Closure of the strait of Hormuz fuels Europe's natural gas trilemma

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Abstract

The Strait of Hormuz closure intensifies natural gas related energy risks for Europe, triggering a new set of energy trilemma. By contemplating several scenarios, we argue that natural gas supplier diversification after the 2022 energy crisis is unlikely to resolve underlying energy-system vulnerability, whereas structural shifts toward renewables is crucial.

On 28 February 2026, the United States and Israel launched Operation Epic Fury against Iran, triggering the largest disruption to global energy supply since the 1970s oil crisis. At the centre of the crisis is the Strait of Hormuz, a passage just 29 nautical miles (54 kilometres) wide at its narrowest point, yet one through which Qatar and the UAE ship almost 20 % of the world's liquefied natural gas (LNG) exports, with no alternative route available[1]. Iran's Islamic Revolutionary Guard Corps declared the Strait closed and has backed that declaration with force. This had a huge impact on the global economy and particularly Europe as a major importer of oil and gas. Diplomatic efforts to end the conflict remain unresolved. A temporary ceasefire was announced on 7 April 2026, with Pakistan mediating subsequent talks covering the Strait, Iran's nuclear programme, and sanctions relief. By early May, the two sides were discussing a one-page memorandum of understanding to end the war and open a 30-day negotiating window, but key sticking points, including the duration of any enrichment moratorium and control of the Strait, remain unresolved.

Natural gas remains central to Europe's energy dependency. Embedded in industrial processes, heating systems, and power markets, it cannot be replaced quickly. The infrastructure built to support that demand, including pipelines, liquefaction terminals, regasification facilities, and tanker fleets, has locked in dependencies that will not unwind on short timescales. The International Energy Agency projects that without stronger policy action, global gas demand will remain near current levels through 2030 and beyond.

This structural lock-in matters enormously when geopolitical shocks strike. The Russia–Ukraine conflict of 2022 forced Europe to rapidly rewire its gas supply chains, displacing Russian pipeline gas with seaborne liquefied natural gas from Qatar, the United States, and elsewhere. Europe succeeded

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in averting a physical shortage, but only at enormous economic cost: gas prices spiked to levels that triggered industrial shutdowns, pushed millions of households into energy poverty, and cost European governments hundreds of billions of euros in emergency support[2]. The response—a rapid pivot to global LNG markets—was understandable. Now, with the closure of the Strait of Hormuz, the market is sending a clearer signal: supplier diversification alone is not enough. Using sandbox scenario simulations, we show what diversification of suppliers can achieve, and where it falls short, amid escalating tensions around Hormuz. We argue that resilient, sustainable energy security in Europe requires structural upgrades to energy systems, anchored by a durable hedge that accelerates solid electrification through a growing share of renewable-led infrastructures.

Hormuz Closure: A Global LNG Shock

The significance of the Strait of Hormuz extends far beyond its physical dimensions. The corridor functions as the principal export gateway for Gulf hydrocarbon producers and remains deeply embedded in the architecture of global LNG and oil trade. Roughly one-quarter of global seaborne oil trade transits the Strait, alongside almost one-fifth of global LNG exports. Critically, Qatar and the UAE together account for almost 20% of global LNG exports, and 93% and 96% of their respective LNG shipments transit the Strait without an alternative route[1]. There is no pipeline bypass, no alternative maritime corridor capable of handling comparable volumes. When the Islamic Revolutionary Guard Corps declared the Strait closed and backed that declaration with force following the outbreak of conflict in late February 2026, the consequence was not a disruption to one supplier among many. It was the effective removal of a fifth of global LNG supply from the market (Figure 1A).

Europe's exposure to this shock is a direct consequence of choices made after 2022. Having rapidly displaced Russian pipeline gas, Europe became a major buyer in global LNG spot markets, capable of drawing cargoes away from Asia through price competition, but equally exposed to any tightening of global supply (Figure 1B). Before the Hormuz closure, European storage levels were already depleted, and the continent was planning record LNG imports in 2026 to rebuild buffers ahead of the following winter.

European gas imports (both pipeline and LNG) are now largely priced against TTF and equivalent spot benchmarks, which respond rapidly to supply disruptions, demand surges, and competition between regional buyers. This exposure predates the Hormuz crisis: the 2022 shock already demonstrated how tightly European prices track global LNG markets. When prices rise sharply in Europe, the effects propagate quickly through the economy: gas-fired power plants set electricity prices at the margin, so a doubling of gas prices translates into a substantial rise in electricity bills for households and businesses alike. Energy-intensive industries, such as chemicals, steel, glass, ceramics, fertilisers, face input cost increases that can tip the balance between profitable operation and shutdown. LNG price volatility is an intrinsic feature of these markets, not an anomaly.

