Geopolitically Driven Energy Crises and Low-Carbon Diversification

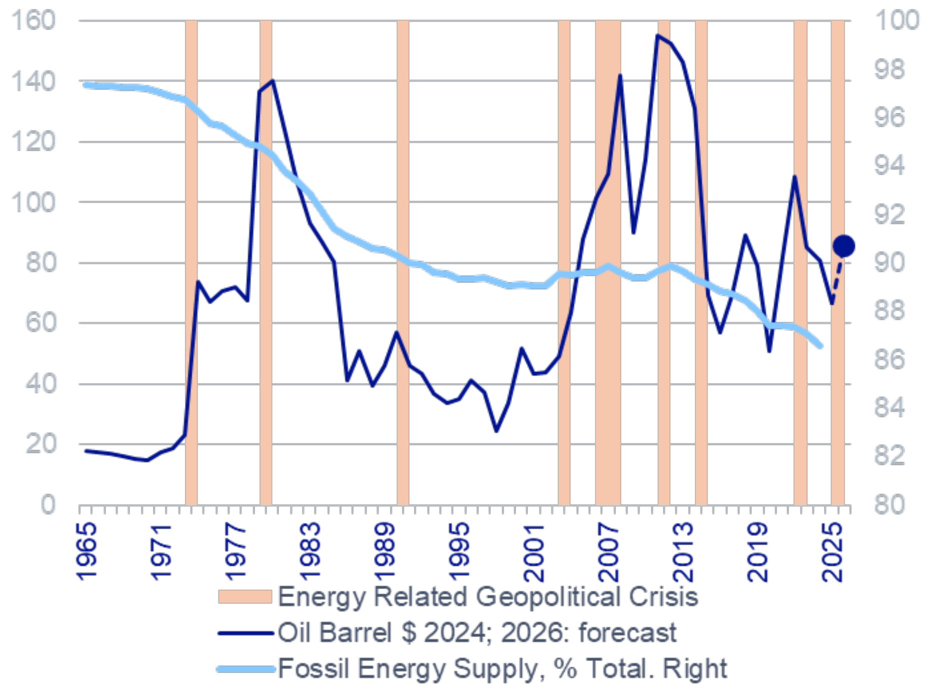
Geopolitical crises do not automatically trigger energy transitions; they accelerate diversification only when economically viable substitutes exist. Price spikes alone are insufficient; transition dynamics are shaped by shifts in perceived supply risk, technological readiness, and policy responses.

Real oil prices exhibit sharp, crisis-driven spikes rather than smooth trends. Major increases coincide with geopolitical disruptions: the 1973–74 oil embargo, the 1979 Iranian revolution, the 1990 Gulf War, the 2011–13 Middle East tensions, and the post-2022 shock following Russia's invasion of Ukraine. These episodes, including the looming war crisis involving Iran, the US and Israel, generate large price deviations (**Figure 1**). More fundamentally, they represent shifts in geopolitical risk regimes that alter expectations about future supply stability.

Despite repeated crises, fossil fuels remain structurally dominant. Their share of global primary energy supply exceeded 95 percent in the early 1970s and has declined only gradually since. Notably, fossil share does not display abrupt breaks during crisis periods (**Figure 1**). Adjustment occurs slowly through investment and capital retirement cycles, consistent with the path-dependent and infrastructure-intensive nature of energy systems (Grübler, 2012; Fouquet, 2010).[1]

1: See Box for a literature review supporting this analysis.

Figure 1. Oil Prices, Fossil Energy Supply and Energy Related Geopolitical Crisis (Brent $2024, % Total)



Source: BBVA Research with data from Home | Statistical Review of World Energy

Two sustained periods of fossil share decline stand out: after the late-1970s crises and since the mid-2000s. The earlier episode was driven primarily by nuclear expansion, a domestically controllable baseload alternative when fossil supply vulnerability became salient.[2] Nuclear power rose from negligible levels in the early 1970s to about 6–7 percent of total energy supply by the mid-1990s (**Figure 2**), and its expansion continued even after oil prices fell in the mid-1980s. This pattern suggests a structural response to perceived scarcity and vulnerability rather than a short-run reaction to price movements, consistent with models in which rising resource risk induces input-saving technological adjustment (Hassler, Krusell & Olovsson, 2021).

