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Effects of the Oil and Gas Crisis in Europe Determined by Russia's War in Ukraine: A Bibliometric Review*

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Abstract

The Russian invasion of Ukraine in February 2022 triggered an unprecedented energy crisis in Europe, radically altering the academic discourse surrounding the continent's energy transition. This study conducts a comprehensive bibliometric analysis of the scientific literature published between 2022 and 2026 to evaluate the effects of this geopolitical shock on the European oil and gas sector. Utilizing PRISMA protocols alongside science mapping tools (Biblioshiny and VOSviewer), the research identifies a massive surge in publications directly correlated with natural gas price spikes. The findings reveal a "structural paradox" within the European response: an immediate, short-term regression to fossil fuels (LNG and coal) to ensure survival, running parallel to a geopolitically driven acceleration of long-term decarbonization policies (REPowerEU). Ultimately, this study demonstrates that the academic narrative has profoundly shifted from treating the energy transition as an ecological challenge to framing it as an urgent matter of national security.

Keywords: energy crisis; Russia-Ukraine war; natural gas; European Union; energy security; bibliometric analysis.

Introduction

The full-scale invasion of Ukraine by the Russian Federation in February 2022 triggered the most severe energy shock Europe has experienced since the oil crises of the 1970s. For decades, the European Union (EU) relied heavily on Russian hydrocarbons, utilizing cheap natural gas as a "bridging fuel" to support its gradual transition toward a zero-emission economy (Kulušić *et al.*, 2024). However, the strategic weaponization of energy exports by Gazprom, culminating in the indefinite shutdown of the Nord Stream 1 pipeline and halts in deliveries to Member States refusing ruble payments, exposed the structural vulnerabilities of this import dependency (Halser and Paraschiv, 2022; Mišík, 2022). Consequently, the European natural gas benchmark (Title Transfer Facility, TTF) surged from a historical average of 20 EUR/MWh to unprecedented peaks exceeding 300 EUR/MWh by the summer of 2022, severely inflating wholesale electricity prices and threatening European industrial competitiveness (Fabra, 2023).

Prior to 2022, the academic discourse on the European energy transition predominantly framed natural gas as an indispensable transitional asset. It was widely viewed as the primary mechanism to balance the intermittency of renewable energy sources while gradually phasing out highly polluting coal (Mišík, 2022; Kulušić *et al.*, 2024). However, the sudden withdrawal of Russian supplies shattered the paradigm of treating energy strictly as a market commodity. The literature immediately preceding and following the Russian invasion highlights that Europe's pre-crisis market architecture was structurally exposed to exogenous shocks, lacking a cohesive external energy security policy to protect against geopolitical weaponization (Mišík, 2022).

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This abrupt decoupling from Russian supplies forced a rapid reconfiguration of the EU's supply, market, and policy architecture. Within months, Russian piped gas exports to the EU collapsed by roughly half, largely replaced by global liquefied natural gas (LNG) imports and aggressive demand-side destruction (Ruhnau *et al.*, 2023; Emiliozzi, Ferriani and Gazzani, 2025). While earlier academic literature primarily focused on linear, long-term decarbonization pathways driven by ecological concerns, the 2022 geopolitical shock forced an immediate reorientation of scholarly priorities.

Despite this massive shift in the research landscape, there remains a critical gap in the literature regarding how the scientific community has conceptually digested this crisis. Few systematic reviews have mapped the quantitative explosion of literature or evaluated the contradictory dynamic where an acute crisis forces a temporary return to high-emission fossil fuels while simultaneously accelerating long-term renewable policy (Borowski, 2022; Hille, 2023).

To address this gap, this study applies a hybrid systematic literature review and bibliometric analysis to answer two primary research questions:

(1) How did the 2022 geopolitical shock alter the conceptual structure and thematic clustering of European energy transition research?
(2) In what ways does scientific literature reflect the tension between immediate fossil-based crisis management and long-term decarbonization goals?

By systematically mapping the post-invasion academic discourse, this paper provides a robust synthesis of the structural paradox (Christophers, 2022; Emiliozzi, Ferriani and Gazzani, 2025) at the heart of Europe's current energy strategy.

Methodology

Objective of the bibliometric analysis

The objective of this study is to provide a systematic and quantitative assessment of the academic literature on the effects of the 2022 oil and gas crisis in Europe determined by Russia's war in Ukraine. By combining performance analysis with science mapping techniques, the study captures both the evolution of scientific production and the underlying thematic organization of the literature, with particular attention to how the post-2022 academic discourse has structured itself around energy security, gas-market dislocations, electricity-price spillovers, EU policy responses, and the longer-horizon implications for European decarbonization.