Europe's LNG Vulnerability

The Hormuz closure has created the most severe test of European gas supply security since the 2022 energy crisis. Qatar Energy's announcement of force majeure following attacks on the Ras Laffan and Mesaieed industrial sites removed the world's second-largest LNG exporter from global markets at a moment of extraordinary tightness. Spot prices on European benchmarks more than doubled within days. The central question facing European policymakers and energy markets is not simply how high prices will go, but whether Europe can secure sufficient physical supply and for how long. Three scenarios, spanning a range of plausible outcomes, illuminate what is at stake.

Scenario 1: Partial reopening under continued disruption: Can a negotiated reopening stabilise markets, or does instability persist? Even if transit through the Strait resumes within one to two months, recent disruptions during negotiations suggest that flows are unlikely to return immediately to pre-crisis levels. Continued security risks, elevated insurance costs, and operational constraints at damaged liquefaction facilities—particularly at Ras Laffan—limit effective export capacity. Under this scenario, the price shock remains significant. Physical supply constraints do not bind, as global LNG flows can still be partially rerouted, but at higher cost and with reduced flexibility (Figure 2A). European LNG import prices stabilise at around 14.0 $/MMBtu, reflecting both constrained supply and persistent risk premia, exceeding pre-crisis levels and the range observed during periods of relative market stability (Figure 2B). The economic harm is real: higher energy bills, squeezed industrial margins, a drag on already fragile European economies, but it is finite and recoverable. The more pressing concern, even in this optimistic scenario, is what it reveals: that Europe's supply position before the crisis was already so stretched that even a brief disruption at one chokepoint produced immediate price stress.

Scenario 2: Strait closed for six months: What if the Strait remains closed for six months? A sustained closure fundamentally alters the economics of European gas supply. Without Qatari exports, global LNG markets face a prolonged period of tightness that no rapid rerouting can resolve. European LNG import prices approach 28.4 $/MMBtu, more than double the rapid-reopening scenario and well above the 2024 average of approximately 12.5 $/MMBtu. Europe faces sustained competition from Asian buyers, particularly the four major East Asian economies—China, Japan, South Korea, and Taiwan—that together accounted for roughly three-quarters of Asian LNG imports in 2025 and which are capable of outbidding European buyers for available spot cargoes. Physical supply does not run out in this scenario, but the price required to attract sufficient cargoes is high enough to inflict serious economic damage. Industrial users facing gas prices at these levels would face pressure to curtail production. Households already strained by the cost-of-living crisis would see energy bills rise again. Governments that spent hundreds of billions shielding consumers from the 2022 shock would face renewed pressure to intervene, with weakened fiscal positions to do so.

Scenario 3: Six-month closure plus US LNG export restrictions: What if the US restricts its own LNG exports? This is the scenario that most demands attention from European policymakers. The United States has become the marginal stabiliser of global LNG markets, accounting for a growing share of flexible spot supply. If domestic US gas prices rise sharply in response to a tightening global market, political pressure to restrict LNG exports to contain inflation at home is a plausible policy response[3]. A 15% reduction in US LNG export availability causes European import prices to escalate sharply to 54.9 $/MMBtu, exceeding the extreme levels recorded during the 2022 energy crisis. Crucially, this price escalation occurs even without a physical shortage in Europe. It is a pricing mechanism, not a tonnage constraint: as the largest marginal exporter, the US plays an outsized role in determining the global spot price against which European imports are benchmarked, and its partial withdrawal removes a key source of price discipline. Europe acting alone to reduce demand makes almost no difference in this scenario. A 10% reduction in European LNG demand—corresponding to roughly 2% of total EU gas consumption—moves prices from 54.9 $/MMBtu to 48.3 $/MMBtu. European demand reductions contribute both to lowering import volumes and to easing global price pressure. A 10% reduction in European demand lowers prices by approximately 12.02%, corresponding to an implied elasticity of -0.83. While empirical estimates for LNG demand elasticities under crisis conditions remain scarce, this value is broadly consistent with the literature. For example, Burke & Yang[4] report a long-run natural gas demand elasticity of approximately -1.25 across more than 40 countries. Importantly, their analysis reflects long-run responses over multiple years, whereas analysis here examines short-run market adjustments during an acute supply shock, for which lower elasticities would be expected. At the same time, prices remain extremely elevated even under significant European demand-side measures, reinforcing the central conclusion that unilateral action alone is insufficient to stabilise markets under a severe global supply disruption. Only coordinated

