digitalisation improves system operation but doesn't increase physical transmission capacity.[47] Therefore, its contribution to energy security is important but limited. In Belgium, digitalisation contributes to security of supply through cross-border coordination. This reflects a model of external balancing, where energy security depends

[44] Markard et al, "Sustainability Transitions"; Geels, "Technological Transitions".
[45] Shaukat et al, "Survey on Consumers Empowerment and Smart Grid".
[46] Agora Energiewende, "Local Electricity Prices in Germany," Berlin: Agora Energiewende (2025), https://www.agora-energiewende.org/publications/local-electricity-prices-in-germany.
[47] European Commission, "European Grids," (2023), https://energy.ec.europa.eu/topics/infrastructure/european-grids_en; ENTSO-E, "Statistical Factsheet 2023".

on regional integration. But Germany follows a model of internal optimisation, which manages stability within the national system. These two models show that energy security can be achieved through different strategies depending on system structure.[48]

Flexibility is another key factor that links smart grids to energy security. The findings suggest that flexibility should be understood as a multidimensional concept. Operational flexibility supports short-term reliability through real-time balancing, while structural flexibility supports long-term resilience through infrastructure and market design. Germany has a strong operational flexibility, but its structural flexibility is limited by grid constraints. Belgium, on the other hand, relies partly on external flexibility, since its system stability depends on regional electricity flows.[49] This means that flexibility contributes differently to energy security, depending on how the system is designed.

Decentralisation also affects energy security. Germany's decentralised system increases the need for coordination and control. It can create risks if it's not properly managed. On the other hand, Belgium's system is more centralised. This system reduces internal risks but increases dependence on external partners. This fact highlights a trade-off between internal resilience and external dependency. The findings also show that energy security is influenced by political and institutional factors. For instance, the European Green Deal aims to improve sustainability and to reduce geopolitical risks.[50] In this context, smart grids support new forms of energy governance and regional cooperation.

Finally, cybersecurity and data governance expand the concept of energy security. As smart grids depend on digital systems, the risks include cyber attacks and data misuse.[51] This means that energy security is no longer only about physical supply, but also about digital and institutional protection.

Conclusion

This study shows that smart grids play an important role in strengthening energy security in Europe, but their impact depends on system structure and context. Smart grids improve reliability by enabling real-time system management, support resilience through flexible and adaptive operation, and contribute to security of supply through both internal optimisation and cross-border integration. However, their impact is not sufficient on its own. Germany is a model of internal optimisation, where smart grids are used to manage a decentralised and renewable-based system. Belgium is a model of external balancing, where energy security depends on regional integration and interconnections. The study also confirms that although digitalisation is necessary, it cannot replace physical infrastructure. In addition, flexibility must be understood as both operational and structural. Without investment in grid expansion and regulatory reform, the contribution of

[48] Inga Boie et al, "Efficient Strategies for the Integration of Renewable Energy."
[49] ENTSO-E, "Statistical Factsheet (2023)".
[50] Diana Vela Almeida, Vijay Kolinjivadi, Tomaso Ferrando, Brototi Roy, Héctor Herrera, Marcela Vecchione Gonçalves, and Gert Van Hecken, "The 'Greening' of Empire: The European Green Deal as the EU First Agenda," *Political Geography* 105 (2023): 102925, https://doi.org/10.1016/j.polgeo.2023.102925.
[51] Carol Vigurs, Chris Maidment, Michael Fell, and David Shipworth, "Customer Privacy Concerns as a Barrier to Sharing Data about Energy Use in Smart Local Energy Systems: A Rapid Realist Review," *Energies* 14, no 5 (2021): 1285, https://doi.org/10.3390/en14051285.

smart grids to energy security will remain limited. Overall, smart grids should be seen as enabling infrastructures within a broader socio-technical system. Their role in energy security is significant, but depends on infrastructure, governance, and European integration.

Energy independence in the European Union: Discourse and the Economic Reality

Noam Leirman[1]

Introduction

The topic of energy security has been at the forefront of political debate since the Russian invasion of Crimea in 2014 and has reached its peak since the second invasion of Ukraine in 2022.[2] Spearheading the political debate is the European Commission which, since 2022, implemented a number of goals to break its dependency on Russian energy with a complete cutoff by 2027.[3] Whilst the Commission seems to have set clear goals, it seems that the Union continues to depend on Russian gas although to a much lower extent than before 2022.[4] This thus raises the question: *How does the European Commission describe and interpret their dependency on Russian gas after 2022, and to what extent does this discourse correspond with the economic reality?*

The goal of this study is to analyse how and why the narrative differs from the real flows of Russian gas. Additionally, this study improves upon the current lack of studies on energy security through a communication studies lens. Firstly, in order to achieve the goals of this study, a literature review will lay out the historical context of these differences as well as the quantitative reality of the issue. The concepts of energy security and narrative/discourse building will also be discussed. Secondly, a brief overview of the methodology will be explored. Finally, a detailed analysis using the previously discussed methodology, of the Commission's and its Member States will be discussed in order to answer the initial

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[2] Piotr Żuk and Paweł Żuk, "National Energy Security or Acceleration of Transition? Energy Policy after the War in Ukraine," *Joule* 6, no. 4 (2022): 709–12, https://doi.org/10.1016/j.joule.2022.03.009.

[3] "Commission Proposes Gradual Phase-out of Russian Gas and Oil Imports into the EU," *European Commission*, May 17, 2025, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1504.

[4] Amadeo Ghiotto, The LNG Trap: Europe's Fossil Gas Dependence on Russia and the United States (Greenpeace Belgium, 2025), https://www.greenpeace.org/static/planet4-belgium-stateless/2025/09/0c135a20-greenpeace-belgium_ru-us-lng-trap.pdf; "Where Does the EU's Gas Come from?," *Council of the European Union*, accessed December 1, 2025, https://www.consilium.europa.eu/en/infographics/where-does-the-eu-s-gas-come-from.

research question.

Literature Review

The literature review will discuss the concept of energy security and the European Union's interpretation of the Concept up until 2022. Additionally a brief overview of the concepts of narratives and framing will be discussed.

The Concept of Energy Security and the European Union

The political interest in energy security first emerged in the 1960s but became more important after the oil crises of the 1970s, where the focus was laid on the economic instability of energy prices.[5] Up until the end of the twentieth century, energy security discussions remained within military and economic dimensions.[6] In 1988, Daniel Yergin defined energy security for developed countries at that time as *"the availability of sufficient supplies at affordable prices."*[7] These two dimensions of availability and affordability have been expanded to four by the Asia Pacific Energy Research Center with the addition of *"Accessibility"* which is based on a quantitative measure of energy, and the dimension of *"Acceptability"* with a focus on the environment and future generations.[8] The two addition Dimensions turned energy security into a democracy issue.[9]

The European Union's view on energy security matches these previously mentioned dimensions, with a Commission paper on energy security stating that energy security should ensure *"uninterrupted physical availability ... at a price which is affordable ... while respecting environmental concerns and looking towards sustainable development."*[10] This vision on energy security was proposed in the year 2000. Since then, a lot has happened including the Green Deal in 2014 and the full-scale invasion of Ukraine by Russia in 2022, but the vision has remained the same although some dimensions have been more prominent than others.[11] Said prominence of specific dimensions is politically constructed de-

[5] Harold Lubell, "Security of Supply and Energy Policy in Western Europe," *World Politics* 13, no. 3 (1961): 400–422, https://doi.org/10.2307/2009482; E. W. Colglazier Jr. and D. A. Deese, "Energy and Security in the 1980s," *Annual Review of Environment and Resources* 8 (1983): 415–49, https://doi.org/10.1146/annurev.eg.08.110183.002215.

[6] Novikau, Aliaksandr. "Conceptualizing and Redefining Energy Security: A Comprehensive Review." WORLD SCIENTIFIC (EUROPE) eBooks, January 1, 2021, 37–59. https://doi.org/10.1142/9781786349224_0002.

[7] Yergin, Daniel. "Energy Security in the 1990s." Foreign Affairs, February 23, 2023. https://www.foreignaffairs.com/articles/united-states/1988-09-01/energy-security-1990s; Daniel Yergin, "Ensuring Energy Security," *Foreign Affairs* 85, no. 2 (2006): 69–82, https://doi.org/10.2307/20031912.

[8] Aleh Cherp and Jessica Jewell, "The Concept of Energy Security: Beyond the Four As," *Energy Policy* 75 (December 2014): 415–21, https://doi.org/10.1016/j.enpol.2014.09.005; Lynne Chester, "Conceptualising Energy Security and Making Explicit Its Polysemic Nature," *Energy Policy* 38, no. 2 (2010): 887–95, https://doi.org/10.1016/j.enpol.2009.10.039.

[9] John A. Paravantis, "Dimensions, Components and Metrics of Energy Security: Review and Synthesis," SPOUDAI - *Journal of Economics and Business* 69, no. 4 (2019): 38–52.

[10] Publications Office of the European Union, "Green Paper: Towards a European Strategy for the Security of Energy Supply," November 29, 2000, 2, https://op.europa.eu/en/publication-detail/-/publication/0ef8d03f-7c54-41b6-ab89-6b93e61fd37c/language-en.

[11] "Ukraine in Maps: Tracking the War with Russia," *BBC News*, May 14, 2025, https://www.bbc.com/news/articles/c0l0k4389g2o; European Commission, Communication from the Commission: The European Green Deal, COM(2019) 640 final (Brussels: European Commission, 2019), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019DC0640; Noam Leirman, "The European Commission's Discourse on the Green Deal: A Shifting Strategic Narrative?" (MSc thesis, Vrije Universiteit Brussel, 2025), https://researchportal.vub.be/en/studentTheses/the-european-commissions-discourse-on-the-green-deal-a-shifting-s/.

pending on the end goal of certain actors.[12]

Narratives and Framing

A crucial part of energy security is energy dependence which is tied to *"the proportion of energy that an economy must import"* in order to meet its energy needs.[13] In 2019, 90% of the EU's gas needs were met by imports with 40% of them coming from Russia, concerns of energy costs and supply after the start of the war underline said dependence.[14] A to a lesser extent type of dependency is the concept of residual reliance, which can be defined by the combination of the words residual and reliance, that is the *"dependence on something"* for something that is *"left over."*[15] This in terms of energy security means the need for an energy source when all the other sources cannot meet the demand at a certain point.

While material dependency on Russian gas forms the backdrop of current EU energy security policy, this study focuses on how political actors interpret and communicate this dependency through their narratives. According to scholars narratives can be defined as having five characteristics: *"making sense of reality,"* referring to *"some beliefs and desires," "linear and predictable*," "predestinated meaning" and an *"engaging character."*[16] They are constructed to convince the public that a certain policy is the right choice.[17] Narratives can differ in problem definition, causal attribution, moral framing and proposed solutions.[18] The use of *"imprecise terminology"* in their narratives allows political actors to promote specific solutions that would not be accepted by the broader public.[19] Another important tool to manipulate discourse is the use of selective emphasis and downplaying parts of a

[12] Cherp and Jewell, "Concept of Energy Security," 415–21.
[13] "Glossary: Energy Dependency Rate," *Eurostat*, accessed May 27, 2026, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Energy_dependency_rate.
[14] Giuseppe Celi et al., "The Asymmetric Impact of War: Resilience, Vulnerability and Implications for EU Policy," *Intereconomics* 57, no. 3 (2022): 141–47, https://doi.org/10.1007/s10272-022-1049-2; "Fossil Fuel Industry Exploiting Europe's Energy Crisis, Says Al Gore," POLITICO, October 1, 2025, https://www.politico.eu/article/al-gore-fossil-fuel-industry-exploiting-europe-energy-crisis/; "EU Gas Markets May Avoid a 2022-Style Crisis – but the Consequences Will Bite Anyway," CEPS, March 17, 2026, https://www.ceps.eu/eu-gas-markets-may-avoid-a-2022-style-crisis-but-the-consequences-will-bite-anyway/; "Is Europe on the Brink of a New Gas Crisis?," DW, accessed May 27, 2026, https://www.dw.com/en/is-europe-on-the-brink-of-a-new-gas-crisis/a-70902875; "Is Europe Prepared for Winter despite Lower Gas Supplies?," DW, accessed May 27, 2026, https://www.dw.com/en/europe-gas-supplies-winter-energy-security-trump-tariffs-russia-graphics/a-73995118; "EU Fears Panic Buying as Gas Reserves Run Low," POLITICO, March 18, 2026, https://www.politico.eu/article/eu-fear-panic-buy-gas-reserves-low-energy-war-iran/.
[15] "Reliance, n.," OED Online, accessed June 17, 2026, https://www.oed.com/dictionary/reliance_n; "Residual, adj.," OED Online, accessed June 17, 2026, https://www.oed.com/dictionary/residual_adj.
[16] N. O. Steblyna, "Narrative in the Field of Political Communications: The Approaches of Most Cited Papers on Web of Science," *Політичне Життя*, no. 3 (2019): 95–100, https://doi.org/10.31558/2519-2949.2019.3.15.
[17] Rui Mu et al., "Policy Narrative, Policy Understanding and Policy Support Intention: A Survey Experiment on Energy Conservation," *Policy Studies* 43, no. 6 (2022): 1361–81, https://doi.org/10.1080/01442872.2021.1954609.
[18] Robert M. Entman, "Framing: Toward Clarification of a Fractured Paradigm," *Journal of Communication* 43, no. 4 (1993): 52, https://doi.org/10.1111/j.1460-2466.1993.tb01304.x.
[19] Scott R. Littlefield, "Security, Independence, and Sustainability: Imprecise Language and the Manipulation of Energy Policy in the United States," *Energy Policy* 52 (January 2013): 779–88, https://doi.org/10.1016/j.enpol.2012.10.040; Jonna Nyman, "Rethinking Energy, Climate and Security: A Critical Analysis of Energy Security in the US," *Journal of International Relations and Development* 21, no. 1 (2018): 5, https://doi.org/10.1057/jird.2015.26.

problem, issue or even solution.[20] Communications on legislation have also been proven to be reframed by political actors in order to achieve their goals and to interpret laws to their advantage.[21]

The European Commission has viewed energy security as a European problem since the conception of the Energy Union in 2015.[22] The Commission's narratives on the subject have changed multiple times as historical events have taken place due to the fact that narratives take multiple factors in consideration when being created with one of them being *"dramatic moments"* such as the Russian invasion of Ukraine.[23] The strategic narrative on energy in particular has shifted since 2022, moving away from sustainability to hard security.[24] The Russian invasion of Ukraine also prompted an EU wide energy crisis which led to the European Commission's introduction of the REpowerEU initiative with the goal of diversifying its energy sources and reducing Russian dependence.[25] However, recent findings and market developments suggest that said dependency has not disappeared entirely but instead has shifted.[26]

Before the 2022 invasion, most Russian gas was imported through pipelines. All of these have gradually stopped providing gas to the EU with the exception of Turkstream.[27] Since then, energy provisions have shifted towards seaborne liquified natural gas (LNG), with Russia being the second largest supplier to the EU.[28] The continued reliance on Russian energy, despite political commitments to energy independence, highlights the importance of examining how the European Union communicates and frames this dependency.

Methodology

In the following part, the research design will be explained as well as the data sourcing and the limitations of this study.

Research design

This study adopts a qualitative research design, and more specifically a narrative analysis. Such analysis is particularly suitable for examining how political actors frame policy is-

[20] Anwen Elias et al., "Position, Selective Emphasis and Framing: How Parties Deal with a Second Dimension in Competition," *Party Politics* 21, no. 6 (2015): 839–50, https://doi.org/10.1177/1354068815597572.
[21] William Haltom and Michael McCann, *Distorting the Law: Politics, Media, and the Litigation Crisis* (University of Chicago Press, 2009); Seda Gasparyan, "Implementing Manipulative Strategies in Legal Speech," Cognition, Communication, *Discourse*, no. 20 (July 2020): 13–26, https://doi.org/10.26565/2218-2926-2020-20-01.
[22] European Commission, "Energy Union," accessed December 12, 2025, https://energy.ec.europa.eu/strategy/energy-union_en.
[23] Michael D. Jones and Mark K. McBeth, "A Narrative Policy Framework: Clear Enough to Be Wrong?," *Policy Studies Journal* 38, no. 2 (2010): 1, https://doi.org/10.1111/j.1541-0072.2010.00364.x.
[24] Leirman, "European Commission's Discourse on the Green Deal."
[25] European Commission, "REPowerEU," May 18, 2022, accessed May 15, 2026, https://commission.europa.eu/topics/energy/repowereu_en.
[26] Bruegel, "Bruegel Dataset: European Natural Gas Imports," version 2026-13-05, *Bruegel*, 2022, https://doi.org/10.64153/WVKK8731.
[27] Bruegel, "Bruegel Dataset: European Natural Gas Imports."
[28] "EU Imports of Energy Products - Latest Developments," *European Commission*, March 2026, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_latest_developments; Bruegel, "Bruegel Dataset".

sues, attribute responsibility and propose solutions within their communications.[29] Rather than focusing on the material dependency itself, this study examines how this dependency is interpreted and communicated through political narratives.

To contextualise these narratives, the analyses will compare them with empirical data on Russian LNG imports into the European Union in order to identify potential discrepancies, contradictions and tensions between the two.[30]

Data Sources and Processing

In order to understand the European discourse on Russian gas, we will study a number of official communications from the Commission as well as the Council. In particular, we will examine the different sanction packages against Russia since its invasion of Ukraine in February 2022, as well as documents pertaining to the RepowerEU initiative discussing Russian gas and LNG as can be seen by the brief overview in Table 1.[31] In addition to these qualitative sources, this study also uses quantitative data on Russian LNG imports into the EU.[32]

The collected qualitative data will be analysed using the program MAXQDA. Coding will be done on an inductive basis which allows for more freedom in comparison to deductive coding.[33] Particular attention will be paid to elements contradicting the quantitative data. A first round of coding will determine which documents will be analysed based on relevant key words such as 'energy,' 'gas,' et cetera.

[29] Entman, "Framing: Toward Clarification of a Fractured Paradigm"; Antonio Losada Trabada and Elba Maneiro, "Political Communication, Framing Strategies, and Public Opinion: Questions for the next Big Crisis," *Atlantic Journal of Communication* 34, no. 1 (2026): 94–113, https://doi.org/10.1080/15456870.2025.2504483; Kathrin Braun, "Between Representation and Narration: Analysing Policy Frames," in *Handbook of Critical Policy Studies*, ed. [Editor(s)] (Edward Elgar Publishing, 2015), https://www.elgaronline.com/edcollchap/edcoll/9781783472345/9781783472345.00033.xml.

[30] Frank Fischer, "Science and Critique in Political Discourse: Elements of a Postpositivistic Methodology," *New Political Science* 3, no. 1–2 (January 1, 1982): 9–32, https://doi.org/10.1080/07393148208429554.

[31] "Timeline - Packages of Sanctions against Russia since February 2022," *Council of the European Union*, accessed March 9, 2026, https://www.consilium.europa.eu/en/policies/sanctions-against-russia/timeline-packages-sanctions-since-february-2022/.

[32] Bruegel, "Bruegel Dataset: European Natural Gas Imports."

[33] Theophilus Azungah, "Qualitative Research: Deductive and Inductive Approaches to Data Analysis," *Qualitative Research Journal* 18, no. 4 (2018): 383–400, https://doi.org/10.1108/QRJ-D-18-00035.

Institution	Document type	Period	N
European Commission	Communication (REPowerEU Plan)	2022	1
European Commission	Press releases & statements (sanctions packages 1–20)	2022-2025	26
European Commission	Presidential speeches & press statements	2022-2025	5
Council of the EU (Consilium)	Press releases (sanctions packages 1–20)	2022-2025	16
Council of the EU (Consilium)	Legislative acts (Council Decision & Regulation)	2014-2026 (amended)	2
TOTAL			**50**

Table 1: Overview of analysed texts.

Limitations

The use of Commission and Council documents does not allow insight into the narrative battle within the European Union as would allow parliamentary debates or politicians statements. This study is limited to analysing the upper layer of EU communications but it allows further research to drill down on specific issues. Additionally, the narrow scope of the study limits generalisation as only two parts of the European Union's political system are used in the analysis. The lack of parliamentary debates and speeches by representatives also limits the validity to a certain extent.

Analysis

In the analysis, the first part will focus on the discourse of the EU itself whilst the second part will emphasise on the empirical data.

Russian Gas in EU Discourse

At the start of the Russian invasion the European leaders promised to end *"Russian energy imports … as soon as possible."*[34] This statement represents a sense of urgency. The twenty sanction packages thereafter continued said discourse with statements such as *"we con-*

[34] European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: REPowerEU Plan, COM(2022) 230 final (Brussels: *European Commission*, 2022), 2, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483.

tinue to do everything in our power to erode Putin's war machine and his revenues" and that *"there is no room for complacency."*[35] The end of Russian energy dependency was also framed as a necessity for a *"truly interconnected and resilient EU energy network,"* which once again shows that the Commission in particular showed great willingness and swiftness in ending Russian energy dependence.[36]

Whilst these statements imply *"hard-hitting"* sanctions, the EU seems to also temper its political discourse when it comes to the underlying legal documents.[37] The sanctions concerning energy seems to include exemptions or even contradictions, which are demonstrated in Table 2.

Additionally, the import ban of Russian energy has not been as swift as was promised. The first thirteen sanction packages did not mention any LNG import or export bans. That changed in June 2024, but these sanctions remained far from what was promised with a focus on the export side of things and limiting *"specific terminals which are not connected to the EU gas pipeline network."*[38] This suggests that the narrative of rapid energy independence is limited by the economic and infrastructural realities, forcing the Union to adopt a more careful and flexible transition than initially communicated. This is further emphasised by framing some of these exemptions as necessary, *"the fast decoupling from Russian energy imports can lead to higher and more volatile energy prices."*[39]

[35] European Commission, "Press Statement by President von der Leyen with Ukrainian President Zelenskyy," May 9, 2023, 3, https://enlargement.ec.europa.eu/news/press-statement-president-von-der-leyen-ukrainian-president-zelenskyy-2023-05-09_en; European Commission, "EU Adopts 13th Package of Sanctions against Russia," February 23, 2024, 1, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_963.

[36] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS REPowerEU Plan, 3.

[37] European Commission, "Ukraine: EU Agrees on Eighth Package of Sanctions," October 6, 2022, 1, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_5989.

[38] European Commission, "EU Adopts 14th Package of Sanctions against Russia," June 24, 2024, 1, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_3423.

[39] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS REPowerEU Plan, 13.

Legislation	Article number	Exemption
Council Regulation (EU) 2022/8793 June 2022	Article 3.3 (a)	Exemption to the prohibition of sale, supply, transfer or export of goods or technology or financial assistance to Russia, for the transport of gas and oil into the EU
Council Regulation (EU) 2022/2474 of 16 December 202216 December 2022	Article 3a.3 (a)	Exemption for the prohibition of new contracts with the Russian energy sector if necessary to maintain the critical energy supply
Council Regulation (EU) 2024/174524 June 2024	Article 3r.3	Exemption to the prohibition of reloading services and financial aid if necessary for the energy supply of a Member State
Council Regulation (EU) 2026/126 January 2026	Article 4.1	Extension for existing long term LNG contracts until January 1st 2027

Table 2: Exemptions of EU's sanction regime on Russia[40]

The Commission's communication on sanctions and specifically energy independence created a message of unity within the Union as *"no Member State can tackle this challenge on its own."*[41] There were calls for clear *"alignment"* across the EU but that also presents discrepancies with reality as stated by Von der Leyen in one of her speeches *"we want our sanctions to be better applied and respected,"* the underlying legal documents also allow for Member States to make exceptions when deemed *"needed"* such as article 3m paragraph six in Council Regulation (EU) 2024/3192 of 16 December 2024 which allowed Croatia to import Russian vacuum gas oil for two additional years after its ban.[42]

[40] Regulation (EU) 2026/261 of the European Parliament and of the Council of 26 January 2026 on Phasing out Russian Natural Gas Imports and Preparing the Phase-out of Russian Oil Imports, Improving Monitoring of Potential Energy Dependencies and Amending Regulation (EU) 2017/1938 (2026), http://data.europa.eu/eli/reg/2026/261/oj; Council Regulation (EU) No 833/2014 of 31 July 2014 Concerning Restrictive Measures in View of Russia's Actions Destabilising the Situation in Ukraine (2026), http://data.europa.eu/eli/reg/2014/833/2026-04-24; Council Decision 2014/512/CFSP of 31 July 2014 Concerning Restrictive Measures in View of Russia's Actions Destabilising the Situation in Ukraine (2025), http://data.europa.eu/eli/dec/2014/512/2025-12-24.

[41] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS REPowerEU Plan, 3.

[42] European Commission, "EU Extends the Scope of Sanctions on Russia and Belarus," March 15, 2022, 1, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1649; European

The Numbers and the Discourse

Whilst the European Commission claimed a fast transition from Russian energy, the numbers do not fully reflect this discourse. As of March 2026, the LNG imports from Russia have remained high as Russia still is Europe's second largest supplier in LNG[43]. Its imports have risen in comparison to before the conflict which can possibly be related to the gas pipe cutoffs which necessitated other means of import in order to satisfy the energy needs of its Member States, as can be seen in Figure 1. The continued use of the Russian supply chain may be an example of residual reliance as the EU still needs to live with the realities of international trade and politics.

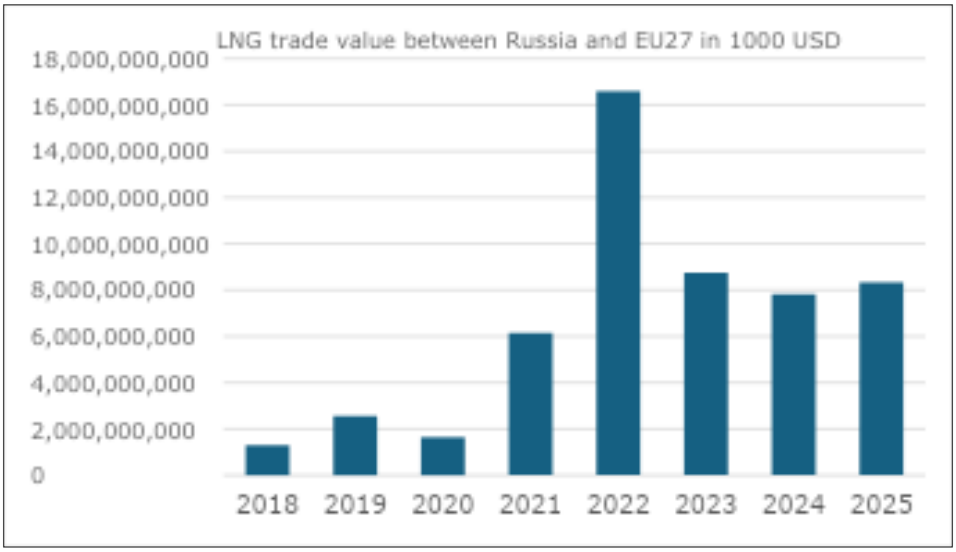

Figure 1: LNG imports by the EU-27[44]

This may help explain why the Union has refrained from sanctioning LNG for over four years. Additionally, while pipelines have been shut down, Turkstream still remains fully operational and runs at a maximum capacity providing eastern Europe with almost 70% of all their energy needs.[45] These continued flows and specific country exceptions show a discrepancy between the discourse of the Union and the economic and infrastructural reality which has led to the need for flexibility mechanisms in order to maintain such discourse of unity, rapidity and enforcement. As a result, the European Union focused its

Commission, "Statement by the President with HR/VP Kallas on the 18th Package of Sanctions against Russia," June 10, 2025, 2, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/statement_25_1471; "Russia's Aggression against Ukraine: EU Adopts 'Maintenance and Alignment' Package," Council of the European Union, July 21, 2022, 1, accessed March 16, 2026, https://www.consilium.europa.eu/en/press/press-releases/2022/07/21/russia-s-aggression-against-ukraine-eu-adopts-maintenance-and-alignment-package/.Council Regulation (EU) 2024/3192 of 16 December 2024 Amending Regulation (EU) No 833/2014 Concerning Restrictive Measures in View of Russia's Actions Destabilising the Situation in Ukraine (2024), http://data.europa.eu/eli/reg/2024/3192/oj.

