

Review

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Review

A Review on the Nexus between Energy Industry, Financial Markets, Environmental Concerns, and Geopolitics

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Abstract: This literature review explores the relationship between energy markets development, environmental concerns, and geopolitics. By presenting a range of sources, we delve into essential themes like carbon emissions, the impact of energy markets deregulation on energy prices, trust in energy-related exchange-traded funds, the correlation between greenhouse gas emissions and global temperature anomalies, and how renewables regulations affect CO₂ emissions. We also discuss relevant research on the impact of social and governance (ESG) considerations on financial performance. The geopolitical aspect is thoroughly presented under the energy framework. Topics, such as energy transitions in the Eastern Mediterranean and MENA regions and maritime oil piracy, are discussed. This review highlights the interdependent nature of these subjects and stresses the need for their interdisciplinary examination.

Keywords: energy markets deregulation; environmental concerns; geopolitical changes

JEL Codes: O13; P18; F50

1. Introduction

The energy landscape is undergoing unprecedented transformations, marked by shifts in market dynamics, heightened environmental awareness, and geopolitical tensions. This literature review aims to synthesize insights from various scholarly works, addressing the intricate connections between energy markets, environmental considerations, and geopolitical factors. The selected references span multiple dimensions related to energy market development, ecological concerns, and geopolitical risks, providing a comprehensive overview.

2. Energy markets development and their interplay with financial markets

Over past years, technology, environmental worries, world politics, and rules have stirred up changes in energy markets, like oil and electricity. Electricity and gas sectors have seen a trend towards less regulation and more freedom. The idea is old but effective: Boost competition, increase efficiency, and give customers more options. Nevertheless, these changes haven't always worked out well. Success has varied. Things like the market structure, level of competition, regulation, and available infrastructure and interconnections all play a part. Deregulation has good features: cost cuts, sparking fresh ideas, and helping renewable Energy. But it also has challenges: controlling the market, uneven prices, ensuring supply, and investment coordination. It introduces new concerns, like the network operators' role, shaping capacity mechanisms, and regulating international trade. While fossil fuels, like coal, oil, and gas, have been used as energy sources for a long time, pressure is mounting. They face environmental policies, climate policies, and rivals like nuclear and renewable sources. Changes in fossil fuel use can happen because of things like demand and supply, prices or world events. We saw this when Russia invaded Ukraine in 2022. It upset the energy markets, made inflation worse and slowed down the growth of economies. Still, fossil fuels are essential to the

world's Energy. But, they also cause threats to our environment, climate, and health.. Therefore, transitioning away from fossil fuels is necessary and urgent, but it also requires careful planning and coordination among all the stakeholders involved.

The development of energy prices has followed complex and contradictory paths. While deregulation is the process that introduces competition, it does not necessarily lead to lower prices. Organized financial markets include lots and different products of Energy, with oil being the first underlying energy product and electricity the last to be introduced in financial markets.

Existing literature [1] investigates the relationship between Financial ETF and Energy ETF, testing spillover effects among ETF and ETF futures and conducting empirical analysis for several sub-periods. Among others, they find that financial and Energy ETFs are suitable for constructing a financial portfolio from optimal risk management perspective. Lisin [2] explore the relationship between financial and Energy markets, focusing on the spillover effect of the transition to renewable Energy on different financial markets. Their study suggests a significant interplay between energy-based products and financial markets. Zhang [3] provides a broader context by discussing the concept of energy finance and its growing relevance, emphasizing the need for further research in this area. A comparative study by Alexopoulos [4] explores the question of trust in conventional and clean energy exchange-traded funds. This research adds a financial perspective to the discussion, examining investor perceptions and preferences in the context of energy investments and their environmental implications. Alexopoulos and Thomakos [5] contribute to risk management literature by introducing functional smoothing techniques. Focusing on energy assets, this research provides a novel approach to mitigating risks in the volatile energy market environment. Trading electrical power in organized financial markets is now the mainstream, leaving natural monopolies behind. In this framework, Tsioufis and Alexopoulos [6] contribute to understanding European day-ahead power markets through a convergence analysis. This research provides valuable insights into market dynamics, helping policymakers and market participants navigate the complexities of the European energy landscape. Dorsman's et al. [7] work links energy issues with economics and financial markets; among others, they examine the dynamics of energy and derivatives trading. Moreover, Deng et al. [8] find in their paper, the beneficial effect of financial derivatives on the sharing and controlling of undesired risks through properly structured hedging strategies. In addition, they include the roles of electricity derivatives in mitigating market risks and structuring hedging strategies for different entities and the existing challenges in increasing the use of electricity derivatives for achieving economic efficiency. The development of energy markets has been motivated and shaped by the continuous aim of controlling prices in favor of society. The interplay between financial markets and energy products is such an example. Nevertheless, a range of factors influence energy prices, including cost factors, market structure, and consumer behavior. The elasticity of demand is a key consideration, with the proportion of income spent on electricity having a significant impact. Additionally, total factor productivity and retail competition can also affect electricity prices. Alexopoulos [9] investigates the growing significance of natural gas as a predictor for retail electricity prices in the United States. This research sheds light on the intricate relationship between different energy sources and their impact on consumer costs, providing valuable insights for policymakers and industry stakeholders. All in all, vast literature examines energy market development in the context of liberalization and financial market involvement.