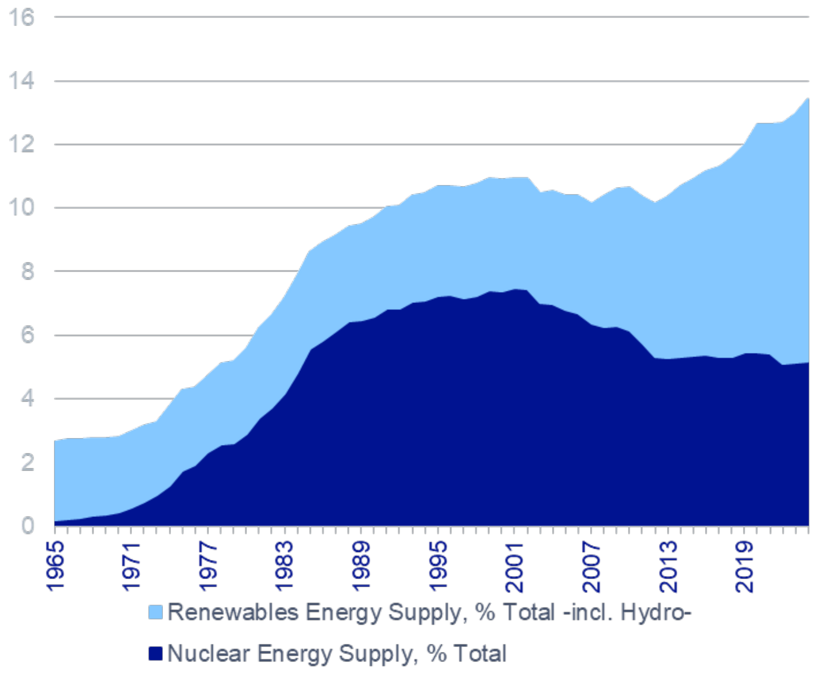
Crucially, it is not the spot price level that appears to drive structural diversification, but the perception of sustained supply risk. Price spikes may be temporary, but crisis episodes increase the expected probability of future disruptions, reshaping risk-adjusted returns and long-term investment incentives. **Geopolitical risk, therefore, operates through expectations and uncertainty, not only through contemporaneous price signals**.

Renewables follow a different trajectory. Their share remained stable until the early 2000s and accelerated only after 2005 (**Figure 2**), alongside falling solar and wind costs and renewed fossil volatility. The absence of renewable expansion after the sequence of crises during the 1970s indicates that geopolitical shocks alone are insufficient to trigger transition. Technological maturity and cost competitiveness are necessary conditions. This interpretation

2 :Importantly, it is not the level of spot oil prices per se that appears to drive structural diversification, but the perception of sustained vulnerability to supply disruptions. While price spikes are often temporary, crisis episodes raise the expected probability of future disruptions, altering the risk-adjusted return of alternative technologies.

aligns with models of directed technical change (Acemoglu et al., 2012), in which relative prices and policy signals redirect innovation toward substitute inputs. **When alternative technologies are sufficiently developed and scalable, elevated fossil risk accelerates their diffusion; when they are not, diversification remains limited**.

Figure 2. Energy Supply. Renewables and Nuclear. % Total



Source: BBVA Research with data from [Home | Statistical Review of World Energy]

More broadly, fossil risk regimes — rather than price levels alone — shape the pace and composition of transition. Heightened geopolitical risk raises the perceived vulnerability of fossil dependence. Policymakers respond by strengthening diversification and resilience strategies, consistent with modern concepts of energy security (Cherp & Jewell, 2014). Macroeconomic evidence shows that sudden supply disruptions can impose meaningful output costs, reinforcing incentives to reduce structural exposure (Bachmann et al., 2022). Financial markets also appear forward-looking, as fossil price movements are associated with higher valuations of renewable energy firms (Henriques & Sadorsky, 2008).

Taken together, geopolitical shocks affect energy transitions through three interconnected channels:

1. **Expectations Channel** - By increasing perceived fossil risk and macroeconomic uncertainty (Caldara & Iacoviello, 2022),
2. **Innovation Channel** - Higher relative fossil risk redirects innovation and capital toward substitute technologies, consistent with directed technical change (Acemoglu et al., 2012; Hassler et al.,2021), and
3. **Policy-Security Channe**l -Governments strengthen diversification, resilience, and strategic autonomy in response to heightened vulnerability (Cherp & Jewell, 2014).[3]

However, the speed and magnitude of adjustment depend critically on the technological frontier available at the time of the shock. Where substitutes are mature—as nuclear power was in the 1970s or renewables increasingly are today—geopolitical crises can accelerate structural diversification. Where substitutes are immature, fossil dependence persists despite elevated risk.

3: It is worth noting that If a geopolitical shock sharply raises energy prices, it could increase political pressure to temporarily relax certain climate policy instruments, such as the ETS carbon price, in order to reduce the short-term cost of using oil and gas. While this could ease energy costs in the short run, it would likely delay the deployment of low-carbon alternatives.