[43] *Bruegel*, "Bruegel Dataset."

[44] World Integrated Trade Solution, "World Integrated Trade Solution (WITS) | Data on Export, Import, Tariff, NTM," 2026, https://wits.worldbank.org/.

[45] CREA – Centre for Research on Energy and Clean Air, "The Last Mile: Phasing Out Russian Oil and Gas in Central Europe – Centre for Research on Energy and Clean Air," *Centre for Research on Energy and Clean Air*, June 11, 2025, https://energyandcleanair.org/publication/the-last-mile-phasing-out-russian-oil-and-gas-in-central-europe/.

discourse on visible success such as the end of Nordstream rather than the continued imports of seaborne LNG and Turkstream flows.

All Russian gas imports will be banned as of September 30, 2027.[46] But, once again, this ban contains important exemptions with Member States being allowed to continue imports when needed in order to secure their energy needs in unusual times as can be seen in Table 2 this can be viewed as a residual reliance on Russian energy sources. The continued use of exemptions and other flexibilities may raise the question if the Union will actually have *"earned [its] [complete] independence from Russia"* as they have stated to be achieved.[47] The European Union may continue to require such mechanisms as it has to live with the economic necessity of affordable energy whilst striving towards an independent and diversified energy landscape.Therefore it may be necessary for the Union to access Russian energy sources as a means of residual reliance.

Legislation	**Article**	**Exemption**
Council Regulation (EU) 2026/126 January 2026	Article 4.1	Extension for existing long term LNG contracts until January 1st 2027
Council Regulation (EU) 2026/126 January 2026	Article 4.2	Extension for Member States to import Russian LNG if energy reserves are not replenished until November 2027
Council Regulation (EU) 2026/126 January 2026	Article 13.2	4-week exemption if Member States find themselves in an energy shortage or emergency

Table 3: Exemptions in EU's Russian LNG import ban[48]

Conclusion

The European Commission frames its energy dependency on Russian gas as rapidly decreasing, while presenting itself as actively pursuing said independence. It frames its efforts as a sign of unity across the Union with calls for solidarity. Sanction communications

[46] "19th Package of Sanctions against Russia: EU Targets Russian Energy, Third-Country Banks and Crypto Providers," *Council of the European Union*, accessed March 16, 2026, https://www.consilium.europa.eu/en/press/press-releases/2025/10/23/19th-package-of-sanctions-against-russia-eu-targets-russian-energy-third-country-banks-and-crypto-providers/.

[47] European Commission, "Speech by the President: European Parliament Plenary Debate," 1, accessed March 16, 2026, https://ec.europa.eu/commission/presscorner/detail/en/speech_25_3102.

[48] Regulation (EU) 2026/261.

emphasise successes while downplaying continued imports. In reality, the sanctions that are framed as "hard hitting" remain full of exemptions and flexibility mechanisms.[49] Added to the fact that Russia remains the European Union's third biggest fossil energy import partner, it seems that the European Commission maintains a strong discourse while preserving flexibility because complete independence is economically difficult.[50]

The use of flexibility mechanisms and exemptions aids the Commission in ensuring continued energy supplies without altering its path towards independence in a continuously evolving global energy market. The use of these mechanisms allows the Commission to use Russian energy when needed as a sort of last resort for residual energy needs. The ongoing geopolitical instability can help explain why the Commission chose to allow additional exemptions in its ultimate ban on Russian LNG imports as it is imperative to a country and economy that all its energy needs remain met.

As of today, the European Union may not have reached complete independence from Russian gas, but it has freed itself from its dependence. What remains is a residual reliance in order to ensure its energy supply. That reality has been difficult to communicate for the European Commission, which is why its narratives may differ from its underlying legal texts and economic realities.

The narrow focus on supra-governmental discourse suggests the need for further research to extend towards member-state discourse on energy security, and the role of the Commission as a broker between Member States with competing narratives/objectives in the context of the unanimity requirement for decisions on foreign policy within the Union.[51]

[49] European Commission, "Implementation of EU Sanctions against Russia," July 27, 2022, 1, accessed May 15, 2026, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_4548.
[50] *Bruegel*, "Bruegel Dataset: European Natural Gas Imports;" Celi et al., "The Asymmetric Impact of War."
[51] "Unanimity," *Council of the European Union*, accessed November 29, 2025, https://www.consilium.europa.eu/en/council-eu/voting-system/unanimity/; Ana E. Juncos and Karolina Pomorska, "Populists in the Shadow of Unanimity: Contestation of EU Foreign and Security Policy," *Politics and Governance* 12 (2024): https://doi.org/10.17645/pag.8099.

Security or sustainability? How 'open strategic autonomy' reconciles energy security and climate neutrality in EU discourse

Sem Noah Verpoten[1]

Introduction

The invasion of Ukraine, the energy crisis, the urgency of climate change, and geopolitical uncertainty have placed energy policy at the centre of the European Union's (EU) political agenda.[2] In this context, energy security, the green transition, and strategic autonomy have become closely intertwined priorities. Yet, although each of these themes has been examined in the literature, they are often analysed as separate policy domains rather than as overlapping and potentially competing frameworks.[3]

The limited attention paid to the coherence between these frameworks creates concerns. Insufficient attention has been given to the tensions that may emerge when progress in one domain generates new vulnerabilities in another. This article therefore asks: How coherent is the EU's discourse in policy papers on the green transition, energy security, and strategic autonomy in its policy frameworks between 2015 and 2024?

This article contributes to the literature on EU policy coherence and strategic autonomy by analysing how energy security, climate neutrality, and the green transition are connected in EU policy discourse. Using thematic document analysis, it traces linkages, trade-offs, and dependency shifts in selected EU policy frameworks between 2015 and 2024. The study shows that EU discourse presents the green transition as a way to strengthen energy security and reduce fossil-fuel dependence, but also recognises new vulnerabilities linked to clean technologies, supply chains, and critical raw materials. It therefore adds

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[2] Marco Siddi, "Coping with Turbulence: EU Negotiations on the 2030 and 2050 Climate Targets," Politics and *Governance* 9, no. 3 (2021): 327–36, https://doi.org/10.17645/pag.v9i3.4267.
[3] Jaden Kim, Florence Jaumotte, Augustus J. Panton, and Gregor Schwerhoff, "Energy Security and the Green Transition," *Energy Policy* 198 (March 2025): 1, https://doi.org/10.1016/j.enpol.2024.114409.

to existing knowledge by showing that EU policy coherence is not complete, but partial and managed.

Current Views on Energy Security in the EU

Energy security is defined from two perspectives: that of energy-importing economies and that of energy-exporting economies. Given that the EU is for the most part an importing economy, this study adopts the definition applicable to energy-importing economies. From this perspective, the reliability of energy supply constitutes a central dimension of energy security. The International Energy Agency defines energy security as the uninterrupted availability of energy sources at an affordable price, highlighting both continuity of supply and affordability as core components.[4]

Drawing on portfolio theory from finance, Jerzyniak argues that energy security is strengthened through a diversified portfolio of energy suppliers, as diversification reduces exposure to supply disruptions and external shocks.[5] Within this framework, renewable energy has gained increasing prominence in energy security analyses, as renewables can replace energy imports and thereby reduce external dependence.[6] At the same time, the growing share of renewable energy introduces new challenges for energy security. As energy security and energy independence are closely interrelated, attempts to increase domestic fossil fuel production in the name of independence may delay the green transition, thereby creating tensions between short-term security objectives and long-term sustainability goals.[7]

The Green Transition

The EU's green transition is mainly structured around the European Green Deal, which was presented by the European Commission in 2019 as an overarching framework to achieve climate neutrality by 2050.[8] One of its central targets is the commitment to reduce greenhouse gas emissions by at least 55% by 2030 compared with 1990 levels.[9] This objective has been integrated into the European Climate Law, which gives the Green Deal a binding legal basis and increases expectations for Member State compliance.[10] Since the

[4] Jaden Kim, Florence Jaumotte, Augustus J. Panton, and Gregor Schwerhoff, "Energy Security and the Green Transition," *Energy Policy* 198 (March 2025): 1, https://doi.org/10.1016/j.enpol.2024.114409; Bert Kruyt, D. P. van Vuuren, H. J. M. de Vries, and H. Groenenberg, "Indicators for Energy Security," Energy Policy 37 (2009): 2167, https://doi.org/10.1016/j.enpol.2009.02.006.

[5] Tomasz Jerzyniak, "The EU De-Risking of Energy Dependencies: Towards a New Clean Energy Geopolitical Order?" *Politics and Governance* 12 (2024): 6, https://doi.org/10.17645/pag.8285.

[6] Mohammad Fazle Rabbi, József Popp, Domician Máté, and Sándor Kovács, "Energy Security and Energy Transition to Achieve Carbon Neutrality," *Energies* 15, no. 21 (2022): 3, https://doi.org/10.3390/en15218126.

[7] Gail Cohen, Frederick Joutz, and Prakash Loungani, "Measuring Energy Security: Trends in the Diversification of Oil and Natural Gas Supplies," *Energy Policy* 39, no. 9 (2011): 4861, https://doi.org/10.1016/j.enpol.2011.06.034.

[8] Claire Dupont and David Torney, "European Union Climate Governance and the European Green Deal in Turbulent Times," *Politics and Governance* 9, no. 3 (2021): 312–15, https://doi.org/10.17645/pag.v9i3.4896.

[9] Eric Ponthieu, "The European Green Deal and Other Climate Plans," in *The Climate Crisis, Democracy and Governance*, SpringerBriefs in Climate Studies (Cham: Springer, 2020), 17–36, https://doi.org/10.1007/978-3-030-58127-5_2.

[10] E. J. DeMarco Jr. and B. Mason, "EU Proposes Climate Law," *The RMA Journal* 102, no. 7 (2020): 14.10 Pantelis Capros et al., "Energy-System Modelling of the EU Strategy Towards Climate-Neutrality," *Energy Policy* 134 (2019): 110960, https://doi.org/10.1016/j.enpol.2019.110960; Felix Schreyer et al., "From Net-Zero to Zero-

energy sector remains a major source of EU emissions, reducing fossil-fuel dependence is central to this transition. This requires further investment in renewable energy, energy efficiency, and electrification. Despite common EU-level targets, Member States keep sovereignty over how they implement these frameworks.[11] This also means that the European Commission has provisionally classified investments in nuclear energy and natural gas as sustainable under its taxonomy. The European Commission acknowledges that these two energy sources are not sustainable but believes that they are necessary to achieve the climate goals.[12]

Open Strategic Autonomy in EU Policy

Strategic autonomy is understood as the EU's ability to take decisions and act independently in strategically vital policy areas.[13] Over time, strategic autonomy has broadened well beyond defence: it has been linked to post-crisis recovery and other domains such as health, and has diffused into energy, climate, and technology governance.[14] This expansion is contested. As the term moved into new policy sectors, scholars have argued that its "geopoliticisation" risks conceptual overstretch or even a "hijacking" of the concept.[15] EU-oriented definitions tend to foreground autonomy as an ability to act without depending on third-party capabilities, underpinned by security of supply, access to critical technologies, and operational sovereignty.[16] When applied to the green transition, this raises a key tension: climate-neutrality strategies can deepen dependencies on upstream supply chains and concentrated manufacturing capacities (e.g., for clean technologies and inputs), making "autonomy" potentially harder to achieve in practice.[17] In the energy domain, the aspiration for strategic autonomy confronts a structural constraint: given the Union's net-import position overall and the concentration of external suppliers, a strict autonomy objective may be less plausible than a strategy centred on diversification and risk reduction.[18]

Fossil in Transforming the EU Energy System," *Nature Communications* 16 (2025): 10700, https://doi.org/10.1038/s41467-025-66682-z.

[11] Marc-Antoine Eyl-Mazzega and Carole Mathieu, "The European Union and the Energy Transition," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra, Lecture Notes in Energy 73 (Cham: Springer, 2020), 34, https://doi.org/10.1007/978-3-030-39066-2_2.

[12] Rainer Haselmann, Sebastian Steuer, and Tobias Tröger, "Gas and Nuclear Power as Transition Technologies: What Does This Mean for Investments," *EconPol Forum* 24, no. 1 (2023): 17–22.

[13] Mario Damen, *EU Strategic Autonomy 2013–2023: From Concept to Capacity*, briefing, European Parliamentary Research Service (Brussels: European Parliament, July 8, 2022), https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI%282022%29733589.

[14] Niklas Helwig and Ville Sinkkonen, "Strategic Autonomy and the EU as a Global Actor: The Evolution, Debate and Theory of a Contested Term," *European Foreign Affairs Review* 27, Special Issue (2022): 1–20, https://doi.org/10.54648/eerr2022009.

[15] Eva Michaels and Monika Sus, "(Not) Coming of Age? Unpacking the European Union's Quest for Strategic Autonomy in Security and Defence," *European Security* 33, no. 3 (2024): 383–405, https://doi.org/10.1080/09662839.2024.2376603.

[16] Felix Arteaga, Tomas Jermalavicius, Alessandro Marrone, Jean-Pierre Maulny, and Marcin Terlikowski, *Appropriate Level of European Strategic Autonomy*, ARES Report no. 8 (November 4, 2016).

[17] Gaspar Filho, Victor, and Thauan Santos. "Energy Security Transition: Clean Energy, Critical Minerals, and New Dependencies." *Ambiente & Sociedade* 25 (2022): e01791.

[18] Eloïse Ryon, "European Strategic Autonomy: Energy at the Heart of European Security?," *European View* 19, no. 2 (2020): 238–244, https://doi.org/10.1177/1781685820968302.

Methodology

This article uses a single-case study design focused on EU policy discourse between 2015 and 2024 on the green transition, energy security, and strategic autonomy. A single-case approach is appropriate because it allows for an in-depth analysis of how coherence is articulated across interconnected policy domains within one institutional setting.[19] The empirical material consists of official EU policy frameworks. These documents are analysed through thematic document analysis in order to trace how the three themes are framed, and problematised, with particular attention to trade-offs and shifts in dependency.

This section operationalises the key variables through a structured set of indicators. These indicators can be subdivided into three main categories to conduct the analysis. The first category comprises the theory-based indicators and consists of three subcategories aligned with the three policy themes. For energy security, four indicators capture the core dimensions of security in energy governance: affordability, availability, diversification (efforts to spread risk by diversifying energy suppliers) and import dependency.[20] For the green transition, four indicators capture the central dimensions: climate ambition (binding targets or commitments), renewable energy consumption, primarily energy consumption and raw material consumption.[21] For the last subcategory, strategic autonomy, four indicators reflect how autonomy is operationalised: capacity to act autonomously, diversification of strategic dependencies, EU capacity building (strengthening EU production), and de-risking.[22]

The second category consists of policy instrument indicators. This category captures whether the documents converge around a shared policy toolbox across frameworks.[23] Building on broader policy-mix literature, four cross-cutting policy instrument indicators are identified in this study: renewable energy deployment, energy efficiency, electrification, and diversification actions. These indicators make it possible to assess whether different EU policy documents propose similar implementation pathways and whether these pathways support a coherent overarching policy mix.[24]

[19] Gary Thomas, "Case Study," in *SAGE Research Methods Foundations* (London: SAGE Publications Ltd, 2019), https://doi.org/10.4135/9781526421036812890.
[20] Bert Kruyt, D. P. van Vuuren, H. J. M. de Vries, and H. Groenenberg, "Indicators for Energy Security," *Energy Policy* 37, no. 6 (2009): 2166–2181, https://doi.org/10.1016/j.enpol.2009.02.006.
[21] Eurostat, "Statistics for the European Green Deal," accessed April 9, 2026, https://ec.europa.eu/eurostat/cache/egd-statistics/#/.
[22] Mario Damen, *EU Strategic Autonomy 2013–2023: From Concept to Capacity*, briefing, European Parliamentary Research Service (Brussels: European Parliament, July 8, 2022), https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI%282022%29733589; European Commission, *Strategic Dependencies and Capacities*, Commission Staff Working Document, accompanying the Communication "Updating the 2020 New Industrial Strategy: Building a Stronger Single Market for Europe's Recovery," *SWD(2021) 352 final* (Brussels, May 5, 2021).
[23] Michael Howlett, "What Is a Policy Instrument? Tools, Mixes, and Implementation Styles," in *Designing Government: From Instruments to Governance*, ed. Pearl Eliadis, Margaret M. Hill, and Michael Howlett (Montreal: McGill-Queen's University Press, 2005), 31–50, https://doi.org/10.1515/9780773581708-004.
[24] Karoline S. Rogge and Kristin Reichardt, "Policy Mixes for Sustainability Transitions: An Extended Concept and Framework for Analysis," *Research Policy* 45, no. 8 (2016): 1620–35, https://doi.org/10.1016/j.respol.2016.04.004.

The final category operationalises coherence and tension indicators. The first indicator, three-way interlinkage, captures passages in which all three themes are found.[25] Trade-off acknowledgement captures explicit recognition of tensions or conflicting priorities between policy objectives.[26] Dependency-shift acknowledgement captures recognition that progress in one domain may generate new dependencies in another.[27] An overview of the entire framework, adapted to the scope of this study, is presented below in Table 1.

Category	Subcategory	Indicators
Theory based indicators	Energy Secruity	Affordability
		Availability
		Import dependency
		Diversification
	Green transition	Climate ambition
		Renewable energy consumption
		Raw material consumption
	Strategic autonomy	Capacity to act autonomously
		Derisking stance
		Diversification
		Capacity building
Policy instrument indicators	n/a	Renewable energy deployment
		Energy efficiency
		Diversification action
		Electrification
Coherence or tensions indicators	n/a	Three-way interlinkage
		Trade-off acknowledgement
		Dependency-shift acknowledgement

Table 1. Indicator framework for assessing coherence and tensions in EU policy discourse. Source: own compilation based on Kruyt et al., "Indicators for Energy Security"; Eurostat, "Statistics for the European Green Deal"; Damen, EU Strategic Autonomy 2013–2023; European Commission, Strategic Dependencies and Capacities; Howlett, "What Is a Policy Instrument?"; Christensen, "Policy Coherence in the Nordic

[25] Lotte Dalgaard Christensen, "Policy Coherence in the Nordic Bioeconomy? A Novel Set-Theoretic Approach to Studying Relations among Policy Goals," *Environmental Policy and Governance* 32, no. 5 (2022): 390–410, https://doi.org/10.1002/eet.1978.

[26] Apollonia Miola, Stephan Borchardt, Franz Neher, and Daniele Buscaglia, *Interlinkages and Policy Coherence for the Sustainable Development Goals Implementation: An Operational Method to Identify Trade-Offs and Co-Benefits in a Systemic Way* (Luxembourg: Publications Office of the European Union, 2019), https://doi.org/10.2760/472928.

[27] Tomasz Jerzyniak, "The EU De-Risking of Energy Dependencies: Towards a New Clean Energy Geopolitical Order?," *Politics and Governance* 12 (2024): Article 8285, https://doi.org/10.17645/pag.8285.

Bioeconomy?"; Miola et al., Interlinkages and Policy Coherence for the Sustainable Development Goals Implementation; and Jerzyniak, "The EU De-Risking of Energy Dependencies."

Analysis

Based on a thematic analysis of the selected documents, this study identified 142 coded indicators.[28] As Table 2 shows, the strongest pattern in the dataset is the linkage between the green transition and energy security, with 61 codes connecting these two domains. The dominance of the green transition and energy security linkage reflects a particular framing strategy: decarbonisation is consistently legitimised through the language of security rather than through normative environmental arguments alone. This suggests that energy security has become the primary discursive vehicle through which the green transition is justified to sceptical audiences. This is reflected in statements emphasising that "the EU's energy supply needs to be secure and affordable for consumers and businesses" and that "financing schemes for households to renovate their houses, can reduce energy bills and help the environment."[29] This coherence is not expressed only at the level of broad policy goals, but is also reflected in the policy instruments proposed in the analysed documents, particularly through energy efficiency and renewable energy deployment. This is followed by 31 codes linking energy security and strategic autonomy, 32 linking the green transition and strategic autonomy, and 14 explicit three-way linkages across all three frameworks. These findings indicate that coherence is present across the analysed policy documents, but that it is expressed more strongly through bilateral linkages than through a fully integrated framework.

Strategic autonomy is clearly present in the analysed documents of the other two policy frameworks, but in a more selective way. These linkages are especially visible in documents such as REPowerEU, the European Green Deal, and the updated Industrial Strategy. In REPowerEU, for example, strategic autonomy is framed through the need to "rapidly reduce our dependence on Russian fossil fuels."[30] While the European Green Deal links the transition to industrial capacity by stating that "investments in strategic value chains are essential."[31] This suggests that strategic autonomy is embedded in the analysed documents primarily through the language of de-risking, capacity-building, and reduced external dependence, which is consistent with literature that understands European strategic autonomy less as isolation and more as resilience and dependency management.[32]

Explicit three-way coherence across the different frameworks appears less frequently, with only 14 indicators linking all three frameworks directly. This suggests that full integration remains limited compared with the two-way indicators discussed above. Moreover, the coding identified 10 trade-off acknowledgements and 4 dependency-shift acknowledgements indicators, indicating that several documents explicitly recognise the tensions

[28] More information on the data and the analysis is available from the author upon request.
[29] European Commission, *The European Green Deal*, COM(2019) 640 final (Brussels, 2019), 6.
[30] European Commission, *REPowerEU Plan,* COM(2022) 230 final (Brussels, 2022), 2; European Commission, *The European Green Deal*, COM(2019) 640 final (Brussels, 2019), 9.
[31] European Commission, *REPowerEU Plan*, COM(2022) 230 final (Brussels, 2022), 2.
[32] Niklas Helwig and Ville Sinkkonen, "Strategic Autonomy and the EU as a Global Actor: The Evolution, Debate and Theory of a Contested Term," *European Foreign Affairs Review* 27, Special Issue (2022): 1–20, https://doi.org/10.54648/eerr2022009.

embedded in this policy alignment. Thus, the coherence stated above should not be overstated. The document REPowerEU from 2022 is particularly important, it does link the green transition, energy security and strategic autonomy while also saying that *"The fast phase-out of Russian fossil fuels will alter the transition trajectory; some coal capacities may be used longer, alongside a role for nuclear and domestic gas resources."*[33] It further notes that *"Achieving REPowerEU will require diversifying renewable equipment and critical raw materials, while the EU solar panel and heat-pump market has seen increasing imports from Asia."*[34] These examples show that coherence in EU discourse is not absolute, but conditional: reducing dependence on fossil fuels may create new dependencies in clean technologies, manufacturing capacity, and critical raw materials.

Dimensions	Indicators	Number of codes
Coherence	Green transition-energy secruity	61
Coherence	Green transition-European strategic autonomy	32
Coherence	Energy security-European strategic autonomy	31
Coherence	Policy instrument indicators	48
Coherence	Three-way linkage	14
Tensions/limits	Trade-off acknowledgement	10
Tensions/limits	Dependency shift acknowledgement	4

Table 2: Distribution of coded indicators across the analysed policy documents. Source: own compilation based on thematic coding of selected EU policy documents.

Conclusion

This article analysed how coherent EU discourse is in policy documents on the green transition and energy security within the broader framework of European strategic autonomy. The findings show a strong connection between the green transition and energy security. Across the analysed documents, decarbonisation is repeatedly linked to lower fossil-fuel dependence, greater resilience, and the long-term stability of the EU energy system. The green transition is therefore presented as more than a climate policy objective. It also functions as part of the EU's response to energy security.

However, this coherence remains incomplete. Strategic autonomy is present in the analysed policy frameworks, but its integration is more selective and less consistent than the link between the green transition and energy security. The documents also recognise sev-

[33] European Commission, *REPowerEU Plan*, COM (2022) 230 final (Brussels, 2022), 3–4.
[34] European Commission, *REPowerEU Plan*, COM (2022) 230 final (Brussels, 2022), 13–14.

eral tensions. In line with the literature, EU policy coherence should therefore be understood as partial and managed coherence, rather than full alignment between all three objectives.

The policy implication is that the EU cannot treat climate neutrality, energy security, and strategic autonomy as automatically mutually reinforcing. Short-term security measures may slow down parts of the transition, while the expansion of clean technologies may create new dependencies on external supply chains and critical raw materials. For EU energy governance, this means that future policy frameworks need to address these dependency shifts more explicitly, rather than assuming that the green transition automatically produces strategic autonomy. A limitation of this study is that it focuses on discourse rather than implementation. Future research could therefore examine whether this managed coherence is also visible in concrete policy outcomes at the EU and Member State level.

Framing Strategic Projects in EU Critical Raw Materials Governance

Zhaleh Abbasi[1]

Introduction

The European Union's (EU) green and digital transitions have elevated critical and strategic raw materials (CRMs and SRMs) from a largely technocratic industrial policy concern to a policy field increasingly framed in terms of strategic autonomy, resilience, and security.[2] These materials are essential inputs for technologies underpinning the EU's climate neutrality and energy security objectives. The EU's shift toward renewable energy has not only broadened the political relevance of CRMs but has also intensified governance challenges surrounding sustainability standards and the acceleration of permitting procedures for strategic projects. In this context, the European Commission proposed the Critical Raw Materials Act (CRMA), which was adopted and entered into force in May 2024. The regulation establishes 2030 benchmarks for extraction, processing, recycling, and import diversification of strategic raw materials in order to reduce supply vulnerabilities. The CRMA aims to strengthen the EU internal market by ensuring secure, resilient, and sustainable access to critical raw materials while reducing external dependencies and maintaining high environmental standards.[3] Strategic Projects constitute a central opera-

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[2] Guillaume Ragonnaud, "Implementing the EU's Critical Raw Materials Act," Briefing PE 766.253 (European Parliamentary Research Service, November 2024), 4; Bernhard Tröster, Simela Papatheophilou, and Karin Küblböck, "Strategic Autonomy Meets Global Dependency: Instruments and Implications of the EU's Raw Materials Policy with Third Countries," *ÖFSE Briefing Paper* no. 36 (Vienna: Austrian Foundation for Development Research, 2025), 4; Christoph Helbig, Dieuwertje Schrijvers, and Alessandra Hool, "Selecting and Prioritizing Material Resources by Criticality Assessments," *One Earth* 4, no. 3 (2021): 339–45, https://doi.org/10.1016/j.oneear.2021.02.006.