global demand reduction across all major importing regions simultaneously produces a meaningful price response, bringing prices down to 37.2 $/MMBtu (Figure 2C). The implication is clear: Although Europe can partially mitigate gas price pressures through a coordinated gas savings strategy, it cannot stabilise global LNG markets through unilateral action alone.

Post-Hormuz Redefinition of Europe's Energy Trilemma

The Hormuz crisis is not an isolated event. It is the third major disruption to European gas supply security in four years, following the 2022 pipeline shock and the 2023–24 Red Sea shipping disruptions. Each has exposed the same underlying vulnerability: Europe's energy system remains structurally dependent on fossil fuel supply chains that traverse contested geographies and are subject to geopolitical risks it cannot control. These are not just short-term disruptions. We face the prospect of sustained price volatility driven by declining upstream investment, fragile transport and storage infrastructure, and recurring geopolitical shocks. Left unaddressed, these compounded risks could produce the worst-case outcome: concurrent high prices and absolute supply shortfalls, with severe consequences for energy security and economic stability.

The scenario analysis reveals a fundamental shift in Europe's energy trilemma (Figure 3). The central constraint is no longer physical scarcity, but price formation in a tightly coupled global LNG market. Even under severe disruption, Europe does not run out of gas. Instead, prices escalate to levels that impose economic damage comparable to physical shortages. Energy security, in this context, cannot be defined solely as access to supply, but must incorporate exposure to extreme price volatility driven by marginal suppliers and global competition.

This redefines the trade-offs between security, sustainability, and equity. Securing LNG supply through price competition ensures physical availability but exacerbates affordability pressures, particularly for households and energy-intensive industries. At the same time, crisis-driven reliance on global LNG markets risks delaying structural decarbonisation by reinforcing dependence on fossil fuel infrastructure. Equity is no longer a purely domestic concern: European prices are determined in global markets where unilateral demand reductions alone have limited ability to stabilise outcomes. Nevertheless, European-scale demand reductions still contribute to lowering import volumes and easing global price pressures, thereby benefiting both European and international consumers. However, even substantial European demand-side measures leave prices at historically elevated levels, underscoring the importance of international coordination for an effective joint demand-response strategy. The result is a trilemma that is increasingly global in nature, where national policy tools alone are insufficient to stabilise outcomes.

The scenarios further highlight the outsised role of marginal suppliers. A partial withdrawal of US LNG exports, even without physical scarcity, triggers extreme price escalation, demonstrating that price stability depends critically on the behaviour of a small number of flexible exporters. This introduces a new dimension of vulnerability: exposure not only to supply disruptions at chokepoints such as the *Strait of Hormuz*, but also to policy decisions in exporting countries that shape global price formation.

Addressing this reconfigured trilemma requires a shift in policy focus. Accelerating the energy transition is therefore not just a climate imperative. It is the most direct and durable response to the security risks this crisis has exposed. Renewable electricity deployment reduces gas demand in power generation, where fuel-switching is technically straightforward and commercially competitive. Electrification of heating through heat pumps and district heating networks directly displaces gas in buildings, which represent the largest single use of gas in most European economies. Industrial electrification addresses the sectors where gas has long been treated as irreplaceable. Energy efficiency measures across all sectors reduce the total energy demand that any supply chain must meet. The technologies are available. Deployment costs have fallen dramatically. The economic case for acceleration, already compelling on climate grounds, is

now overwhelming on security and affordability grounds too.

