

ENERGY SECURITY AND GREEN TRANSFORMATION AMID GEOPOLITICAL CONFLICTS

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Amidst the pressing global energy transition, nations strive to shift from fossil fuels to renewables, grappling with environmental urgency and complex energy security challenges. This article explores the multifaceted impact of geopolitical tensions, including the Russia-Ukraine conflict and Middle Eastern instability, on energy security and the global green transformation. It discusses how these conflicts have triggered both short-term reliance on fossil fuels and a renewed drive toward sustainable energy independence. Moreover, it delves into Europe's Green Deal, China's technological advancements, and the United States return to the Paris Agreement as transformative steps, all underscoring the need for robust international cooperation. This in-depth analysis highlights the strategies, obstacles, and global collaborations essential for achieving a resilient and sustainable energy future.

Gökhan Bafra*

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* Gökhan Bafra is a Freelance Sustainability Professional.

The world is undergoing a transformative shift in its energy systems. Although fossil fuels have constituted the backbone of global economies since the mid-20th century, this framework has become unsustainable. The environmental costs and supply security risks of fossil-based energy systems have compelled countries to transition to renewable energy sources. However, this shift entails a series of challenges for energy security. Conflicts, notably the Russia-Ukraine war and instability in the Middle East, have heightened threats to energy supply security, underscoring the significance of renewable energy investments.

Energy security is critical not only for strategic interests but also for the sustainable well-being of societies. Ensuring uninterrupted access to energy is vital for safeguarding living standards, maintaining economic stability, and promoting sustainable development. However, dependency on fossil fuels complicates this security imperative. Rising energy costs and supply chain disruptions may hinder the green transition, yet the unsustainable nature of fossil-based energy infrastructure has become one of the main drivers incentivizing investments in renewable energy sources.

The Transformative Impact of Geopolitical Conflicts on Energy Security

Historically, energy security has been defined by a nation's capacity to ensure an uninterrupted and cost-effective energy supply, with fossil fuel-based trade sitting at the heart of geopolitical relations. Energy security is integral to the green transition; countries must secure their energy supply sustainably while continuing economic development. Although the transition to renewable energy holds the long-term potential for energy independence, this process faces obstacles such as supply shortages and price fluctuations that can strain nations during the transition phase.

Energy security is crucial for economic growth, sustaining citizens' living standards, and ensuring sustainable development. However, fossil fuel-based systems create environmental issues, complicating the fight against climate change. Germany's Energiewende initiative exemplifies this; by phasing out nuclear and fossil fuel usage, Germany aims to transition to renewable energy. Yet this shift has led to temporary supply shortages and increased energy costs.¹

The transition to renewable energy is an environmental necessity and an economic and strategic imperative. The European Union (EU) has taken significant steps in this regard, aiming to achieve carbon neutrality by 2050 by phasing out fossil

1) Clean Energy Wire, "Germany's Energiewende in brief," <https://www.cleanenergywire.org/germanys-energiewende-brief> accessed on 14 October 2024.

fuels.² However, sudden increases in energy prices and supply chain disruptions have compelled many countries to revert to fossil fuels in the short term.

Geopolitical conflicts that impact energy supply, particularly in regions dependent on energy imports such as Europe, pose direct threats to energy security and green transition processes. The Russia-Ukraine conflict, for instance, has led to sharp fluctuations in energy prices and placed European countries in serious energy supply predicaments. In 2022, Russia reduced its natural gas exports to the E U by 80 percent, causing gas prices to surge by up to 300 percent.³ Consequently, the EU has decided to enhance its liquefied natural gas (LNG) imports and expedite renewable energy investments to reestablish energy security.⁴

These types of geopolitical conflicts not only threaten energy security but may also force countries to revert to fossil fuels temporarily. For instance, many European countries have had to reactivate coal plants temporarily but are simultaneously developing strategies to accelerate the transition to renewable energy.⁵ The Russia-Ukraine war has compelled Europe to reassess its energy policies, leading to diversification and increased investment in sustainable energy sources.

Moreover, trade and technological competition between China and the United States significantly impacts energy security. China holds a substantial share in renewable energy technologies, leading globally in solar and wind energy production.⁶ This growth in China's energy production capacity and its influence on the green transition have significant implications for shaping global energy markets.