[3] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials, *Official Journal of European Union* L 1252 (3 May 2024), art. 1, http://data.europa.eu/eli/reg/2024/1252/oj .

tional instrument of the CRMA, while the European Critical Raw Materials Board (the "Board") coordinates their prioritisation and implementation across Member States.[4]

The Commission approved 47 strategic projects within the EU on March 25, 2025 and 13 projects outside the Union on June 4, 2025. However, the approval process has drawn criticism for limited transparency and for the possibility that accelerated procedures may weaken sustainability safeguards.[5] For instance, the debate surrounding the Mina do Barroso lithium project illustrates how narratives of supply security and industrial competitiveness can be used to justify project prioritisation despite concerns about environmental impacts and local participation.[6] These developments highlight how the framing of strategic projects plays an important role in legitimising the accelerated implementation of the CRMA.

This article therefore examines how strategic projects are framed in EU policy discourse and how such framing contributes to legitimising their prioritisation and accelerated development. In particular, the analysis explores the tension between supply-security narratives and sustainability commitments in the governance of critical raw materials. To address this question, the paper draws on discursive institutionalism and applies qualitative framing analysis to Commission communications, Strategic Project fact sheets and related policy documents.

Policy Debates and Governance Challenges in the CRMA

Early assessments raise doubts about the effectiveness of the CRMA's implementation instruments. An audit by the European Court of Auditors found that the added value of the strategic project instrument remains uncertain, noting that many selected projects may struggle to contribute significantly to EU raw material supply by 2030 despite the procedural advantages associated with accelerated permitting and increased investor visibility.[7] Analysts emphasise that the Act's supply benchmarks remain non-binding and that structural constraints such as financing gaps and regulatory bottlenecks may limit its capacity to significantly reduce the EU's dependence on imported raw materials.[8] Moreover, the effectiveness of the CRMA will depend on coordinated implementation across Member States and improved access to finance and stronger institutional coordination. Yet early assessments suggest persistent shortcomings in these areas.[9] Finally, scholars highlight

[4] Regulation (EU) 2024/1252, recital 9.

[5] Alessandra Hool, Christoph Helbig, and Gijsbert Wierink, "Challenges and Opportunities of the European Critical Raw Materials Act," *Mineral Economics* 37 (2024): 663–664, https://doi.org/10.1007/s13563-023-00394-y.

[6] Marta Pacheco, "European Commission Keeps Portuguese Lithium Mine's Strategic Status Despite Environmental Concerns," *Euronews*, December 4, 2025, https://www.euronews.com/my-europe/2025/12/04/european-commission-keeps-portuguese-lithium-mine-strategic-status-despite-environmental-c.

[7] European Court of Auditors, "Critical Raw Materials for the Energy Transition – Not a Rock-Solid Policy," *Special Report* 04/2026 (Publications Office of the European Union, 2026), 11–12, 44–48, https://www.eca.europa.eu/ECAPublications/SR-2026-04/SR-2026-04_EN.pdf.

[8] Bernhard Tröster, Simela Papatheophilou, and Karin Küblböck, "In Search of Critical Raw Materials: What Will the EU Critical Raw Materials Act Achieve? An Analysis of Legal and Factual Implications of the CRMA," (Austrian Foundation for Development Research, 2024), 6–7, https://doi.org/10.60637/2024-rr18; Hool, Helbig, and Wierink, "Challenges and Opportunities," 665.

[9] Ragonnaud, "Implementing the EU's Critical Raw Materials Act", 4.

that the absence of coherent circular economy roadmaps and targets risks prioritising acceleration over longer-term structural coherence in EU raw materials governance.[10]

Academic research on the CRMA is still emerging and has largely focused on the Act's objectives, governance design and broader implications for EU resource policy. The Commission has promoted a broader simplification agenda, including omnibus legislative packages and accelerated procedures intended to reduce administrative burdens and strengthen EU competitiveness.[11] Critics warn that such measures may weaken environmental and social safeguards and risk undermining the sustainability objectives of EU raw-materials governance.[12] Furthermore, recent studies analyse how narratives of urgency and acceleration are mobilised to legitimise faster mining permits and industrial development, and examine the institutional reforms, legislative changes and governance coordination required for implementing the Act and supporting critical raw material supply.[13] However, limited attention has been paid to how strategic projects themselves are framed and justified at the EU level during the early phase of implementation. Examining how strategic projects are framed is therefore crucial for understanding how the Act's policy objectives are translated and legitimised in concrete industrial and resource developments.

Discursive Institutionalism and Framing Analysis

Discursive institutionalism emphasises the role of ideas and discourse in shaping political action.[14] Within this approach, policy outcomes are shaped by how actors interpret chal-

[10] Brian Baldassarre and Samuel Carrara, "Critical Raw Materials, Circular Economy, Sustainable Development: EU Policy Reflections for Future Research and Innovation," *Resources, Conservation and Recycling* 215 (2025): 2, https://doi.org/10.1016/j.resconrec.2024.108060.

[11] European Commission, "Commission Welcomes Political Agreement on Omnibus I Simplification Package," December 9, 2025, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_2981; Ragonnaud, "Implementing the EU's Critical Raw Materials Act", 3–4.

[12] For critical perspectives on Strategic Projects under the CRMA, see Andreas Budiman, "Strategic Projects Abroad: Environmental Concerns, Communities Sidelined, Transparency Missing," *European Raw Materials Coalition* (EURMC), June 4, 2025, https://eurmc.org/news/strategic-projects-abroad-environmental-concerns-communities-sidelined-transparency-missing/ (highlighting concerns regarding transparency and risks of externalizing extraction to third countries); Sanja Bogojević, "The European Green Deal, the Rush for Critical Raw Materials, and Colonialism," *Transnational Legal Theory* 15, no. 4 (2024): 612, https://doi.org/10.1080/20414005.2024.2399408 (critiquing the limited safeguards for indigenous peoples and the reproduction of extractive asymmetries); Vitor Correia and W. Eberhard Falck, "Europe's Critical Raw Materials: Balancing Strategic Needs with Environmental Protection," *Intereconomics* 60, no. 5 (2025): 297–302, https://doi.org/10.2478/ie-2025-0057 (discussing tensions between resource security, environmental protection, and social acceptance); and Bettina Müller, Luciana Ghiotto, and Lucía Bárcena, *The Raw Materials Rush: How the European Union Is Using Trade Agreements to Secure Supply of Critical Raw Materials for Its Green Transition* (Transnational Institute, 2024), https://www.tni.org/files/2024-01/The_Raw_Materials_Rush.pdf (arguing that EU trade instruments and strategic partnerships reproduce extractivist dynamics and externalise environmental and social costs to resource-rich countries in the Global South).

[13] Åsa Nilsson Dahlström, Ann-Sofie Kall, and Åsa Westermark, "It's about Time: Governing through Acceleration under the Critical Raw Materials Act in Sweden," *The Extractive Industries and Society* 26 (2026): 4, https://doi.org/10.1016/j.exis.2026.101869; Krzysztof Galos and Krzysztof Szamałek, "Main Factors Influencing the Implementation of the EU Critical Raw Materials Act in Poland," *Przegląd Geologiczny* 73, no. 3 (2025): 208–214, http://dx.doi.org/10.7306/2025.23.

[14] Martin B. Carstensen and Vivien A. Schmidt, "Power through, over and in Ideas: Conceptualizing Ideational Power in Discursive Institutionalism," *Journal of European Public Policy* 23, no. 3 (2016): 322, https://doi.org/10.1080/13501763.2015.1115534.

lenges through specific ideational elements, including discourse, narratives, frames, and norms. Concepts such as strategic autonomy, resilience and circularity do not merely describe policy objectives. They structure which challenges are prioritised, which policy options appear feasible, and which governance choices are regarded as legitimate. Building on this approach, Martin Carstensen and Vivien Schmidt conceptualise ideational power as a distinct form of political power and distinguish between three dimensions. Power through ideas, referring to the ability to persuade through normative and cognitive arguments; power over ideas, referring to the capacity to shape or exclude competing interpretations from the policy debate; and power in ideas captures the deeper background assumptions that structure what is considered reasonable or viable.[15]

One way to analyse how such ideas shape policy debates is through framing. Here, framing is examined as a form of ideational power, focusing on how policy actors exercise power through ideas by mobilising narratives of supply security, urgency and sustainability in the discourse surrounding strategic projects under the CRMA. This article adopts a policy-framing perspective within a constructivist framework to analyse how such narratives define policy problems and legitimise governance choices in the early implementation of the CRMA. Framing analysis provides a useful lens for examining how policy actors define policy problems and justify governance choices, and how these interpretations are strategically aligned with the institutional priorities and constraints of EU policymaking.[16]

The empirical analysis is based on a qualitative dataset of European Commission documents related to the early implementation of the CRMA. The core material consists of 59 strategic project fact sheets published by the Commission in 2025, which provide standardised descriptions of the selected projects and their expected contribution to EU critical raw material supply.[17] These are complemented by the CRMA regulation and supporting implementation documents including the strategic project application template, the Individual Assessment Report framework, and the Commission's Questions and Answers on strategic projects.

The analysis applies qualitative framing analysis to examine how Strategic Projects are justified in the analysed documents, as this approach enables the study of how policy actors construct and justify policy choices through specific narratives. The dataset was systematically coded in MAXQDA using a structured codebook developed through an iterative process combining deductive and inductive elements, focusing on how projects are framed and justified rather than simply counting the frequency of specific terms.[18] The

[15] Ibid., 323–333.

[16] Falk Daviter, "Policy Framing in the European Union," *Journal of European Public Policy* 14, no. 4 (2007): 662, https://doi.org/10.1080/13501760701314474 ; Heike Klüver, Christine Mahoney, and Marc Opper, "Framing in Context: How Interest Groups Employ Framing to Lobby the European Commission," *Journal of European Public Policy* 22, no. 4 (2015): 495, https://doi.org/10.1080/13501763.2015.1008550.

[17] The Commission formally approved 60 Strategic Projects in 2025. However, only 59 project fact sheets had been published and were accessible at the time of coding. The analysis of project-level framing therefore covers 59 fact sheets.

[18] For the full coding structure and operational definitions, see the Appendix. See Johnny Saldaña, *The Coding Manual for Qualitative Researchers*, 2nd ed. (Sage, 2013); Stefan Rädiker and Udo Kuckartz, *Qualitative Data Analysis with MAXQDA: Research, Practice and Examples* (Springer, 2020), chap. 8, https://doi.org/10.1007/978-3-030-15671-8; Christina Silver and Ann Lewins, *Using Software in Qualitative Research: A Step-by-Step Guide*,

dataset was coded to identify recurring patterns of legitimation and prioritisation, focusing on supply and industrial necessity, sustainability, socio-economic benefits, and procedural acceleration. This makes it possible to examine how different legitimation logics are combined and where tensions between supply-security and sustainability commitments emerge.

Discussion

The coding analysis identifies the main justificatory frames through which strategic projects are legitimised under the Critical Raw Materials Act. The most prominent justificatory pattern is sustainability justification, accounting for (38.40%) of all coded segments, followed by supply and industrial necessity justification (33.33%), socio-economic legitimisation (15.38%), and acceleration and prioritisation (13.89%). Given the CRMA's explicit supply-security rationale, supply and industrial necessity was expected to dominate the corpus, with sustainability playing a supporting rather than autonomous role.

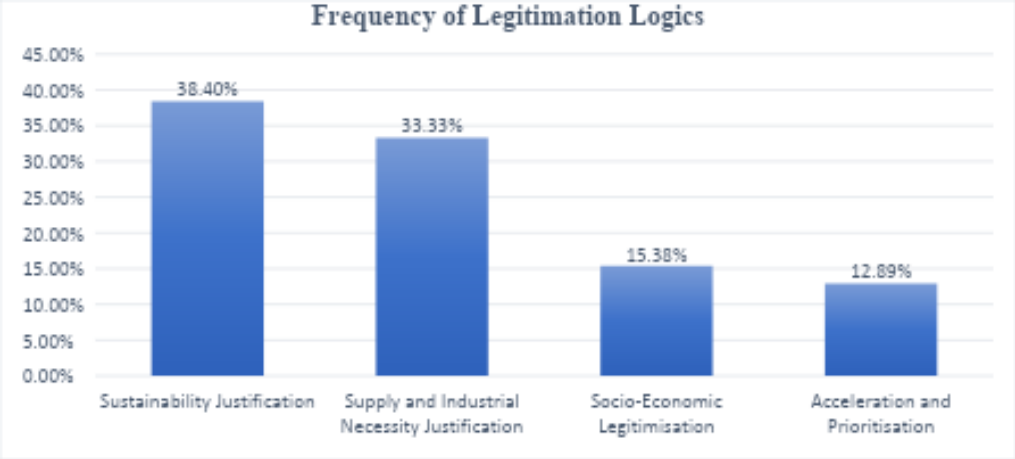

Figure 1: Frequency of Legitimation Logics. Note: Categories derive from the codebook developed for this study. Percentages represent the share of all coded segments across the full dataset. For full code definitions, the Appendix is available upon request from the author.

Two closely interconnected justificatory domains stand out across the dataset: sustainability justification and supply and industrial necessity justification. Their relatively close distribution indicates that strategic projects are legitimised through two interconnected but not equivalent logics. The first centres on sustainability, circularity, and environmental responsibility; the second on securing material supply and strengthening industrial capacity. socio-economic legitimisation and acceleration and prioritisation appear less frequently but reinforce the dominant logics by anchoring social acceptance and constructing institutional urgency.

2nd ed. (Sage, 2014).

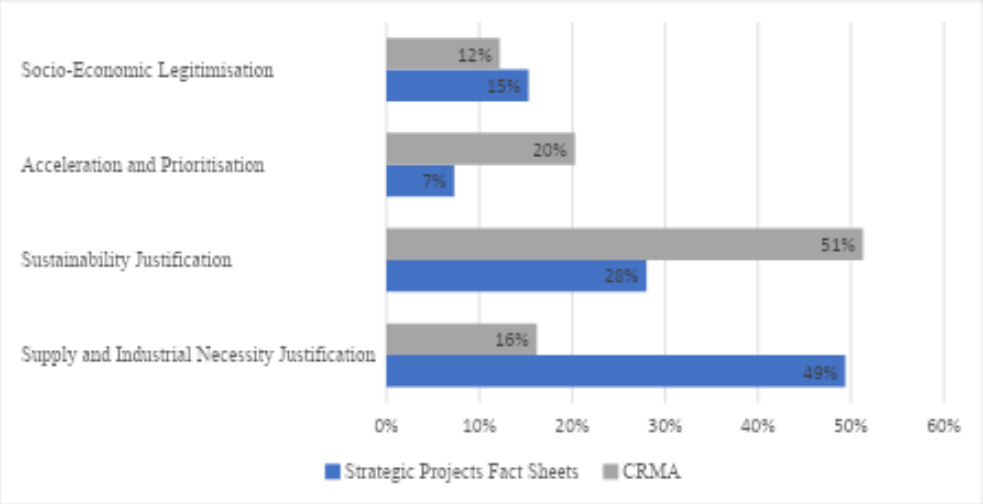

Figure 2: Note: Percentages represent the share of coded segments within each document group. For full code definitions, the Appendix is available upon request from the author.

The different legitimising logics identified in the coding analysis perform distinct political functions within the broader governance framework of the CRMA. Table 1 summarises the main analytical characteristics of each category.

Legitimisation logic	Political function	Key analytical finding
Supply and Industrial Necessity Justification	Constructs strategic vulnerability and industrial necessity	Most prominent in project fact sheets; links raw material projects to strategically prioritised downstream industries
Sustainability Justification	Broadens political legitimacy through environmental and governance rationales	Most prominent in the regulatory framework; functions as both an autonomous legitimising frame and a support for industrial-security objectives
Socio-economic Legitimisation	Strengthens contextual and territorial legitimacy	Spatially differentiated: supplementary within the EU but more central in third-country projects
Acceleration and Prioritisation	Legitimises procedural urgency and expedited governance	Most strongly articulated in the CRMA regulation; frames faster governance as strategically necessary

Table 1: Analysis categories.

Across both the regulatory framework and project-level documentation, strategic raw materials are constructed as a problem of industrial vulnerability. The Regulation explicitly frames strategic projects as instruments to *"ensure a secure supply"* and reduce the risk of disruptions, linking raw material availability directly to the functioning of the internal market and strategic technologies. This framing positions supply-security not merely as an economic issue but as a condition for industrial sovereignty. Through the lens of discursive institutionalism, this reflects power through ideas: supply-security operates as a persuasive frame that transforms raw material extraction, processing, and recycling into politically necessary interventions. The industrial value chains subcode reveals that strategic projects are legitimised not primarily through raw material production itself, but through their connection to downstream sectors such as batteries, electric vehicles, permanent magnets, and renewable energy technologies. This linkage frames raw material development as a necessary condition for industrial decarbonisation and technological competitiveness.

Supply-security and dependency narratives operate differently. While industrial value chain framing establishes strategic relevance, supply-security framing establishes strategic vulnerability. Project descriptions repeatedly identify external dependency as a structural weakness, particularly where supply chains are geographically concentrated. The Kobaloni Energy Zambia project, for example, explicitly states that it would reduce EU dependence on a single third country responsible for refining 95% of global cobalt. This framing transforms market concentration into geopolitical risk, constructing the political case for EU intervention. Similar dependency narratives appear across lithium, graphite, and rare earth projects, where external supply reliance is framed as incompatible with long-term industrial resilience. Strategic autonomy connects these concerns by framing raw material capacity as part of a wider project of reducing structural dependence and strengthening European control over strategic sectors. Importantly, this framing extends beyond domestic production. External projects in Zambia and Brazil are also presented as contributing to European strategic autonomy through diversification, demonstrating that autonomy in this context does not imply self-sufficiency but controlled interdependence.[19]

Sustainability justification challenges a purely industrial reading of strategic projects. project promoters are required to demonstrate how environmental impacts will be monitored, prevented, and minimised, alongside evidence of socially responsible practices and transparent governance structures. Sustainability therefore operates not merely as political rhetoric, but as an institutionalised criterion of project recognition. Some projects provide measurable indicators, such as emissions reductions, lower energy intensity or reduced environmental footprint, while others emphasise renewable energy integration, reduced land-use impacts, or improved waste recovery systems. These environmental claims align strategic projects with broader EU climate objectives and governance standards, strengthening their institutional legitimacy. Circular economy narratives form

[19] For the EU's framing of strategic partnerships as mutually beneficial, and a critique of this framing, see Müller, Ghiotto, and Bárcena, The Raw Materials Rush, 15-16, which shows that partnership agreements lack binding social and environmental safeguards and risk deepening extractive dependency in third countries rather than enabling local value addition.

a second distinct sustainability layer, particularly in recycling projects. Projects such as Portovesme CRM Hub, Fortum Hydromet and LIFE22-ENV-IT-INSPIREE frame material recovery and reuse as central project objectives, linking waste streams directly to strategic raw material supply. However, circularity is not reducible to supply-security alone. In many cases, it is framed simultaneously as environmental responsibility, industrial innovation, and resource efficiency. This suggests that circular economy discourse functions as a bridge between industrial and environmental policy rationales. Compliance with EU rules and ESG/responsible sourcing further reinforce sustainability legitimacy by embedding strategic projects within broader governance norms. References to environmental assessments, labour standards, anti-corruption measures and certification schemes demonstrate that sustainability is also constructed procedurally, through adherence to recognised institutional standards. Thus, the sustainability frame positions strategic projects not only as necessary industrial interventions, but as environmentally and socially governable forms of industrial development. In this way, sustainability functions as a parallel legitimising logic that makes accelerated raw material development politically acceptable.

Socio-economic legitimisation plays a distinct but secondary role. Unlike supply-security and sustainability, which are structurally embedded across the corpus, socio-economic arguments appear more selectively and contextually. A clear pattern emerges in external strategic projects, where employment creation, regional development and local supplier integration are emphasised more strongly. In projects such as Kobaloni and São Miguel Paulista, these narratives serve to establish mutual benefit and development legitimacy, particularly in third-country contexts. Socio-economic framing is thus spatially differentiated. Within the EU it functions as supplementary local legitimation, while outside the EU it becomes central for justifying international partnerships.

Finally, acceleration and prioritisation, while quantitatively the least frequent category, is institutionally significant. Unlike other frames, it is articulated most strongly in the CRMA itself rather than in project fact sheets. The Regulation explicitly constructs speed as a governance necessity through streamlined permitting, time-bound procedures, and urgent administrative treatment. This reflects what recent scholarship describes as a *"moral economy of speed,"* in which urgency narratives normalise accelerated governance and frame procedural speed as a necessary response to strategic vulnerability.[20]

Conclusion

This analysis shows that strategic projects are legitimised through a layered discursive structure in which industrial necessity and sustainability operate as closely interconnected sources of legitimacy, but with different political functions. While sustainability frequently overlaps with supply-security objectives, particularly in circular economy projects, it also functions as an autonomous legitimising frame grounded in environmental performance, regulatory compliance, and responsible governance. This reveals an im-

[20] Michael Hitch and George Barakos, "Critical Minerals as a Trojan Horse: The Political Ecology of Green Extractivism in Climate Governance," *The Extractive Industries and Society* 26 (2026): 6, https://doi.org/10.1016/j.exis.2025.101845.

portant asymmetry in the CRMA's policy discourse which, situated within Carstensen and Schmidt's conceptualisation of ideational power, reflects two distinct persuasive frames: supply-security establishes industrial vulnerability as the central condition requiring urgent governance intervention, while sustainability grounds the political acceptability of that intervention in environmental performance and regulatory compliance. Therefore, the analysis highlights how EU critical raw materials governance does not resolve the tension between industrial acceleration and sustainability commitments but governs and stabilises it through strategically constructed policy frames.

This study has several limitations. The analysis is based exclusively on official Commission documents, which represent the institutional framing of strategic projects rather than the full range of stakeholder perspectives. Furthermore, as the CRMA is still in early implementation, the findings reflect initial framing choices that may shift as projects progress. Future research could examine how these frames are contested or reinterpreted by non-institutional actors, and how implementation practices diverge from discursive commitments over time. Comparative analysis across Member States or between the CRMA and similar critical minerals frameworks in other jurisdictions would also extend the findings of this study.

How Reliable Are Europe's First CSRD-compliant Sustainability Reports?

Sander Debeer[1]

Introduction And Research Question

In 2025, some European companies published their first mandatory sustainability report under the Corporate Sustainability Reporting Directive (CSRD),[2] an ambitious legislation the European Union introduced to improve transparency in sustainability reporting. Yet a fundamental question remains unanswered: are these reports actually reliable?

The shift towards mandatory sustainability reporting was driven by several factors. One important driver was the European Green Deal, with its objective of achieving climate neutrality by 2050,[3] transforming corporate sustainability disclosure from a largely voluntary initiative into a matter of public interest. Additionally, growing evidence that climate-related risks carry financial implications led investors and other stakeholders to insist that companies disclose sustainability-related information, enabling them to integrate these risks into their investment decisions.[4]

[1] Sander Debeer is a student in Business Engineering at the Vrije Universiteit Brussel. The research idea for this article originated from an internship at RSM Belgium, where the author first encountered the practical challenges of sustainability reporting compliance.

[2] European Parliament and Council of the European Union, Directive 2022/2464 of 14 December 2022 Amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC, and Directive 2013/34/EU, as Regards Corporate Sustainability Reporting, *Official Journal of the European Union* L 322 (December 16, 2022): 15-18, https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng; Tania Pantazi, "The Introduction of Mandatory Corporate Sustainability Reporting in the EU and the Question of Enforcement," *European Business Organization Law Review* 25, no. 3 (May 13, 2024): 509–32, https://doi.org/10.1007/s40804-024-00320-x.

[3] European Parliament and Council of the European Union, Regulation 2021/1119 of 30 June 2021 Establishing the Framework for Achieving Climate Neutrality and Amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), *Official Journal of the European Union* L 243 (9 July 2021): 1–17, https://eur-lex.europa.eu/eli/reg/2021/1119/oj/eng.

[4] Janne Ruohonen and Helmi Kullas, "The Assurance of Corporate Sustainability Reports and the Renewed Role of Certified Auditors," *European Company and Financial Law Review* 21, no. 3–4 (November 1, 2024): 442–71, https://doi.org/10.1515/ecfr-2024-0013.

Together, these developments transformed voluntary financial reporting into a mandatory requirement under the CSRD.[5] Companies that were previously subject to the Non-Financial Reporting Directive (NFRD),[6] are now required to comply with the CSRD.[7] As a result, all financial reports published in 2025 must be accompanied by a sustainability report that complies with the CSRD. [8]

This expansion of reporting obligations makes the CSRD highly relevant to the broader issue of energy security in Europe. Since policymakers rely on corporate energy data for infrastructure planning and renewable capacity assessments, energy security depends not only on infrastructure and supply but also on the accuracy and reliability of the information disclosed by companies.[9] Based on this, this study addresses the following research question: To what extent are the first CSRD-compliant sustainability reports for the financial year 2024 internally consistent, complete, and transparent?