Database and search strategy

The dataset was collected from the Scopus database, accessed through the university library system. The use of a single database minimizes data convergence errors and ensures consistency in bibliographic records. Scopus was selected due to its extensive coverage of peer-reviewed journals and its suitability for bibliometric research. The search was conducted using the following query:

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TITLE-ABS-KEY((oil OR gas) AND crisis AND europe*) AND PUBYEAR > 2021 AND PUBYEAR < 2027 AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"ch") OR LIMIT-TO(DOCTYPE,"cp") OR LIMIT-TO(DOCTYPE,"re")) AND (EXCLUDE(SUBJAREA,"DENT") OR EXCLUDE(SUBJAREA,"HEAL") OR EXCLUDE(SUBJAREA,"VETE") OR EXCLUDE(SUBJAREA,"NURS") OR EXCLUDE(SUBJAREA,"IMMU") OR EXCLUDE(SUBJAREA,"PSYC") OR EXCLUDE(SUBJAREA,"PHAR") OR EXCLUDE(SUBJAREA,"BIOC") OR EXCLUDE(SUBJAREA,"PHYS") OR EXCLUDE(SUBJAREA,"MEDI"))
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The search was limited to the period 2022–2026 and included only articles, conference papers, and review papers published in English.

Data filtering and PRISMA procedure

Figure 1 presents the PRISMA 2020 flow diagram, summarizing the identification, screening, eligibility, and inclusion stages of the bibliometric review. The retained corpus reflects the focus of this review on the effects of the 2022 oil and gas crisis in Europe determined by Russia's war in Ukraine.

The included studies address natural gas supply disruptions, the diversification of Europe's gas mix through LNG and non-Russian pipeline imports, oil-product market dislocations, and the sanctions regime targeting Russian hydrocarbons. They also cover electricity-market spillovers from gas-price shocks, household energy poverty, industrial competitiveness losses, and the inflationary consequences of the crisis. Several papers offer national case studies of decoupling from Russian energy supplies, particularly for Germany, Poland, Italy, Romania, and other Central and Eastern European countries most exposed to the shock.

EU policy responses are also represented, including REPowerEU, gas storage regulation, the gas-price cap debate, and broader reforms of European electricity-market design. Finally, the corpus extends to the longer-horizon consequences of the crisis for European decarbonization pathways, including the role of green hydrogen, carbon capture, and the temporary return of coal as a bridging fuel.

The exclusion criteria are presented in **Figure 1**.