With its central role in global oil production, the Middle East remains a critical element affecting energy markets worldwide. The strategic role of countries such as Saudi Arabia and the United Arab Emirates in energy supply means that regional instability often leads to sudden fluctuations in global oil prices. Tensions between Saudi Arabia and Iran in 2022 and ongoing conflicts in Yemen have resulted in uncertainties in oil supply, causing rapid increases in oil prices. Additionally, disputes over production quotas among OPEC+ countries have added complexity to strategies for controlling oil supply. Fluctuations in global oil prices directly threaten energy

2) European Commission, "2050 Long-term Strategy," Climate Action, https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2050-long-term-strategy_en accessed on 11 October 2024.

3) European Central Bank, "Speech by Fabio Panetta, Member of the Executive Board of the ECB," ECB, 16 November 2022, <https://www.ecb.europa.eu/press/key/date/2022/html/ecb.sp221116~c1d5160785.en.html> accessed on 17 October 2024.

4) GIS Reports Online, "The European Union's LNG supply security" <https://www.gisreportsonline.com/r/eu-lng/> accessed on 16 October 2024.

5) Clean Energy Wire, "German govt takes next step to reactivate hard coal plants for supply security in gas crisis," <https://www.cleanenergywire.org/news/german-govt-takes-next-step-reactivate-hard-coal-plants-supply-security-gas-crisis> accessed on 16 October 2024.

6) World Economic Forum, "China rapidly expands wind power capacity: Here's what you need to know about the global energy transition this week" <https://www.weforum.org/agenda/2023/03/china-wind-power-energy-transition-power-global-energy-crisis-6-march/> accessed on 15 October 2024.

security, especially for nations dependent on energy imports. Despite the decline in demand at the onset of the COVID-19 pandemic in the early 2020s, oil prices surged rapidly due to geopolitical crises in the Middle East.⁷ This increase has intensified economic pressures in regions such as Europe and Asia, pushing countries towards urgent renewable energy investments. These tensions in the Middle East serve as catalysts for accelerating energy transition processes worldwide, simultaneously making short-term fossil fuel dependency inevitable.

Geopolitical Crises as Catalysts for Green Transition

Geopolitical crises deepen concerns over energy security while also acting as significant catalysts for accelerating the transition to renewable energy. In regions dependent on fossil fuels, energy security policies have become more robust during periods of crisis, increasing the need for investment in renewable energy sources. Consequently, investments in renewable energy are now prioritized not only for environmental reasons but also for strategic and economic independence. Accelerating investments by governments and the private sector in this area have significantly contributed to the rapid proliferation of green energy technologies.

The Russia-Ukraine conflict has shaken confidence in fossil fuel dependency across Europe, hastening the transition to sustainable solutions for energy security. In this context of energy insecurity, countries' efforts to reduce fossil fuel dependency have become an essential factor driving the green transition. Germany, for example, aims to meet 80 percent of its electricity demand from renewable sources by 2030,⁸ while Northern European countries are expediting their transition to green energy independence through substantial investments in hydropower and offshore wind energy.

China has also become a significant player in this transition. Under its 14th Five-Year Plan, China seeks to increase its renewable energy production, reduce energy imports, and sustain its global clean energy market leadership.⁹ In 2021, China accounted for 70 percent of global solar panel production, a share that may reach 80 percent by 2025.¹⁰ As of 2022, wind energy capacity in Europe also grew by 15

7) Middle East Institute, "COVID-19, the oil price war, and the remaking of the Middle East," <https://www.mei.edu/publications/covid-19-oil-price-war-and-remaking-middle-east> accessed on 15 October 2024.

8) Clean Energy Wire, "Germany's Aim for 80% Renewables in Electricity by 2030 Well Within Reach-Minister," <https://www.cleanenergywire.org/news/germanys-aim-80-percent-renewables-electricity-2030-well-within-reach-minister> accessed on 17 October 2024.

9) S&P Global Commodity Insights, "China's 14th Energy Five-Year Plan: Pivoting Toward a Modern Energy System," <https://www.spglobal.com/commodityinsights/en/ci/research-analysis/chinas-14th-energy-fiveyear-plan-pivoting-toward-a-modern-ener.html> accessed on 17 October 2024.