In a post-Hormuz world, energy security in Europe is shaped less by whether gas arrives, but more by what global LNG price swings decide. Europe's gas problem is no longer just about whether natural gas arrives, it's about what it costs when global LNG markets move. The only reliable hedge against high gas prices is less gas. Every year of delay in accelerating electrification, storage, and efficiency is a year of continued exposure to the next Hormuz, the next pipeline sabotage, the next force majeure declaration from the world's largest LNG exporter. The events of 2026 have made the stakes unmistakably clear.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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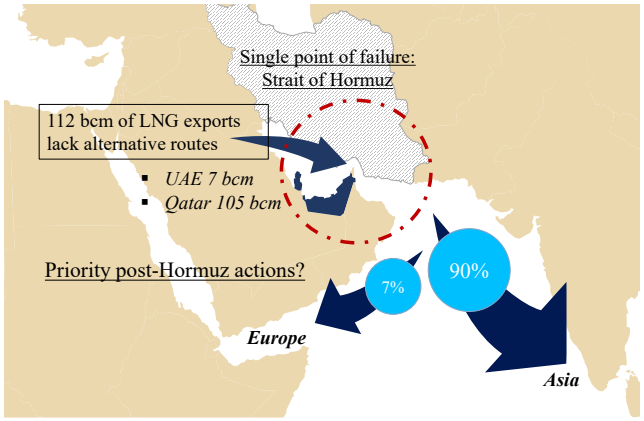

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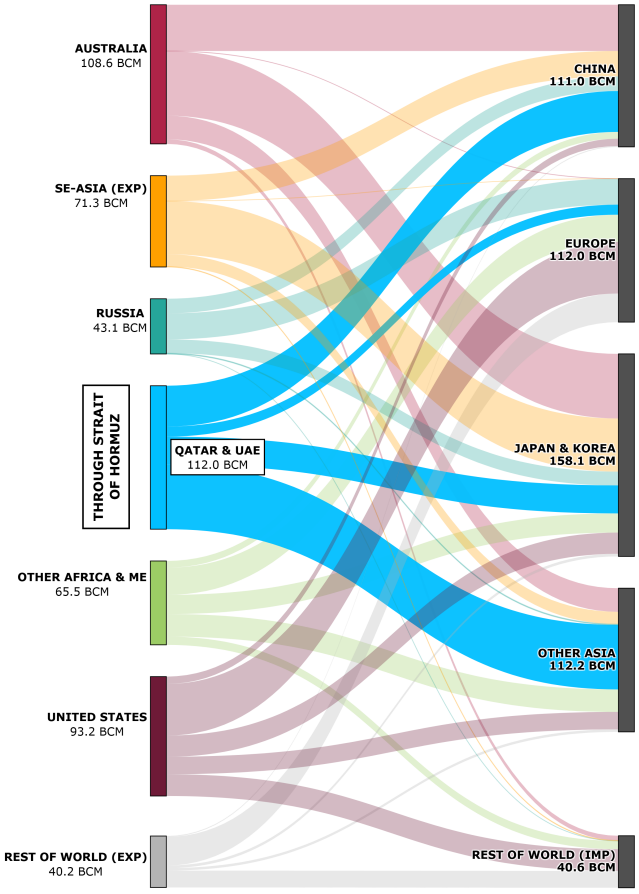

(B)

Figure 1: The Strait of Hormuz as a critical chokepoint in global LNG trade. Supply disruptions disproportionately affect Asian importers but have systemic consequences for European gas markets through global price transmission and competition for flexible LNG cargoes. (A) LNG exports via the the Strait of Hormuz—of which the vast majority are destined to Asia—are restricted. Source: IEA[1]. (B) Global LNG trade flows in 2024, illustrating the scale and geographic distribution of exports transiting the Strait of Hormuz. Although Europe receives a smaller direct share of these LNG flows than Asia, European gas markets remain highly exposed through global competition for diverted cargoes, amplifying price volatility and supply security risks across the EU. Source: Based on reported values from UN Comtrade[5], complemented by estimates for unreported export volumes.