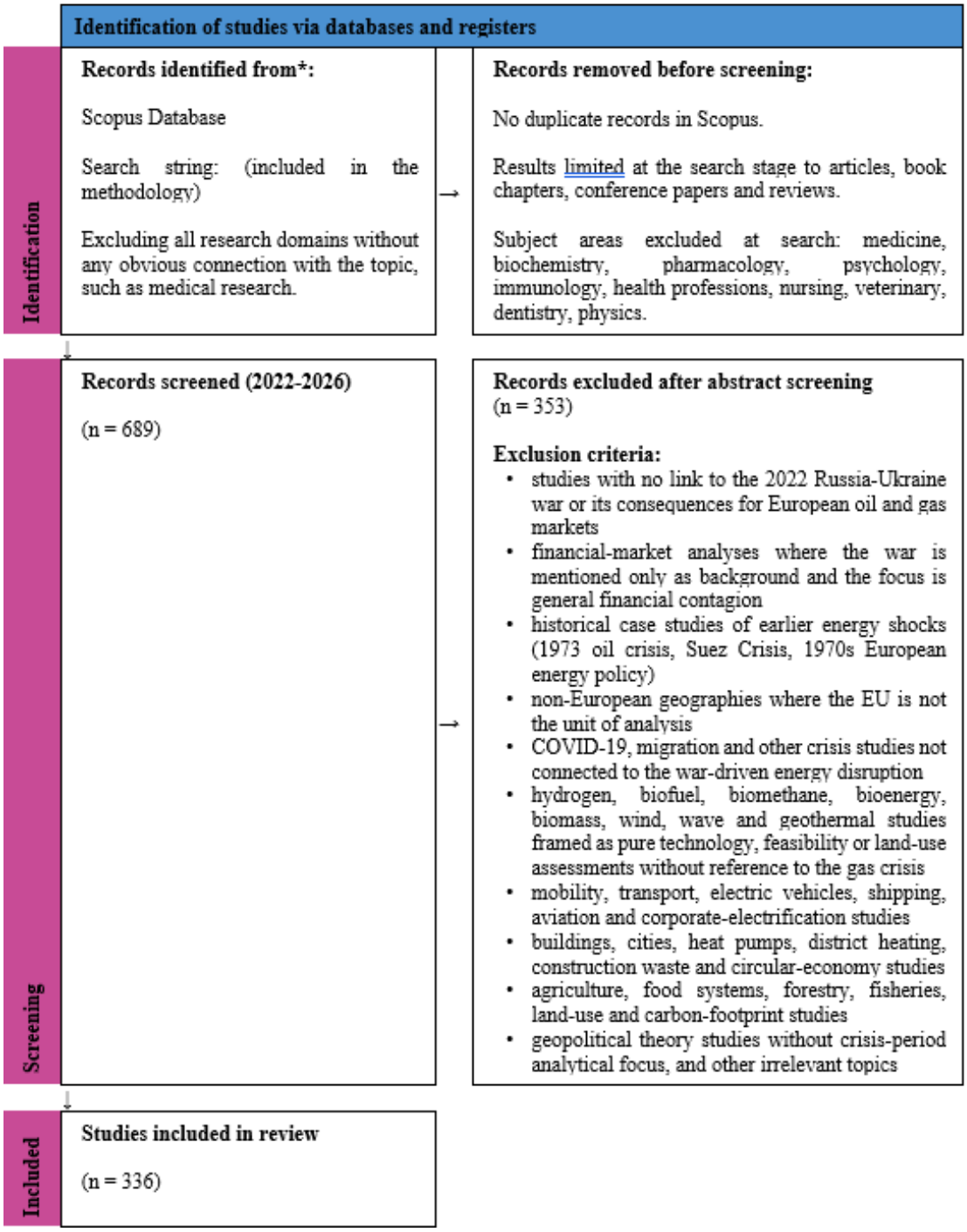

Figure 1. PRISMA flow diagram for the current study

*Notes. * The search was run on 18 May 2026 and limited to 2022-2026.*

Data filtering and PRISMA procedure

The dataset covers the period 2022–2026 and includes 336 documents from 208 sources, involving 980 authors. The articles included in 2026 appeared online in 2025, which falls within the window considered in the search string. The average number of citations per document is 10.03, and the average document age is 2.28 years, both lower than for broader energy-transition reviews, reflecting the recency of the literature on the 2022 oil and gas crisis. The dataset reflects a moderate level of collaboration, with an average of 3.21 co-authors per document and an international co-authorship rate of 22.62%. Most publications are articles (260), followed by conference papers

(38), book chapters (30), and review papers (8). Compared with broader energy-transition bibliometric reviews, the slightly higher share of single-authored documents (86, or 25.6% of the corpus) reflects the prominence of conceptual, policy-oriented, and country-focused commentary in the immediate aftermath of the war.

Data cleaning and harmonization

To ensure consistency and accuracy, the dataset was processed and cleaned prior to analysis. Empty keyword fields exported from Scopus were removed to avoid the spurious appearance of an "NA" term in the keyword frequency tables and co-occurrence networks. Keyword standardization was then performed via a thesaurus file applied at data-loading stage, eliminating redundancies and unifying similar terms. This step is essential in bibliometric studies, as inconsistencies in keywords and country names can distort clustering results and network analyses, particularly in a corpus where geopolitical actors and energy carriers are central thematic nodes.

Bibliometric analysis methods

Bibliometric analysis was conducted using a combination of performance analysis and science mapping techniques, following established methodologies in the literature (Ge, Liu and Zhong, 2024). Performance analysis was used to evaluate the scientific output of the field, including publication trends, source distribution, citation patterns, and the geographic distribution of contributing authors. This allows for the assessment of the growth, geographic spread, and early maturity of research on the European oil and gas crisis driven by the war in Ukraine. Science mapping techniques were applied to explore the conceptual structure of the field. In particular, keyword co-occurrence analysis was used to identify relationships between research topics and to group them into thematic clusters.

The analysis was performed using two software tools: *Biblioshiny* (R package) and VOSviewer (Van Eck and Waltman, 2017). *Biblioshiny* was used for descriptive statistics and macro-level thematic analysis, including the construction of word frequencies over time, the thematic map, and the reference publication year spectroscopy. VOSviewer was employed for network visualization and detailed clustering. Clustering is based on keyword co-occurrence networks, where nodes represent keywords and links indicate the frequency with which they appear together in the same documents. The resulting clusters represent major thematic areas within the literature. The interpretation of these clusters is presented in Section 4.2.

Results and discussion

The most significant articles and topics in the field

The evolution of the annual scientific production on the European oil and gas crisis demonstrates a dramatic shift catalyzed by geopolitical events. The corpus retained for this review covers the period 2022–2026 and exhibits a sharp surge followed by a gradual normalization. In 2022, the year of the full-scale invasion, 44 documents were already published, indicating an immediate scholarly mobilization in the months following 24 February 2022. The volume then more than doubled in 2023, reaching the corpus's peak of 113 publications, as researchers responded to the severe disruptions in energy supply and the extreme volatility of European markets that had unfolded over the preceding twelve months (Borowski, 2022; Ruhnau *et al.*, 2023). Output stabilized at 96 documents in 2024 and gradually contracted to 59 in 2025 and 24 in early 2026 (an incomplete year at the time of data collection), reflecting both the partial easing of the supply crisis and the natural exhaustion of "first-wave" commentary papers (see **Figure 2**).