Corporate Sustainability Reporting Directive (CSRD)

One of the key differences between the NFRD and the CSRD is the introduction of double materiality. This means that companies must report not only on their impact on the environment, but also on how environmental factors affect their business activities. In addition, CSRD reports require external validation from an independent auditor.[10] This alone entails significant costs,[11] but limited assurance is necessary to verify whether companies meet the reporting requirements. However, the consequences of publishing incorrect information in a CSRD report remain largely undefined. The CSRD does not specify a standardised enforcement framework. So, each country is responsible for establishing its own penalties.[12] According to Pantazi, it is nevertheless important to keep in mind that companies are unlikely to do so, as being exposed could lead to reputational damage.[13]

The CSRD is implemented through the European Sustainability Reporting Standards (ESRS). These standards define what companies must report on sustainability and ensure that reporting is clear and comparable. The ESRS framework is grouped under the three pillars of ESG: Environmental (E1–E5), Social (S1–S4), and Governance (G1).[14]

[5] Pantazi, "The Introduction of Mandatory Corporate Sustainability Reporting".
[6] European Parliament and Council of the European Union, Directive 2014/95/EU of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups, *Official Journal of the European Union* L 330 (15 November 2014): 1–9, https://eur-lex.europa.eu/eli/dir/2014/95/oj/eng.
[7] "CSRD Reporting Requirements 2025 Guide," Karomia, accessed November 25, 2025, https://www.karomia.eu/csrd-guide.
[8] "Corporate Sustainability Reporting," *European Commission*, accessed December 11, 2025, https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en.
[9] Nicolas Garcia Pickard et al., "Credible company transition plans for climate change mitigation: a geographical dependency assessment," *European Commission Joint Research Centre* JRC139084 (Seville: European Commission, 29 August 2024), https://publications.jrc.ec.europa.eu/repository/handle/JRC139084.
[10] Pantazi, "The Introduction of Mandatory Corporate Sustainability Reporting".
[11] Ruohonen and Kullas, "The Assurance of Corporate Sustainability Reports".
[12] Pantazi, "The Introduction of Mandatory Corporate Sustainability Reporting".
[13] ibid.
[14] Luigi Operato et al., "Navigating CSRD Reporting: Turning Compliance into Sustainable Development with Science-Based Metrics," *Environmental Development* 54 (June 2025): 101138,

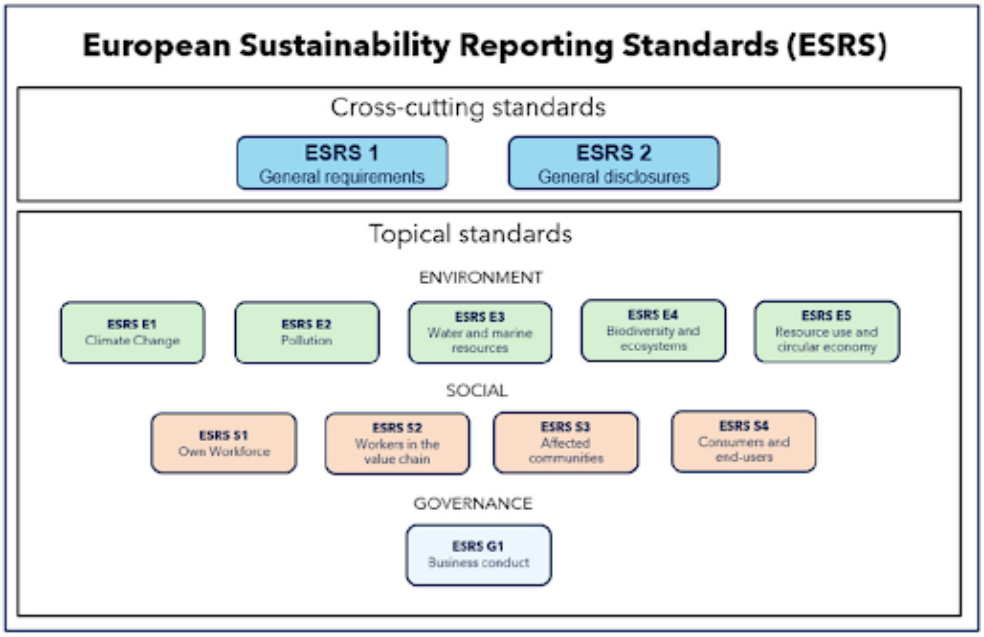

Figure 1: ESRS Framework.[15]

In a previous study, 166 integrated reports with ESRS disclosure requirements, prior to the introduction of the CSRD, were manually analysed. It was found that the best disclosures were related to E1, S1, and G1, while little was reported on S2, S3, and S4.[16]

Ultimately, the main objective of the CSRD is to ensure that reported information on ESG matters is transparent and comparable. By increasing the quality and consistency of sustainability reporting, the EU hopes to strengthen stakeholders' trust in sustainability reports and stimulate capital flows toward sustainable economic objectives.[17]

Challenges And Future Of CSRD

Currently, this obligation creates significant challenges for small and medium-sized enterprises. As they have never previously been required to report on frameworks such as the ESRS, they face a disadvantage compared to companies that were already subject to the NFRD. This implies that they do not have access to the same resources or external support. Furthermore, reporting in English is mandatory, which may be a disadvantage for companies operating in non-English-speaking Member States.[18]

It is also important to take financial costs into account. This is clearly described in the study by Ruohonen and Kullas. The authors explain that companies face two types of costs. First, costs required to start reporting, such as investments in new information systems to accurately measure and collect the necessary data. Second, recurring costs associated with each reporting period, including personnel cost and an external auditor.[19]

[15] ibid.
[16] Nicola Raimo et al., "Integrated Reporting and the Corporate Sustainability Reporting Directive: Bridging The Gap or Growing Apart?," *Management Decision* (May 19, 2025), https://doi.org/10.1108/md-10-2024-2408.
[17] Ruohonen and Kullas, "The Assurance of Corporate Sustainability Reports".
[18] Walter Leal Filho et al., "European Sustainability Reporting Standards: An Assessment of Requirements and Preparedness of EU Companies," *Journal of Environmental Management* 380 125008 (April 2025), https://doi.org/10.1016/j.jenvman.2025.125008.
[19] Ruohonen and Kullas, "The Assurance of Corporate Sustainability Reports".

That is why larger companies tend to show higher levels of ESRS compliance. This is explained through the legitimacy theory: due to their visibility among the public and pressure to meet stakeholders' demand, they are more likely to demonstrate responsible conduct.[20] Companies in environmentally sensitive sectors similarly show higher compliance rates.[21] Previous research on the NFRD confirms this, indicating that larger companies perform better in terms of reporting quality, as they possess more technical and financial resources.[22]

This challenge has already been acknowledged by the European Commission, which on 26 February 2025 launched the "Omnibus Sustainability Rules Simplification Package," aimed at reducing the administrative and reporting burdens faced by companies.[23] The proposed reforms include, for example, deferring reporting obligations from 2025 to 2027 and increasing various thresholds that determine whether companies fall under the CSRD.[24] Initially, the intention was for the CSRD to apply to all large companies that are not publicly listed, as well as all companies that are listed within the EU. It would also cover non-EU companies with subsidiaries in the EU, as well as credit institutions and insurance companies above a certain size threshold.[25]

The Omnibus package represents the first of five planned packages designed to simplify the implementation of the CSRD.[26] At the same time, the ECB has warned that any simplification of sustainability reporting could undermine the data collection needed by credit institutions for risk-management processes.[27]

Finally, it is important to consider practices that could undermine the reliability of CSRD reports. A persistent concern under both the NFRD and CSRD is greenwashing. Despite increasing regulatory pressure, greenwashing indicators were still present in a study of 192 reports. This issue is sector specific, with higher risks in manufacturing and services sectors.[28] The opposite can also occur, known as 'greenhushing', where companies deliberately remain silent on material topics or use vague, irrelevant statements and mislead-

[20] Mark C. Suchman, "Managing Legitimacy: Strategic and Institutional Approaches," *The Academy of Management Review* 20, no. 3 (July 1995): 571, https://doi.org/10.2307/258788.
[21] Raimo et al., "Integrated Reporting".
[22] Oana Marina Radu et al., "Company-Level Factors of Non-Financial Reporting Quality under a Mandatory Regime: A Systematic Review of Empirical Evidence in the European Union," *Sustainability* 15, no. 23 (November 24, 2023): 16265, https://doi.org/10.3390/su152316265.
[23] European Commission Directorate-General for Financial Stability, Financial Services and Capital Markets Union, "Omnibus Package," *European Commission*, 1 April 2025, https://finance.ec.europa.eu/news/omnibus-package-2025-04-01_en.
[24] Sara Todeschini, "The Great EU Reversal: Fast-Track Deregulation and the Erosion of Europe's Sustainability Ambition with the Omnibus I Regulation," *European Law Blog* (October 27, 2025), https://doi.org/10.21428/9885764c.909cc95e.
[25] Pantazi, "The Introduction of Mandatory Corporate Sustainability Reporting".
[26] Todeschini, "The Great EU Reversal".
[27] European Central Bank, Opinion of 8 May 2025 on proposals for amendments to corporate sustainability reporting and due diligence requirements, *Official Journal of the European Union* C/2025/3667 (8 July 2025), https://eur-lex.europa.eu/eli/C/2025/3667/oj/eng.
[28] Agne Sneideriene and Renata Legenzova, "Uncovering Greenwashing: Investigating Impression Management Gap in Corporate Reporting," *Sustainability* 17, no. 18 (September 17, 2025): 8342, https://doi.org/10.3390/su17188342.

ing visual elements.[29] The occurrence of greenwashing and greenhushing can, among other factors, be explained through the lens of Agency Theory. Disclosing information may have consequences for the manager's personal interests when it is tied to the market value of the company.[30]

Given the number of upcoming changes, particularly those proposed under the Omnibus package as discussed above, and given the remaining uncertainty regarding their implementation and scope, it is particularly valuable to examine the reliability of the CSRD reports that have already been published. Such an analysis could also serve as a reference framework once all simplification measures have been implemented.

Methodology

Data And Sample

This study uses a qualitative content analysis on the first CSRD-compliant sustainability reports for Fiscal Year 2024.[31] A sample of 798 CSRD documents from the KEY ESG database, representing companies across Europe and sectors, was analysed in two phases: a manually coded subsample of 15 reports proportional to sector representation,[32] followed by automated analysis of the complete sample using MAXQDA.

Measurement

A codebook was developed based on the three key themes being investigated: completeness, internal consistency and transparency. Since the analysing involves CSRD documents, the codes are based on the ESRS framework, as done in previous research.[33] Binary codes will be used to determine whether certain elements are present or absent, such as ESRS 2 and E1-E5.[34] Additionally, quality scale codes (ranging from 1 to 4) will assess the depth of disclosure, where presence alone is not sufficient, such as figures and targets.[35]

[29] Agnieszka Janik and Adam Ryszko, "Greenwashing in Sustainability Reporting: A Systematic Literature Review of Strategic Typologies and Content-Analysis-Based Measurement Approaches," *Sustainability* 18, no. 1 (December 19, 2025): 17, https://doi.org/10.3390/su18010017.

[30] Ronald A. Dye, "Disclosure of Nonproprietary Information," *Journal of Accounting Research* 23, no. 1 (1985): 123, https://doi.org/10.2307/2490910.

[31] Klaus Krippendorff, "Reliability in Content Analysis," *Human Communication Research* 30, no. 3 (July 2004): 411–33, https://doi.org/10.1111/j.1468-2958.2004.tb00738.x; Satu Elo and Helvi Kyngäs, "The Qualitative Content Analysis Process," *Journal of Advanced Nursing* 62, no. 1 (March 18, 2008): 107–15, https://doi.org/10.1111/j.1365-2648.2007.04569.x; Maria Chiara Demartini et al., "Does the Transparency of Sustainability Reports Matter? A Quantitative Assessment," *Corporate Social Responsibility and Environmental Management* 32, no. 1 (August 21, 2024): 18–43, https://doi.org/10.1002/csr.2926.

[32] Steve Campbell et al., "Purposive Sampling: Complex or Simple? Research Case Examples," *Journal of Research in Nursing* 25, no. 8 (June 18, 2020): 652–61, https://doi.org/10.1177/1744987120927206.

[33] Raimo et al., "Integrated Reporting".

[34] ibid.

[35] Jill Hooks and Chris J. van Staden, "Evaluating Environmental Disclosures: The Relationship between Quality and Extent Measures," *The British Accounting Review* 43, no. 3 (September 2011): 200–213, https://doi.org/10.1016/j.bar.2011.06.005.

Key themes	Code type	Fokus	Key ESRS elements
Completeness	Binary (B)	Presence of mandatory elements	ESRS 2, E1-E5, S1-4, G1 and DMA
Internal Consistency	Scale 1-4 (S)	Coherence within the report	Figures, methods, targets, scope
Transparency	Binary (B)	Verifiability of claims	Methodology, assurance, uncertainties

Table 1: Overview of key themes and their measurement approaches.

Analysis

The reports are analysed using MAXQDA, via the following procedure.[36] First, the table of contents is examined to assign binary codes.[37] Second, for the dimension of internal consistency, seven reports are coded manually using scale codes accompanied by a brief memo documenting the score and its reasoning. This population size was chosen because the study involves a homogeneous population, with a specific objective.[38] These CSRD reports were selected to make a representative variation across all sectors available in the population. Third, the dimension of transparency is coded using MAXQDA's auto-coding feature, using a self-created keyword list.[39] Finally, for the completeness section, a subsample of 15 CSRD reports was created, building on the seven reports already selected for internal consistency and supplemented by eight additional reports chosen according to the same selection criteria.[40] 'Sector' will then be used as a document variable to establish a link between completeness and the sector. This mixed-methods design has been applied in a comparable NFRD Study.[41]

Justification For Manual Coding

Manual coding was preferred over automated analysis for both the internal consistency and completeness dimensions. For internal consistency it is used because it requires contextual interpretation, assessing whether figures, methodologies and targets are coherent across the same report is a judgement that cannot be reliably automated.

[36] Elo and Kyngäs, "The Qualitative Content Analysis Process".
[37] Raimo et al., "Integrated Reporting".
[38] Monique Hennink and Bonnie N. Kaiser, "Sample Sizes for Saturation in Qualitative Research: A Systematic Review of Empirical Tests," *Social Science and Medicine* 292 (January 2022): 114523, https://doi.org/10.1016/j.socscimed.2021.114523.
[39] Ries Breijer and René P. Orij, "The Comparability of Non-Financial Information: An Exploration of the Impact of the Non-Financial Reporting Directive (NFRD, 2014/95/EU)," *Accounting in Europe* 19, no. 2 (May 4, 2022): 332–61, https://doi.org/10.1080/17449480.2022.2065645.
[40] Hennink and Kaiser, "Sample Sizes for Saturation in Qualitative Research".
[41] Saverio Petruzzelli and Francesco Badia, "The Quality Assessment of Stakeholder Engagement Disclosure in the EU Mandatory Non-Financial Reporting Framework," *Journal of Applied Accounting Research* 25, no. 1 (May 30, 2023): 126–48, https://doi.org/10.1108/jaar-11-2022-0290.

For the completeness dimension, it is important to account for the risk of false positives when using auto-coding based on keyword lists.[42] This is especially relevant for the ESRS standards, which frequently appear in the double materiality analysis to indicate that a standard has been assessed as non-material and therefore excluded from reporting. Including these in the automated coding would incorrectly suggest that the relevant disclosures are present, when in fact the opposite is true.

Limitations And Challenges

Some limitations need to be acknowledged. First, with qualitative content analysis, the interpretation of the data relies on human judgment. Since this research will be conducted solo, it is not possible to perform an intercoder reliability check as was done in similar studies.[43] To mitigate this, a detailed codebook was maintained throughout the process.

Another factor to consider is the diversity of the sample itself. Some sectors have a larger representation in the sample than others. Nevertheless, the decision was made to keep the sample as broad as possible, under the assumption that a more inclusive dataset ultimately leads to richer and more reliable findings.[44]

Sector Distribution - Sup-sample vs Full Dataset				
Sector	**N full dataset**	**% full dataset**	**N sub-sample**	**% sub-sample**
Manufacturing	305	38,2	5	33,33
Financial Services	159	19,9	4	26,67
Energy & Utilities	116	14,5	2	13,33
Technology & Telecom	83	10,4	2	13,33
Real Estate & Construction	44	5,5	1	6,67
Transport & Logistics	39	4,9	1	6,67
Other/mixed	52	6,5	0	0,00
Total	**798**	**100,0**	**15**	**100,00**

Table 2: Sector Distribution

[42] Jelle W. Boumans and Damian Trilling, "Taking Stock of the Toolkit," *Digital Journalism* 4, no. 1 (November 3, 2015): 8–23, https://doi.org/10.1080/21670811.2015.1096598.
[43] Cliodhna O'Connor and Helene Joffe, "Intercoder Reliability in Qualitative Research: Debates and Practical Guidelines," *International Journal of Qualitative Methods* 19 (January 1, 2020), https://doi.org/10.1177/1609406919899220.
[44] Nicholas Cofie, Heather Braund, and Nancy Dalgarno, "Eight Ways to Get a Grip on Intercoder Reliability Using Qualitative-Based Measures," *Canadian Medical Education Journal* (March 29, 2022), https://doi.org/10.36834/cmej.72504.

Findings

Completeness

Findings on completeness show an uneven distribution of ESRS coverage. E1 (Climate change) and its related subcodes were found in nearly every document. The presence of E2 and E3 was generally lower across all sectors, while S2 and S3 were not present in the Financial Services sector.[45]

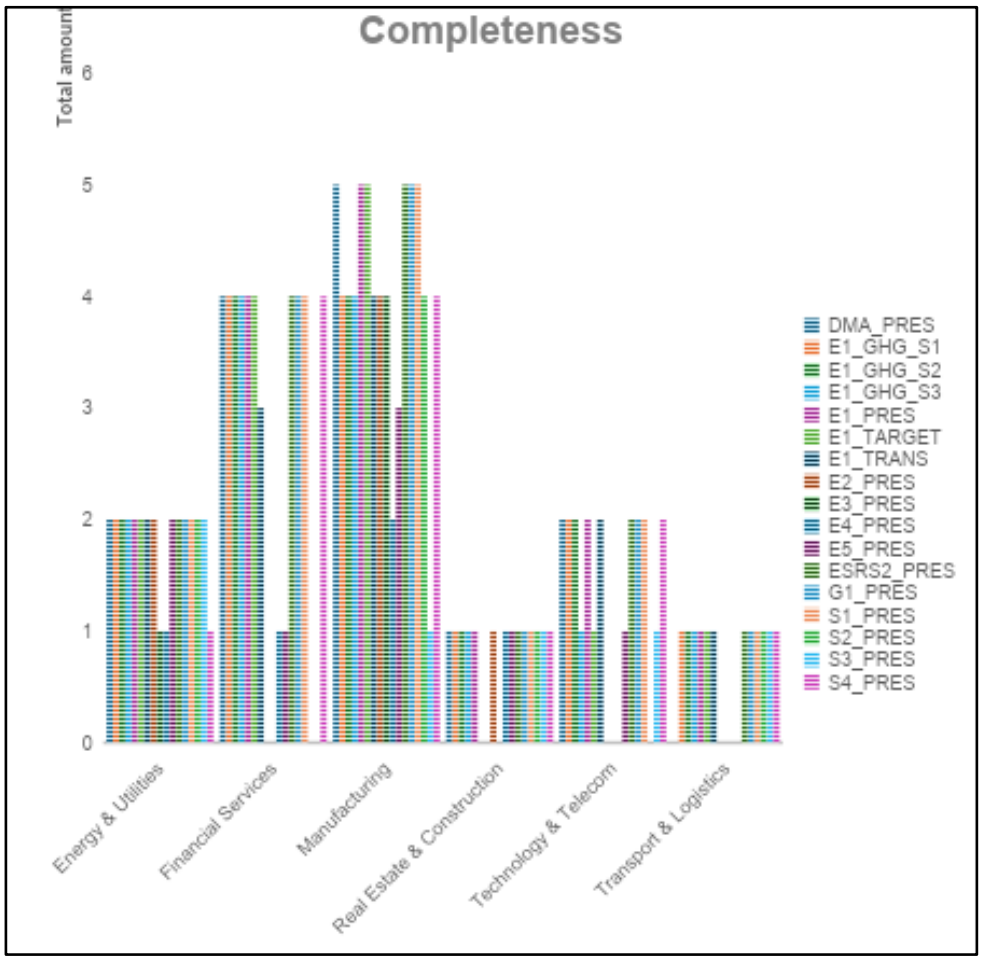

Figure 2: Findings on completeness.

Internal consistency

The second research dimension was evaluated using four scale codes: IC_FIGURES, IC_METHOD, IC_TARGET and IC_PERIOD. All five codes were applied exclusively to the manually coded sub-sample, using a four-point scale (1 = Insufficient, 2 = Partial, 3 = Sufficient, 4 = Strong). The results obtained are as follows:

[45] More information on the data and the analysis, including the appendices, is available from the author upon request

Document	IC_FIGURES	IC_METHOD	IC_TARGET	IC_PERIOD
OMV	4	4	4	4
UCB Biopharma	3	3	3	3
Arion banki	3	2	2	2
Grupo San José	3	2	3	2
ENAV	4	3	3	3
Merck & Co.	3	3	3	4
74Software	2	2	3	1
Average	**3,14**	**2,71**	**3,00**	**2,71**

Table 4: Internal Consistency results

Numerical Consistency (IC_FIGURES)

This code mainly focused on quantitative figures, most commonly greenhouse gas (GHG) emission values. With an average score of 3,14, it is the highest-scoring section.

Two reports, OMV and ENAV, received the highest score of four. It is important to mention ENAV, as it not only covers all three scope emissions in relevant sections but does so consistently using the same unit (tCO_2e), while comparing it with a base year. OMV also scored a four, with the exceptional feature that the GHG figures were always accompanied by a detailed methodological annex.

Four other reports scored a three, indicating that GHG figures are reported consistently and correctly, and that year-on-year comparisons are helpful for the reader. 74Software being the only downfall, where GHG emissions were presented using multiple different units, such as $ktCO_2$ and tCO_2eq. This lack of consistency in units led to 74Software receiving a score of two.

Methodological Consistency (IC_Method)

This section scored the lowest, with an average score of 2,71. OMV is the only company to achieve a score of 4, again due to their strong methodological references and well-structured GHG management framework. It references frameworks such as the OGMP (Oil & Gas Methane Partnership) 2.0 for methane emissions and IPCC factors throughout the entire report. Additionally, OMV clearly distinguishes between the methodologies for both market-based and location-based Scope 2 emissions.

The other reports score between 2 and 3. These reports consistently reference the GHG Protocol and cite relevant emission sources but lack full methodological coverage.

Target-Action Consistency (IC_TARGET)

This dimension yields an average score of 3,00. Once again, OMV scores the highest points. For each of its primary climate targets, the report includes a dedicated progress-tracking table with details about the baseline year value, the 2030 target and the current year value. This structure makes it easy to verify whether stated targets are being pursued through actions and whether reported results are on track.

The scores of the remaining reports can be explained by the absence of a clear progress-tracking table or the lack of explicit milestone reporting.

Temporal Consistency (IC_PERIOD)

With an average score of 2,71, this code aligns somewhat with the previous one, which is why OMV again scores the maximum of four. Merck also scores well for consistently using the same base year across all relevant targets.

Arion Bank, Grupo San José, and 74Software received the lowest scores, as none of their reports explicitly mention a base year, which undermines the reader's ability to properly interpret the reported figures.

Transparency

The third dimension examined in this study is transparency, examined through four binary codes:

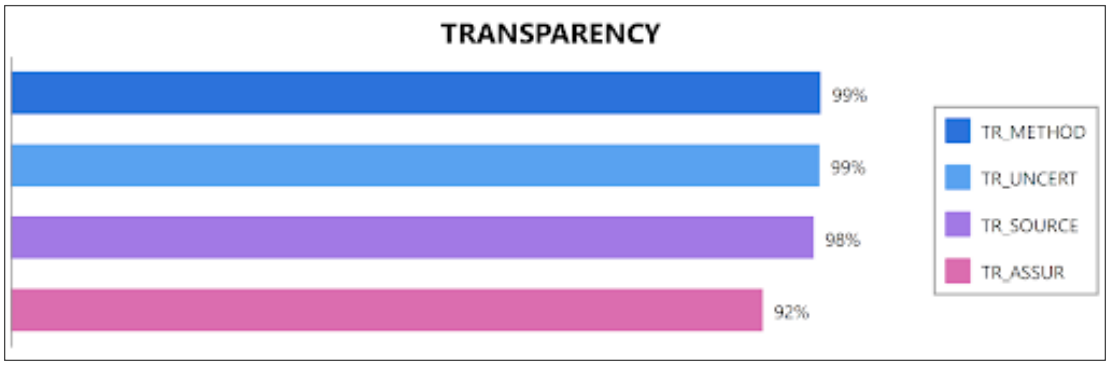

Figure 3: Dimension Transparency examined through four binary codes.

TR_SOURCE and TR_METHOD are the most frequently coded transparency elements. It suggests that a significant share of CSRD reporters not only indicate that they followed the GHG Protocol, but also support their quantitative data with external sources and explain their calculation methods. TR_UNCERT shows a moderate presence, which is consistent with the agency theory.[46] TR_ASSUR is the least coded element, which is the most surprising finding since the CSRD mandates limited assurance for all CSRD reports. These results still reflect a meaningful trend toward better transparency.

[46] Dye, "Disclosure of Nonproprietary Information".

Conclusion

To answer the research question, the CSRD-compliant sustainability reports for the financial year 2024 show an overall positive view. The observed results from the completeness dimension are closely aligned with previous findings, which showed that E1, S1, and G1 are the most thoroughly disclosed, while S2, S3, and S4 are reported less extensively.[47] These findings suggest that early adopters of the CSRD framework demonstrate a substantial understanding of its requirements.The most notable transparency observation is that none of the reports in the sub-sample explicitly disclose being 'off track' on a key target, a finding that aligns with agency theory: managers may selectively withhold negative performance information.[48] Whether this selective disclosure is intentional or simply a first-year reporting oversight remains an open question, but it is an aspect worth paying attention to in future research. The disclosure of data uncertainties remains low, again aligning with agency theory and previous research on greenwashing and greenhushing,[49] which identified the neglect of material information in corporate sustainability reporting. A striking result is the extent to which companies fail to disclose information about their external assurance process, despite CSRD explicitly requiring limited external assurance.[50] This inconsistency raises questions about the current enforcement framework, concerns that have already been highlighted by Pantazi.[51] Of course, it is important to consider the risk of false positives when analysing the transparency dimension.[52]

Finally, the outperformance of larger companies relative to smaller entities supports the legitimacy theory,[53] suggesting that larger firms invest more in reporting quality.[54] The findings also carry implications for the ongoing Omnibus discussion:[55] If the first reporters following the CSRD already exhibit gaps in internal consistency and transparency, raising reporting thresholds and reducing reporting obligations for smaller companies may lower financial burdens, but it risks widening the quality gap between large and small entities and narrowing the scope of available sustainability data. The findings suggest that strengthening enforcement and methodological guidance should be prioritised.

For future research, involving multiple coders could strengthen the reliability of the quantitative content analysis and a larger, more balanced sample across sectors would also allow for more meaningful comparisons. Furthermore, replicating this research over multiple reporting years could reveal the impact of recent Omnibus changes,[56] especially on the quality gap between large and smaller companies. Additionally, it would be valuable to examine whether the ESRS standards deemed “not material” by reporters, and therefore excluded from the report, are truly non-material.

[47] Raimo et al., “Integrated Reporting”.
[48] Dye, “Disclosure of Nonproprietary Information”.
[49] Sneideriene and Legenzova, “Uncovering Greenwashing”; Janik and Ryszko, “Greenwashing in Sustainability Reporting”
[50] Pantazi, “The Introduction of Mandatory Corporate Sustainability Reporting”.
[51] ibid.
[52] Boumans and Trilling, “Taking Stock of the Toolkit”.
[53] Suchman, “Managing Legitimacy”.
[54] Radu et al., “Company-Level Factors of Non-Financial Reporting Quality”; Raimo et al., “Integrated Reporting”.
[55] European Commission, “Omnibus Package”.
[56] Todeschini, “The Great EU Reversal”.

Justice and Democracy in EU Energy Transitions: Effective local and regional governance for energy communities in EU Energy Policy

Caoilte Bashford[1]

Introduction

The European Union's (EU) Action Plan for Affordable Energy seeks to increase security of energy supply and insulate energy prices from shocks to ensure energy affordability for EU industry and citizens.[2] The Citizens' Energy Package (CEP) —one of the Action Plan for Affordable Energy's eight actions and consisting of a Communication, recommendations for Member States, and an Action Plan of the European Commission— aims to "*increase citizens' participation in the energy transition and strengthen the social dimension…*,"[3] with particular emphasis on the efficacy of energy communities.[4] The CEP intends to build on the EU's 2019 Clean Energy Package and its constituent Renewable Energy Directive (RED II) and Internal Market for Electricity Directive (IMED), which gave legal definitions

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[2] Communication from the Commission – Action Plan for Affordable Energy: Unlocking the True Value of Our Energy Union to Secure Affordable, Efficient and Clean Energy for All Europeans, COM(2025) 79 final (2025), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025DC0079.

[3] Action Plan for Affordable Energy, 9.