Figures 1 and 2 below show a network of related scientific publications based on the co-occurrence of indexed keywords. The initial publications were exported from Scopus. The terms used for the search were "energy", "financial", "markets" and "development", with an and criterion. After limiting the related literature to the subject areas of Energy, economics, finance, social sciences, decision sciences, and business and management, a total number of 4.459 documents were found. We insert them in Vosviewer to create our literate networks. As shown, the keywords: commerce, investment, energy markets, financial markets, costs, and power markets are those with the highest occurrences and linkages with other terms. Table 1 below presents their association performances in detail.

Table 1. The most common research terms based on the times of co-occurrences in the examined literature.

Research Item	Occurrences	Links	Total link strength	Cluster
Commerce	1684	993	19976	green
Investment	1461	992	17884	yellow
Energy markets	1143	982	15265	green
Financial markets	1024	903	13167	green
Costs	746	979	13037	blue
Power markets	576	824	7943	blue

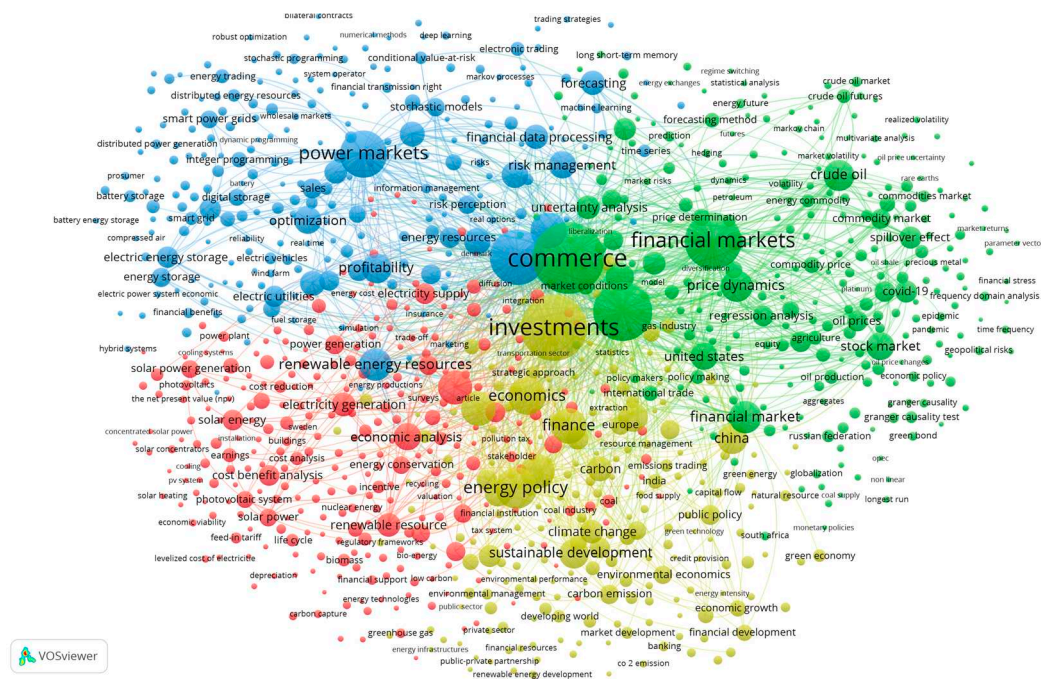


Figure 1. Network visualization of the literature on energy markets development and financial markets (produced using Vosviewer).