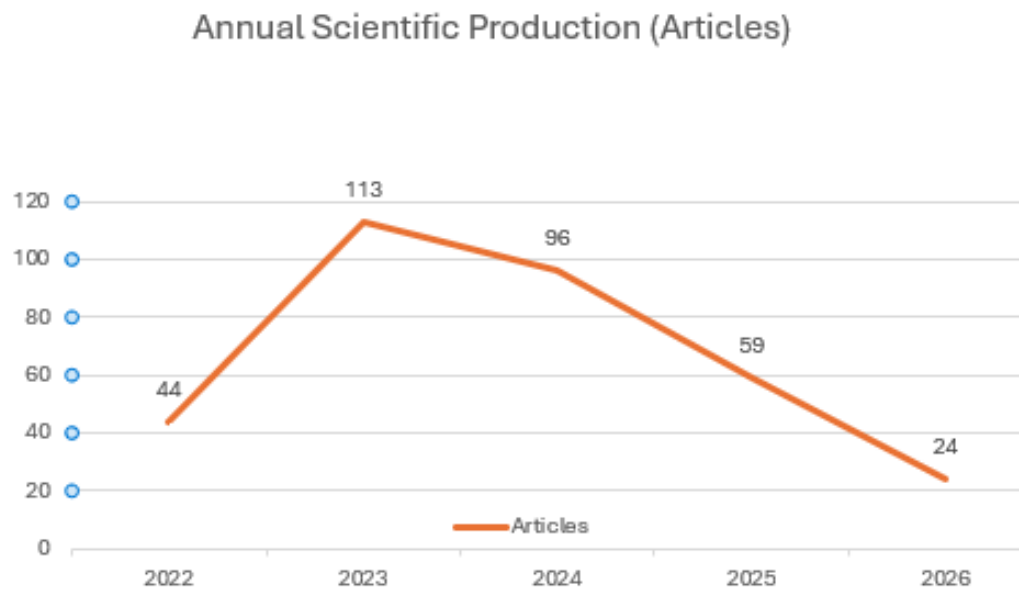

Figure 2. Number of articles per year as selected from Scopus.

This massive surge in academic output was directly correlated with the historic price spikes at the Title Transfer Facility (TTF) gas hub, where natural gas wholesale prices soared from a historical average of around 20 EUR/MWh to unprecedented peaks exceeding 300 EUR/MWh by the summer of 2022 (Fabra, 2023; Ruhnau *et al.*, 2023). The publication curve lags the price curve by roughly one year, which is consistent with the typical peer-review cycle: the 2023 peak in scholarly output corresponds to research initiated in mid-to-late 2022, at the height of the TTF dislocation and amid the first cuts in Russian pipeline flows (Astrov *et al.*, 2022; Halser and Paraschiv, 2022). The distribution of documents by source reveals an unusually concentrated outlet structure, with one journal accounting for nearly one-tenth of the entire corpus (see **Figure 3**). The journal-trajectory profile (**Figure 4**) makes this difference visible: *Energies* was already publishing crisis-related work in 2022 (10 papers in the first year alone) and continued to grow steadily through 2026, while Energy Economics, Energy Policy and Energy all started near zero in 2022 and accumulated their output over the following three years, consistent with the longer peer-review cycles characteristic of econometric and policy research. Taken together, these figures capture the field's explosive quantitative expansion in the immediate aftermath of the invasion and its rapid structural consolidation around a small set of dedicated dissemination channels.

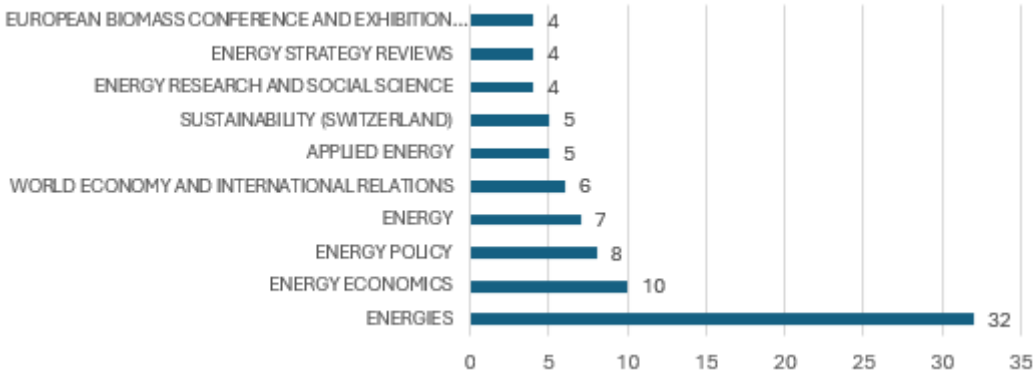

Figure 3. Number of articles from the most prominent sources.