[4] Communication from the Commission – Citizens' Energy Package, COM(2026) 115 final (2026), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52026DC0115. The aims of the CEP are outlined in the Commission Staff Working Document accompanying its recommendations for Member States, as "*a comprehensive strategy with dedicated measures and policies to help overcome institutional, cultural, technical and socio-economic barriers and to allow energy communities to reach their full potential in achieving climate and energy transition objectives is needed at EU, national and local levels…*" to "*maximise [energy communities] potential for an inclusive and just transition*" and to "*overcome constraints of technical capacity and access to finance*". Commission Staff Working Document - Implementation Package Accompanying the Commission Recommendation on Energy Communities, Supplier Risk Management, and Protection of Vulnerable Customers, SWD(2026) 126 final (2026), 10, https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2026)126.

to energy communities.[5] These definitions formalised at the European level what had already developed in practice across Member States, providing a framework for the promotion of energy communities in acknowledgement of the potentially transformative role of a decentralised and participative energy system in the energy transition and for energy security and resilience. However, while these definitions provided an enabling framework for the development of energy communities, the success of energy communities often relies on effective local, regional, and national governance, and they are often inhibited by specific situated governance challenges at these scales.[6]

This article critically evaluates EU energy policy, assessing its ability to facilitate energy communities that promote participation and strengthen the social dimension, operationalised as energy democracy and energy justice respectively. Through an explicit focus on the local and regional governance in EU transition regions[7] and the interaction of energy

[5] Madeleine Wahlund and Jenny Palm, 'The Role of Energy Democracy and Energy Citizenship for Participatory Energy Transitions: A Comprehensive Review', Energy Research & Social Science 87 (May 2022): 102482, https://doi.org/10.1016/j.erss.2021.102482. Energy communities are broadly defined by the European Commission as "*a basic organisational concept that brings together citizens, businesses and local authorities to collectively participate in sustainable energy activities through a legal entity empowered to produce, consume, store, share, supply and aggregate energy and to provide energy-related services… [whose] primary purpose should be to provide environmental and socio-economic community benefits rather than financial profits*." Commission Staff Working Document - Implementation Package Accompanying the Commission Recommendation on Energy Communities, Supplier Risk Management, and Protection of Vulnerable Customers, 17. The RED gave legal definition for a "*Renewable Energy Community*" (REC), a legal entity whose primary purpose is to provide *"environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits*", is autonomous and based on "*open and voluntary participation*", under shareholder or member control who are "*natural persons, SMEs or local authorities, including municipalities"*, in ownership of and located proximate to renewable energy projects that it has developed. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (Recast) (Text with EEA Relevance.), OJ L 328 82 (2018), art. 2(16), http://data.europa.eu/eli/dir/2018/2001/oj. The IMED gave legal definition for a "*Citizen's Energy Community*" (CEC), similarly a legal entity "*based on voluntary and open participation*" whose primary purpose is to provide "*environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits*" but as a more technology-neutral model yet restricted to electricity generation where REC provided for heating and cooling systems—without restricting membership geographically and leaving it open to any entity, however, limiting control to "*natural persons, local authorities, including municipalities, or small enterprises*". Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU (Recast) (Text with EEA Relevance.), OJ L 158 125 (2019), art. 2(11), http://data.europa.eu/eli/dir/2019/944/oj.

[6] Gilles Debizet et al., *Local Energy Communities: Emergence, Places, Organizations, Decision Tools*, 1st edn (Routledge, 2022), https://doi.org/10.4324/9781003257547; Federico Gianaroli et al., 'Exploring the Academic Landscape of Energy Communities in Europe: A Systematic Literature Review', *Journal of Cleaner Production* 451 (April 2024): 141932, https://doi.org/10.1016/j.jclepro.2024.141932; Maurizio Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts', *European Journal of Spatial Development* 21, no. 1 (2025): 122–55, https://doi.org/10.5281/zenodo.16092245; Irina Antoskova et al., 'The Role of Local Governance in Developing Value Oriented Energy Communities in Europe: A Review', *2025 IEEE 66th International Scientific Conference on Power and Electrical Engineering of Riga Technical University (RTUCON)*, 23 October 2025, 1–5, https://doi.org/10.1109/RTUCON67996.2025.11415073; Ted Limbeek et al., 'A Perspective on Energy Citizenship and Transitions in Europe', *Energy Research & Social Science* 126 (August 2025): 104144, https://doi.org/10.1016/j.erss.2025.104144; L. Neij et al., 'Energy Communities—Lessons Learnt, Challenges, and Policy Recommendations', *Oxford Open Energy* 4 (January 2025): oiaf002, https://doi.org/10.1093/ooenergy/oiaf002.

[7] Transition Regions are defined as NUTS level 2 territorial units whose GDP per capita is between 75 % and 100 % of the average GDP per capita of the EU-27. Regulation (EU) 2021/1060 of the European Union and of the

governance scales, it is argued that while the CEP does present some opportunities to local and regional governance in the governance of energy communities, although few that meaningfully enable greater energy justice and energy democracy. Through its approach, methods, and combination and application of analytical concepts, this article aims to address the persistent gap regarding the spatial dimension of energy strategies while also providing empirical insights for literatures characterised by theoretical and conceptual discussion.[8]

Conceptual and Analytical Framework

This section defines the analytical concepts of *energy communities, energy justice*, and *energy democracy* operationalised in this article, explaining why energy citizenship, although prominent in the literature, is not adopted in its analysis.

Energy Communities

The concept of energy communities derives from their practice. Within scientific literature, they are broadly defined as "*a grouping of individuals or legal entities actively involved in a project of production and/or consumption of renewable energy*."[9] They are social and political processes constituting diverse actors and objectives, interacting with diverse local contexts, technical aspects, and forms of governance that are embedded within their wider social, economic, and political systems.[10] Energy communities are to be understood as complex, multi-actor governance processes where legal, institutional, and fiscal frameworks play a key role in success.[11] While energy communities can occur without the participation of local public authorities, local authority participation can significantly address spatial and scalar challenges, given the interaction of energy communities with local policy and planning, and particularly to enable "*more compelling results*" regarding desired attendant social and economic benefits (e.g., reduced energy costs, reduced energy poverty, local and regional employment, and greater uptake of renewables).[12] Overall, energy communities require "*clear, consistent and complete regulations*" and "*effective*

Council of 24 June 2021 Laying down Common Provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and Financial Rules for Those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy, OJ L 231 159 (2021), art. 108.

[8] Kirsten E. H. Jenkins et al., 'The Methodologies, Geographies, and Technologies of Energy Justice: A Systematic and Comprehensive Review', *Environmental Research Letters* 16, no. 4 (2021): 043009, https://doi.org/10.1088/1748-9326/abd78c; Debizet et al., *Local Energy Communities*; Jan Osička et al., 'Energy Justice and Energy Democracy: Separated Twins, Rival Concepts or Just Buzzwords?', *Energy Research & Social Science* 104 (October 2023): 103266, https://doi.org/10.1016/j.erss.2023.103266; Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts'.

[9] Debizet et al., *Local Energy Communities,* 1.

[10] Debizet et al., *Local Energy Communities;* Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts'.

[11] Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts'.

[12] Lorna Kiamba et al., 'Socio-Economic Benefits in Community Energy Structures', *Sustainability* 14, no. 3 (2022): 1890, https://doi.org/10.3390/su14031890; Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts'.

planning and financial tools"[13] with participatory decision-making, co-construction practices, and information and knowledge-sharing contributing to their success.[14]

While inclusive, democratic, or participatory organisational characteristics are often assumed in scientific definitions of energy communities, and strongly implied in their EU definition, both focus on active participants in a decentralised energy system with an emphasis on participants that both consume and produce energy—i.e. "prosumers".[15] RED II and IMED provide a basic set of rights and obligations for the independent or collective management, production, or storage of energy as prosumers or within energy communities. The implicit assumption is that democratic and justice benefits in line with EU just transition goals would inherently ensue from the establishment of these rights and obligations.[16]

Energy Justice and Energy Democracy

Similar to the multi-scalar nature of the energy system and its challenges, energy justice and energy democracy require a multi-scalar approach.[17] Indeed, these concepts have an intertwined character, often linked in scientific literature with the concept of energy citizenship. However, critical review of energy citizenship literature argues that it lacks conceptual clarity and is suffused with diverse normative assumptions that limit its analytical applicability.[18] Significantly, a focus on energy citizenship as inherently participative can curtail the inclusive goals of just energy transitions, promoting inequalities and rendering "*prosumerism… a somewhat elitist phenomenon*."[19] The contested nature of energy citizenship is reflected in EU policy, where its definition is argued to be narrow, limited, and exclusive, defined through responsibilities and expectations, and affording little political agency —standing in tension with the bottom-up, citizen-led practices from which the concept of energy communities originally derived.[20]

Consequently, this article forgoes application of energy citizenship as an analytical concept, instead operationalising the established conceptions of energy justice and energy democracy, considering their implementation sufficient to effectively promote participation and strengthen the social dimension respectively. Moreover, through recognising

[13] Pioletti et al., 'Exploring the Local and Regional Dimensions of the Renewable Energy Communities' Activation in Diverse European Institutional Contexts', 147.
[14] Debizet et al., *Local Energy Communities*.
[15] Florian Hanke et al., 'Do Renewable Energy Communities Deliver Energy Justice? Exploring Insights from 71 European Cases', *Energy Research & Social Science* 80 (October 2021): 102244, https://doi.org/10.1016/j.erss.2021.102244; Gianfranco Di Lorenzo et al., 'Challenges in Energy Communities: State of the Art and Future Perspectives', *Energies* 15, no. 19 (2022): 7384, https://doi.org/10.3390/en15197384.
[16] van Bommel and Höffken, 'Energy Justice within, between and beyond European Community Energy Initiatives'; Camelia Delcea et al., 'Energy Communities: Insights from Scientific Publications', *Oeconomia Copernicana* 15, no. 3 (2024): 1101–55, https://doi.org/10.24136/oc.3137; Commission Staff Working Document - Implementation Package Accompanying the Commission Recommendation on Energy Communities, Supplier Risk Management, and Protection of Vulnerable Customers.
[17] van Bommel and Höffken, 'Energy Justice within, between and beyond European Community Energy Initiatives'.
[18] Antti Silvast and Govert Valkenburg, 'Energy Citizenship: A Critical Perspective', *Energy Research & Social Science* 98 (April 2023): 102995, https://doi.org/10.1016/j.erss.2023.102995.
[19] Silvast and Valkenburg, 'Energy Citizenship', 3.
[20] Limbeek et al., 'A Perspective on Energy Citizenship and Transitions in Europe'.

the intertwined nature and characteristics of these two concepts, this article attempts to aid applied forms of energy justice and energy democracy through which diverse forms of citizenship can flourish.[21] Defining energy justice through its distributive, procedural, and recognition aspects, it is conceptualised as *"an energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and impartial energy decision making*."[22] This article specifically focuses on *"energy justice between energy community initiatives and related actors*" and how the institutions and actors involved can instil and promote energy justice both within and beyond energy communities.[23] Correspondingly, energy democracy is conceptualised as a policy goal where "*citizens are the recipients, stakeholders… and account-holders*" and in which governance is characterised by "*wide participation… in an inclusive and transparent decision-making"*.[24] While the concept of energy democracy has faced criticism, including conceptual overlap with energy justice, it offers a complementary, overt focus on inclusion and participation in political terms, in line with the goal of strengthening participation.[25] Through these definitions, energy justice and energy democracy allow critical evaluation of the CEP against its stated aims of increasing citizens' participation in the energy transition and strengthening the social dimension.

Methodology and Research Design

This section sets out the *phronetic* methodological approach and research design used by the research. A phronetic methodological approach aims to identify and problematise potential tensions in policy and practice, prioritising contextual actionable knowledge for interventions.[26] It is a value-based approach that insists on explicit positionality and reflexivity, requiring the researcher to represent a perspective, explain practices from this perspective, and propose interventions accordingly.[27] The perspective represented here is energy justice and energy democracy as defined above. These definitions structure evaluation and analysis, serving as the analytical framework and acting as the benchmark for transparency of reasoning and coherence of recommendations and conclusions.[28]

[21] Max Lacey-Barnacle, 'Proximities of Energy Justice: Contesting Community Energy and Austerity in England', Energy Research & Social Science 69 (November 2020): 101713, https://doi.org/10.1016/j.erss.2020.101713; Sufyan Droubi et al., 'A Critical Review of Energy Democracy: A Failure to Deliver Justice?', Energy Research & Social Science 86 (April 2022): 102444, https://doi.org/10.1016/j.erss.2021.102444.

[22] Sovacool et al., 'New Frontiers and Conceptual Frameworks for Energy Justice', 677; Jenkins et al., 'Energy Justice'; Santos Ayllón, 'Debates on the Future of Energy Justice'.

[23] van Bommel and Höffken, 'Energy Justice within, between and beyond European Community Energy Initiatives'.

[24] Szulecki, 'Conceptualizing Energy Democracy', 35.

[25] Droubi et al., 'A Critical Review of Energy Democracy'; Wahlund and Palm, 'The Role of Energy Democracy and Energy Citizenship for Participatory Energy Transitions'; Osička et al., 'Energy Justice and Energy Democracy'; Silvast and Valkenburg, 'Energy Citizenship'.

[26] Flyvbjerg, *Making Social Science Matter.*

[27] Flyvbjerg, *Making Social Science Matter*; Wanda Pillow, 'Confession, Catharsis, or Cure? Rethinking the Uses of Reflexivity as Methodological Power in Qualitative Research', *International Journal of Qualitative Studies in Education* 16, no. 2 (2003): 175–96, https://doi.org/10.1080/0951839032000060635; Flyvbjerg et al., *Real Social Science;* Jaswinder K. Dhillon and Nest Thomas, 'Ethics of Engagement and Insider-Outsider Perspectives: Issues and Dilemmas in Cross-Cultural Interpretation', *International Journal of Research & Method in Education* 42, no. 4 (2019): 442–53, https://doi.org/10.1080/1743727X.2018.1533939; Kaitlin R. Sibbald et al., 'Positioning Positionality and Reflecting on Reflexivity: Moving From Performance to Practice', *Qualitative Health Research,* 28 March 2025, 10497323241309230, https://doi.org/10.1177/10497323241309230.

[28] Flyvbjerg, *Making Social Science Matter;* Sarah J. Tracy, 'Qualitative Quality: Eight "Big-Tent" Criteria for

Research Design and Methods

Consistent with its methodological approach, the research employed a two-step design: a comparative case study to provide contextual insights into challenges and for recommendations, and a critical evaluation of the CEP. Using GDP-per-capita (PPS) as a control variable to determine transition regions,[29] the cases under comparison are the NUTS[30] 2 category regions of the province of Drenthe (NL13-see Figure 1) in the Netherlands and the Northern and Western region (IE04-see Figure 2) in Ireland.[87]

Figure 1: OpenStreetMap Contributors. Map of Drenthe Province (NL13), the Netherlands. 2025. 1:1,200,000 scale. OpenStreetMap.org. Accessed 08 April 2026. https://www.openstreetmap.org/?#map=8/52.869/6.227

Excellent Qualitative Research', *Qualitative Inquiry* 16, no. 10 (2010): 837–51, https://doi.org/10.1177/1077800410383121.

[29] PPS, or 'Purchasing Power Standard', is a common currency unit that eliminates price level differences between countries to facilitate GDP comparisons across EU Member States and define transition and less-developed regions for receipt of structural funds. Eurostat, 'Glossary: Purchasing Power Standard (PPS)', Eurostat Statistics Explained, European Commission, accessed 31 March 2026, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Purchasing_power_standard_(PPS).

[30] NUTS, or 'Nomenclature of Territorial Units for Statistics', is a hierarchical system of geocodes, dividing the EU into territorial units for the purpose of "*collecting, developing and harmonising European regional statistics, assessing levels of eligibility for EU Structural Funds, and framing EU regional policies*." For each Member State there is a three-level hierarchy of regional subdivisions based on population thresholds. Ibid. The NUTS 2 category is the unit for the application of regional policy and the disbursement of regional funds, with the NUTS 3 subdivision, predominantly, acting as a unit of statistical analysis. Ibid. Local Administrative Units (LAUs) further subdivide NUTS 3 into local authorities, such as county and city councils in Ireland and municipalities in the Netherlands. European Parliament, 'Common Classification of Territorial Units for Statistics (NUTS)', Fact Sheets on the European Union, 30 September 2025, https://www.europarl.europa.eu/factsheets/en/sheet/99/common-classification-of-territorial-units-for-statistics-nuts-.

[31] IE04 comprises the NUTS 3 sub-regions of Border (IE041, encompassing the LAUs of Cavan, Donegal, Leitrim, Monaghan, and Sligo) and West (IE042, encompassing the LAUs of Galway City and Galway, Mayo, and Roscommon). It had a population of approximately 917,949 in 2025, representing approximately 17.6% of the

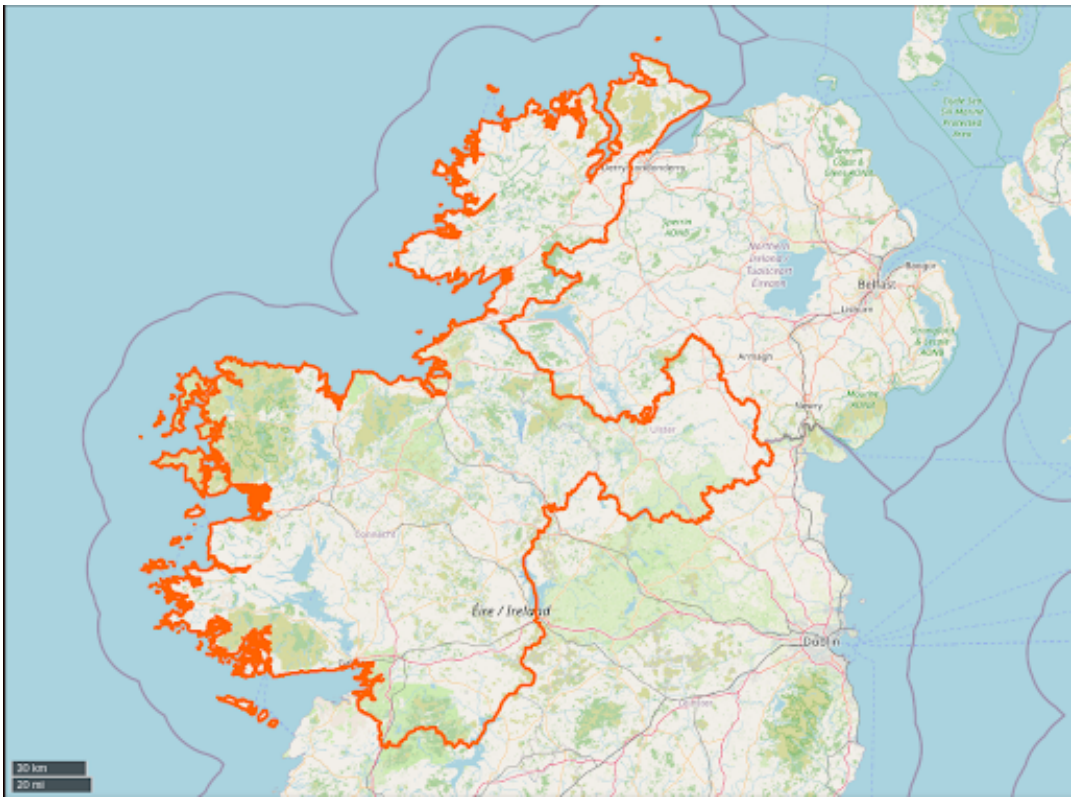

Figure 2: OpenStreetMap contributors. Map of Northern and Western Region (IE04), Ireland. 2026. 1:1,200,000 scale. OpenStreetMap.org. Accessed 08 April 2026. https://www.openstreetmap.org/?#map=8/54.220/-9.121

national population. The political and governance system of Ireland is considered to be highly centralised with strong governance constraints at the sub-national level. ocal governance in Ireland—whose decision-making body is composed of directly elected members—holds responsibility for services such as the maintenance of roads, local planning policy formulation and the adjudication of development proposals, and recreational and amenity facilities management and has no revenue-raising capacities. Regional governance in Ireland currently takes the form of "Regional Assemblies"—the Northern and Western Regional Assembly (NWRA) being relevant to this research—comprised of delegates from constituent city/county councils holding responsibility for the management of EU structural funds at the regional level and monitoring the financial and administrative performance of the constituent city/county councils. NL13 comprises the NUTS 3 sub-regions of Noord-Drenthe (NL131, encompassing the LAUs of Assen, Noordenveld, Tynaarlo, and Aa en Hunze), Zuidoost-Drenthe (NL132, encompassing the LAUs of Emmen and Borger-Odoorn), and Zuidwest-Drenthe (NL133, encompassing the LAUs of Coevorden, Hoogeveen, De Wolden, Midden-Drenthe, Meppel, and Westerveld). It had a population of approximately 506,529 in 2025, representing approximately 2.8% of the national population. oth IE04 and NL13 have the lowest GDP per capita (PPS) of their respective countries' NUTS 2 regions, are classified as transition regions based on their 2015–2017 GDP per capita, and are recipients of regional funds for the period 2021–2027. Constitutionally, the Netherlands is considered a decentralised unitary state with the provincial (i.e. regional) level acting as "area managers" responsible for spatial planning, environmental policy, energy and climate policy, traffic and transport, and regional economic policy as well as the monitoring and supervision of public administration at the municipal (i.e. local) level, yet are considered comparatively weak. While municipalities hold responsibilities for employment policy, social welfare and public health, public order and safety, school housing, local transport, culture and recreation, as well as tasks in social and spatial planning, funded through the centralised awarding of grants which is argued to limit their autonomy. Collective voluntary citizen action concerning specific issues and organised into various sub-municipal bodies with the possibility of a budget grant is formalised in local government legislation in the Netherlands. Hans Vollaard, 'Local State-Society Relations in the Netherlands', in *Close Ties in European Local Governance*, ed. Filipe Teles et al., Palgrave Studies in Sub-National Governance (Springer International Publishing, 2021), https://doi.org/10.1007/978-3-030-44794-6_18.

Interestingly, GDP per capita (PPS) in the NUTS 3 Border sub-region (IE041) stood at 70.6% relative to the EU average in 2023 which would put it in the less-developed classification.[32] Therefore, the conclusions and recommendations may hold relevance for regions in this classification. Data collection proceeded through two complementary methods, as follows:

i. a self-administered questionnaire targeting organisations and individuals with direct experience of energy community governance at the local and regional scale and designed to capture contextual insights, consistent with the methodological approach (n=16, response rate 19%)[33]

ii. a criteria-based policy evaluation of the CEP, informed by critical policy analysis, assessing the adequacy and implications of its proposals against a set of criteria deductively derived from the analytical framework.[34] The specific elements of the

[32] The average GDP per capita (PPS) for the EU was €38,100 in 2023, with the average in the same year in IE041 standing at €26,900. European Commission, ed., *Eurostat Regional Yearbook: 2025 Edition*, 2025 edition (Publications Office, 2025), https://doi.org/10.2785/3366990; Eurostat, 'Gross Domestic Product (GDP) at Current Market Prices by NUTS 3 Region', Eurostat Data Browser, accessed 31 March 2026, https://ec.europa.eu/eurostat/databrowser/product/page/NAMA_10R_3GDP.

[33] Flyvbjerg, 'Five Misunderstandings About Case-Study Research'; Flyvbjerg et al., *Real Social Science*; Sarah J. Tracy and Margaret M. Hinrichs, 'Big Tent Criteria for Qualitative Quality', in *The International Encyclopedia of Communication Research Methods* (John Wiley & Sons, Ltd, 2017), https://doi.org/10.1002/9781118901731.iecrm0016. Harsh Suri, 'Purposeful Sampling in Qualitative Research Synthesis', *Qualitative Research Journal* 11, no. 2 (2011): 63–75, https://doi.org/10.3316/QRJ1102063. Article 22 of RED II requires Member States to provide information portals and one-stop shops to give legal, technical, and financial support to energy communities. The Sustainable Energy Authority of Ireland (SEAI) is the nationally designated one-stop shop in Ireland, while Energie Samen in the Netherlands serves a similar function in the Netherlands, with Drentse KEI acting as a 'regional dome', or regional umbrella body of energy cooperatives, acting as a one-stop shop under the umbrella of Energie Samen. The contact details for energy communities were found on the publicly available lists on the SEAI and Drentse KEI websites. 'Find a Local Sustainable Energy Community', Sustainable Energy Authority of Ireland, n.d., https://www.seai.ie/plan-your-energy-journey/for-your-community/sustainable-energy-communities/sec-map; 'Initiatieven en energiecoöperaties', Drentse Kei, n.d., https://drentsekei.nl/zij-doen-al-mee/cooperaties/. Using their aim and maturity as a control, achieved through controlling for their stage of activity in SEAI repository ("Plan" or "Do" stages) and an evaluation of their publicly available description, as well as evaluation of their suitability in line with the operationalised definition of energy communities through the same method, i.e. a community organised project either engaged in the production, consumption, or both, of renewable energy. Through this, 24 and 22 energy communities in NL13 and IE04, respectively, were contacted. Targeting environmental, community, and planning departments, one regional and 23 local departments in IE04 were contacted for participation as well as the regional energy community coordinator. Apart from details for regional energy community coordinator, details for similar contacts in NL13 were not publicly available, requiring exploratory emails to the public email inboxes of the 12 municipalities and the regional authority (the province of Drenthe). The self-administered questionnaire yielded 16 responses (from a total of 85 contacted energy communities or local or regional departments), 7 of which responded to the open question. 10 responses were from IE04 (four from energy communities, and six from local or regional authorities or organisations with responsibility for energy communities) and six from NL13 (four from energy communities, and two from local or regional authorities or organisations with responsibility for energy communities). While the approximately 19% response rate is acknowledged as a limitation, the responses represent a meaningful proportion of the contacted population and the information considered analytically significant and sufficient for the contextual purposes of the questionnaire and to address the research question.

[34] Frank Fischer et al., eds, Handbook of Critical Policy Studies (Edward Elgar Publishing, 2015), https://doi.org/10.4337/9781783472352; Jenkins et al., 'The Methodologies, Geographies, and Technologies of Energy Justice'; Droubi et al., 'A Critical Review of Energy Democracy'; Osička et al., 'Energy Justice and Energy Democracy'; Frank Fischer, *Critical Policy Inquiry: Interpreting Knowledge and Arguments* (Edward Elgar Publishing, 2024), https://doi.org/10.4337/9781789900811; Peter Linquiti, 'Operationalizing Lasswell's Call for Clarification of

CEP under evaluation are, as follows: the "*Communication from the Commission – Citizens' Energy Package*" (hereafter, the Communication) of 10 March 2026, the "*Commission Recommendation (EU) 2026/1007 of 30 April 2026 on supporting the development of energy communities and maximising the potential of self-consumption*" (hereafter, the Recommendation) and its Annex, the "*Energy Communities Action Plan*" (hereafter, the Action Plan).[35]

Evaluating the Citizens' Energy Package

This section assesses the CEP against the energy justice and energy democracy criteria, drawing on responses to the self-administered questionnaire to identify the opportunities and challenges it presents to local and regional governance for enabling greater energy justice and energy democracy in energy communities.