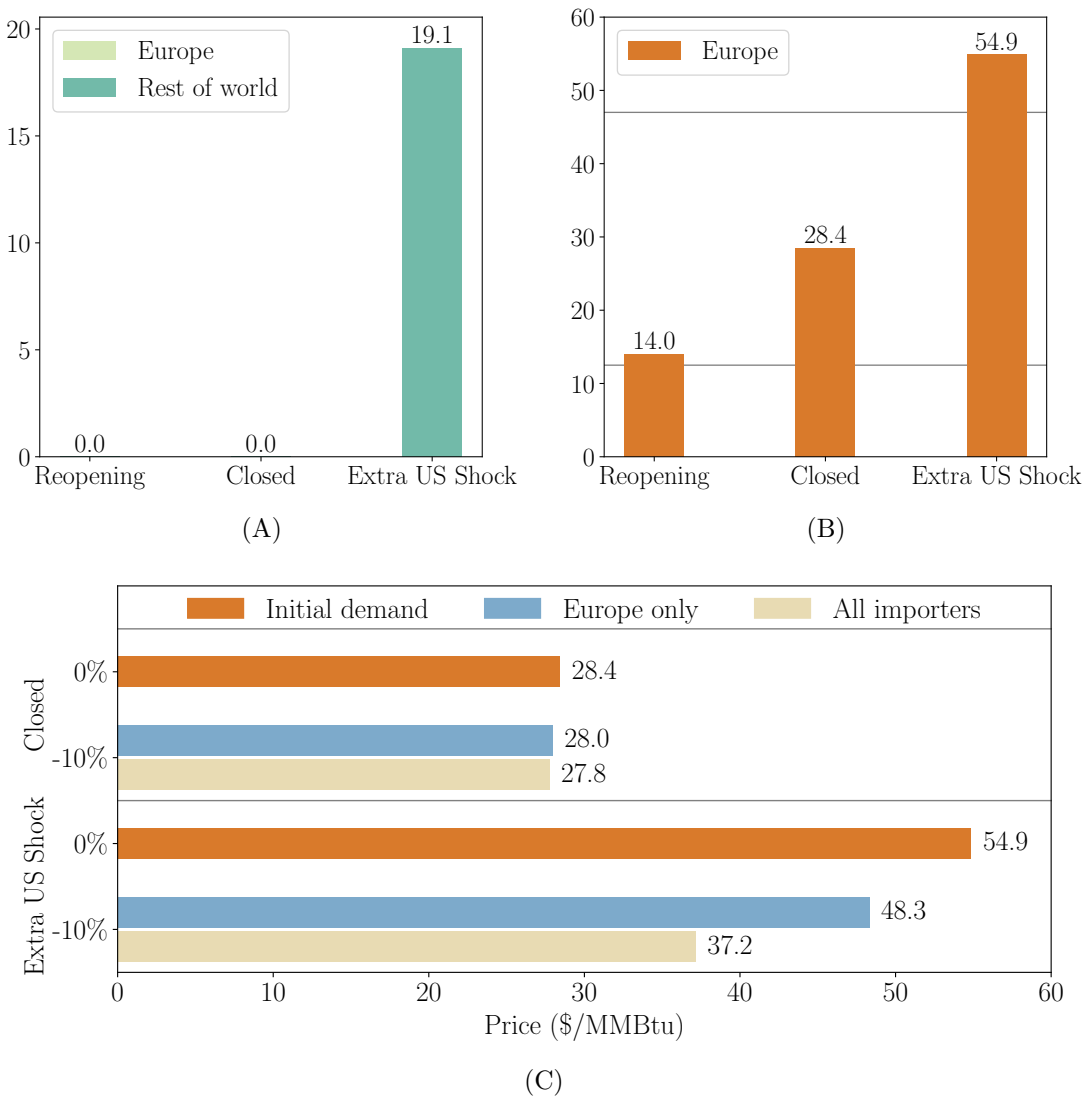

Figure 2: Impacts of LNG supply disruptions and policy responses across scenarios. (A) No physical shortages emerge in Europe, but significant unmet demand arises in Asia under severe supply constraints. (B) The corresponding increase in European LNG import prices, exceeding levels observed during the 2022 energy crisis under compounded shocks. Panel (c) illustrates that unilateral European demand reductions provide moderate relief from LNG price pressures, whereas coordinated global demand responses generate substantially stronger price reductions. The analysis is based on the linear programming model introduced in [6], which minimizes total LNG supply costs defined as delivered ex-ship LNG costs across a global trade network. The model includes constraints on liquefaction capacities at exporting countries, regasification capacities at importing regions, bilateral trade flows, shipping capacities, and demand satisfaction, while allowing for endogenous price formation via shadow prices of demand constraints. To focus on short-term market flexibility, the model is calibrated to uncontracted LNG volumes by subtracting long-term contracted flows from both liquefaction and regasification capacities. Baseline demand and infrastructure capacities are derived from publicly available LNG market data for the most recent pre-crisis year. Demand reductions are implemented as exogenous downward adjustments to regional LNG demand levels. The magnitude of supply shocks and demand adjustments is chosen to reflect historically observed disruptions and policy responses during the 2022 energy crisis. Source: Zwickl-Bernhard & Neumann [6]; scenario analysis by authors.