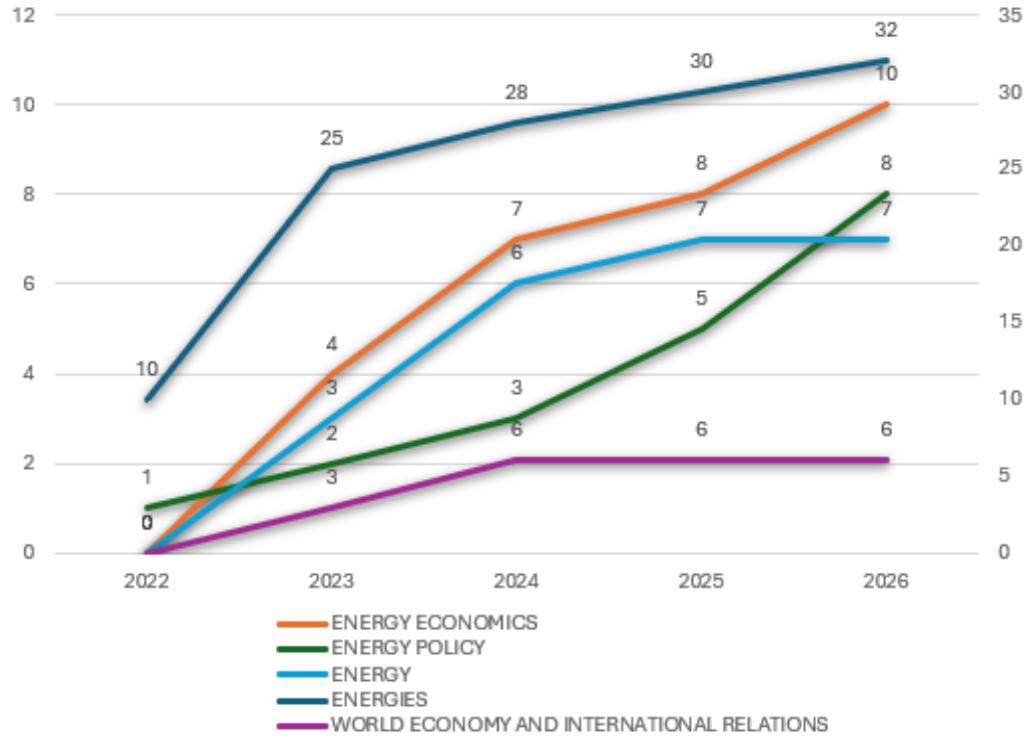

Figure 4. Production for the most prominent journals in this domain.

Below is a discussion of the main topics presented in the reviewed literature and the relevance of each for the European oil and gas crisis triggered by Russia's war in Ukraine. Four major themes can be identified from the examined articles: (1) the 2022 European energy shock, market dislocations and electricity-price spillovers; (2) the Russia–Ukraine war, energy security and EU dependency on Russian hydrocarbons; (3) national case studies and EU policy responses; and (4) crisis-driven decarbonization pathways. Taken as a whole, these topics highlight the political, economic, and technological dimensions of an energy crisis without precedent in modern European history (Mišík, 2022; Hille, 2023; Petrosyan and Harutyunyan, 2024).

The 2022 European energy shock: market dislocations and electricity-price spillovers

The most heavily cited stream within the corpus addresses the immediate market consequences of the 2022 supply shock, explicitly driven by Russia's full-scale invasion of Ukraine and the strategic weaponization of its natural gas exports (Astrov *et al.*, 2022; Emiliozzi, Ferriani and Gazzani, 2025). The literature emphasizes how Gazprom's deliberate withholding of supplies, culminating in the indefinite shutdown of the Nord Stream 1 pipeline and halts in deliveries to Member States refusing ruble payments, exposed Europe's structural dependency on Russian fossil fuels (Halser and Paraschiv, 2022; Mišík, 2022).

With particular attention to how this geopolitically induced gas price crisis propagated into electricity prices and broader commodity markets, Su et al. (2023) examine spillover effects among fossil fuel, renewables and carbon markets across the crisis period. They document a sharp intensification of cross-market connectedness once Russian flows began contracting in late 2021, with European gas acting as the dominant transmitter of volatility. Borowski (2022) provides one of the earliest empirical accounts of how this shock translated into short-term policy reversals, including the partial return to coal in several Member States (most visibly in Germany, Poland, the Netherlands and Italy) to compensate for the sudden loss of Russian gas, which had previously accounted for roughly 40% of the EU's imports (Astrov *et al.*, 2022; Emiliozzi, Ferriani and Gazzani, 2025). Coal-fired generation rose noticeably across the EU during the winter of 2022–2023, a development that ran directly counter to the European Green Deal's phase-out trajectory and that scholars have since interpreted as the most visible expression of the structural paradox at the heart of the crisis. Zakeri et al. (2023) demonstrates the dramatic deterioration in industrial competitiveness for energy-intensive sectors such as fertilizers, aluminum, steel and ceramics, several of which scaled back or temporarily halted European production during the peak of the crisis.

Together, these contributions reframe the 2022 episode as a market-design failure as much as a geopolitical supply failure and have shaped the post-2022 debate over inframarginal price caps, contracts for difference, the merit-

order reform, and the broader restructuring of the EU electricity market that culminated in the 2024 electricity-market design package.

Russia–Ukraine war, energy security and EU dependency on Russian hydrocarbons

A second prominent thematic cluster explores the profound vulnerabilities inherent in the European Union's historical reliance on Russian fossil fuels and the resulting geopolitical risk following the invasion of Ukraine (Astrov *et al.*, 2022; Hille, 2023).

For decades, EU-Russia energy trade was largely perceived through a liberal economic lens, establishing infrastructural path dependencies that functioned as a pillar of post-Cold War cooperation (Siddi, 2022). However, Russia's strategic weaponization of energy exports dramatically shifted this paradigm, reframing the EU's import dependency where Russia previously supplied approximately 40% of the bloc's natural gas, from a commercial convenience to an acute security liability (Astrov *et al.*, 2022; Mišík, 2022). The literature emphasizes that the 2022 shock was not entirely unforeseen; it was preceded by strategic supply withholdings by Gazprom in 2021, which severely depleted European storage levels and exposed the structural weakness of an internal market lacking a cohesive external energy security policy (Mišík, 2022).