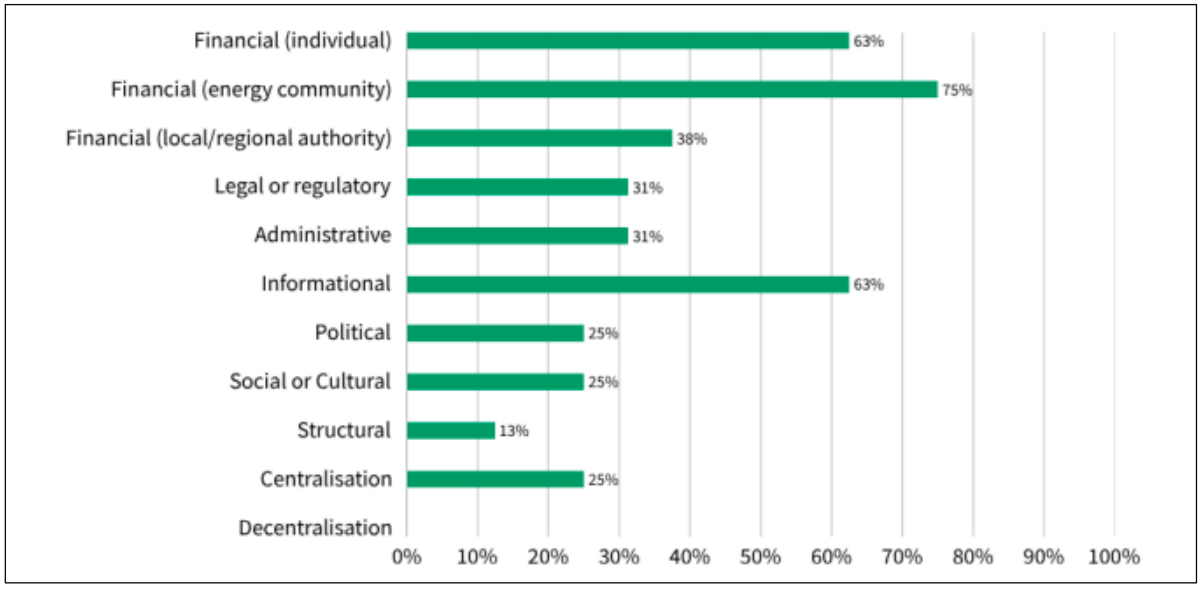

Figure 3: Responses to "What do you consider to be the main barriers to meaningful and inclusive participation in energy community governance?" Respondents could select multiple options. n=16. Own survey data, April-May, 2026

Value Goals: An Equity-Based Approach to Normative Public Policy Analysis', Policy Sciences 57, no. 1 (2024): 193–219, https://doi.org/10.1007/s11077-024-09525-w; Santos Ayllón, 'Debates on the Future of Energy Justice'.

[35] The Communication consists of four 'pillars' and nine 'actions': "Pillar I: Lowering Energy Bills for Households" comprising "Action 1: Lowering taxes and levies on electricity for households to the EU minimum", "Action 2: Lowering network costs for local consumers", "Action 3: Boosting the use of clean and energy-efficient technologies", and "Action 4: Empower consumers to have the cheapest offer and to switch supplier quickly"; "Pillar II: Protecting and Empowering Consumers" comprising "Action 5: Boosting energy self-production and energy sharing among citizens", "Action 6: Promoting flexibility through retail contracts", and "Action 7: Strengthening consumer trust"; "Pillar III: Tackling Energy Poverty and Vulnerability" comprising "Action 8: Joining forces to reduce energy poverty", and "Action 9: Protecting vulnerable citizens from disconnections"; "Pillar IV: Implementing the existing EU laws", with no action points. Communication from the Commission – Citizens' Energy Package.The Recommendation consists of 10 sections, as follows: "Governance and Monitoring", "Permitting and System Integration", "Standardised Approach to Energy Sharing", "Remuneration to Maximise the Value of Self-Consumption", "Access to Relevant Energy Markets", "Access to Public Funding and Private Financing", "Awareness-raising and Capacity-building Support", "Regional and Cross-border Cooperation", "Social Inclusiveness", and "Digitalisation and Innovation". The Action Plan consists of 5 sections, as follows: "1. Effective enabling frameworks", "2. Access to financing", "3. Awareness-raising and capacity-building", "4. Social inclusion and public participation", and "5. Digital innovation and system integration". Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, OJ L 2026/1007 (2026), https://eur-lex.europa.eu/eli/reco/2026/1007/oj/eng.

A lack of financial resources for energy communities and for local and regional authorities is identified in both cases as a significant barrier to supporting fairness, inclusiveness and meaningful participation in energy communities (see Figure 3 and 4). While the CEP promotes the use of the LIFE programme —an EU funding instrument for projects related to the environment and climate action— and Cohesion Funding —EU funding under Cohesion Policy aimed at promoting economic, social, and territorial cohesion through the reduction of disparities of development— for the development of energy communities, it presents an opportunity for energy justice and democracy inasmuch as it can reflect contextual concerns and promote local knowledge and an active role for citizens, which is not guaranteed.[36] This only tacitly recognises the specific challenges of transition regions offering limited opportunities for energy justice and democracy.[37]

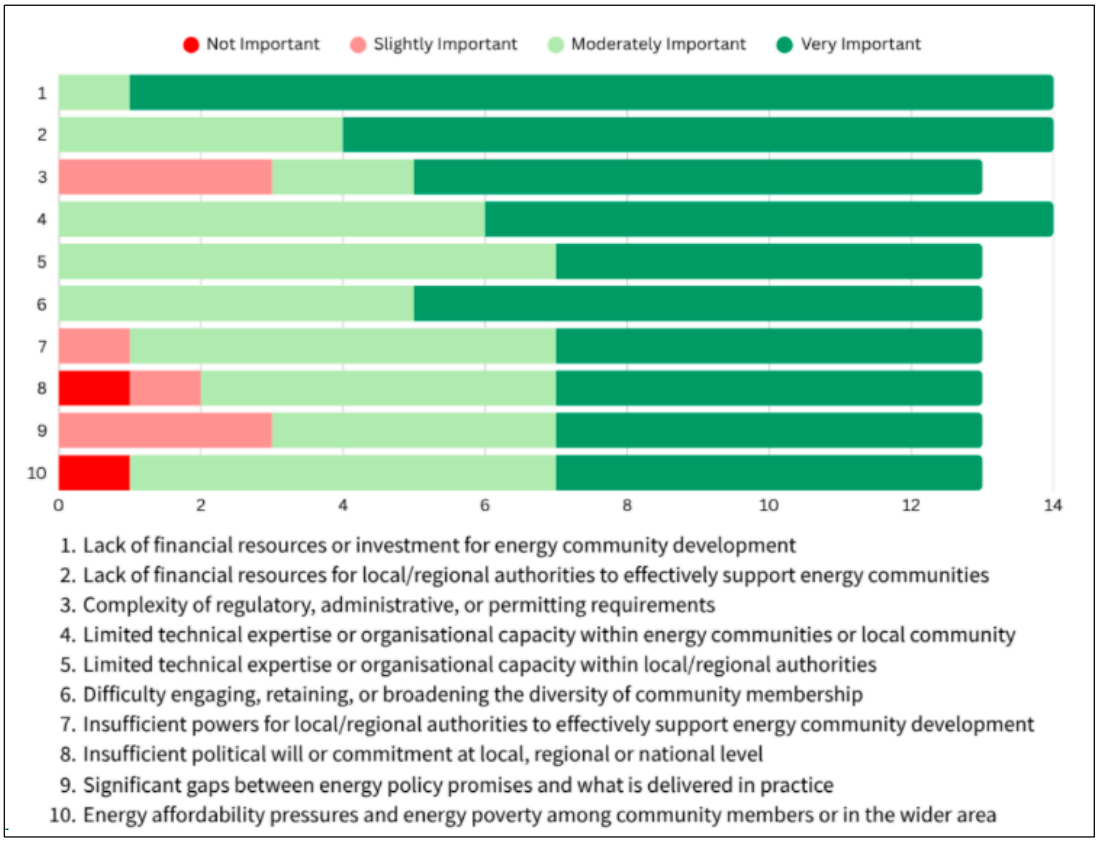

Figure 4: Responses to "How significant are the following challenges for energy communities and local authorities in pursuing fairness and inclusivity in your locality?" Respondents could select multiple options. n=16. Own survey data, April-May, 2026

[36] Riccardo Crescenzi and Mara Giua, 'The EU Cohesion Policy in Context: Does a Bottom-up Approach Work in All Regions?', *Environment and Planning A: Economy and Space* 48, no. 11 (2016): 2340–57, https://doi.org/10.1177/0308518X16658291; Jenkins et al., 'Energy Justice'; Szulecki, 'Conceptualizing Energy Democracy'; Arjan H. Schakel, 'Multi-Level Governance in a "Europe with the Regions"', *The British Journal of Politics and International Relations* 22, no. 4 (2020): 767–75, https://doi.org/10.1177/1369148120937982; Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 6, 7, 10.

[37] Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 6.

Limited technical expertise and organisational capacity are noted as an impediment for local and regional authorities in promoting fairness and inclusiveness in energy communities (see figure 4). While the CEP does promote the provision of technical guidance and training and promotes Member State consultation with local and regional authorities, among others, in the implementation of the Recommendation, it does not promote their substantive representation and meaningful participation in energy governance.[38] Moreover, the participation of local and regional authorities in the proposed dialogue on the implementation of EU legislation, as well as the "Citizen Energy Dialogue", is largely ignored, presenting a challenge, and the European Commission itself does not commit to engaging with local and regional authorities, instead committing itself only to informing local authorities of their rights and opportunities regarding energy communities.[39] Similarly, while the commitment to promote the integration of energy communities into local energy planning "among members of the Covenant of Mayors and Citizen Energy Advisory Hub (CEAH) presents a real opportunity, it is exclusive to these groups and, as a result, does not advance equal participation in energy governance.

While the CEP presents a potential opportunity for local and regional authority involvement in energy governance through regulatory sandboxes —a tool to allow for experimentation without some of the usual applicable regulation— this is only if the interests of local and regional authorities and communities, rather than corporate interests, are considered and foregrounded, which is not guaranteed.[40] Overall, there is a lack of recognition of local and regional authorities throughout the CEP: it does not promote their substantive participation or inclusion in energy policy or in drafting of national strategies, despite the assessment that "*[l]ocal authorities have a key role in supporting and engaging with citizens, but they are often insufficiently involved in policy development and lack the powers and means to deliver measures to citizens.*"[41] While this likely reflects the limited role of the EU in energy policy, the non-binding nature of the recommendations means that promoting their participation remains a possibility without constitutional overreach.

Transparent decision-making at all levels of governance and inclusive governance structures are highlighted by some respondents as significant for making energy communities more democratic, inclusive and fair (Figure 4). Considering the indication of gaps between what energy legislation provides for on paper and what is delivered in practice for energy communities and local authorities (see Figure 3), this points to a need for the promotion of participation in energy governance. The recommendation to "*clearly differentiate between the concept of renewable energy communities and citizen energy com-*

[38] Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 4, 7.
[39] Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 9–10.
[40] Imke Lammers and Lea Diestelmeier, 'Experimenting with Law and Governance for Decentralized Electricity Systems: Adjusting Regulation to Reality?', *Sustainability* 9, no. 2 (2017): 212, https://doi.org/10.3390/su9020212; Esther C. Van Der Waal et al., 'Participatory Experimentation with Energy Law: Digging in a "Regulatory Sandbox" for Local Energy Initiatives in the Netherlands', *Energies* 13, no. 2 (2020): 458, https://doi.org/10.3390/en13020458; Schneiders, 'Regulatory Sandboxes in the Energy Sector: Are They Key to the Transition to a Net Zero Future?'
[41] Communication from the Commission – Citizens' Energy Package, 10.

munities"[42] and to "*adequately define the concepts of 'effective control', 'autonomy', and 'social, economic and environmental benefits*'"[43] is an acknowledgement of these gaps and of the power imbalances that can exist in energy community governance, promoting transparency and legal clarity for local and regional authorities.[44] The recommendation for full transposition of RED and IMED presents an opportunity for more transparent governance. However, for it to be a substantive opportunity requires effective multi-level coordination in Member States, including in development of legislation, which is not guaranteed and may not prove effective, even in cases of relative decentralisation.[45] Similarly, while the attendant recommendations for frameworks that assess barriers and potentials presenting opportunities for meaningful participation, barrier assessment has been found to focus too much on internal conditions.[46]

While the CEP does recognise the costs and benefits for energy communities and for vulnerable, marginalised, or less resourced people, it cannot be considered to present opportunities for the substantive participation of local and regional authorities, or indeed energy communities, in energy governance or in the ownership of energy systems. It does not properly acknowledge the contextual and situated position of energy communities within local and regional contexts and the specific challenges that local and regional authorities may face in supporting them. Consequently, if local and regional authorities do have a *"key role to play"*,[47] a number of recommendations are forthcoming to effectively place *"[f]airness and equality [...] at the heart of the energy transition",*[48] namely: promote and support local knowledge in energy policy and governance;[49] and, fully integrate the ambitions and objectives of a participatory and decentralised energy system into multi-level energy policy and governance (Figure 5).

[42] Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 3.
[43] Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption, 7.
[44] Jenkins et al., 'Energy Justice'; Szulecki and Overland, 'Energy Democracy as a Process, an Outcome and a Goal'; Michael Krug et al., 'Implementing European Union Provisions and Enabling Frameworks for Renewable Energy Jenkins et al., 'Energy Justice'; Szulecki and Overland, 'Energy Democracy as a Process, an Outcome and a Goal'; Michael Krug et al., 'Implementing European Union Provisions and Enabling Frameworks for Renewable Energy Communities in Nine Countries: Progress, Delays, and Gaps', *Sustainability* 15, no. 11 (2023): 8861, https://doi.org/10.3390/su15118861.
[45] Dörte Ohlhorst, 'Germany's Energy Transition Policy between National Targets and Decentralized Responsibilities', *Journal of Integrative Environmental Sciences* 12, no. 4 (2015): 303–22, https://doi.org/10.1080/1943815X.2015.1125373; Krug et al., 'Implementing European Union Provisions and Enabling Frameworks for Renewable Energy Communities in Nine Countries'; Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption.
[46] Saveria Olga Murielle Boulanger et al., 'Designing Collaborative Energy Communities: A European Overview', *Energies* 14, no. 24 (2021): 8226, https://doi.org/10.3390/en14248226; Commission Staff Working Document - Implementation Package Accompanying the Commission Recommendation on Energy Communities, Supplier Risk Management, and Protection of Vulnerable Customers.
[47] Communication from the Commission – Citizens' Energy Package, 10.
[48] Communication from the Commission – Citizens' Energy Package, 8.
[49] Jenkins et al., 'Energy Justice'; Szulecki and Overland, 'Energy Democracy as a Process, an Outcome and a Goal'.

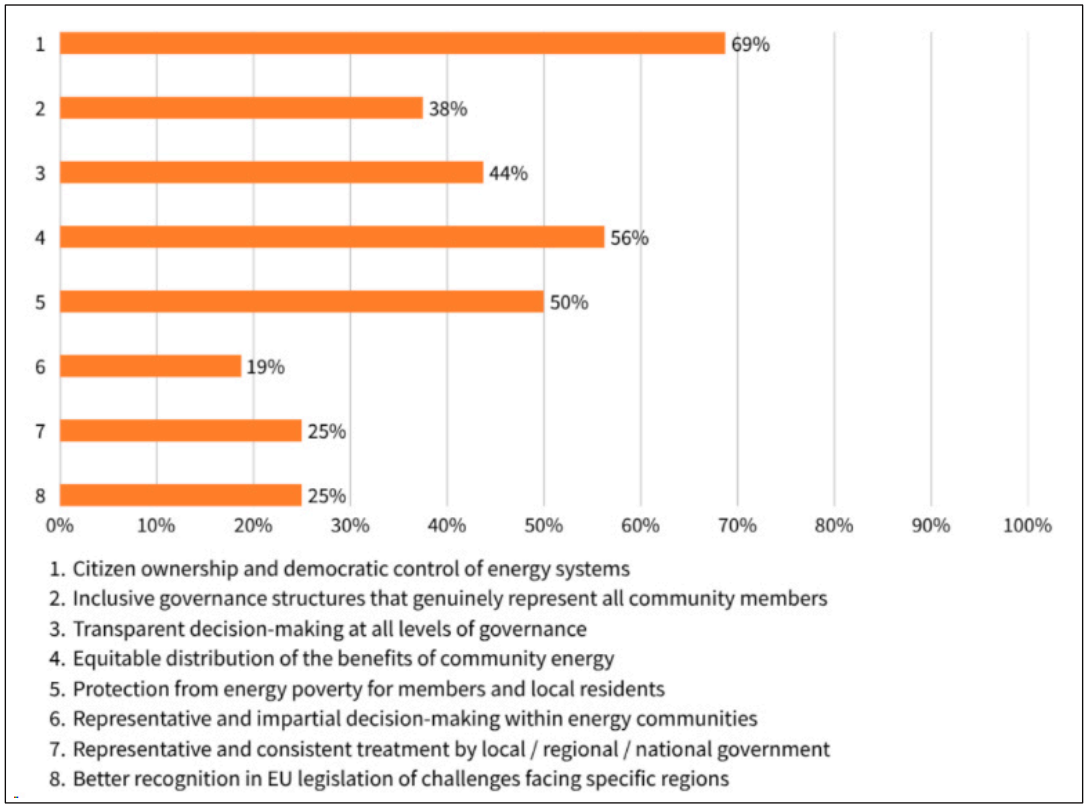

Figure 5: Responses to "Based on your experience, what is most needed to make energy communities more democratic, inclusive, and fair?" Respondents could select multiple options. n=16. Own survey data, April-May, 2026

Conclusion

Operationalising energy justice and energy democracy has allowed identification and problematisation of unjust and anti-democratic aspects of EU energy policy.[50] The EU must promote the inclusion of local knowledge in policy and collective rights and abilities to participate in and affect decision-making.[51] While the CEP recommendations for Member States are non-binding, they can carry significant weight, especially when considered in their role accompanying the IMED and RED.[52] Just and democratic processes or outcomes in energy communities cannot be assumed, and require just and democratic gov-

[50] Jenkins et al., 'The Methodologies, Geographies, and Technologies of Energy Justice'.

[51] Andreas Ladner et al., 'Measuring Local Autonomy in 39 Countries (1990–2014)', *Regional & Federal Studies* 26, no. 3 (2016): 321–57, https://doi.org/10.1080/13597566.2016.1214911; Andrew Beer et al., '1. What Is Place-Based Policy?', *Regional Studies Policy Impact Books* 2, no. 1 (2020): 11–22, https://doi.org/10.1080/2578711X.2020.1783897; Christina E. Hoicka et al., 'Implementing a Just Renewable Energy Transition: Policy Advice for Transposing the New European Rules for Renewable Energy Communities', *Energy Policy* 156 (September 2021): 112435, https://doi.org/10.1016/j.enpol.2021.112435; Jenkins et al., 'The Methodologies, Geographies, and Technologies of Energy Justice'; Wahlund and Palm, 'The Role of Energy Democracy and Energy Citizenship for Participatory Energy Transitions'.

[52] Consolidated Version of the Treaty on the Functioning of the European Union, C 202/1 (2016), arts 194, 288; Oana Andreea Stefan et al., 'EU Soft Law in the EU Legal Order: A Literature Review', SSRN Electronic Journal, ahead of print, 2019, https://doi.org/10.2139/ssrn.3346629; Corina Andone and Florin Coman-Kund, 'Persuasive Rather than "Binding" EU Soft Law? An Argumentative Perspective on the European Commission's Soft Law Instruments in Times of Crisis', *The Theory and Practice of Legislation* 10, no. 1 (2022): 22–47, https://doi.org/10.1080/20508840.2022.2033942.

ernance that recognises the reflexive processual nature of energy justice and energy democracy. Doing so could place *"[f]airness and equality [...] at the heart of the energy transition,"*[53] ensure its success, and contribute to energy security and affordability throughout Europe.[54]

In line with the methodological approach, the research sought contextual insights rather than statistical generalisability. Further research surveying practitioner opinions on the CEP with a larger sample would prove valuable and complement the findings presented here. Furthermore, the technical specifications of the CEP (e.g., permitting, grid connections/costs) fell outside the scope of the research.[55] Given their significance for energy community initiatives,[56] their potential effects warrant dedicated investigation.

[53] Communication from the Commission – Citizens' Energy Package, 8.

[54] Sovacool et al., 'New Frontiers and Conceptual Frameworks for Energy Justice'; Hanke et al., 'Do Renewable Energy Communities Deliver Energy Justice?'; Florian Hanke and Rachel Guyet, 'The Struggle of Energy Communities to Enhance Energy Justice: Insights from 113 German Cases', *Energy, Sustainability and Society* 13, no. 1 (2023): 16, https://doi.org/10.1186/s13705-023-00388-2; Leen Peeters et al., 'Addressing the Gaps in Understanding and Assessing Energy Communities', *Energy Research & Social Science* 127 (September 2025): 104176, https://doi.org/10.1016/j.erss.2025.104176.

[55] cf. Commission Recommendation (EU) 2026/1007 of 30 April 2026 on Supporting the Development of Energy Communities and Maximising the Potential of Self-Consumption.

[56] Interviewee, 13 April 2026

Strategic Competition in the Arctic: Resources, Sea Lanes and Governance, 2013–2026

Yuliia Mayevska[1]

Introduction

Over the past decade, the Arctic has shifted from a region often characterised by low-tension cooperation to an increasingly important arena of geopolitical competition. Contemporary Arctic geopolitics arises from the interplay of three interconnected factors: material interests in hydrocarbons and critical minerals; geopolitical considerations related to marine access and military positioning; and institutional arrangements shaping governance and decision-making authority. The accelerated retreat of sea ice is fundamentally altering the regional resource landscape, creating new extraction potential. This article examines how competing state interests in Arctic resources, sea lanes and governance systems explain the region's transformation from a peripheral space, long treated by states as an insulated zone of low-tension cooperation, into a central arena of international security. It argues that the Arctic's growing importance is rooted in climate change, which is transforming physical accessibility and resource potential, but that its geopolitical significance is ultimately shaped by the ways in which states attach strategic meaning to new forms of access, control and participation. To capture this shift, this article focuses on the period between 2013 and 2026. The year 2013 serves as a critical baseline, marking the moment China was granted Observer status in the Arctic Council, the region's primary intergovernmental forum for environmental and sustainable development cooperation. This proved key to effectively globalising regional geopolitics. Extending the analysis to 2026 captures the contemporary strategic reality, which is heavily defined by the systemic rupture in regional cooperation.

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Methodology

This article uses a qualitative multiple case study design and a structured focused comparison of Russia, the United States and China across three dimensions: resources, sea lanes and governance. These three actors were selected because they constitute the three systemic actors that structure contemporary Arctic geopolitics. Russia combines continuous Arctic sovereignty with extensive material infrastructure, enabling sustained strategic planning. The United States underpins the Arctic security architecture and rules-based maritime order. China represents the principal external actor, engaging through economic influence without territorial presence. Other Arctic states are excluded as cases because their positions are embedded within NATO and EU frameworks. The strategic interaction between these three actors is evaluated through a process logic where resource demands drive the use of sea lanes and these emerging corridors ultimately require governance, capturing how material change is converted into strategic competition in the Arctic.[2] The analysis draws on academic literature, official Arctic strategies and recent investigative accounts. Official strategies identify declared priorities, while academic and investigative sources contextualise and compare those claims through triangulation.[3] To keep the comparison transparent, the findings were organised in a coding table.[4] The main limitation is that the article analyses declared interests and secondary accounts rather than classified decision-making or direct policy implementation.

Results

Natural Resources and Critical Raw Materials

Receding ice alters the physical geography of Arctic resources, but this shift becomes a security issue because states view these hydrocarbons and critical minerals as vital strategic assets. Russia's interest in Arctic resources is both economic and geopolitical. This region accounts for over 80% of Russia's natural gas reserves and 17% of its oil reserves, with the continental shelf estimated to hold 85.1 trillion cubic metres of gas and 17.3 billion tonnes of oil, making it central to Russia's long-term economic strategy.[5] However, Russia's Arctic ambitions extend beyond narrow economic calculations.[6] Arctic resource development functions as a demonstration of Russian state capacity; it allows the Kremlin to project national power and consolidate Russia's position as the dominant regional actor. State-owned companies, Rosneft and Gazprom, function as instruments of geopolitical ambition. The true mechanism of this power projection lies in the physical realities of extraction. The massive, state-directed logistical footprint required to monetise these

[2] Robert K. Yin, *Case Study Research and Applications*, 6th ed. (Thousand Oaks, CA: Sage, 2018); Alexander L. George and Andrew Bennett, *Case Studies and Theory Development in the Social Sciences* (Cambridge, MA: MIT Press, 2005).
[3] Michael Quinn Patton, *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, 4th ed. (Thousand Oaks, CA: Sage, 2015).
[4] The coding table is available from the author upon request.
[5] Russian Federation, *Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period up to 2035* (October 26, 2020), http://www.kremlin.ru/acts/bank/45972.
[6] Arild Moe and Daniel S. Hamilton, "Russia and the Development of Arctic Energy Resources in the Context of Domestic Policy and International Markets," in *The Arctic and World Order*, ed. Kristina Spohr, Daniel S. Hamilton and Jason C. Moyer (Washington, DC: Brookings Institution Press, 2021), 119–142.

strategic reserves effectively domesticates the frontier, providing the Kremlin with the dual-use infrastructure necessary to secure military access and dictate terms along the Northern Sea Route (NSR), the maritime shipping lane running along Russia's Arctic coast from the Barents Sea to the Bering Strait. Successful Liquefied Natural Gas (LNG) projects provide Russia with access to growing Asian markets. For Russia, the Arctic is therefore one of the key pillars of its economic and geopolitical future.

The United States approaches Arctic resources from a structurally different position. Alaska possesses substantial deposits of zinc, gold, copper, molybdenum and offshore hydrocarbons. Alaskan metallic mineral sites rank within the top 10% largest worldwide in terms of metal content, anchoring the state's strategic importance.[7] Nevertheless, the U.S. frames resource policy around two imperatives that starkly differentiate Washington's approach from Moscow's assertion of territorial dominance and Beijing's strategy of using resource investments to buy regional influence. First, according to the 2022 National Strategy for the Arctic Region, the U.S. explicitly prioritises a just energy transition by investing in renewable energy infrastructure to diversify Alaska's economy away from fossil fuels to mitigate the severe environmental vulnerabilities of the region, targeting the ecological damage caused by diesel spills and the accelerated ice melt driven by black carbon pollution.[8] However, by May 2026, this environmental framing has been increasingly subsumed by hard-security imperatives; the May 2026 Joint Statement on Arctic Security from the Arctic Allies underscores a strategic shift toward bolstering military presence, enhancing surveillance and coordinating expert oversight in resource development and critical infrastructure protection to counter Russian and Chinese influence.[9] Second, the United States concentrates on the resilience of supply chains for critical minerals by exploring Alaska's potential for responsible mineral production.[10] This reflects growing concern about strategic dependence on foreign-controlled resources. Washington approaches Arctic resources not only as an economic opportunity, but as a question of energy security and national resilience. Ultimately, Washington effectively employs resource policy as a strategic counterweight to foreign influence, leveraging its regulatory power and close allied network to maintain a competitive advantage in supply chain security against adversarial encirclement via enhanced investment screening and critical infrastructure protection.