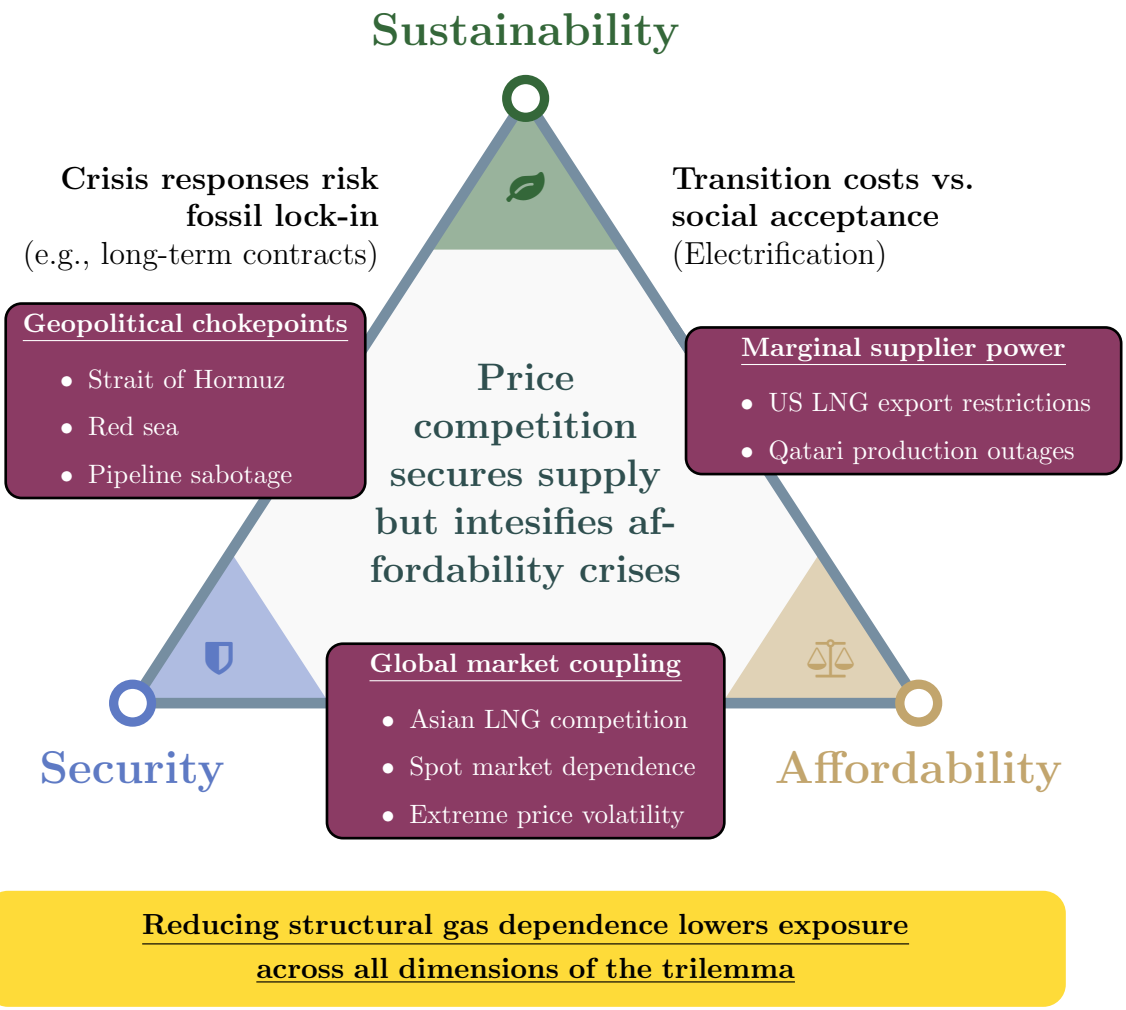

Figure 3: Post-Hormuz redefinition of Europe's LNG energy trilemma. The scenario analysis shows that Europe's primary vulnerability under severe LNG disruptions is no longer physical gas scarcity, but exposure to extreme price volatility in tightly coupled global LNG markets. External shocks—including geopolitical chokepoints, marginal supplier behaviour, and global LNG competition—intensify trade-offs between energy security, affordability, and decarbonisation. In this reconfigured trilemma, national policy tools alone are insufficient to stabilise outcomes, highlighting the need for coordinated demand reduction, accelerated electrification, and structural reductions in gas dependence.