The literature network consists of a total of four clusters (see Figure 1) based on the association strength of keywords. In the blue cluster, the terms "power markets" and "costs" are the terms with the highest strength, "energy efficiency" and "economic analysis" are the strongest centers in the red cluster, while "investments" and "energy policy" are in the yellow one. Last, "commerce" and "financial markets" lead the green cluster. Regarding the time of publication of the examined literature, we see in Figure 2 that established research terms have been analyzed, as expected, in older years. Indicative examples of such research terms are the net present value, electric utilities, feed-in tariffs, and power markets published in 2016. Conversely, related research published in 2023 includes terms like blockchain, energy trading, green bonds, and deep learning.

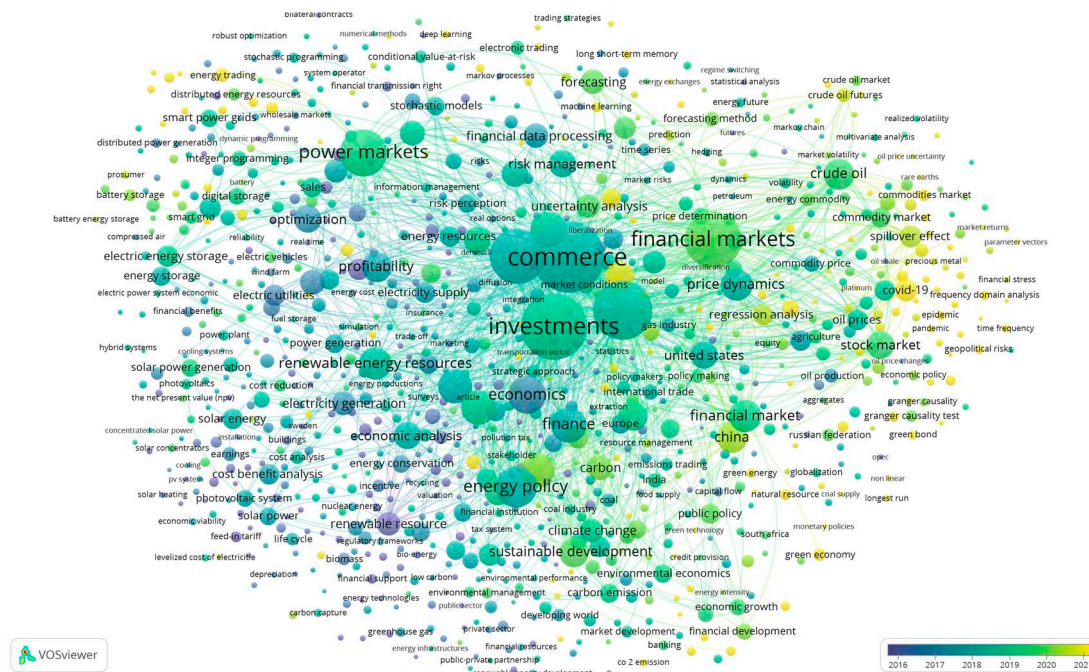


Figure 2. The examined literature network based on the respective publication date (produced using Vosviewer).

3. The nexus of energy and environmental concerns

The nexus of energy and environmental concerns is a complex and multifaceted issue, as highlighted by Bishoge [10]. The transition to renewable energy sources is crucial in mitigating the environmental impact of energy use. This transition is further emphasized by Chen [11], who stresses the need for sustainable Energy and environmental policies. Dincer [12,13] underscore the importance of energy efficiency in reducing environmental impact, and the need for a simultaneous consideration of energy supply and environmental concerns. Collectively, these studies emphasize the need for a holistic approach to addressing the nexus of energy and environmental concerns, focusing on renewable energy sources and energy efficiency.

Table 2 below shows the most examined key words from this literature.

Table 2. The most common research terms in the literature examining the interplay between energy and environmental concerns.