Furthermore, the academic discourse highlights how this weaponized dependency induced asymmetric crisis affectedness across Member States. Countries with historically high reliance on Russian hydrocarbons, such as Germany and several Eastern European nations, faced disproportionate macroeconomic and security threats compared to less dependent states like France or Spain (Astrov *et al.*, 2022; Petrosyan and Harutyunyan, 2024). These structural disparities hampered supranational solidarity, leading to fragmented, national-level crisis responses rather than unified European capacity-building. Ultimately, this literature stream converges on the premise that severe geopolitical risks associated with fossil fuel imports have fundamentally altered the EU's strategic outlook, effectively merging the objectives of national security and energy transition, and forcing an accelerated, irreversible decoupling from Eurasian energy integration (Astrov *et al.*, 2022; Hille, 2023).

National case studies and EU policy responses

A third distinct subset of the literature evaluates the practical efficacy of the emergency policy responses implemented by the European Union and its Member States, relying heavily on national case studies to quantify demand reduction and supply diversification. In response to the crisis, the EU launched several regulatory interventions, including the REPowerEU plan and mandatory gas storage filling targets, alongside a coordinated push for a 15% voluntary reduction in natural gas demand (European Commission, 2022). Empirical modeling demonstrates that this uniform demand destruction was a highly effective short-term mechanism to mitigate wholesale price spikes, significantly outperforming the limited price-relief provided by releasing strategic gas reserves (Kotek, Crisán and Tóth, 2023).

National-level analyses, particularly focusing on Germany as the largest and most exposed importer, provide granular insights into these mitigation strategies. Halser and Paraschiv (2022) assess the German pathway to overcoming import dependency, highlighting a critical short-term import gap that required the rapid installation of Floating Storage and Regasification Units (FSRUs) and the temporary, albeit controversial, delayed phase-out of coal and nuclear power plants.

Furthermore, the literature confirms that demand-side adjustments played a decisive role in crisis management. Ruhnau et al. (2023) empirically estimate the German behavioral response, revealing a 23% reduction in natural gas consumption in the second half of 2022. Notably, their findings show asymmetric reaction times: while industrial consumers responded to initial wholesale price signals as early as September 2021, small consumers and households only exhibited substantial savings following the full-scale invasion in early 2022, driven by both retail price contagion and ethical concerns (Ruhnau *et al.*, 2023).

Together, these studies validate that while infrastructure diversification was necessary, aggressive demand destruction was the critical variable ensuring grid stability.

Crisis-driven decarbonization pathways

The final prominent research stream explores the complex, and at times contradictory, impact of the geopolitical shock on the European Union's long-term decarbonization trajectory. The literature identifies a dual timeline characterizing the crisis response. In the short term, the imperative to maintain grid stability and prevent economic

collapse forced a temporary regression in climate ambitions, heavily documented through the reactivation of coal- and oil-fired power plants to compensate for the sudden withdrawal of Russian pipeline gas (Liu, Jing and Zhao, 2023). This reactionary shift toward high-emission fossil fuels temporarily disrupted the linear progression of the European Green Deal and highlighted the structural vulnerability of the electricity market (Liu, Jing and Zhao, 2023; Emiliozzi, Ferriani and Gazzani, 2025). Conversely, however, scholars widely argue that the severe geopolitical risks associated with fossil fuel supplier countries have fundamentally acted as a catalyst for the green transition (Hille, 2023).

The extreme volatility and historically high prices of natural gas have accelerated the economic parity of renewable energy and alternative vectors. Münster et al. (2024) observe that the crisis significantly increased the demand and economic feasibility for green hydrogen and offshore wind, as the high costs of natural gas made electrolytic hydrogen production competitive much earlier than previously projected. Furthermore, energy system modeling indicates that the persistent absence of Russian gas elevates the critical importance of carbon capture and storage (CCS) technologies to abate emissions from the short-term resurgence of coal, while paving the way for a sharp, policy-driven scale-up of systemic electrification and domestic green hydrogen infrastructure by 2050 (Durakovic, del Granado and Tomasgard, 2024; Emiliozzi, Ferriani and Gazzani, 2025).

Keyword clustering

The full-scale invasion of Ukraine by the Russian Federation in February 2022 triggered the most severe energy shock that Europe has experienced since the oil crises of the 1970s, exposing the structural dependency of the European Union on Russian hydrocarbons and forcing a rapid reconfiguration of its supply, market, and policy architecture (Goldthau and Youngs, 2023; International Energy Agency, 2026). Within months, Russian piped gas exports to the EU collapsed by roughly half, while the share of Russian gas in EU imports fell from around 45% in 2021 to approximately 15% in 2023, replaced largely by liquefied natural gas (LNG) and by aggressive demand-side adjustments (Bordoff and O'Sullivan, 2022; European Commission, 2026)

This abrupt decoupling has reframed natural gas and LNG in the academic literature not only as critical assets for ensuring short-term supply resilience against geopolitical weaponization, but also as transitional or "bridging" fuels within the broader trajectory toward climate neutrality (Mišík, 2022; Kulušić *et al.*, 2024). This dual role, balancing immediate security imperatives with long-term decarbonization commitments, has profoundly shaped the trajectory of post-2022 research.

At a more granular level, mapping the literature using VOSviewer generated a network structured into five distinct thematic clusters (see **Figure 5**), illustrating the complexity and interdependencies of the post-2022 European energy debate.