China's interest in Arctic resources stems from its status as the world's largest consumer of energy resources and one of the world's leading trading nations. While China's 2018 Arctic Policy initially established its status as a "near-Arctic state" and essential regional stakeholder, its operational approach is driven by the Outline of the 15th Five-Year Plan

[7] Paula Adánez-Sanjuán and Egidio Marino, "Mineral Resources and Their Governance Challenges in the Arctic Region," in *The Routledge Handbook of Arctic Governance*, ed. Elena Conde and Corine Wood-Donnelly (London: Routledge, 2025), 58–78.
[8] The White House, *National Strategy for the Arctic Region* (October 2022), https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/10/National-Strategy-for-the-Arctic-Region.pdf.
[9] U.S. Department of State, "Joint Statement on Arctic Security from the Arctic Allies – Canada, Kingdom of Denmark including Greenland and the Faroe Islands, Finland, Iceland, Norway, Sweden, and the United States of America," Office of the Spokesperson, May 22, 2026, https://www.state.gov/releases/office-of-the-spokesperson/2026/05/joint-statement-on-arctic-security-from-the-arctic-allies-canada-kingdom-of-denmark-including-greenland-and-the-faroe-islands-finland-iceland-norway-sweden-and-the-united-states-of-ame.
[10] The White House, *National Strategy for the Arctic Region.*

(2026-2030).[11] By prioritising the security of strategic resource corridors, this planning framework allows Beijing to transition from a diplomatic observer to an active industrial participant. China seeks to leverage its capital, technology and market potential to participate in the extraction of Arctic oil, gas and minerals, as a non-Arctic state. Leveraging the climate-driven expansion of regional accessibility, Beijing utilises its immense capital reserves to secure targeted hydrocarbons and critical minerals essential to its domestic industrial demand.[12] Beijing also treats resource investment as a tool for achieving broader political objectives. By investing in Arctic infrastructure, Beijing strengthens its claim to be a legitimate "near-Arctic state" and an important stakeholder in a region where it holds no territorial sovereignty. Resource access becomes a means of transforming economic participation into political legitimacy.

Thus, the resource dimension reveals a three-way structure of interests. The highly centralised Russian state views the Arctic as a flagship demonstration of Russia's state capacity to ensure it remains the strategically dominant power in the region.[13] The United States seeks to reduce strategic dependence on China-linked critical mineral supply chains whilst simultaneously undertaking a domestic transition away from the hydrocarbons on which Russia depends. This places Washington in direct strategic conflict with Moscow: it is a systematic struggle over whether the Arctic's future flows should be governed by Russia's physical sovereign enclosure or by the regulatory, rule-based network the United States utilises to protect its own dominant position in the regional hierarchy. China seeks access to resources through economic means rather than territorial claims, creating tension with both Russia, which wants unipolar regional dominance and the U.S., which is determined to safeguard the resilience of its supply chain. However, securing these resources is only the first step in the strategic equation; these materials are virtually useless without the physical transport corridors required to bring them to global markets.

Sea Lanes

Arctic sea lanes are better understood as emerging transport corridors than as established trade routes. Extreme seasonality and lack of deep-water ports prevent the reliable, high-volume shipping seen in commercial arteries like the Suez Canal. Consequently, these routes currently function as high-risk, niche paths rather than the foundational hubs of global trade.[14] Receding sea ice provides the physical possibility of movement, but not the commercial conditions required for stable transit integration. Russia's interest in Arctic sea lanes centres around the Northern Sea Route, but its importance lies less in ordinary commercial transit than in state-controlled strategic connectivity. Russia is devel-

[11] State Council Information Office of the People's Republic of China, *China's Arctic Policy* (January 26, 2018), https://english.www.gov.cn/archive/white_paper/2018/01/26/content_281476026660336.htm; People's Republic of China, *Outline of the 15th Five-Year Plan (2026-2030) for National Economic and Social Development of the People's Republic of China (2026),* https://www.wko.at/ktn/aussenwirtschaft/euclera-translation-15th-five-year-plan-2026-2030-.pdf.

[12] Beate Steinveg, "Arctic Strategies of Non-Arctic States," in *The Routledge Handbook of Arctic Governance*, ed. Elena Conde and Corine Wood-Donnelly (London: Routledge, 2025), 225–239.

[13] Moe and Hamilton, "Russia and the Development of Arctic Energy Resources".

[14] Kenneth R. Rosen, *Polar War: Submarines, Spies, and the Struggle for Power in a Melting Arctic* (New York: Simon & Schuster, 2026).

oping the NSR by modernising port hubs, transport infrastructure and expanding its conventional icebreaker fleets, operating a fleet of eight nuclear-powered icebreakers with plans to construct 10 additional vessels by 2035, with the ambition of increasing cargo volumes to 130 million tonnes by 2035.[15] Moscow sees the route as a national development project rather than an international shipping opportunity. Russian Arctic shipping is mostly connected to the export of LNG, oil, minerals from projects around Yamal, Novy Port, Sabetta, Dudinka and Norilsk.[16] It allows the Kremlin to strengthen legal and administrative control over Arctic navigation through pilotage, icebreaker escorts, fees and the role of Rosatom in NSR management.[17] Crucially, the route cements Russia's great-power position by providing a strategic maritime corridor that links European and Asian markets entirely within sovereign waters, safely insulated from Western naval choke points.[18] As Arctic waters become more navigable, Moscow seeks to ensure that this new mobility operates under Russian control.

For the United States, Arctic sea lanes matter primarily as questions of access, legal openness and strategic mobility. However, Washington's traditional interest in ensuring that emerging routes remain open under international rules has shifted toward active, collective military protection. The U.S. prioritises freedom of navigation and overflight, maritime domain awareness, Coast Guard icebreaking capacity and infrastructure, such as the deep-draft harbour in Nome.[19] This operational shift is solidified by the May 2026 Allied Joint Statement, which emphasises enhanced situational awareness, surveillance capabilities and coordination within existing NATO frameworks such as air policing.[20] While Washington historically limited NATO's footprint to avoid direct escalation, it has increasingly pivoted toward an alliance-driven deterrence model to secure critical corridors.[21] U.S. Arctic posture has historically favoured expeditionary operations over the permanent, all-weather infrastructure required for consistent governance.[22] To transition from this limited, seasonal presence to sustained maritime operations, the U.S has finalised a $3.5 billion contract for a new class of 11 Arctic Security Cutters, designed to establish a year-round operational footprint[23] Since Arctic navigation remains uncertain, Washing-

[15] Russian Federation, *Strategy for the Development of the Arctic Zone*; "Russia to Build 10 More Icebreakers and 46 Salvage Vessels to Develop NSR," The Maritime Executive (February 13, 2026), https://maritime-executive.com/article/russia-to-build-10-more-icebreakers-and-46-salvage-vessels-to-develop-nsr.

[16] Lawson W. Brigham, "Governance and Economic Challenges for the Global Shipping Enterprise in a Seasonally Ice-Covered Arctic Ocean," in *The Arctic and World Order*, ed. Kristina Spohr, Daniel S. Hamilton and Jason C. Moyer (Washington, DC: Brookings Institution Press, 2021), 143–159.

[17] Rosatom, "Vladimir Putin Signed a Law on Rosatom's Powers in Northern Sea Route Development," press release, July 19, 2022, https://rosatom-energy.ru/en/media/rosatom-news/vladimir-putin-singed-a-law-on-rosatom-s-powers-in-northern-sea-route-development/.

[18] Ernie Regehr, "Military Infrastructure and Strategic Capabilities: Russia's Arctic Defense Posture," in *The Arctic and World Order*, ed. Kristina Spohr, Daniel S. Hamilton and Jason C. Moyer (Washington, DC: Brookings Institution Press, 2021), 187–218.

[19] The White House, *National Strategy for the Arctic Region*.

[20] U.S. Department of State, "Joint Statement on Arctic Security," May 22, 2026.

[21] Benjamin Schaller and Horatio Sam-Aggrey, "NATO, the OSCE, and the Arctic Region: European Security Organizations and the High North," in *Routledge Handbook of Arctic Security,* ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 348–360.

[22] Kenneth R. Rosen, *Polar War: Submarines, Spies, and the Struggle for Power in a Melting Arctic* (New York: Simon & Schuster, 2026).

[23] U.S. Department of Homeland Security, "Coast Guard Finalizes Contract for Five New Arctic Security Cutters," press release, May 13, 2026, https://www.dhs.gov/news/2026/05/13/coast-guard-finalizes-contract-five-new-

ton approaches sea lanes primarily as a question of future access and legal order, rather than as an immediate shipping opportunity.[24]

China's interest in Arctic sea lanes centres on the Polar Silk Road, the official Arctic extension of Beijing's Belt and Road initiative aimed at developing shipping routes and building regional infrastructure, as a framework for Chinese participation in Arctic shipping, investment and commercial navigation.[25] As China lacks Arctic sovereignty, its position depends on access rather than territorial control. Beijing seeks access to future maritime corridors and a role in shaping the infrastructure. China's interest is not limited to cooperation with Russia on the NSR. Beijing also pays attention to the Transpolar Sea Route (TSR) because it could offer a more direct Asia-Europe connection and reduce reliance on a route regulated by Moscow.[26] Unlike NSR, the TSR crosses the international high seas of the central Arctic Ocean directly over the North Pole, offering a geographically shorter connection that completely bypasses coastal state jurisdiction. China's icebreaker activity is anchored by the regular polar deployments of its Xuelong and Xuelong 2 research vessels. Furthermore, the recent unveiling of an advanced nuclear-powered heavy icebreaker prototype design indicates that Beijing is already building technical knowledge and symbolic presence in this space.[27] The opening of Arctic sea lanes does not automatically mean equal access; each route is shaped by maritime zones, coastal-state jurisdiction and legal interpretation.[28] China's ability to use the Arctic depends on maintaining navigation as an international legal right rather than as a privilege controlled by Arctic coastal states. China's interest is less about owning Arctic space than about avoiding exclusion from the rules. While China's strategic rhetoric echoes the U.S. commitment to freedom of navigation, this alignment is one of convenience rather than coordination. Whereas the U.S. relies on international maritime norms to resist Russia's physical enclosure of the Arctic, this same legal framework provides the opening that allows China to project its own influence.

Sea-route competition in the Arctic stems from debates over who should set the terms of access. The central conflict is that Russia benefits from routing Arctic mobility through a regulated national corridor, while the U.S. and China both have reasons to resist dependence on that corridor. While routes like the Transpolar Sea Route or the Northwest Passage exist, they remain geographically or climatically challenged. As illustrated in Figure 1, these competitive corridors present vastly different transit geographies: the TSR for now traverses permanent, deep-sea ice packs and the Northwest Passage is characterised

arctic-security-cutters.

[24] Brigham, "Governance and Economic Challenges".

[25] State Council Information Office of the People's Republic of China, *China's Arctic Policy.*

[26] Mia M. Bennett, Scott Stephenson, Kang Yang, Michael T. Bravo and Bert De Jonghe, "Climate Change and the Opening of the Transpolar Sea Route: Logistics, Governance, and Wider Geo-Economic, Societal and Environmental Impacts," in *The Arctic and World Order,* ed. Kristina Spohr, Daniel S. Hamilton and Jason C. Moyer (Washington, DC: Brookings Institution Press, 2021), 161–186.

[27] Siobhán Delaney, "China Accelerates 'Polar Silk Road' With Nuclear Icebreaker, Stakes Claim to Logistics, Resources and Strategic Footholds as Arctic Cold War Intensifies," *The Economy*, February 13, 2026, https://economy.ac/news/2026/02/202602288062.

[28] Elena Conde, "A Legal and Political Analysis of Maritime Arctic Boundary Disputes and Future Scenarios," in *The Routledge Handbook of Arctic Governance,* ed. Elena Conde and Corine Wood-Donnelly (London: Routledge, 2025), 393–410.

by shallow, poorly charted straits and unpredictable ice-choke points[29] The NSR gives Russia practical authority over movement along its Arctic coast.[30] From the American perspective, it creates legal and strategic problems because it can weaken freedom of navigation. From the Chinese perspective, cooperation with Russia is useful, but full dependence on the NSR would limit China's room for manoeuvre. Arctic sea lanes transform movement itself into a source of geopolitical leverage. Russia's massive, nuclear-powered fleet allows Moscow to physically enforce administrative control over the NSR, while the United States manages a severe capability gap ahead of its planned Cutter deployments and China expands its modern fleet to secure independent access to international corridors like the TSR. Yet, as these routes transform from abstract possibilities into active logistical corridors, the competition naturally shifts from physical movement to legal control, requiring new governance structures to dictate who is allowed to navigate them.

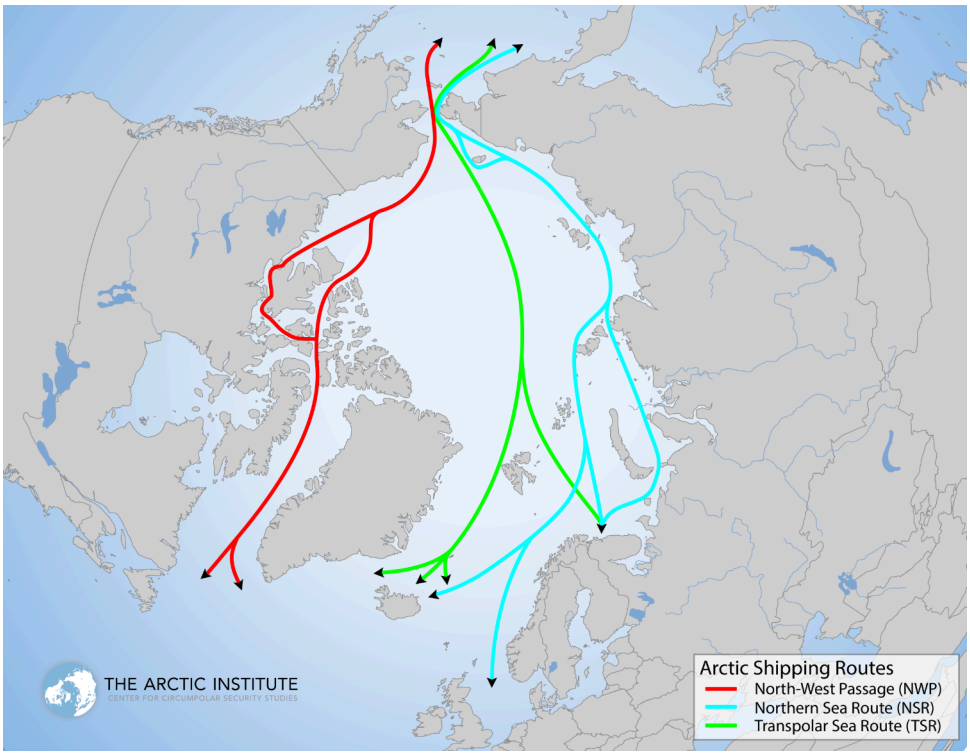

Figure 1: Malte Humpert: "Arctic Shipping Routes". Copyright: The Arctic Institute and Malte Humpert, thearcticinstitute.org/arctic-maps/

Governance

Russia's governance interests in the Arctic are primarily structured around sovereignty, strategic control, military and state-led regional development. Russia links governance to national security, socio-economic modernisation, demographic stabilisation and the extension of the outer limits of Russia's continental shelf.[31] These objectives are not isolated policy goals but interdependent pillars of sovereignty. Legal claims to the continental shelf provide an economic and jurisdictional basis for resource control, whilst military capabilities and population presence help translate these claims into effective territorial

[29] Malte Humpert, "The Future of the Northern Sea Route – A 'Golden Waterway' or a Niche Trade Route," map, *The Arctic Institute – Center for Circumpolar Security Studies*, https://www.thearcticinstitute.org/future-northern-sea-route-golden-waterway-niche/.
[30] Brigham, "Governance and Economic Challenges".
[31] Russian Federation, *Strategy for the Development of the Arctic Zone.*

cessary conditions for Arctic development. Governance is an instrument for consolidating territorial authority and geopolitical influence. Russia's domestic Arctic governance model is highly centralised and hierarchical; decision-making authority is concentrated at the federal level and Arctic development is coordinated through vertical state structures rather than pluralistic regional participation, which often places indigenous concerns and local human-security priorities below broader strategic objectives.[32] Socio-economic and environmental challenges are addressed primarily insofar as they support territorial consolidation and strategic control.[33] For Russia, Arctic governance is ultimately a political practice through which geography is transformed into authority, ensuring that the High North develops on Moscow's terms.

The U.S. Arctic governance functions as a dual-track strategy: it seeks to protect the existing institutional architecture while simultaneously pursuing focused security consolidation in critical nodes like Greenland. This operational focus introduces a complex trilateral dynamic within the Kingdom of Denmark, where direct U.S. diplomatic and economic outreach to Nuuk often intersects sensitively with Copenhagen's constitutional authority over foreign and defence policy. [34] The U.S.'s central concern is the durability of Arctic institutions, especially the Arctic Council and the ability of legal frameworks, scientific cooperation and allied coordination to manage increasing activity in the region, yet it treats Greenland as an essential bastion for homeland defence, early warning and North Atlantic access.[35] This approach reflects the U.S. position as both an Arctic state through Alaska and a wider system-level security actor. Alaska, Greenland and Iceland are strategic nodes that connect Arctic governance to homeland defence, early warning and North Atlantic access.[36] The U.S. preference for institutional governance also rests on the fact that the Arctic is already governed through a layered architecture of the Arctic Council, Indigenous Permanent Participants, six organisations representing Arctic Indigenous peoples who hold unique, non-voting decision-making seats, and the legal practices rooted in the United Nations Convention on the Law of the Sea (UNCLOS), which established the primary legal framework for maritime boundaries and economic zones. This existing structure allows regional problems to be managed without creating a new security order from scratch.[37] The United States supports alliance preparedness in the Arctic, but its traditional caution about institutionalising NATO, historically maintained to preserve the re-

[32] Aytalina Ivanova and Gail Fondahl, "Legal Reform, Governance, and Security in the Russian Arctic," in *Routledge Handbook of Arctic Security*, ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 295–308.

[33] Alexander Sergunin, "Arctic Security Perspectives from Russia," in Routledge Handbook of Arctic Security, ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 129–139; Alexander Sergunin, "Russia's Arctic Strategy: From 'Hard' to 'Soft' Security," in The Routledge Handbook of Arctic Governance, ed. Elena Conde and Corine Wood-Donnelly (London: Routledge, 2025), 279–300.

[34] Atlantic Council Task Force on Greenland, "A US and Allied Strategy for Greenland," *Atlantic Council*, May 13, 2026, https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/a-us-and-allied-strategy-for-greenland/.

[35] The White House, *National Strategy for the Arctic Region*; Atlantic Council Task Force, "US and Allied Strategy for Greenland."

[36] Rasmus Gjedssø Bertelsen, "Arctic Security in International Security," in *Routledge Handbook of Arctic Security*, ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 57–68.

[37] Andrew Chater, Wilfrid Greaves and Leah Sarson, "Assessing Security Governance in the Arctic," in *Routledge Handbook of Arctic Security,* ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 43–56.

gion's low-tension character, has increasingly yielded to shifting strategic realities.[38] Driven by intensifying Sino-Russian military coordination, Washington has pivoted toward active, collective burden-sharing models. This is underscored by the NATO launch of the 'Arctic Sentry' initiative to synchronise disparate national operations into a single, coherent operational approach to establish a persistent allied vigilance footprint that prioritises collective deterrence over the legacy model of exceptionalist regional insulation.

China's primary governance interest in the Arctic is recognition. China argues that Arctic affairs have global implications and therefore cannot be treated as the exclusive concern of Arctic states.[39] China tries to frame the Arctic as a space of shared management rather than exclusive regional control. Beijing presents itself as a responsible external stakeholder whose role is justified by climate interdependence, scientific cooperation, international law and the global consequences of Arctic change. The key concern is how far China can be admitted into the Arctic-state order. Its position is best understood as a strategy of controlled inclusion; it recognises the privileged role of the Arctic Eight – the eight nations with sovereign Arctic territory, which include Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States – whilst resisting an interpretation of governance that would reduce non-Arctic actors to passive observers.[40] This careful language reflects the Xi-era approach to global governance, where legal compliance and institutional participation serve both to reassure established actors and to expand China's influence over emerging rule-making spaces.[41] The "global Arctic" framing helps China present its role as a consequence of the Arctic's widening connections, rather than as a simple external intrusion.[42]

Arctic cooperation is becoming politically contested. All three states continue to rely on legal language, but they attach different purposes to it. Russia uses governance to protect sovereign authority and limit external influence over its Arctic zone. The U.S. treats governance as a way to preserve institutional stability and prevent strategic competition from becoming uncontrolled. China uses the same institutional language to argue that non-Arctic actors should not be excluded from shaping the region's future. The conflict lies in the fact that governance is no longer a neutral framework for cooperation; it has become an instrument through which states protect their positions.

[38] Schaller and Sam-Aggrey, "NATO, the OSCE, and the Arctic Region".
[39] State Council Information Office of the People's Republic of China, *China's Arctic Policy.*
[40] Marc Lanteigne, "Considering the Arctic as a Security Region: The Roles of China and Russia," in *Routledge Handbook of Arctic Security,* ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 311–323.
[41] Manuel J. Rocha-Pino, "The Arctic's Governance with Chinese Characteristics During the Xi Jinping Government (2012–2023)," in *The Routledge Handbook of Arctic Governance,* ed. Elena Conde and Corine Wood-Donnelly (London: Routledge, 2025), 301–318.
[42] Klaus Dodds, "Geopolitics, Security, and Governance," in *Routledge Handbook of Arctic Security*, ed. Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey (New York: Routledge, 2020), 258–269.

Discussion

The findings suggest that the Arctic can no longer be treated as insulated from wider geopolitical dynamics, because resources, sea lanes and governance now interact as parts of the same strategic environment.[43] Crucially, the comparison of these dimensions reveals that Arctic competition exposes state capacity as much as state ambition. The comparison shows that Arctic competition is asymmetrical; Russia, the United States and China do not pursue identical goals, nor do they possess the same kind of Arctic power. Russia seeks to consolidate control through hydrocarbons, the Northern Sea Route and sovereignty-centred governance. The U.S. prioritises openness, institutional stability and strategic resilience. China seeks access and recognition through law and investment. The Arctic is becoming a space where different forms of power overlap and collide.

The main analytical implication is that the three dimensions cannot be separated. Resources create economic incentives for Arctic engagement, but they depend on transport corridors and infrastructure. Sea lanes create new possibilities of mobility, but their value depends on regulation. Governance then determines whether access is treated as a shared right or negotiated political status. Melting ice creates openings, but state interests decide how those openings are interpreted, regulated and contested.[44]

This operational asymmetry underscores that Arctic power depends not only on formal legal claims but on the material capacity to operate and govern under extreme conditions. By contrast to Washington's historically expeditionary approach, Russia's robust physical presence illustrates a deliberate strategy of continuous regional presence.[45] This capacity problem is compounded by a governance problem: pressure on critical infrastructure and the weakening of Arctic exceptionalism indicate that cooperation now depends on a level of political trust that is increasingly difficult to sustain.[46]

Conclusion

The physical changes occurring in the Arctic do not inherently create a geopolitical arena; rather, these environmental shifts only become geopolitically important because states attach strategic value to them. The region did not become central merely because ice is melting; it became central because Russia, the United States and China interpret that accessibility through incompatible strategic priorities. Resources turn the Arctic into a question of energy security and economic power; sea lanes turn it into a question of mobility and control; governance turns it into a question of authority and legitimacy. This makes Arctic rivalry less visible than open confrontation, but more embedded in the everyday mechanisms through which the region is developed and governed, specifically, through resource investments, maritime transit frameworks and international rule-mak-

[43] Gunhild Hoogensen Gjørv, Marc Lanteigne and Horatio Sam-Aggrey, eds., *Routledge Handbook of Arctic Security* (New York: Routledge, 2020).
[44] Elena Conde and Corine Wood-Donnelly, eds*., The Routledge Handbook of Arctic Governance* (London: Routledge, 2025); Dodds, "Geopolitics, Security, and Governance".
[45] Kenneth R. Rosen, *Polar War: Submarines, Spies, and the Struggle for Power in a Melting Arctic* (New York: Simon & Schuster, 2026).
[46] Mia Bennett and Klaus Dodds, *Unfrozen: The Fight for the Future of the Arctic* (New Haven: Yale University Press, 2025).

ing. As these developmental frameworks become heavily politicised, cooperation is no longer the default mode of Arctic governance; rather, it becomes entirely conditional on whether joint efforts can occur without compromising a state's geopolitical leverage.

The Arctic's transformation is driven by a chain reaction between state interests that plays out across all three dimensions analysed in this article. As demonstrated, resources require logistical corridors, those emerging corridors require legal rules and the right to shape those rules requires institutional recognition. This interdependence is what moves the High North from the margins to the centre of international security; decisions made there now affect energy security, maritime mobility and the balance of political influence far beyond the region itself. Since the article focuses on declared interests and secondary sources, future research should examine how far Arctic strategies are implemented in practice, particularly through operational data, policy implementation and expert interviews.

The Arctic transitioned into a fractured arena of competing security architectures. Russia relies heavily on Chinese financial capacity to sustain its physical infrastructure, solidifying Sino-Russian alignment against NATO presence. As the strategic chain reaction across these three dimensions becomes fully securitised, cooperation will inevitably give way to deterrence. Moving toward regional stability will depend less on the Arctic Council and more on traditional hard-security deconfliction lines to prevent open confrontation.

AI Statement

During writing this article, I used several language-support tools in a limited and supplementary way. Grammarly was used to check grammar, spelling, punctuation and clarity. DeepL was used occasionally to verify wording and improve the accuracy of academic English phrasing. ChatGPT was used as a writing-support tool to suggest synonyms, improve sentence structure and clarify wording. The source selection, interpretation of evidence, comparative analysis and arguments are my own. All cited academic literature, official policy documents and investigative accounts were selected, read and assessed by me. I reviewed and edited all language-support suggestions before including any changes in the final article. I am aware that AI-assisted tools can produce inaccurate suggestions, so I remained responsible for checking the accuracy and relevance of the final text.

Trilemma in Practice: State Aid, Energy Storage and the Hungarian Case

Dániel Csapó[1]

Introduction

Climate neutral by 2050, this was the goal set out by the European Green Deal proposed by the president of the European Commission, Ursula Von der Leyen in 2019.[2] This package of policy initiatives aimed to review existing legislation for climate compatibility and introduce new regulation across the circular economy, innovation, construction, farming, and livestock sectors.

On 24 February 2022, the Russian Federation launched a full-scale invasion of Ukraine, which quickly became the largest conflict on the European continent since WW2. In response to this aggression, the European Commission launched REPowerEU to end the reliance on Russian Fossil Fuels by 2030. The initiative has three main goals: to save energy, to increase clean energy production and to diversify energy supplies.[3]

These circumstances sum up to a particularly acute "*energy trilemma*", where Hungary represents a specifically difficult case, due to its energy intensive industries and high import dependence on Russian hydrocarbons.[4]

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[2] European Commission, "Communication from the Commission: The European Green Deal", COM(2019) 640 final (Brussels, December 11, 2019).

[3] European Commission, *REPowerEU Plan*, COM(2022) 230 final (Brussels: European Commission, 2022).