Research Terms
GHGs, Temperature anomalies, ESG, Energy Efficiency, Renewables, Regulation, CO2, Economic growth, Environmental performance, Energy Intensity, Carbon intensity, green sources, Sustainable

Concerning GHGs Agliardi et al. [14] study the relationship between greenhouse gas (GHG) emissions and global warming using multi-level rolling analysis and copula methods. Their paper finds that emissions have a constant effect on temperature anomalies, but there is a high probability of joint extreme events (i.e., high temperatures and emission concentrations). The paper suggests a cautious approach to emissions to prevent extreme warmings.

Regarding ESG, this paper [15] uses the environmental pillar of ESG (environmental, social, and governance) as a proxy for environmental corporate social responsibility, and examines the performance of environmentally clustered portfolios using simple quantitative investment strategies with optimum asset rotation. The paper finds that both environmental status and dynamic environmental performance are key characteristics of divergent financial behaviors. It shows that

environmentally low-rated companies present better financial performance, while environmental leaders are less risky and show more resilience.

On res regulation, this work [16] decomposes the effect of renewable energy sources (RES) regulation on CO₂ emissions in the EU-15 countries using panel data from 1990 to 2008. It employs a fixed effects model with instrumental variables to account for endogeneity and heterogeneity. The paper finds that RES regulation has a negative effect on CO₂ emissions, but this effect varies across countries and over time. RES rules actually help in bringing together the makeup of the fuel mixture amongst EU-15 nations.

Looking at the bond between how regulations and infiltration of renewable energy sources (RES) affect emissions in EU-15 countries, Alexopoulos's study [17] looks at data from 1990 to 2008. He runs a series of tests, including panel unit root tests, panel cointegration tests, and panel causality tests, to discover the long-term and immediate effects. A long term interconnection, between RES regulations, RES infiltration and emissions is found. His research also identifies a relationship between RES regulations and RES new power installations.

On another research strand, analyses [18,19] examine the impact of regulations on energy sources (RES) in the EU 15 countries from 1990 to 2008. These studies stress that Renewables policies help reduce CO₂ emissions and increase the share of res energy sources in the electricity fuel mix. Furthermore, it has been observed that these regulations contribute to final energy consumption among EU 15 nations. Thomakos et al. research [20] employs standard econometric tests to establish a relationship between growth and EPI, indicating that in the short-term economic growth drives improvements in EPI. Their results also suggest that economic growth status and carbon intensity levels significantly contribute to variations, in EPI scores.

Moreover, they delve into the connection, between carbon intensity, a metric that gauges greenhouse gas emissions per unit of output and how it serves as an indicator for evaluating performance and the effectiveness of policies [21]. To gauge the strength of carbon intensity in comparison to factors like energy sources and economic growth they utilize the Environmental Performance Index (EPI) as a benchmark. Their findings suggest that carbon intensity exhibits the link with EPI implying that nations with lower carbon intensity generally achieve superior environmental outcomes and implement more favorable environmental policies.

4. The bilateral relationship between Energy and geostrategic interests

Energy is of the essence when nations' interests, security, and influence are examined. The exploration and utilization of energy resources such as hydrocarbons in the Eastern Mediterranean have the potential to reshape power dynamics and bring both opportunities and challenges. The relationships between energy producers and consumers, whether they are allies or rivals, are influenced by factors like energy availability, accessibility, and affordability. One notable example is the China-Pakistan Economic Corridor (CPEC), which aims to connect China with the port of Gwadar. This project seeks to enhance trade and energy cooperation between the two countries, but raises concerns among players like India and the United States [22]. Similarly, developments related to Eastern Mediterranean energy resources have implications for the Cyprus issue. The Republic of Cyprus and Turkey claim rights over hydrocarbon reserves and maritime boundaries [23]. Hence, depending on relationships and geopolitical circumstances, energy can cooperate or fuel conflict.