- The **green cluster** focuses on the long-term energy transition and decarbonization agenda, organized around keywords such as *renewable energy*, *renewable energy sources*, *climate change*, *greenhouse gases*, *decarbonization*, *energy transition*, and *energy efficiency*. This cluster reflects literature that interprets the war as an accelerator of the European Green Deal and the shift toward low-carbon energy systems, despite temporary increases in coal consumption during 2022–2023 (Goldthau and Tagliapietra, 2022; Hainsch *et al.*, 2022)
- The **red cluster** captures the economic and regulatory dimension of the crisis, centered around *energy policy* and *energy crisis*, the most prominent keywords in the network. It includes terms such as *costs*, *electricity prices*, *energy prices*, *power markets*, *gas crisis*, and *energy utilization*, highlighting the strong academic focus on market volatility, inflationary pressures, and policy responses to the disruption of European energy markets (Adolfsen *et al.*, 2024).
- The **blue cluster** highlights the geopolitical and energy-security dimension of the crisis. It groups terms such as *European Union*, *energy security*, *Ukraine*, *Russia-Ukraine war*, *geopolitics*, *alternative energy*, and *electricity*. The co-occurrence of geopolitical actors with security-related terminology demonstrates how the literature frames the conflict as a structural challenge to European strategic autonomy and energy resilience (Bordoff and O'Sullivan, 2022; International Energy Agency, 2026).
- The **yellow cluster** focuses on gas-market infrastructure and supply-chain dynamics, incorporating keywords such as *natural gas*, *LNG*, *gas supply*, *energy market*, *commerce*, and *European countries*. This cluster reflects studies examining diversification strategies, LNG expansion, and the restructuring of European gas-import routes following the reduction of Russian pipeline supplies.
- The **purple cluster**, although smaller, acts as a structurally important geopolitical hub centered on *Russia*, *gas*, and *energy*. It captures literature analyzing the Russian Federation simultaneously as the source of the supply shock, the target of sanctions, and the catalyst for the strategic reorientation of EU energy policy.

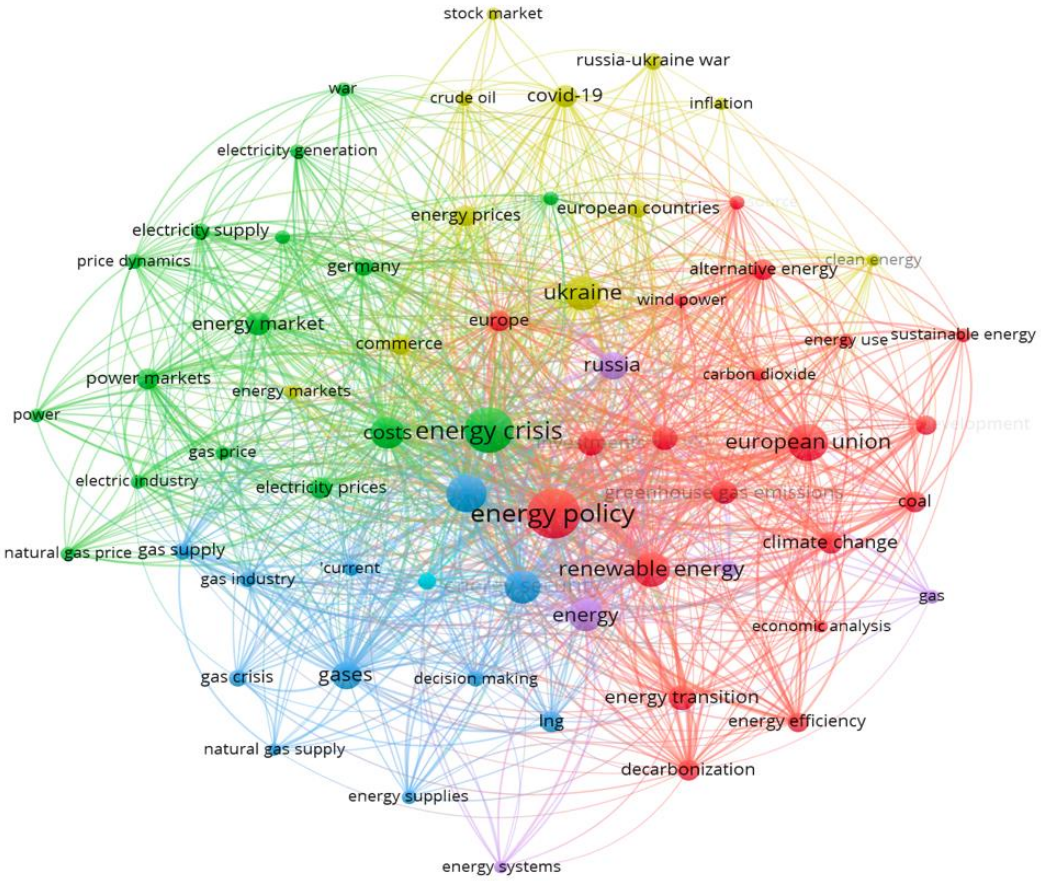

Figure 5. Clustering results produced by VOSviewer.