Box 1. Literature Review: Geopolitical Risk and Energy Diversification

Reference	Key Contribution
Caldara, D., & Iacoviello, M. (2022). "Measuring Geopolitical Risk." American Economic Review, 112(4), 1194–1225.	Develops a widely used news-based Geopolitical Risk (GPR) index to quantify adverse geopolitical events. Shows that higher geopolitical risk reduces investment, employment, and overall economic activity, while increasing downside risks and disaster probabilities. Provides a key empirical tool to link geopolitical crises to shifts in investment behavior and macroeconomic expectations.
Acemoglu, D., Aghion, P., Bursztyn, L., & Hémous, D. (2012). "The Environment and Directed Technical Change." American Economic Review, 102(1), 131–166.	Develops a growth model of directed technical change with "dirty" and "clean" inputs. Shows that relative prices and policy (e.g., carbon taxes and R&D subsidies) can redirect innovation toward clean technologies when inputs are sufficiently substitutable. Identifies optimal policy mixes, the costs of delay, and the conditions for shifting long-run innovation
Hassler, J., Krusell, P., & Olovsson, C. (2021). "Directed Technical Change as a Response to Natural Resource Scarcity." Journal of Political Economy, 129(11), 3039–3079.	Develops a quantitative macro model of input-saving technical change in response to rising scarcity of exhaustible resources. Shows that markets endogenously generate energy-saving innovation—accelerated after the 1970s oil shocks—and that long-run growth can persist despite higher resource costs through substitution and innovation.
Cherp, A., & Jewell, J. (2014). "The Concept of Energy Security: Beyond the Four As." Energy Policy, 75, 415–421.	Reconceptualizes energy security as low vulnerability to risks—defined by exposure and resilience—rather than the traditional "4 As" (availability, accessibility, affordability, acceptability). Emphasizes that resilience and diversification are central to managing geopolitical energy shocks
Grübler, A. (2012). "Energy Transitions Research: Insights and Cautionary Tales." Energy Policy, 50, 8–16.	Reviews historical energy transitions, showing they are long, multi-decadal processes driven by technology scale-up, demand shifts, and sustained innovation and policy. Emphasizes learning from past transitions to inform future low-carbon change.
Fouquet, R. (2010). "The Slow Search for Solutions: Lessons from Historical Energy Transitions." Energy Policy, 38(11), 6586–6596.	Reviews historical energy transitions across major services and shows that price and supply shocks accelerated shifts when viable substitutes were available.

Bachmann, R., et al. (2022). "What if? The Economic Effects for Germany of a Stop of Energy Imports from Russia." Economic Policy, 37(112), 731–773.	Quantifies Germany's vulnerability to a sudden stop in Russian energy imports using a multi-sector open-economy model. Shows that GDP could fall by 0.5–3% and that outcomes depend on substitution and reallocation—shifting incentives toward diversification and resilience.
Henriques, I., & Sadorsky, P. (2008). "Oil Prices and the Stock Prices of Alternative Energy Companies." Energy Economics, 30(3), 998–1010.	Shows that oil prices and technology stocks Granger-cause renewable energy stock prices, indicating that oil market movements help explain renewable sector valuations.

Source: BBVA Research

Highlights of the Week

Global	The Middle East and Global Energy Markets – Topics - IEA. The IEA is closely monitoring the situation in the Middle East, including the potential implications of any prolonged disruptions to energy flows through the Strait of Hormuz.
Global	Copper prices have hit record highs, but smelters face mounting strategic pressures. Copper markets enter uncharted territory as structural and short-term pressures converge.
España	Por un Pacto de Estado frente a la emergencia climática | Clima y Medio Ambiente | EL PAÍS. Luis Morales Carballo. El calentamiento global exige planificación anticipatoria, inversión sostenida y una gobernanza capaz de articular al Estado, las comunidades y los ayuntamientos en un mismo marco estratégico.

DISCLAIMER

The present document does not constitute an “Investment Recommendation”, as defined in Regulation (EU) No 596/2014 of the European Parliament and of the Council of 16 April 2014 on market abuse (“MAR”). In particular, this document does not constitute “Investment Research” nor “Marketing Material”, for the purposes of article 36 of the Regulation (EU) 2017/565 of 25 April 2016 supplementing Directive 2014/65/EU of the European Parliament and of the Council as regards organisational requirements and operating conditions for investment firms and defined terms for the purposes of that Directive (MIFID II).

Readers should be aware that under no circumstances should they base their investment decisions on the information contained in this document. Those persons or entities offering investment products to these potential investors are legally required to provide the information needed for them to take an appropriate investment decision.

This document has been prepared by BBVA Research Department. It is provided for information purposes only and expresses data or opinions regarding the date of issue of the report, prepared by BBVA or obtained from or based on sources we consider to be reliable, and have not been independently verified by BBVA. Therefore, BBVA offers no warranty, either express or implicit, regarding its accuracy, integrity or correctness.

This document and its contents are subject to changes without prior notice depending on variables such as the economic context or market fluctuations. BBVA is not responsible for updating these contents or for giving notice of such changes.

BBVA accepts no liability for any loss, direct or indirect, that may result from the use of this document or its contents.

This document and its contents do not constitute an offer, invitation or solicitation to purchase, divest or enter into any interest in financial assets or instruments. Neither shall this document nor its contents form the basis of any contract, commitment or decision of any kind.