Marketos et al. [24] explore the dynamics of the Eastern Mediterranean area encompassing countries such, as Cyprus, Egypt, Greece, Israel, Lebanon, Libya, Syria and Turkey. They argue that this region is currently undergoing changes due to the discovery of natural gas reserves, forming alliances, and involving external actors. The authors also emphasize the cultural and religious connections between the Eastern Mediterranean nations and Europe well as the Middle East. In their research [25], they thoroughly examine how Energy shapes relations among states and regions. They delve into concepts such as energy security, energy diplomacy and energy transition while exploring their relevance to both challenges and opportunities in the Eastern Mediterranean and MENA regions. Additionally, they analyze how developments like the US shale revolution and the implementation of the Paris Agreement targets on climate change mitigation efforts globally have

impacted the energy landscape amidst events, like the COVID 19 pandemic. Moreover, the fate of Egyptian-Turkish relations, which have been strained since the 2013 coup that ousted President Mohamed Morsi, a Muslim Brotherhood leader supported by Turkey, are examined [26]. The authors trace the historical and ideological roots of the rivalry between the two countries, and how it has been exacerbated by their conflicting interests and interventions in Libya, Syria, and the Eastern Mediterranean. Moreover, the transportation issue of energy resources from the Eastern Mediterranean and MENA regions to the final customers, mainly in Europe and Asia is mentioned [27]. In more details, the advantages and disadvantages of different modes of transportation, such as pipelines, liquefied natural gas (LNG), and electricity grids are presented. In another strand, the geostrategic alliances in the Eastern Mediterranean and MENA regions are assessed [28], via the stereotyped political and cultural prototypes that exist throughout western. It is explained how this development has its foundation mostly in the US' Pivot to Asia' policy, resulting in a lower priority ranking of the Middle East for Washington, but also in the emergence of China's economic incursion on the wider region. In another aspect of their work [29] the changing geometry of Greek foreign policy, and how it has re-defined its relations with the West and its role in the Eastern Mediterranean and MENA regions is explained. They argue that Greece has adopted a more proactive and multidimensional approach, seeking to diversify its partnerships and enhance its regional influence. Additionally they explore the involvement of actors, from both international spheres in the Eastern Mediterranean Middle East and North Africa (EM MENA) region. Their analysis focuses on understanding how these actors shape the dynamics and outcomes of alliances [30]. They delve into the interactions and conflicts among entities such as the United States, Russia, China, the European Union (EU) NATO and the Arab League investigating their impact on stability and security. Furthermore they examine the effects of embracing energy sources as part of an energy mandate in these regions [31]. This examination includes identifying factors that drive or impede this transition, towards Energy and highlights both challenges and opportunities faced by actors. Additionally, they examine scenarios and the implications of this energy transition on the region's geopolitics, economy and environment.

Understanding the economics of Energy and the limitations that impede the exploitation and utilization of energy resources is crucial in comprehending the dynamics in the Eastern Mediterranean and MENA regions [32]. Fundamental limitations include exploration and production costs, inadequate infrastructure and technology, political disputes, legal conflicts, and environmental and social concerns. Global geopolitical shifts have sparked a "Great Game" characterized by competition among global players for control over and influence in both Eastern Mediterranean/MENA regions as well as emerging areas of interest, like Arctic passage routes, naval corridors or even South China Sea [33–35].

Regional powers such, as Turkey have been displaying an ambitious foreign policy in the Eastern Mediterranean and MENA regions. It is important to understand the origins and evolution of Turkey's approach, which reflects its Ottoman aspirations and dissatisfaction with the West. Evaluating the consequences and challenges of Turkey's attitude is crucial especially considering the tensions and conflicts it has sparked with neighboring countries like Greece, Cyprus, Egypt, Israel and even the EU. The literature extensively analyzes two opposing geostrategic blocks competing for dominance in Euro Africa's trans-Mediterranean trade and energy connections. These blocks comprise countries like Greece, Cyprus, Israel, Egypt, France Italy UAE on one side; on the other we have Turkey along with Libya Qatar and Iran. The literature sheds light into the motivations and objectives of the above-mentioned country groups, as they attempt to control region's energy security and balance the geopolitics.

5. Conclusions

This short literature review stresses the close ties between energy trade, environmental concerns, and world politics and points out the different aspects of these interdependent frameworks. It covers a broad range of topics, from the inclusion of energy products in financial markets, environmental regulation's effect on the energy industry, and how geopolitics, especially in the Eastern

Mediterranean and MENA areas, shape national decisions. All in all, the different sides of these subjects show why examining these issues using various science fields is essential.

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