10) International Energy Agency, "Solar PV Global Supply Chains: Executive Summary," <https://www.iea.org/reports/solar-pv-global-supply-chains/executive-summary> accessed on 19 October 2024.

percent, underscoring the accelerated pace of the green transition.¹¹

Investment and Technological Development Needs for Green Transition

For the energy transition to succeed, it requires the shift from fossil fuels to renewables and substantial investments in technology development and infrastructure. Energy storage systems, grid modernization, smart grids, and energy efficiency technologies are fundamental components of this transition. Transitioning from fossil fuels to renewable sources demands a thoroughly restructuring existing energy infrastructure.

The development of these technologies contributes to accelerating the green transition and lowering costs, making the shift more accessible. In 2021, global energy storage capacity grew by 30 percent, reaching 20 GW, while the cost of lithium-ion batteries has dropped by 90 percent since 2010.¹² These advancements have expanded the applicability of renewable energy sources and supported energy supply security. However, access to these technologies may be limited by geopolitical tensions, particularly the escalating trade disputes between the United States and China, which may slow down strategic green transition processes due to disagreements over trade and technology. Additionally, China's dominance in rare earth element production renders the green transition partially dependent on China.

The Role of International Cooperation in Sustainable Energy Policies

Securing energy and achieving green transition goals should not be confined to national efforts but should instead be achieved through coordinated international collaboration. In this regard, the Paris Agreement stands as a cornerstone of global cooperation, guiding countries with binding targets for carbon emissions reduction and accelerated renewable energy transition, while aiming to ensure global energy security.

The success of sustainable energy policies relies on collaboration, particularly among major economic powers. For instance, the EU's Green Deal serves as a prominent example for accelerating global energy transition. Through this deal, the EU aims to reduce its own carbon emissions and support green energy transition through partnerships with third countries. This initiative is backed by a comprehensive energy strategy, with the EU planning to invest €1 trillion and cut emissions by 55 percent

11) WindEurope, "Wind Energy in Europe 2022: Statistics and the Outlook for 2023-2027," <https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2022-statistics-and-the-outlook-for-2023-2027/> accessed on 19 October 2024.

12) PV Magazine, "IEA Calls for Sixfold Expansion of Global Energy Storage Capacity," 26 April 2024. <https://www.pv-magazine.com/2024/04/26/iea-calls-for-sixfold-expansion-of-global-energy-storage-capacity/> accessed on 24 October 2024.

by 2030.¹³

The EU's Green Deal is an environmental endeavor and a strategic policy aimed at countering China's growing influence in energy markets. Through this initiative, the EU seeks to enhance its leadership in green energy technology and reduce dependency on energy imports, establishing a new power center in the global energy markets. This move is particularly relevant in light of China's dominance in solar panel and wind turbine production, as the EU's efforts to bolster its green technology capacity are vital for environmental goals and global trade and energy security. Thus, the Green Deal aims to balance China's influence in the energy market while protecting the EU's economic interests.

The United States' withdrawal from the Paris Agreement under President Donald Trump's administration allowed China to lead in global climate policy. However, President Joe Biden's administration's reentry into the agreement can be considered part of a strategy to restore U.S. influence in this arena and counterbalance China's growing impact. By increasing investments in renewable energy technologies and green economy, the U.S. aims to achieve environmental goals while balancing China's dominance in technology and energy markets. In 2021, the U.S. increased its renewable energy investments by 40 percent over the previous year, reaching \$110 billion.¹⁴ However, trade wars between the U.S. and China and supply chain issues related to renewable energy technologies pose significant obstacles to this process, presenting risks that could slow green transition goals.

Global platforms that facilitate global cooperation, such as COP summits, are essential for coordinating sustainable energy policies worldwide. These summits provide crucial platforms for sharing knowledge and harmonizing energy policies across nations. However, political tensions among significant energy consumers and producers can undermine the effectiveness of these collaborations, leading to delays in the green transition.

13) European Commission, "Fit for 55: Delivering the EU's 2030 Climate Target on the Way to Climate Neutrality," https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal/fit-55-delivering-proposals_en accessed on 20 October 2024.

14) World Resources Institute, "Clean Energy Progress in the United States: Addressing Climate and Economic Goals," <https://www.wri.org/insights/clean-energy-progress-united-states> accessed on 20 October 2024.