Network analysis: pivotal nodes and the price-and-market sub-cluster

While the aggregate co-occurrence map presented in **Figure 5** reveals the macro-structure of the literature, it inevitably compresses the role of individual high-centrality nodes into broader cluster aggregates. The connections with natural gas, LNG, gas supply, and commerce (yellow cluster), together with European Union, geopolitics, and Russia-Ukraine war within its own blue cluster, indicate that the literature articulates Ukraine not only as a victim of supply disruption but as the connective term linking gas-market reconfiguration, geopolitical realignment, and macroeconomic spillovers (Ahlawat, 2022; Adekoya *et al.*, 2023). For the argument developed in this chapter, the configuration of the Ukraine node justifies treating the war not as an isolated exogenous event but as a point of articulation between pre-existing vulnerabilities, gas dependency, uneven member-state exposure, and the subsequent strategic reorientation embodied in REPowerEU and the revised Renewable Energy Directive (European Commission, 2026).

The red cluster captures the concrete economic manifestation of the crisis and the architecture of European energy markets under pressure. The central node, energy policy, the most frequently occurring keyword in the dataset, is densely connected to energy crisis, costs, electricity prices, energy prices, power markets, gas crisis, and energy utilization (Adolfsen *et al.*, 2024). The recurrent appearance of Germany at the boundary of the cluster confirms its status as the dominant national case study in the literature, explained by its structural exposure to Russian pipeline gas and its centrality as a continental transit hub.

Unlike the transition-oriented green cluster or the gas-infrastructure-oriented yellow cluster, the red cluster operates with predominantly quantitative tools, econometric models, market simulations, demand-elasticity estimates, and provides the empirical substrate that underpins the normative arguments developed elsewhere in the literature. For the present chapter, this figure legitimizes the subsequent discussion of price-cap mechanisms, the reform of the EU electricity market design, and the protective measures deployed to shield households and energy-intensive industries from the inflationary spillovers of the crisis.

Conclusion

This study provides a comprehensive bibliometric and thematic analysis of the European energy crisis catalyzed by Russia's war in Ukraine, specifically focusing on the shockwaves transmitted through the oil and gas sector. The findings reveal a massive, exponential surge in scientific output directly correlated with the historic natural gas price spikes at the Title Transfer Facility (TTF) hub (Fabra, 2023; Ruhnau *et al.*, 2023).

The academic discourse is categorized into four key thematic areas: climate policies and sustainability, market dynamics and electricity price contagion, the geopolitical dimensions of energy security, and the accelerated deployment of hydrogen and Power-to-X technologies (Zakeri *et al.*, 2023; Durakovic, del Granado and Tomasgard, 2024). From a bibliometric perspective, the results demonstrate a clear evolutionary trajectory in the academic discourse over time. Prior to the 2022 invasion, early research predominantly concentrated on isolated technological feasibility, basic corporate social responsibility metrics, and treating natural gas as a reliable "bridging fuel" (Kulušić *et al.*, 2024). However, empirical literature has expanded exponentially and undergone a profound conceptual shift toward comprehensive environmental, social, and governance (ESG) integration (Tuyon *et al.*, 2026).

Recent scholarship has transitioned toward highly integrated, multi-disciplinary assessments that scrutinize the alignment between ambitious supranational policies, such as the REPowerEU plan, and practical national implementation barriers (Wojtaszek, 2025). Furthermore, the science mapping reveals an increasing academic focus on the structural paradoxes of the transition. The discourse is moving beyond simple decarbonization pathways to rigorously evaluate corporate financialization, geopolitical vulnerabilities, and the enduring profitability of fossilized capital (Christophers, 2022).

Ultimately, the systematic review underscores that the energy transition is a complex, non-linear process. The immediate necessity to substitute Russian pipeline gas with a massive influx of global LNG indicates a prolonged period of coexistence with oil and gas, rather than their immediate replacement, cementing their central role in short-term survival (Emiliozzi, Ferriani and Gazzani, 2025)

Implications for regulators. Policymakers must adopt a delicate dual strategy: accelerating renewable energy deployment while simultaneously decarbonizing and managing existing fossil fuel systems to ensure grid stability (Wang *et al.*, 2023)). The structural exposure of European electricity markets to marginal gas prices necessitates profound market design reforms to shield consumers and energy-intensive industries from extreme volatility (Fabra, 2023; Zakeri *et al.*, 2023). Furthermore, while securing short-term alternative supplies via global LNG is critical to prevent economic collapse (Halser and Paraschiv, 2022), regulators must strictly control these investments to prevent infrastructural "lock-in" and stranded assets that could compromise the 2050 Net-Zero targets (Kotek, Crisán and Tóth, 2023).

Future research should address the "structural paradox" of the energy transition: while long-term policies aim to reduce fossil fuel dependence, short-term global crises often reinforce it. Specifically, studies should examine the interaction between compounding geopolitical instabilities, particularly involving the war in Iran, and energy security, as disruptions in maritime chokepoints like the Strait of Hormuz (Geldard, 2026) continue to severely impact global prices. Further empirical investigation is also urgently needed into the practical scalability of green hydrogen and carbon capture and storage (CCS) technologies to permanently replace lost Russian gas volumes (Kotek, Crisán and Tóth, 2023; Durakovic, del Granado and Tomasgard, 2024), as well as the profound influence of financial markets on corporate transition strategies (Christophers, 2022).

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