[4] European Commission, *Hungary – Energy Country Profile* (Brussels, 2023);Moheb T. Malak, Augustus J. Panton, Hugo Rojas-Romagosa, and Atticus Weller, "Promoting Energy Security in Hungary: A Model-Based Analysis," IMF Selected Issues Paper No. 2025/121 (Washington, DC: International Monetary Fund, 2025), https://doi.org/10.5089/9798229023177.018.

This article focuses on Hungary as a case study to examine the European Union's energy trilemma, concentrating on the period between 2022 and 2025, a period marked by market adjustment, regulatory change and geopolitical tension. By analysing Hungary's energy storage support scheme introduced during this period, this research aims to investigate how the policy seeks to balance the competing objectives of energy security, sustainability and competitiveness, while evaluating its design and early impacts within the Hungarian energy sector.

Literature Review

This article engages with three core concepts of the literature: the energy trilemma as an analytical framework, the co-benefits between decarbonisation and energy security, and the EU state aid rules governing national support schemes. Together these establish the lens applied to Hungary's storage scheme.

Conceptualising Energy Security and the Energy Trilemma

Definitions of energy security remain highly context-dependent, reflecting the authors' assumptions and backgrounds. The literature broadly treats it as a multi-dimensional concept rather than a singular goal, intersecting with policymaking[5] political decision-making,[6] international relations and national security.[7] Efforts to turn the concept measurable center around three main dimensions: availability, since shortages constrain economic and welfare growth;[8] diversity, a core source of resilience that guards against simultaneous failure[9] and affordability, since high or unstable prices harm both households and industry.[10] Cherp and Jewel theorised that any conceptualisation of energy security should ultimately be based on the general concept of security, answering the questions: "*Security for whom?*", "*Security for which values?*" and "*Security from what threats?*"[11]

[5] Fahad Bin Abdullah, Rizwan Iqbal, Sadique Ahmad, Mohammed A. El-Affendi, and Maria Abdullah, "An Empirical Analysis of Sustainable Energy Security for Energy Policy Recommendations," *Sustainability*, no. 10 (2022): 6099, https://doi.org/10.3390/su14106099.

[6] Piotr Żuk and Paweł Żuk, "National Energy Security or Acceleration of Transition? Energy Policy after the War in Ukraine," *Joule* 6, no. 4 (2022): 709–712, https://doi.org/10.1016/j.joule.2022.03.009; Kacper Szulecki and Indra Overland, "Russian Nuclear Energy Diplomacy and Its Implications for Energy Security in the Context of the War in Ukraine," *Nature Energy* 8, no. 4 (2023): 413–421, https://doi.org/10.1038/s41560-023-01228-5.

[7] Mohammad Al-Saidi, "White Knight or Partner of Choice? The Ukraine War and the Role of the Middle East in the Energy Security of Europe," *Energy Strategy Reviews* , no. 49 (2023): 101116, https://doi.org/10.1016/j.esr.2023.101116; Daniel Mara, Silviu Nate, Andriy Stavytskyy, and Ganna Kharlamova, "The Place of Energy Security in the National Security Framework: An Assessment Approach," *Energies* 15, no. 2 (2022): 658, https://doi.org/10.3390/en15020658; Hans Liwång, "Future National Energy Systems, Energy Security and Comprehensive National Defence," *Energies* 16, no. 18 (2023): 6627, https://doi.org/10.3390/en16186627.

[8] Jaden Kim, Florence Jaumotte, Augustus J. Panton, and Gregor Schwerhoff, "Energy security and the green transition," *Energy Policy* 198 (2025): 114409, https://doi.org/10.1016/j.enpol.2024.114409.

[9] Raiane R. Freitas, Aline M. S. Costa, Silvangela L. Barcelos, and Shigeaki L. Lima, "Impact of Generation Source Diversity on Power System Energy Security Assessment," in 2025 16th IEEE International Conference on Industry Applications (INDUSCON) (Piscataway, NJ: IEEE, 2025), 1218–1225, https://doi.org/10.1109/INDUSCON66435.2025.11241394.

[10] Lazar Gitelman, Elena Magaril, and Mikhail Kozhevnikov, "Energy security: new threats and solutions," *Energies* 16, no. 6 (2023): 2869, https://doi.org/10.3390/en16062869.

[11] Aleh Cherp and Jessica Jewell, "The concept of energy security: Beyond the four As," *Energy policy* 75 (2014):

This article adopts that multi-dimensional view, operationalising energy security through the three dimensions of the established energy trilemma: security of supply, drawn from availability and diversity; sustainability, adding the decarbonisation imperative central to the post-2022 context; and competitiveness, drawn from affordability. These three interdependent pillars form a trilemma because progress on one frequently comes at the expense of another, and it is this balancing problem that the article examines.

Within the EU, these dimensions are reflected in Article 194 TFEU, which sets objectives of a functioning internal energy market, security of supply, energy efficiency, renewables, and interconnected networks,[12] mirroring the trilemma while adding the EU's particular emphasis on market integration and cross-border infrastructure.[13]

Co-benefits between Decarbonisation and Energy Security

Identifying the co-benefits between decarbonisation and energy security, challenging the view that the two objectives necessarily compete, has been tackled by an increasing number of academics recently.[12] Expanding renewable generation reduces reliance on imported fossil fuels and diversifies supply, lowering the vulnerability to the price and geopolitical shocks seen in 2022.[14] Climate-driven investment in clean energy also reduces the vulnerability of energy infrastructure to climate impacts, reinforcing security further.[15] However, fully realising these gains require deliberate effort. As variable renewables grow, their output, depending on weather, has to be balanced to avoid curtailment. This makes electricity storage the technology that allows higher renewable shares to translate into real security improvements.[16] Storage therefore sits at the intersection of all three trilemma dimensions, a position of particular importance for import-dependent member states such as Hungary.

EU State Aid, Energy Policy and the Legal Context

The design of support schemes, Hungary's electricity storage aid among them, is limited by the Union's legal framework, as to not distort or threaten trade and competition between Member States.[17] Yet these support schemes may still be deemed compatible with the legal environment if they pursue objectives under certain circumstances which

415-421, https://doi.org/10.1016/j.enpol.2014.09.005.

[12] Consolidated Version of the Treaty on the Functioning of the European Union, OJ C 202, June 7, 2016, art. 194(1).

[13] Laura Kaschny, "The EU Energy Trilemma in Transition," *ERA Forum*, no. 4 (2025): 595–609, https://doi.org/10.1007/s12027-025-00860-w.

[14] Mohammad Fazle Rabbi et al., "Energy Security and Energy Transition to Achieve Carbon Neutrality," *Energies* 15, no. 21 (2022): 8126, https://doi.org/10.3390/en15218126.

[15] Bernard Njindan Iyke, "Climate Change, Energy Security Risk, and Clean Energy Investment," *Energy Economics* 129 (2024): 107225, https://doi.org/10.1016/j.eneco.2023.107225.

[16] Trinadh Pamulapati et al., "A Review of Microgrid Energy Management Strategies from the Energy Trilemma Perspective," *Energies* 16, no. 1 (2022): 289, https://doi.org/10.3390/en16010289.

[17] TFEU, art. 107(1).

are for a common interest.[18] In this case Article 194 TFEU aims to create the legal background for the functioning of energy markets, security of supply, promote efficiency, renewables, and interconnected networks, all goals that closely mirror the dimensions of the trilemma and connect those dimensions to market logic.[16]

This legal framework creates tension in the development of national support schemes. While the member states are expected to facilitate the energy transition, this often involves selective financial support that could distort regular market competition. This tension is addressed by allowing certain aid that fits defined conditions, and in the case of energy related aid, several forms of aid are compatible with the internal markets.[19] More recently, in response to the energy crisis, two further instruments have expanded the toolset available for designing state aid that supports low-carbon technologies: the 2022 Guidelines on State Aid for Climate, Environmental Protection and Energy (CEEAG) and the 2023 Temporary Crisis and Transition Framework (TCTF). Both still require adequate mechanisms to defend internal competition.[20]

Within this ever-changing framework, support scheme design must navigate a multitude of policy constraints. Hungary's electricity storage scheme exemplifies this: it must advance security of supply and decarbonisation without distorting competition or breaching EU state aid rules. Although existing analyses discuss these requirements in general terms, relatively little attention has been paid to how a specific scheme influences the different dimensions of the energy trilemma within a particular Member State. This study examines the Hungarian electricity storage scheme and evaluates its design and effects through the combined lenses of energy security, sustainability, and competitiveness.

Methodology

This article uses a mixed-method case study approach focusing on the utility-scale electricity storage support scheme in Hungary which was approved in 2023 by the Union.[21] The scheme supports the deployment of up to 800 MW of storage to balance the grid and integrate variable renewable output,with aid awarded through competitive bidding, capped at each project's funding gap, and conditional on completion within 36 months. The goal of the article is to do an in-depth analysis of a specific policy instrument within a broader environment, which is well suited to a case study approach.[22] A single

[18] TFEU, art. 107(3).
[19] European Commission, *Guidelines on State Aid for Climate, Environmental Protection and Energy 2022*, C(2022) 481 final (Brussels: European Commission, 2022).
[20] European Commission, T*emporary Crisis and Transition Framework for State Aid Measures to Support the Economy Following the Aggression Against Ukraine by Russia*, C/2023/1236, OJ C 101 I, March 17, 2023.
[21] European Commission, State Aid SA.102428, "TCTF-RRF: Aid for energy storage facilities for the integration of weather variable renewable energy sources", Commission Decision of 21 June 2023, OJ C 276.
[22] Robert K. Yin, *Case Study Research: Design and Methods*, 5th ed. (Thousand Oaks, CA: Sage, 2014).John Gerring,

case study approach is capable of generating valuable input with direct bearing on the broader research problem, if the case selection has been done strategically.[23] Hungary represents a critical case within the European Union, as it is heavily import dependent on Russian hydrocarbons, its industries are energy intensive and it has a low share of renewables, which combined creates one of the most difficult energy trilemma situations in the Union. Findings from this case can carry analytical significance that goes beyond Hungary, which can be used to illuminate the trade-offs for Member States navigating the Union's energy transition.

The mixed-method design integrates qualitative document analysis with a quantitative descriptive trend analysis.[24] The combination is appropriate, because the research question requires both an assessment of policy and the outcomes. Policy is best observed through document analysis, while for the observable outcomes, performance indicators are needed. The two methods are treated as complementary aspects.

The qualitative section relies on structured policy document analysis formed of two primary sources. The first is the European Commission's state aid decision,[25] and the second is Hungary's National Energy and Climate Plan.[25] Document analysis is particularly well suited to examine how institutional actors communicate and justify their policy choices.[26] Each document was coded against the three trilemma dimensions: security of supply, sustainability, or competitiveness, and then compared with the quantitative indicators to assess how the scheme's stated aims relate to observed outcomes.

The quantitative section relies on a descriptive trend analysis drawing on data gathered from Eurostat, Ember, and the Hungarian transmission system operator MAVIR. Although the research question centres on 2022–2025, the series begins in 2015 to establish a pre-crisis baseline; without it, the post-2022 movements in import dependency, generation mix, and prices could not be distinguished from Hungary's longer-term structural trend.[27]

C*ase Study Research: Principles and Practices*, (Cambridge University Press, 2007).

[23] Bent Flyvbjerg, "Five Misunderstandings About Case-Study Research," Qualitative Inquiry 12, no. 2 (2006): 219–245, https://doi.org/10.1177/1077800405284363

[24] John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th ed. (Thousand Oaks, CA: Sage, 2014).

[25] Hungary, *Final Updated National Energy and Climate Plan 2021–2030 (submitted 2024)*, Commission Staff Working Document, 16 October 2024, (Brussels: European Commission, 2024). https://commission.europa.eu/publications/hungary-final-updated-necp-2021-2030-submitted-2024_en.

[26] Jared Wesley, "The Qualitative Analysis of Political Documents," in *From Text to Political Positions: Text Analysis across Disciplines*, ed. Bertie Kaal, Isa Maks, and Annemarie van Elfrinkhof (Amsterdam: John Benjamins Publishing Company, 2014), 135–160, https://doi.org/10.1075/dapsac.55.07wes; Glenn A. Bowen, "Document Analysis as a Qualitative Research Method," *Qualitative Research Journal* no. 2 (2009): 27–40, https://doi.org/10.3316/QRJ0902027.

[27] Michael Howlett and M. Ramesh, *Studying Public Policy: Policy Cycles and Policy Subsystems*, 2nd ed. (Oxford: Oxford University Press, 2003); European Commission, *Energy Country Datasheets: Monitoring Progress Towards the Energy Union Objectives*, (Brussels: European Commission, 2023).

A descriptive approach is appropriate given the small number of annual observations and the complexity of energy systems, and it is consistent with established EU practice in energy policy evaluation. The indicators examined were turned into measurable items as follows:

Table 1. Operationalisation of the three trilemma dimensions.

Dimension	Indicators	Source (dataset)	Rationale
Energy Secrurity	Energy import dependency	Eurostat (nrg_ind_id)	Captures vulnerability to external supply disruption
Sustainability	Renewables share in electricity generation	Ember	Broader coverage than Eurostat; tracks decarbonisation of the generation mix
Competitiveness	Industrial electricty price (500–1,999 MWh band)	Eurostat (nrg_pc_205)	Cost exposure of energy-intensive industry
Competitiveness	Household electricity price (2,500–4,999 kWh band)	Eurostat (nrg_pc_204)	Consumer affordability
Implementation	Storage capacity deployed	MAVIR	Progress against the 800 MW target (data from 2023 onward)

It must be acknowledged that Hungarian retail prices have been subject to government-imposed price cap scheme since 2013,[28] which has been amended in 2022 so only consumption up to approximately 2,523 kWh per year maintained the less expensive rate.[29] This limits price comparability to other member states. Electricity storage capacity from MAVIR is used to examine the progress of the scheme's implementation, not as a long-term trend, as data is only available from 2023 onwards, since that is the year when the plan was approved. The indicator is compared to the targets set in the Commission's approval.

[28] Hungary, 2013. évi CCXXXI. törvény egyes törvényeknek a rezsicsökkentés végrehajtásával összefüggő módosításáról [Act CCXXXI of 2013 on Amendments to Certain Laws Regarding the Implementation of Utility Cost Reduction], *Magyar Közlöny* 2013/223 (December 19, 2013).
[29] Hungary, 301/2022, (VIII. 9.) Kormányrendelet a rezsicsökkentés végrehajtásáról szóló 2013. évi CCXXXI. törvény módosításáról [Government Decree 301/2022 of 9 August 2022 Amending Act CCXXXI of 2013 on Utility Cost Reduction], *Magyar Közlöny* 2022/131 (August 9, 2022).

Analysis

Sustainability

SA.102428 has been accepted as it was deemed necessary in facilitating a smooth transition for the Hungarian electricity system.[25] This rationale is strongly supported by the available quantitative data, as Hungary's solar electricity generation, rising from 0.5% in 2015 to 27.3% by 2025, while lignite fell from 18.8% to 3.3%. Gas has also shown a notable dip in 2024 to 18.8% but has risen back to 20.3% by 2025.[30] The share of renewables in total electricity production climbed from 10.6% in 2015 to 35.3% in 2025, accelerating markedly after 2021 (Figure 2).[37] This sustained trajectory reflects a structural shift, rather than a fluctuation, consistent with the co-benefits between clean energy investment, security and sustainability identified in the literature.

Storage is integral to this trajectory, since the variability of solar output means electrical grids face challenges in absorbing excess output during peak production periods. The decision identifies system balancing as the scheme's primary objective, in support of a 90% low-carbon electricity target.[25] The scheme's causal contribution to Hungary's renewable trajectory therefore remains plausible rather than demonstrated. Although the capacity has almost doubled going from 35.3 MW deployed by end-2024 to 73.2 MW in only 5 months, showing a gathering momentum, it still falls short of the 800 MW goal (Figure 1).[31]

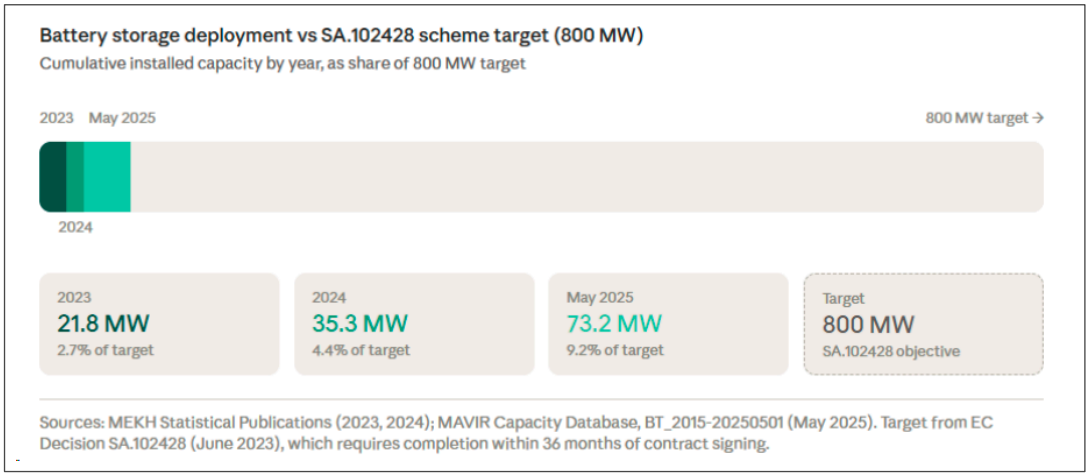

Figure 1. Deployed electricity storage capacity in Hungary against the target, 2023 - 2025.

[30] Ember, "Yearly Electricity Data Europe," London: Ember Climate, Accessed February 14, 2025, https://ember-energy.org/data/yearly-electricity-data/.
[31] Magyar Energetikai és Közmű-szabályozási Hivatal (MEKH). A magyar villamosenergia-rendszer 2023. évi adatai / Data of the Hungarian Electricity System 2023. Budapest: MEKH, 2024; MEKH, A magyar villamosenergia-rendszer 2024. évi adatai / Data of the Hungarian Electricity System 2024. Budapest: MEKH, 2025; Magyar Villamosenergia-ipari Átviteli Rendszerirányító (MAVIR). Bruttó és nettó beépített teljesítőképesség primerforrásonként, 2015–2025 / Gross and Net Installed Capacity by Primary Source, 2015–2025. Budapest: MAVIR, 2025.

Energy Security

The import dependency data shows a volatile trajectory, ranging between 54% and 70% from 2015 to 2021, before spiking to 64.2% following the Russian invasion in 2022 and falling to 48.9% in 2024 (Figure 2).[32] This decline is consistent with the scheme's objectives. The simultaneous increase of solar production is the most proximate driver, with storage being an amplifier enabling solar output to be retained and dispatched rather than curtailed, directly reducing hours of import reliance.

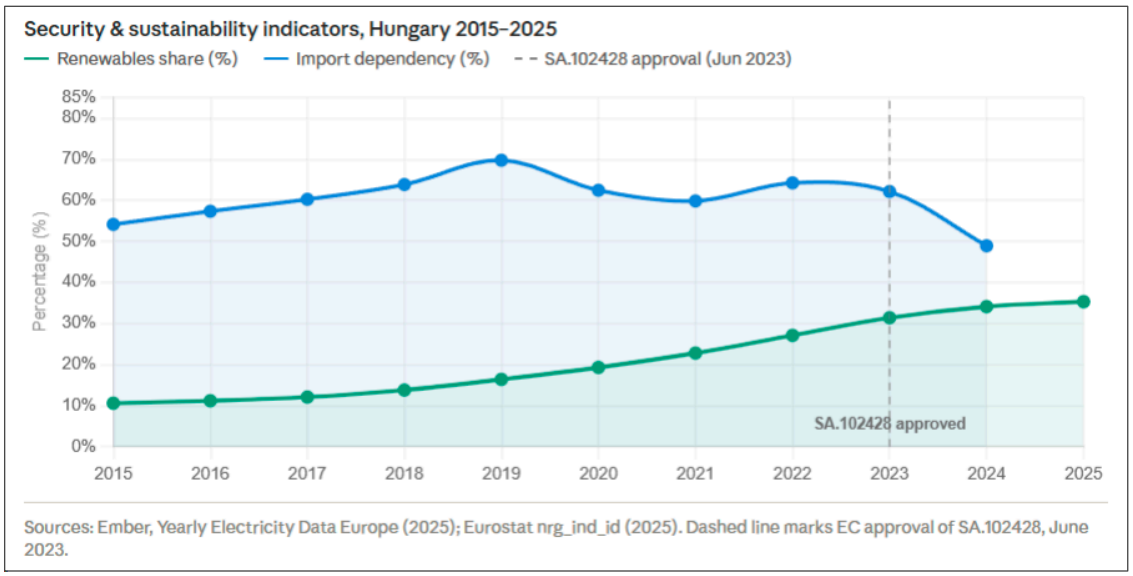

Figure 2. Hungary's energy import dependency and renewable electricity generation share, 2015–2025.

The cross-border eligibility clause in the decision opens part of the scheme to projects in neighbouring Member States with coupled balancing markets, acknowledging that grid security cannot be solved through domestic investment alone. This unusual design choice reflects the urgency present in post 2022 energy policy and a structural reality which the literature constantly identifies that security in highly interconnected systems is a collective rather than individual property. The scheme's security contribution is therefore best understood not as a standalone intervention but as one node in a regional response.

Competitiveness

To approve aid under Article 107(3), the Commission applies a balancing test, weighing the aid's benefits against its effect on competition to ensure the latter is not distorted more than necessary.[22] In practice, this means aid is awarded through competitive bidding and capped at the difference between a project's costs and its expected revenues, called the funding gap. The Commission's funding gap calculation found that discounted net revenues covered only 47% of initial investment costs, demonstrating the need for

[32] Eurostat, *Energy Import Dependency*, dataset nrg_ind_id (Luxembourg: Statistical Office of the European Union, accessed February 14, 2025).

public support. The conditions that make storage necessary also make it commercially unviable without state intervention.

Industrial electricity prices in the medium non-household consumption band rose nearly fivefold between 2017 and 2023, from 0.041 €/kWh to 0.199 €/kWh, before falling to 0.143 €/kWh in 2024,[33] which is still 3.5 times higher than in 2017. This represents a setback for competitiveness for the energy-intensive Hungarian industry. Household electricity prices show an opposing trend, thanks to the price cap implemented by the government originally in 2013, whose scope has been narrowed in 2022 due to financial stress. The medium household band is kept at an artificially low level, 0.024 €/kWh in 2024, which is well below the market rate in other member states (Figure 3).[34] This cap transfers costs to the state, rather than resolve the issue causing high electricity prices. The scheme also exempts households by having its operations funded by a levy on industrial customers, creating a tension in competitiveness rather than affordability.

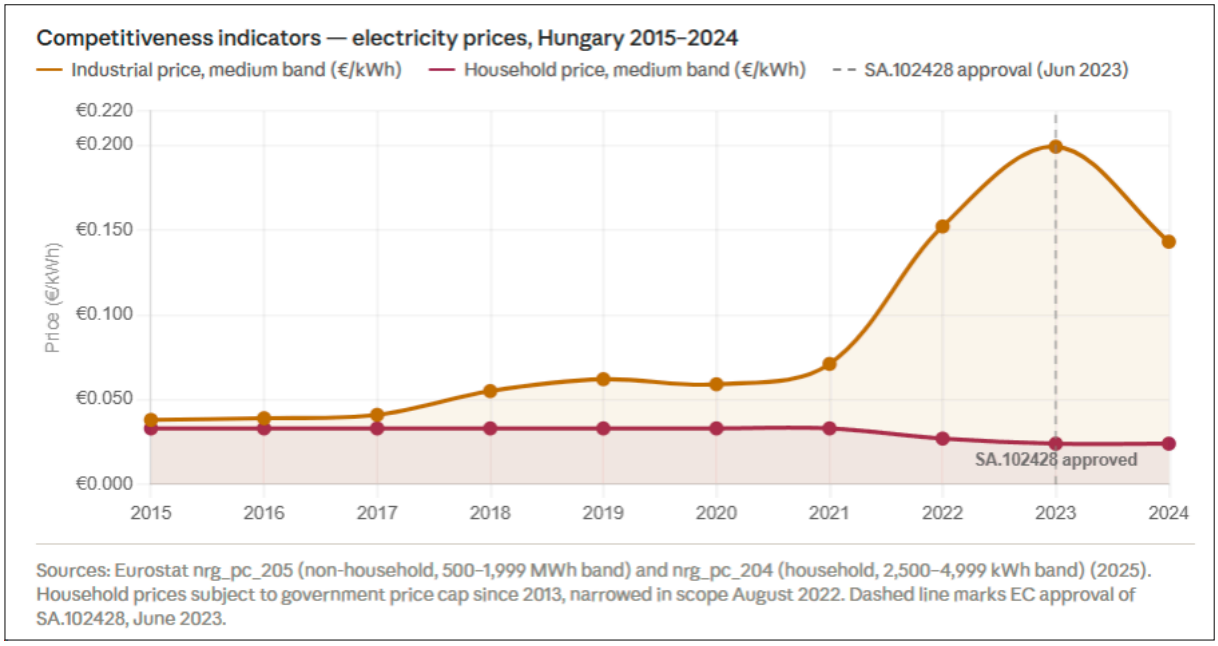

Figure 3. Electricity prices for industrial and household consumers in Hungary, 2015 –2025.

On a longer time horizon than available, this storage scheme could lead to the reduction of system costs and lowering reliance on gas fired powerplants in sunless times, but the scheme is too recent yet to draw conclusive opinions.

[33] Eurostat, *Electricity Prices for Non-Household Consumers — Bi-Annual Data*, dataset nrg_pc_205 (Luxembourg: Statistical Office of the European Union, accessed February 14, 2025), https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_205/default/table?lang=en.
[34] Eurostat, *Electricity Prices for Household Consumers — Bi-Annual Data*, dataset nrg_pc_204 (Luxembourg: Statistical Office of the European Union, accessed February 14, 2025), https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_204/default/table?lang=en.

The competitive dimension reveals a certain asymmetry in reach, since although its design is appropriate in its addressing of market integrity and aid allocation, broader industrial challenges (such as financial difficulties caused by fossil fuel price volatility) are beyond its capabilities.

Conclusion

Using the three dimensions of the energy trilemma for evaluation, Hungary's storage scheme presents an uneven but coherent picture. Sustainability is the strongest aspect, where scheme design and Hungary's generation trajectory are mutually reinforcing. It is supportive of energy security, where import dependency has declined, though not as the sole result of the scheme. Competitiveness is the most limited where structural price pressures on industrial consumers persist and the scheme's contribution remains indirect and long-term in nature.

Early implementation data confirms 35.3 MW deployed by end-2024, accelerating to 73.2 MW by May 2025 against an 800 MW target. This trajectory, while still far short of the scheme's ambition, suggests the deployment gap reflects how long large storage projects take to permit, build, and connect to the grid rather than a design failure and that the scheme's contribution to all three trilemma dimensions will be better assessed once the data matures.

The study's single-case design restricts the generalisability of results. Future research could examine comparable Central European member states such as Slovakia, Czechia or Poland, to assess whether similar schemes produce consistent results across different national energy contexts, and revisit Hungary's implementation trajectory once the deployment data matures.

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